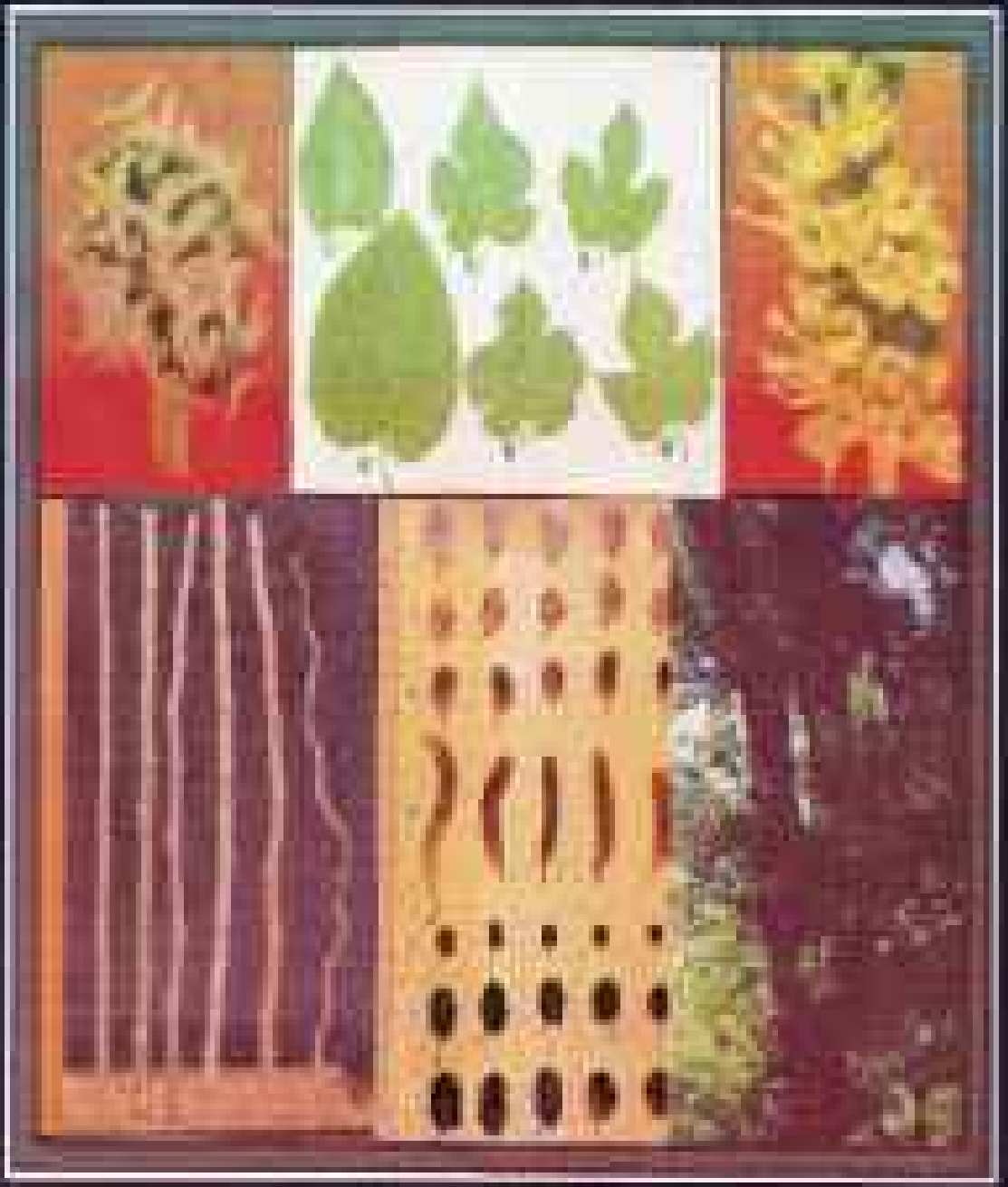
Genetic resources of mulberry and utilisation



K. BENGUPTA & T. R. DANDIN

CSR&TI MYSORE

Genetic Resources of Mulberry and Utilisation

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— K. Sangeeth

S. B. Hande

PREFACE

[illegible] which will be of great use to [illegible] in particular and the state system [illegible] in general. We owe [illegible] to [illegible] and his colleagues who have worked hard in organizing the workshop and [illegible] its proceedings. In a personal sense, I am happy to be associated with this [illegible], even though I was not able to participate in the Workshop.

Prof. V. L. Chopra
Hon'ble Minister-in-charge, Centre and
Vice-Chairman, Board of Trustees,
Lokayukta Award for Work
Gandhi Memorial

March 21, 1969

[illegible]

[illegible] co-ordination among [illegible] is one of the important matters to be considered.

I am extremely happy to be here and benefit by your views. The Societies from different organisations have assembled to discuss for the present issue. I assure my full support and I want to make clear that Railway is not a competitor. Always it serves a Complete but also not provide any. We can spend any amount of time for such a important issue. I once again request to you all to have meaningful discussions and hope that the workshop will contribute richly for the cause of Complete construction.

V. Bhaskaramurthy, I.A.S.
Member Secretary
Central Silk Board,
Bangalore

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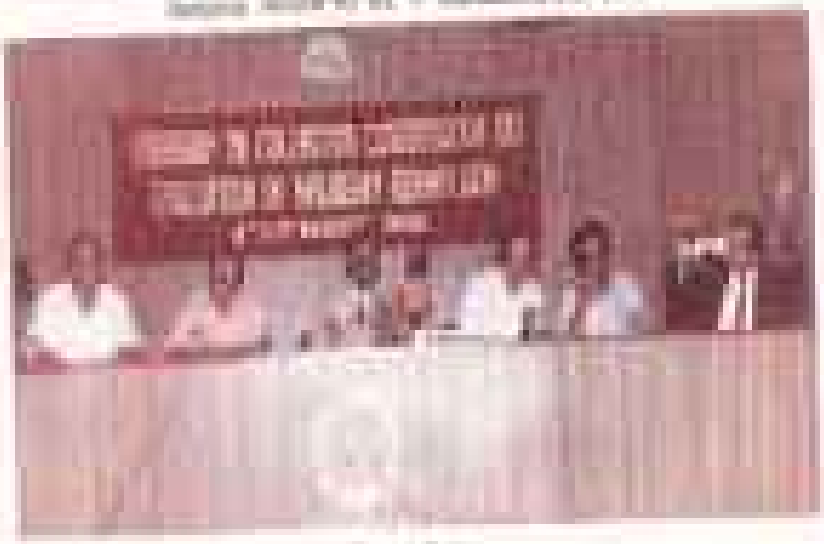

KEYNOTE ADDRESS

GERM PLASM MAINTENANCE — ITS SIGNIFICANCE AND METHODS

A. [illegible]
Director
Central Agricultural Research and Training Institute, Myanmar

Germ plasm is already defined by many [illegible] of genetic diversity accumulated through years of evolution under domestication and natural selection. [illegible]

Principally, the genetic resources in plants come from:

(a) the wild species and [illegible] as primary source of diversity,

(b) [illegible] as the secondary source of diversity,

(c) the diversity [illegible] plant breeding programmes including [illegible] selection etc.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

genetic and other characteristics (e.g., maturity, disease and pest resistance, etc.) of the collected materials, and cataloguing. Before conservation can start, regions should be identified and ecotypes collected. These should be followed by characterization and cataloguing. Further, the seed accessions should be evaluated (by world users) so that one knows the genetic diversity of the material. Following this, further collection, cataloguing and conservation in other areas of diversity. A long storage and renewal system has to be developed for this. A programme has also to be drawn up for the collection of wild or weedy species.

Incidentally, the plant explorer is to visit those collecting, cataloguing and conservation of all the seed in case a few aspects is impossible. Even, if only the crop plants are taken, the global genetic resources comprise thousands of local and even wilder types from the whole of nature comprising all the wild, native and weedy relatives as well as the cultivated and exotic ones. It is, then, of utmost importance that instead of thinking of having just a few centres for collection of various crops, there should be global (internationally designated) centres for each crop assigned by a network of collaborators in various countries and continents.

While locating the global or intercontinentally designated centres, one should primarily keep in mind the place of origin of a crop and its large scale distribution. Where could the material for the germplasm collection and conservation for the crop and can be situated that is, the time and the [illegible] region where more than 70% of the cultivars (natural and domesticated) occur and production takes place. Similarly for wheat, what could be a better place than the Armenian region and her Arid and Semi-arid people like Guatemala region linking the Inter-African Peninsula.

For millets, (Korea and J. the Himalayan Sub-Himalayan and the India-China regions have been the major areas of diversity with a large number of primitive and wild cultivars and hybrids, wild relatives, weedy forms and related genera distributed (some times) [illegible] which has its distribution in South America. All the other important species of Africa have their origin and distribution in the Himalayan/Sub-Himalayan and the India-China regions extending in the East up to Japan (Australia is not known to have any millet) species endemic to the region and to the West up to Europe through the Central and West Asia. This being the position, there could hardly be an area where the germplasm centre for millets could be located other than in the Himalayan/Sub-Himalayan or the India-China regions.

Having discussed the importance and need for the establishment of germplasm (gene pool) centres and their possible locations, let us have a look at the methods that are required to be followed for such a programme.

The main programme of a gene pool centre should necessarily include the following:

5) Exploration and Collection

Explorations can be of two types:

(i) Region specific multi-crop explorations

(ii) Crop specific explorations

The first one requires extensive studies covering the entire flora of a region. This can better be taken up by say, the Botanical Survey/Natural History Society of a country whose mandate is to cover the entire flora of the country. The other one, the one in question, may congregate explorations but is to be preceded by a general exploration. After a preliminary multi-crop exploration is based on the general information now already available, one should concentrate on the second viz., the crop specific explorations of the material (grove, species and others). During explored, the collection should start.

Explorations and collections should involve collectors and co-operative efforts both at the international (through IBPGR) as well as national (NBPGR) levels. A network of collection centres are required to be established and explorations missions planned and organised with target areas and target crops. A scientist should primarily oversee specific crop explorations. (Exp. Sunflower field in Rajasthan) objective can good) collected.

Though exploration and collection must be a continuous activity, a great amount of discretion and discrimination is needed. The necessary base collection should be planned on preferences of the current collections maintained. All particulars have to be noted carefully & these/landraces should be identified from earlier information, the areas for search for scientific and concerted efforts made to collect stocks preferably with roots. Such identified collections can prove to be valuable additions to a germplasm bank. This screening, however, does not, in any way, discredit or relegate to the background the good or existing core collections in others and where data are available, key ( ) the balance between existing identified and recently collections is required, mainly to keep the germplasm activity within bounds.

Practical methods of collection should be followed and the material also field conditions and history of phenological, ecological, SAS, habitat and other specified should be recorded on the label and passport markers or further studies.

6) Characterisation, Cataloguing and Evaluation

Characterisation of the material is of utmost importance since the great the idea whether the material collected is a new one and if not, how far it differs from those already collected. The characterisation should include morphologi-

old, original, embryological, anatomical, physiological and biochemical facts.

The material should then be catalogued with the accession or museum numbers.

Cataloguing has to be planned for accessibility — physical, psychological, as well as chemical, to ensure the required types of information are supplied to different users/readers for every visit and discovery. The publication should be regular and of the common pattern.

Suitable exhibits need to be developed before any effort is wasted on the publicity for the programme. A list of descriptors to describe the properties which it is hoped to record and to be developed should be compiled, standards for easy flow of information and documentation of programmes from any part of the world.

b) Conservation

Once a material has been identified as in need of having some special attention, it is required to be conserved. Conservation can be defined by grouping or dividing the duties, including an active physical one, but also regarded as 'passive and preventive'. Cleaning of the object is one most valid for classification of conservation of objects.

Various conditions and treatment methods of conservation of exhibits through each cleaning and other methods have been studied. Studies, other than materials that have not and can also be conserved over through these cultures, encapsulation and impregnation. All these methods should be explored to have the most effective and economic conservation. Besides conservation by individual units, conservation centres should be developed.

Research on the methods of evaluating original materials, the complications in the handling methods of preservation and to the concerned in which the principles methods are to be assessed and treatment objectives.

While conserving emphasis such is to be placed on planning departments and taking decisions to maintain groups of models (or one of the, to obtain continued to these lines of organization, as principles conditions. Criteria for selecting or also creating environment parameters, conditions, need to be studied and investigated. This is all knowledge and to preservation, to observing the number of groups, needs to be maintained and given up of records.

c) Preservation, Exchange and Co-ordinated Work

Co-operative principles and co-ordination systems for complete evidence to

development proposals or introduction and exchange of material from one large scale physiographical region and environment. This has to be followed by selection through an evaluation study on the selected and recommended breeds. These are chosen not only to satisfy the peripheral but also their essential attributes like weight gain, fattening ability with relative agricultural value are being considered by several international institutes under the Consultative Group on International Agricultural Research and such study should be conducted with other major plan. Similarly, national programmes of trade should be drawn up and coordinated.

Emphasis should be placed on collecting information on additional inputs should also be considered for evaluating utilization. Though the concept of utility value is relative, it is difficult, a basic to agricultural crops to get an idea of these values. A way to overcome this also utility value is determine the price or economic range that where, how well neighbors where price models have been made in arriving at prices etc. Apply the information could not the economic utilization and conversion, to analyse a case of scarce varieties that must be produced in changing economic circumstances. Hence, it is very essential that the participants discuss in small and broad who essential questions from a real village communities on their visits. Though it is a difficult job (or, it may) be necessary to study the varieties of the germplasm diseases encouraged and beneficial attributes.

3) Plant Genetics

Connected with introduction and exchange is the question of acclimatization. A plant before introduction must be thoroughly checked for disease and pest resistance and only after its complete test trace or diseases disease and pest free be introduced in the protected land. Researches or experiments have led to the development of various techniques some to indicate artificial selection successful crops grown in exceptionally favourable. It is also preferable to have a pest safety isolation scheme for foreign materials on their borders. Today, researches from one region to the other on being taken into germplasm are not to directly use of the disease resistant of the material. Even in the indigenous materials a check should be made of disease care to pass before being transferred from one region to the other or being used for the germplasm.

4) Systematics and Information services

A strong documentation and information service is essential in a germplasm centre.

(i) It prepares the standard descriptive sheets, manuals, for easy and uniform

(b) to document and preserve all the data available which should be updated from time to time during the new varieties and eliminating those which by evolution become inadequate genetic changes and have lost the characters for which they were conserved;

(c) to prepare computerized data of all the material available with their characters in an easily retrievable form like the national package DARE based on the barcode system.

A museum and a herbarium containing type specimens should be developed for taxonomical study.

A library with books and literature on plant collection and conservation including germplasm distribution should be developed. Information bulletins on the material available in a centre and its renewal received should be brought out periodically.

7) Training in Collection and Conservation of Germplasm Material

Exploration, collection, characterization, cataloguing and conservation of germplasm being considered important, scientists and technicians are required to be trained in the various processes involved. Thus it is very essential that a germplasm conservation centre keeps a programme of training in all these aspects both for its own people and those coming from the field and elsewhere.

Realizing the importance of germ plasm conservation, during the XVI International Congress of Genetics held at Toronto, Canada during 20-27th August, 1988, a five weeks was presented on methods of germplasm conservation, maintenance of population structure, emergence of genetic erosion. Papers which are represented in coming pages.

CONCLUSION

In conclusion it can only be said that adequate financial support, man hours, characterization, cataloguing and conservation of germplasm material are either as due to known conservation area as the primary centres of origin many of them will die to be lost and lost for ever. There is a high time that they are identified, collected and conserved. Along with collection and conservation, documentation and evaluation particularly at the international level should also be taken up, but while doing so the importance of local collection should not be lost sight of.

Further, conservation without utilization becomes a one way traffic leading to a blind end. Thus along with collection and conservation should also come evaluation and utilization involving breeding of new breeding programmes

and failure of new varieties leading to well-being and economic advancement of farmers. Such well-being should again not be confined to a region but instead based on that the benefit of such a programme can reach the largest number of countries and people.

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IMPROVEMENT AND UTILIZATION OF MULBERRY GERMPLASM

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With the advent of new varieties the major breakthrough in yield improvement in crops has come through in the utilization of germplasm. The green revolution was basically due to the high utilization of our collection from the [illegible] gene collection and selections in breeding high yielding variety of wheat. This has resulted in doubling of the yield in wheat all over the world. Even in the case of Paddy, almost all the modern varieties of paddy has been developed through the utilization of dwarf and high fertility responsive genotype Dee-geo-woo-gen. The yields of Ragi in Karnataka were low about [illegible] compared to the yields obtained 30 years ago. This again is the result of introduction of African germplasm and selections.

In case of potato and sugarcane, earlier also such breakthrough have been made. When potato was introduced in Europe, it became the major staple crop of that continent and succumbed to late and early blight. Several expeditions were sent to collect resistant types in South America, which is the centre of origin of potato and very soon the crop was brought back under cultivation. A similar situation came to the sugarcane industry in India in 1918 when important Indian varieties were lost to disease. Dr. Venkatraman utilized the Saccharum spontaneum, a wild cane and developed several variable varieties as well as [illegible] made India an important sugarcane producing country in the world.

I am very happy to note that large collection of germplasm has been made in Mulberry and related species and maintained at CSB and CSR&TI, Mysore. Fortunately, mulberry seems to originate from China, and lot of variability is present in the Sub-Himalayan range from Kashmir to Assam. This makes it imperative to collect the germplasm and evaluate it properly for different regions in India.

There are five major steps in enrichment of germplasm: (1) Collection, (2) Maintenance, (3) Documentation, (4) Evaluation, and (5) Utilization in developing suitable varieties.

Collection

With regard to collection, it may be necessary to take stock of the germplasm, as it might be possible that all the collection could have come from the same geographic tracts. If the base of the genotypes is available from the collection already made this may be examined and expeditions need to be made for other

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GEOGRAPHIC DISTRIBUTION AND EVOLUTION OF THE GENUS *MORUS* L. (MORACEAE)

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[Linnaeus (1753)] established the genus *Morus* with 3 species viz., *M. alba*, *M. nigra*, *M. rubra*. *M. tatarica* (L.) Loudon and *M. australis* Poir. have 2 species each later considered as synonyms of these genera. Nowadays, after a large number of new species were described and named from many countries from different parts of the world, only approximately about 10 species are accepted. Today, Morus comprises of about 68 morphological species and several cultivars of mulberry and hybrids. Because the identity and nomenclature of the species of *Morus* is very confusing, the number of species growing all the world have fluctuated. Koidz. Morus (1931) recognizes only three species under the genus *Morus*. As for Rehder (1940) species (viz. Koidz. Rafinesque) have been described under the genus *Morus*, 10 more of them have been retained as questionable or as varieties or even mentioned as doubtful species (viz., Pursh), Bureau-Schneid., Gaudich. Millspaugh, Blanco, Pampanini, Blanco and Merrill.). Koidzumi (1917, 1931) and Hotta (1969, 1970) have attempted to critically identify and reclassify the species of *Morus* with more emphasis on Asiatic species but their works are restricted to a limited number of species. The species of *Morus*, being highly heterozygous and an advanced plant genus, produce a number of natural hybrids with many intermediate forms which create difficulties with regard to their correct identification. In order to correctly record the number of species growing in the world there is an urgent need for the revision or reclassifying of the genus on a worldwide basis. Of about 68 species to be recognized in the genus, a greater number occur in Asia especially in China and Japan, but the commercial varieties is also rich in the *Morus* species. The genus is poorly represented in Africa, Europe and Middle East, while it is unrepresented in Australia.

In Asia, 24 species are represented in China, 10 species (including hybrid species or cultivars) in Japan, 6 in Korea, 4 each in Taiwan and India, 3 each in Burma and Indonesia, 2 each in Thailand, Vietnam and Afghanistan and 1 each in Arabia, Oman and Mongol. In the Americas, out of 21 species, as many as 14 species are found in the North American and the remaining 7 species in Central and South America. From the distribution pattern of the species of *Morus* it is clear that there is a great diversity of the species in the Asia-Japanese

region of the Old World and the Rocky mountain northwest to Alaska of continental America in the New World (Fig. 1).

Geographical distribution of the Genus Mimus L.

(1) a remarkably or even a high percentage of endemism in Mimus species. Peru (no table 1) is evident that Chile has 12 endemic species out of 21. Ecuador has 14 out of 19, while North America has 9 out of 14 species. However, there is every possibility that the number of endemic species may be reduced when the genus is revised on a world basis.

Explosion. The significance of wild species in crop improvement programmes has been much evoked in recent years and the literature and germplasm collections have yielded highly rich for genetic of diversity of crop plants for augmenting genetic variability of economic importance. Portugal (2001) is the only successfully advanced country where wild mulberry genetic resources are still available. It is based on isolation of the primitive habitat of wild species in their ecological environment programmes and the quality available data on Mimus from their wild explored lists. Exploration of wild mulberries in China still unknown out records, Chiang (1981) has identified 8 new species and 3 variety. In Asia, although attempts have been made to collect the wild populations of Mimus, they are not systematic and restricted to only one area of Asia. A systematic approach to check and collect the wild germplasm material from Himalaya where the Mimus species are reported should be started as a priority programme. It may also be suggested that joint wild resource explorations in the neighbouring areas in Asia should be taken up initially and later extended to Australia and other areas. The expeditions assessment of exports of germplasm, genetics and breeding and collections of Mimus

species to be considered through an International Germplasm Improvement Programme. In such collaborative programmes mulberry germplasm from different agro-climatic conditions should be developed for researchers on laboratory, some improvement crossings of materials and other plant species which have relevance to germplasm improvement. The materials should be carefully screened under strict quarantine procedures especially for those introduced from outside the country to avoid any possible spread of diseases, diseases and pests. Such programmes and collections not only help in increasing the genetic potential of wild mulberry resources but will also help in correct identification of species of Morus. The germplasm of American Morus species has not been fully explored and utilized by any of the economically advanced countries. Even the species from the tropical areas in Africa, Middle East, Thailand and Indonesia need to be explored and properly exploited.

Presently there is an immediate need for a systematic survey and collection of wild species of Morus, primitive local races and obsolete varieties from all mulberry rich and economically advanced countries of the world. This is to be undertaken on a war footing basis as there is a great threat to the wild populations due to over-exploitation, deforestation, changing land use pattern and climatic conditions. This is especially true for tropical countries where deforestation is going on at an alarming rate.

A critical taxonomic study of the germplasm collections is very important to correctly identify and characterize the species, to know the interspecific relationship and the distribution patterns of the species. Finally a systematic collection of the germplasm collection for desirable characters and their potentiality in improvement programmes should be undertaken. A work entitled mulberry descriptor (Dandin and Jolly, 1986) has been prepared by Central Sericultural Research and Training Institute, Mysore, considering the main traits of characters essential for mulberry improvement programmes. This descriptor should be fully utilized to characterize all the germplasm collections. The descriptor data should be documented and recorded on computers for easily retrieval and utilization.

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Table 1 [illegible] species of the Tyson River [illegible]

Name of the country	Total number of species	Total number of endemic species
ASIA		
1. China	24	17
2. India	4	1
3. Indonesia	2	2
4. Japan	10	6
5. Korea	3	1
6. Taiwan	4	3
7. Thailand	2	0
AMERICAS		
1. Argentina	1	0
2. Colombia	3	1
3. Mexico	7	5
4. Peru	1	1
5. USA	11	8

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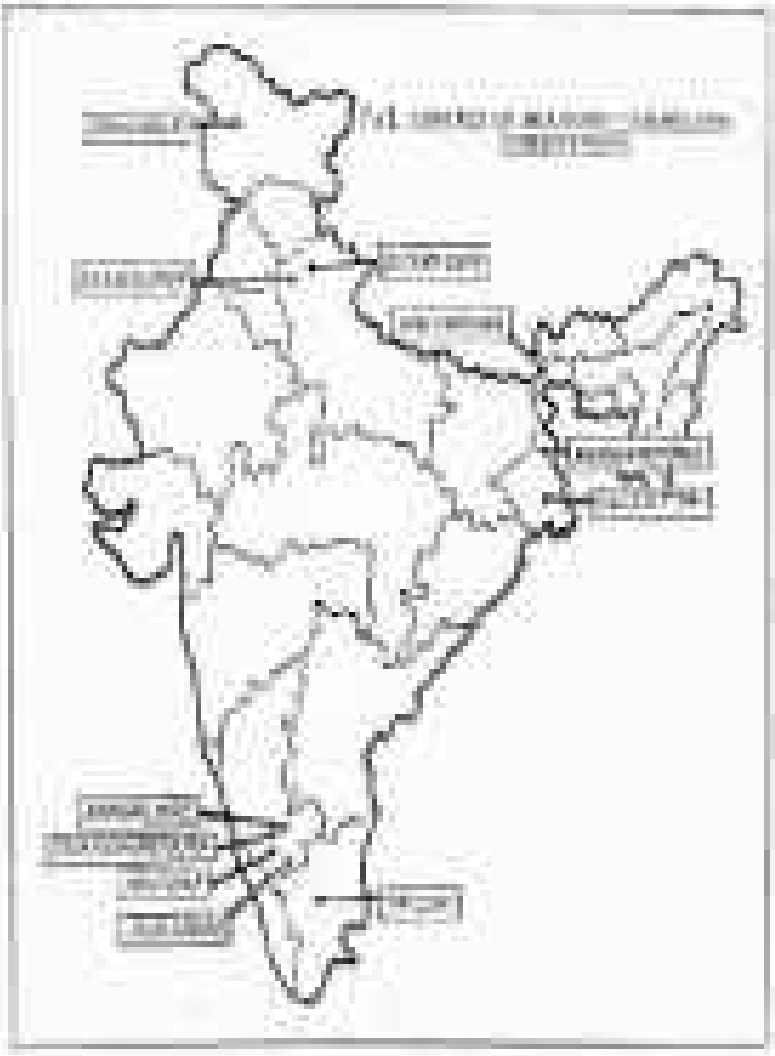
Technology is the basis of improvement and prosperity especially for some kind of agricultural products in a particular place or a country. Knowledge of the available genotype variability is the pre-requisite for any breeding programme and it becomes necessary in any plant or animal breeder to scientific investigation and observation the available genotypes of a particular crop or stock in hand. The need of the commercially important crops, germplasm centres have been established and maintained by organizations working on specific crops. In addition, National organizations like NBPGR serve a good deal of regional centres for coordinating the programme. International Board of Plant Genetic Resources is an international coordinating body working in collection, conservation and distribution of germplasm of crops in general, and is also responsible for exchange of vital germplasm among various countries.

For centuries, a wide local variety of plantain, and yams have been established by different communities who have taken up cultivation commercially and traditionally. Central Silk Board a premier organization promoting the growth and development of sericulture industry has played a major role in this direction. Prior to the establishment of Central Silk Board, the mulberry sericulture existed in West Bengal, Karnataka and Jammu and Kashmir where sericulture was mostly practised since 17th century were considering the importance of improved varieties of mulberry.

Prior to 1950's some individual efforts have been made to introduce the varieties of mulberry from China, Japan and USSR. Among the early introductions, Department of Sericulture, Government of Karnataka had introduced Kanva 2, Mysore local, Goshoerai and multivoltine grid materials. Subsequently these varieties were also introduced in Jammu and Kashmir from where called Chakravarthi became popular. Later Central Silk Board established its research institutes one at Berhampore and another at Mysore. Large amount of material was introduced from Japan, France, Italy, USSR by raising seedlings.

At present mulberry germplasm is being maintained at various places. The wildlife source, multivoltine, polyvoltine and bivoltine(CSR) like Anaimp 2, Kanva 2, CSR27, Mysore local, Berhampore white local etc. germplasm are taken through



The IUCN Red List (2011) enumerates 1,141 endemic and near endemic species of plants in India. Out of these, 1,021 endemic and 1,127 near endemic species are represented in CBHTE. Moreover, in addition to 1,021 IUCN (2011) Red-listed species, 1,141 species have been identified associated to monsoonal, precipitation and countryside ecosystems and the same is given in Table 1. Among the endemic species diversity of these are trees (upper 1/2), followed by herbs (1/3) and shrubs (1/6). Approximate grouping shows that about 1/3 of these species is IUCN, while a dominant species richness for other red-listing is unrecognized, a most important region. It belongs to IUCN, endangered, a major species and divided in temperate regions of China, Central and South America, 1/3 belong to IUCN endangered important species of botanical significance. 1 species belong to IUCN, Gujarat, a three endangered species.

Most of the indigenous resources are found throughout, but also concentrated in 3 to 4 and Orissa Kendujhar regions of Madhya Pra... Among 107 indigenous species of CBHTE Bhopal, 60 are found from Western, 11 from E & E, and 13 endemic from Bhopal Region. The exact number of indigenous resources is complicated in local collections. Plate 3.1 illustrates, peripheral flora and endemic.

Endemic species

The Indian subcontinent (Subtropical) belong to 30 ..., 10 ... mammals, 144 Lemurian, 14 Amphibians, 87 Turtle and other type important species has still living need are 40 continuous, 14 endemic and 87 rapid. 87 indigenous species of CBHTE Bhopal, are not found from Western. 11 from E & E, and 13 endemic from Bhopal Region. The exact number of indigenous resources is complicated in local collections. Plate 3.1 illustrates, peripheral flora and endemic.

In addition to the mentioned, fishing economic or natural resources, some folks of Bhopal's State 1 & 6, in Ashoka agro the recreation of 1000 from a rich flora of Mammalian and about 4 species are found concentrated in this region (Fig. 3). These plants are in the mentioned Municipality and of type of mammal evaluate in these areas agro by subjected and commercial. Plants in this direction are studied as early as 1927 and Indian areas have evaluated by a team of scientists of CBHTE, Bhopal. Many these 150 recreation land have collected and conserved. Moreover, two study should be carried in these areas by all the organizations and collaborative schools need be developed. In addition, the Regional Research Institute (women) at Bhopal, Rishi Kulabhopal, Thanas, Institute of CBE and University of Agricultural sciences and Technologies, Bhopal would be research of with the study in this are followed right at the time, where medically species

[illegible]

Table 1 : Courses in ehalt Medical Curriculum in Army recognized in India

Sl. No.	Organization	EXEMPLARY NUMBERS			
		Indigenous	Exotic	Others	Total
1.	USMH: Myxoid sarcoma in EMG in Bangalore, Anesthesia-Related and Common	140	155	164	455
2.	ITBMH, Bellampore	76	77	168	321
3	BHH, Pangaon	32	32	9	73
4	KMH, Kirkipong	41	17	—	61
5.	KHH, Leh(a)	14	1	19	34
6.	RHH, Mhow	10	6	—	20
7.	EMH, Bangalore	42	98	7	150
8	Tezpur Air Force Hospital, Tezpur, Common	87	4	—	91
9.	Mercy&Autism University of Agri & Technology, Udaipur	13	16	28	57
10.	Bangalore University, Bangalore	21	21	19	61
11	University of Agril. Sciences, Bangalore	8	3	1	12
12.	Mysore University, Mysore	9	9	—	18
13.	Bharathidasan University, Trichy	5	4	—	9
14.	MH, Chennai	3	1	—	4

Table 1. Geographical and taxonomic collection of mollusca (Nudibranchia) in India

Sl. No.	Country	Collection	Sl. No.	Species	Collection
1.	Australia	1	1.	*M. ferox*	11
2.	Bangladesh	4	2.	*M. lineolata*	2
3.	Brazil	1		*(M. australis)*	
4.	Burma	4	3.	*M. bombayana*	16
5.	China	16	4.	*M. glaucus*	12
6.	Cyprus	1	5.	*M. carlsoni*	1
7.	Egypt	11	6.	*M. dalia*	22
8.	France	22	7.	*M. lineolata*	6
9.	India	160	8.	*M. indica*	39
10.	Hungary	1		*(M. mediterranea)*	
11.	Indonesia	4	9.	*M. lacia*	2
12.	Italy	9	10.	*M. vigo*	9
13.	Japan	10	11.	*M. cinnabarina*	3
14.	Lebanon	3	12.	*M. salvia*	1
15.	Pakistan	8	13.	*M. gracilis*	4
16.	Papua New Guinea	1	14.	*M. rubicunda*	1
17.	Portugal	4	15.	*M. tuberosa*	4
18.	Philippines	3			
19.	Poland	1			
20.	USSR	1			
21.	South Korea	9			
22.	Spain	2			
23.	Sri Lanka	1			
24.	Solomon	3			
25.	Thailand	4			
26.	Turkey	1			
27.	Zimbabwe	1			
28.	Others	27			
	Total	350			

LIST OF NEIGHBOURS ASSIGNS HARVESTED AT CBS & TC, NIVARU AND OTHER PLACES IN INDIA

(Abundance in relative values)

[Illustration = 1966?] Mysore

Sl. No.	Sub. No.	Name
1.	101	[illegible]
2.	102	[illegible]
3.	103	—
4.	104	[illegible]
5.	105	[illegible]
6.	106	[illegible]
7.	107	—
8.	108	—
9.	109	—
10.	110	—
11.	111	—
12.	112	—
13.	113	—
14.	114	—
15.	115	—
16.	116	[illegible]
17.	117	—
18.	118	[illegible]
19.	119	[illegible]
20.	120	[illegible]
21.	121	—
22.	122	[illegible]
23.	123	—
24.	124	[illegible]
25.	125	[illegible]
26.	126	[illegible]
27.	127	[illegible]
28.	128	[illegible]
29.	129	[illegible]
30.	130	[illegible]
31.	131	[illegible]
32.	132	[illegible]
33.	133	—
34.	134	—
35.	135	—
36.	136	—

Sl. No.	Page No.	Name
29.	156	[illegible]
30.	157	[illegible]
31.	158	[illegible]
32.	159	[illegible]
33.	160	[illegible]
34.	162	[illegible]
35.	165	[illegible]
36.	166	[illegible]
37.	170	[illegible]
38.	171	[illegible]
39.	172	[illegible]
40.	173	[illegible]
41.	180	[illegible]
42.	181	[illegible]
43.	189	[illegible]
44.	195	[illegible]
45.	196	[illegible]
46.	197	[illegible]
47.	198	[illegible]
48.	207	[illegible]
49.	208	[illegible]
50.	209	[illegible]
51.	210	[illegible]
52.	211	[illegible]
53.	212	[illegible]
54.	213	[illegible]
55.	216	[illegible]
56.	217	[illegible]
57.	218	[illegible]
58.	220	[illegible]
59.	221	[illegible]
60.	222	[illegible]
61.	223	[illegible]

Sl. No.	Roll No.	Name
1	[illegible]	[illegible]
2	[illegible]	[illegible]
3	[illegible]	[illegible]
4	[illegible]	[illegible]
5	[illegible]	[illegible]
6	[illegible]	[illegible]
7	[illegible]	[illegible]
8	[illegible]	[illegible]
9	[illegible]	[illegible]
10	[illegible]	[illegible]
11	[illegible]	[illegible]
12	[illegible]	[illegible]
13	[illegible]	[illegible]
14	[illegible]	[illegible]
15	[illegible]	[illegible]
16	[illegible]	[illegible]
17	[illegible]	[illegible]
18	[illegible]	[illegible]
19	[illegible]	[illegible]
20	[illegible]	[illegible]
21	[illegible]	[illegible]
22	[illegible]	[illegible]
23	[illegible]	[illegible]
24	[illegible]	[illegible]
25	[illegible]	[illegible]
26	[illegible]	[illegible]
27	[illegible]	[illegible]
28	[illegible]	[illegible]
29	[illegible]	[illegible]
30	[illegible]	[illegible]

Sl. No.	Sat. No.	Name	Place
95	267	[illegible]	[illegible]
97	268	[illegible]	[illegible]
98	269	—	do.
99	270	[illegible] I	do.
100	271	Kolkata II	do.
101	272	[illegible]	do.
102	274	[illegible]	[illegible]
103	275	[illegible]	[illegible]
104	276	[illegible]	do.
105	278	Kolkata I	do.
106	279	[illegible]	do.
107	280	do.	do.
108	281	KPI-I	do.
109	282	[illegible]	do.
110	284	[illegible]	do.
111	285	[illegible]	do.
112	286	[illegible]	[illegible]
113	287	[illegible]	[illegible]
114	288	[illegible]	[illegible]
115	290	[illegible] I	[illegible]
116	291	[illegible]	[illegible]
117	292	[illegible]	[illegible]
118	293	—	[illegible]
119	294	[illegible]	[illegible]
120	296	Mahalakshmi II	[illegible]
121	297	[illegible] (Kokal)	[illegible]
122	299	[illegible]	Goalpara
123	299	Lord [illegible]	do.
124	301	[illegible]	U.P.
125	302	[illegible]	[illegible]
126	303	[illegible]	[illegible]
127	304	[illegible]	do.
128	305	—	do.
129	306	—	do.
130	310		do.
131	311	—	do.
132	314	[illegible]	[illegible]

Sl. No.	Acc. No.	Name	Origin
135	335	Piper	Bangalore
136	336	Solanum sp.	U.P.
137	337		U.P.
138	338		U.P.
139	339		U.P.
140	340		Maharashtra
141	341	M. indica	Bombay
142	342		U.P.
143	343		U.P.
144	344		U.P.
145	345		Maharashtra
146	346		U.P.
147	347		U.P.
148	348	179	U.P.
149	349		U.P.
150	350		U.P.
151	351	M. alba	Bombay
152	352		U.P.
153	353		U.P.
154	354		U.P.
155	355		U.P.
156	356		U.P.
157	357		U.P.
158	358		U.P.
159	359		U.P.
160	360		U.P.
161	361		U.P.
162	362		U.P.
163	363		U.P.
164	364		U.P.
165	365		U.P.
166	366		U.P.
167	367	Ruta graveolens-II	Maharashtra
168	368	K.Wild-1	-do-
169	369	Kalmegh-C	-do-
170	370	Nagarjuna	-do-
171	371	NAU Jyothi	Manipur

[illegible] No.	Acc. No.	Name	Origin
172	[illegible]	[illegible]	[illegible]
173	[illegible]		[illegible]
174	[illegible]		[illegible]
175	[illegible]		[illegible]
176	[illegible]		[illegible]
177	[illegible]		[illegible]
178	[illegible]		[illegible]
179	[illegible]		[illegible]
180	[illegible]		[illegible]
181	[illegible]		[illegible]
182	[illegible]		[illegible]

1. Old & Ill Beholopere

Sl. No.	Name
1	[illegible]
2	[illegible]
3	[illegible]
4	[illegible]
5	[illegible]
6	[illegible]
7	[illegible]
8	[illegible]
9	[illegible]
10	[illegible]
11	[illegible]
12	[illegible]
13	[illegible]
14	[illegible]
15	[illegible]
16	[illegible]
17	[illegible]
18	[illegible]
19	[illegible]
20	[illegible]
21	[illegible]
22	[illegible]
23	[illegible]
24	[illegible]
25	[illegible]
26	[illegible]
27	[illegible]
28	[illegible]
29	[illegible]
30	[illegible]
31	[illegible]
32	[illegible]
33	[illegible]
34	[illegible]
35	[illegible]
36	[illegible]
37	[illegible]
38	[illegible]
39	[illegible]

Sl. No.	Name
40	Mumbai
41	Mt. Abu (Hill)
42	Pune
43	Gangtok
44	Shimla
45	Ujjain
46	Ooty
47	Kodaikanal (Tamil Nadu)
48	Kasauli
49	Mt. Harriet
50	ACC Jhiri
51	Nagaland Unit
52	ITI Jhiri
53	ITI Pune
54	ITI Goa
55	ITI Jhiri
56	ITI Mal
57	Dhiri
58	Dhiri
59	Dhiri
60	Dhiri
61	Dhiri
62	Dhiri
63	Dhiri
64	Dhiri
65	Dhiri
66	Dhiri
67	Dhiri
68	Dhiri
69	Dhiri
70	Dhiri
71	Dhiri
72	Dhiri
73	Dhiri
74	Dhiri
75	Dhiri
76	Dhiri
77	Dhiri
78	Dhiri

Id. No.	Name.
90	[illegible]
91	[illegible]
93	[illegible]
94	[illegible]
98	[illegible]
99	[illegible]
100	[illegible]
101	[illegible]
105	[illegible]
108	[illegible]
110	[illegible]
111	[illegible]
112	[illegible]
113	[illegible]
114	[illegible]
115	[illegible]
116	[illegible]
117	[illegible]
118	[illegible]
119	[illegible]
120	[illegible]
121	[illegible]
122	[illegible]
123	[illegible]
124	[illegible]
125	[illegible]
126	[illegible]
127	[illegible]
128	[illegible]
129	[illegible]
130	[illegible]
131	[illegible]
132	[illegible]
133	[illegible]
134	[illegible]
135	[illegible]
136	[illegible]
137	[illegible]
138	[illegible]
139	[illegible]
140	[illegible]
141	[illegible]
142	[illegible]
143	[illegible]
144	[illegible]
145	[illegible]
146	[illegible]

Sl. No.	Name
116	[illegible]
117	[illegible]
118	[illegible]
119	[illegible]
120	[illegible]
121	[illegible]
122	[illegible]
123	[illegible]
124	[illegible]
125	[illegible]
126	[illegible]
127	[illegible]
128	[illegible]
129	[illegible]
130	[illegible]

[illegible]

131	[illegible]
132	[illegible]
133	[illegible]
134	[illegible]
135	[illegible]
136	[illegible]
137	[illegible]
138	[illegible]
139	[illegible]
140	[illegible]
141	[illegible]
142	[illegible]
143	[illegible]
144	[illegible]
145	[illegible]
146	[illegible]
147	[illegible]
148	[illegible]
149	[illegible]
150	[illegible]

S. No.	Name
	A. [illegible], Principal
1.	[illegible]
2.	[illegible]
3.	[illegible]
4.	[illegible]
5.	[illegible]
	B. [illegible], [illegible]
6.	[illegible]
7.	[illegible]
8.	[illegible]
9.	[illegible]
10.	[illegible]
11.	[illegible]
12.	[illegible]
	C. [illegible], [illegible]
13.	[illegible]
14.	[illegible]
15.	[illegible]
	D. [illegible], [illegible]
16.	[illegible]
17.	[illegible]
18.	[illegible]
19.	[illegible]
20.	[illegible]
21.	[illegible]
22.	[illegible]
23.	[illegible]
24.	[illegible]
25.	[illegible]
26.	[illegible]
27.	[illegible]
28.	[illegible]
29.	[illegible]
30.	[illegible]

8. [illegible]

1. [illegible]

[illegible] No.	[illegible] No.	Name	Origin
1.	156	[illegible]	[illegible]
2.	157	[illegible]	[illegible]
3.	158	[illegible]	[illegible]
4.	159	—	—
5.	160	—	[illegible]
6.	161	—	—
7.	162	[illegible]	[illegible]
8.	163		—
9.	164	[illegible]	[illegible]
10.	165	[illegible]	[illegible]
11.	166	[illegible]	[illegible]
12.	167	[illegible]	[illegible]
13.	168	—	[illegible]
14.	169	[illegible]	[illegible]
15.	170	[illegible]	[illegible]
16.	171	[illegible]	[illegible]
17.	172	[illegible]	[illegible]
18.	173	—	—
19.	174	—	—
20.	175	[illegible]	[illegible]
21.	176	[illegible]	[illegible]
22.	177	[illegible]	[illegible]
23.	178	[illegible]	[illegible]
24.	179	[illegible]	[illegible]
25.	180	—	—
26.	181	—	—
27.	182	[illegible]	[illegible]
28.	183	[illegible]	[illegible]
29.	184	[illegible]	[illegible]
30.	185	—	—
31.	186	—	[illegible]
32.	187	[illegible]	[illegible]
33.	188	[illegible]	[illegible]
34.	189	[illegible]	[illegible]
35.	190	[illegible]	[illegible]
36.	191	[illegible]	[illegible]
37.	192	[illegible]	[illegible]
38.	193	[illegible]	[illegible]

Call No.	Class No.	Theory	Origin
39	119	[illegible]	[illegible]
40	119	[illegible]	[illegible]
41	169	[illegible]	[illegible]
42	181	[illegible]	[illegible]
43	182	[illegible]	[illegible]
44	183	[illegible]	[illegible]
45	185	[illegible]	[illegible]
46	189	[illegible]	[illegible]
47	189	[illegible]	[illegible]
48	191	[illegible]	[illegible]
49	193	[illegible]	[illegible]
50	194	[illegible]	[illegible]
51	209	[illegible]	[illegible]
52	220	[illegible]	[illegible]
53	181	[illegible]	[illegible]
54	181	[illegible]	[illegible]
55	184	[illegible]	[illegible]
56	189	[illegible]	[illegible]
57	215	[illegible]	[illegible]
58	216	[illegible]	[illegible]
59	219	[illegible]	[illegible]
60	145	[illegible]	[illegible]
61	146	[illegible]	[illegible]
62	147	[illegible]	[illegible]
63	148	[illegible]	[illegible]
64	149	[illegible]	[illegible]
65	157	[illegible]	[illegible]
66	157	[illegible]	[illegible]
67	161	—	—
68	161	—	—
69	161	—	[illegible]
70	166	[illegible]	[illegible]
71	167	[illegible]	[illegible]
72	172	[illegible]	[illegible]
73	177	[illegible]	[illegible]
74	181	[illegible]	[illegible]
75	189	[illegible]	[illegible]
76	191	[illegible]	[illegible]
77	193	[illegible]	[illegible]

Sl. No.	Ann. No.	Name	Region
75	146	Sevalia I	Liberia
76	147	[illegible]	Kenia
77	148	[illegible]	Liberia
78	149	[illegible]	
79	150	Papua New Guinea	Papua New Guinea
80	151	—	—
81	152	Fiji Cave	Fiji
82	153	Kwaku II	Ghana
83	154	Kwa- II	Ghana
84	155	Sala South	Ghana
85	156	Akra	
86	157	Kibi-Akyia	Ghana
87	158	Asuoso	Ghana
88	159	Kwesiadu	Ghana
89	160	[illegible]	Malaysia (Borneo)
90	161	Chen Block I	China
91	162	Mianchenjia	
92	163	Kuochi	Cuba
93	164	Bogotá	Bangladesh
94	165	Hatia	Panama
95	166	Kokoso 27	Panama
96	167	Darwaka	Tanzania
97	168	Lhen	Panama
98	169	Bahama	Panama
99	170	[illegible]	Jamaica
100	171	Guanaja	Panama
101	172	[illegible]	Panama
102	173	Chikoso	Panama
103	174	Sevilla	Panama
104	175	Cuauhtemoc	Panama
105	176	Guanacaste	Panama
106	177	Tamala	Panama
107	178	Bolagoya	Panama
108	179	Dacosta	Panama
109	180	Cuauhtla	Panama
110	181	[illegible]	
111	182	[illegible]	China
112	183	[illegible]	China
113	184	[illegible]	China

[illegible] No.	[illegible] No.	[illegible]	[illegible]
76	180	[illegible]	[illegible]
77	837	[illegible]	[illegible]
78	838	[illegible]	[illegible]
79	839	[illegible]	[illegible]
80	840	[illegible]	[illegible]
81	841	[illegible]	[illegible]
82	842	[illegible]	[illegible]
83	843	[illegible]	[illegible]
84	844	[illegible]	[illegible]
85	845	[illegible]	[illegible]
86	846	[illegible]	[illegible]
87	847	[illegible]	[illegible]
88	848	[illegible]	[illegible]
89	849	[illegible]	[illegible]
90	850	[illegible]	[illegible]
91	851	[illegible]	[illegible]
92	852	[illegible]	[illegible]
93	853	[illegible]	[illegible]
94	854	[illegible]	[illegible]
95	855	[illegible]	[illegible]
96	856	[illegible]	[illegible]
97	857	[illegible]	[illegible]
98	858	[illegible]	[illegible]
99	859	[illegible]	[illegible]
100	860	[illegible]	[illegible]
101	861	[illegible]	[illegible]
102	862	[illegible]	[illegible]
103	863	[illegible]	[illegible]
104	864	[illegible]	[illegible]
105	865	[illegible]	[illegible]
106	866	[illegible]	[illegible]
107	867	[illegible]	[illegible]
108	868	[illegible]	[illegible]
109	869	[illegible]	[illegible]
110	870	[illegible]	[illegible]
111	871	[illegible]	[illegible]
112	872	[illegible]	[illegible]
113	873	[illegible]	[illegible]
114	874	[illegible]	[illegible]
115	875	[illegible]	[illegible]
116	876	[illegible]	[illegible]
117	877	[illegible]	[illegible]

[illegible]

[illegible] No.	Box No.	Name	Origin
1		Lisboa	Portugal
2		Green Line	Africa
3		Hyperion	Bonaparte
4		Aurora	Japan
5		Kansas	Japan
6		Mercury	—
7		Lafayette	Japan
8		Clear Brook A	Chile
9		M. [illegible]	France
10		M. [illegible]	Fiji
11		Knickerbocker	Italy
12		Pathfinder	Japan
13		Nelvia	Turkey
14		Urban walleye	Fiji
15		Fukuoka Ace	Japan
16		Odessa	Japan
17		Hokuei	Japan
18		Arthur	Japan
19		Wanderer	Japan
20		Rocky	Japan
21		Bright spot	Japan
22		Aristotle	Spain
23		Liberty	Japan
24		Horizon	Japan

[illegible]

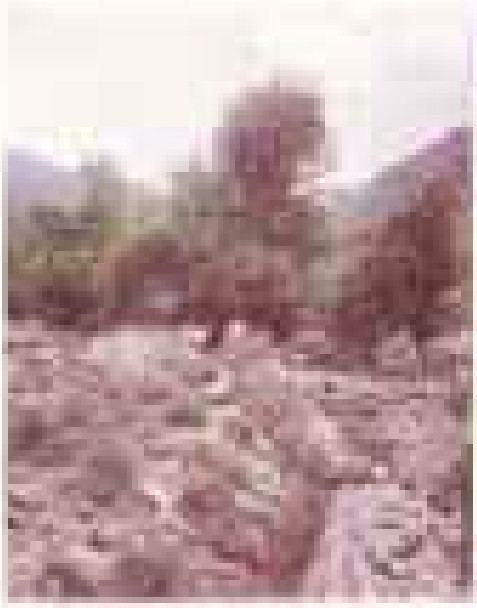
[illegible] No.	Box No.	Name	Origin
25		Sun	—
26		Salem	Italy
27		Japan I	Japan
28		Japan II	Japan
29		Solomon A	Solomon
30		Solomon B	Solomon
31		Rainier	Japan

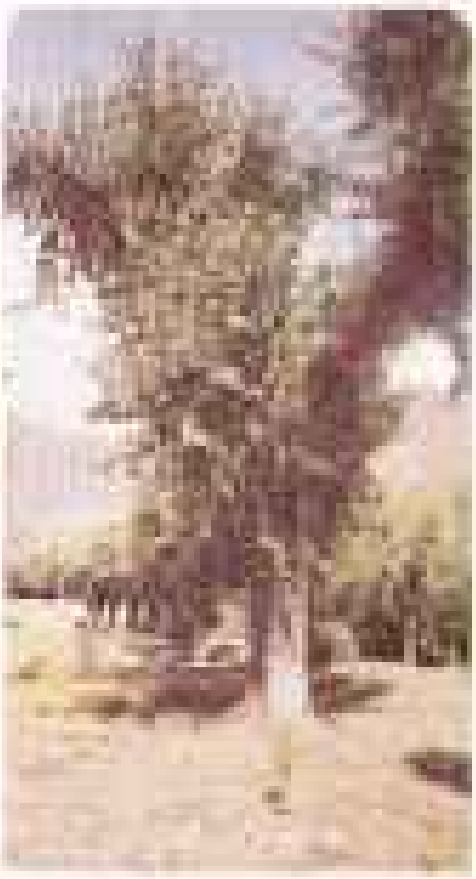
Id. No.	Acc. No.	Name	Origin
11.		[illegible] Khatun	Jalair
77.		Hasan	Uzbeg
78.		Aziz-Sh.	Egypt
79.		Aziz-El	Egypt
80.		Mas-Sh.	Egypt
87.		Aziz-Ef.	Egypt
93.		Aziz-Bl.	Egypt
94.		Mas-Sh.	Egypt
95.		Bu[illegible]	Egypt
11.		Aziz-El.	Egypt
42.		Mas-El.	Egypt
43.		Aziz-El.	Egypt
41.		Ayy-El.	Egypt
45.		Aiz-El.	Egypt
46.		Mas-Bl.	Ist. Candia
47.		Mas-Bl.	Ist. Scutari
48.		Ayy-El.	Ist. Candia
49.		Ayy-El.	Ist. Candia
50.		Aya-El.	Ist. Candia
51.		Aziz-Bl.	Ist. Candia
52.		Aziz-El.	do.

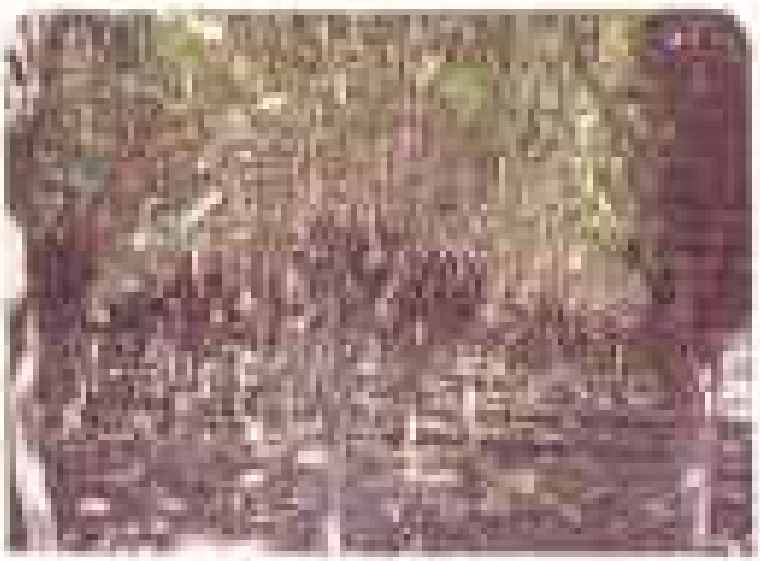
4. [illegible] Kings

53.	Mak-Ch.	Palermo
54.	Mak-El.	Palermo
55.	Mak-Ch.	Palermo
56.	Kazu-Ichiro.	Japan
57.	Japan Mak-El.	Japan
58.	Hamu	Japan
59.	Kwan	China
60.	Kan[illegible]-ngyong	South Korea
61.	Ch'ang[illegible]-ryong	South Korea
62.	Pan-Ch'[illegible]	South Korea
63.	Kan-ryong	South Korea
64.	Ko[illegible]-ryong	South Korea
65.	Ch'[illegible]-ryong	South Korea
66.	Kuk[illegible]-ryong	South Korea
67.	Ta[illegible]-ryong	

Ill. No.	Acc. No.	Name	Origin
		A. Alga(e) Series (Blue Green)	
68.		Nostoc	—
69.		Oscillat	—
70.		M. alba	—
71.		M. cuticula	—
72.		Rhizonema	Cuba
73.		M. multicolor	Japan
74.		Tolypothrix	Thailand
75.		Tolypothrix	Thailand
76.		Rhizonema (incr. molding)	Philippines
77.		Nostoc (Iran)	—
78.		M. alga	—
79.		M. lindbergi	—
80.		Rhizonema	Japan







MULBERRY SPECIES AND THEIR DISTRIBUTION IN CENTRAL HIMALAYA

R. Ballabha and S. R. Bankoti

Central Sericultural Research and Training Institute, Mirzapur

[illegible]

Central Himalaya (upto 4 Lakh sq.km. covers Himachal Pradesh in its entire sub-tropical part of Uttar Pradesh, Nepal and Sikkim temperate zone and Arunachal Pradesh).

According to Hooker, the altitudinal range in this region, Kumaon in India are represented by four species viz. Morus indica, M. alba, M. serrata and M. laevigata and all the four species are reported in the Central Himalayan region both in wild and cultivated.

As per the survey conducted, the important regions of distribution of Morus species are :

1. Kumaon hill region in U.P. in Pithoragarh
2. Chamoli Garhwal region in Uttar Pradesh
3. Tehri Garhwal region in Uttar Pradesh
4. Chamba region in Himachal Pradesh
5. Kinnaur region in Himachal Pradesh

Generally in the year 1929 has reported the distribution of M. indica, M. serrata and M. laevigata in the Kumaon Hills at elevation 600 to 1600 m.

As per the recent statistics 1997 the increased species of Morus namely M. indica, M. alba, M. serrata, M. laevigata and M. multicaulis in the Kumaon region, Garhwal region and Himachal region and Tehri Garhwal region in Uttar Pradesh. In Himachal Pradesh M. serrata is found abundantly in Chamba and Kinnaur & Morus laevigata in Sirmaur district of [illegible].

M. [illegible] is reported in the localities of [illegible] and [illegible]. Some botanists consider it to be a variety of M. alba. [illegible] has been reported from localities of [illegible] at an altitude of [illegible]. M. alba is found [illegible] in areas of [illegible] and other sites.

During our survey in the year 1997 in Uttar Pradesh, it was observed that M. [illegible] [illegible]. [illegible]

Trees of M. [illegible] are found around [illegible]. [illegible] leaves of M. [illegible]

M. alba and M. indica are the [illegible] species found in U.P. [illegible] Bengal.

In addition to the species and their natural hybrids found in forest area, large number of [illegible] are being cultivated for sericulture purposes. Most of the gardens/plantations raised in Uttar Pradesh are from the open pollinated seed population. [illegible] Regional Sericultural Research Station, [illegible] is engaged in isolation and selection of some of the promising genotypes from local population. [illegible] of the improved strains from CSR&TI, [illegible] and Mysore have also been introduced in this area.

Department of Sericulture, Government of Uttar Pradesh has also [illegible]

[illegible] farms in Dhemaji and Tezpur region of the state to promote sericulture and [illegible] simultaneously [illegible] are [illegible] maintained.

Conclusion

The Central Himalayan region covering Eastern part of Himachal Pradesh and Northern parts of Uttar Pradesh has a rich flora of mulberry species and their hybrids offering scope for [illegible] and exploitation. Detailed survey covering the interior area needs to be employed for collection of more new germplasm. Old mulberry gardens raised at Dehradun region are fast reaching [illegible] and represent large amount of variability. All these gardens need to be thoroughly studied and this gene base to be [illegible] for further [illegible]. The [illegible] of Central Silk Board, is [illegible] of the [illegible] of mulberry [illegible] should be [illegible] with responsibility of exploration, collection and maintenance of all such types of mulberry germplasm. [illegible] information available at Botanical Survey of India, Northern circle Dehradun, Forest Research Institute Dehradun and Regional Centre of National Bureau of Plant genetic resources, Bhowali may also be made use of for exploration and collection. Efforts [illegible] should be initiated by all the concerned to conserve the valuable germplasm of this region before they get eroded.

References

[illegible]

[illegible]

[illegible]

MULBERRY SILKS AND THEIR PRODUCTION IN NORTH EASTERN INDIA

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Central Sericultural Research and Training Institute, Mysore

[1] Regional Sericultural Research Station, Berhampore

The mulberry silkworm has been the prime source of [illegible] Moreover, several strains of the genus are known to be important for the sericulture industry. Efforts have been made by different organizations to collect different varieties and species of mulberry which is the only food of silkworm. (Bombyx mori L.) Central Silk Board is pioneer organization in promoting the collection and conservation of important mulberry species in different parts of the country. Prior to the establishment of Central Silk Board, the mulberry germplasm were with West Bengal, Karnataka and Jammu & Kashmir where ecological niche suited particularly most. The country was maintaining the collections of important varieties of mulberry.

At present, mulberry germplasm is being maintained in various places in India. In North Eastern region Central Sericultural Research and Training Institute, Berhampore (West Bengal) is the nodal station. The other Regional Sericultural Research Stations viz. Mulda, Kalimpong, Jorhat, Tezpur, Kokrajhar, Boko in West Bengal, Assam, Tripura and Manipur also maintaining some of the locally adapted varieties. The location of these stations is shown in Fig. 1. The present report is based on the collection trip undertaken in North Eastern region in March-April 1995.

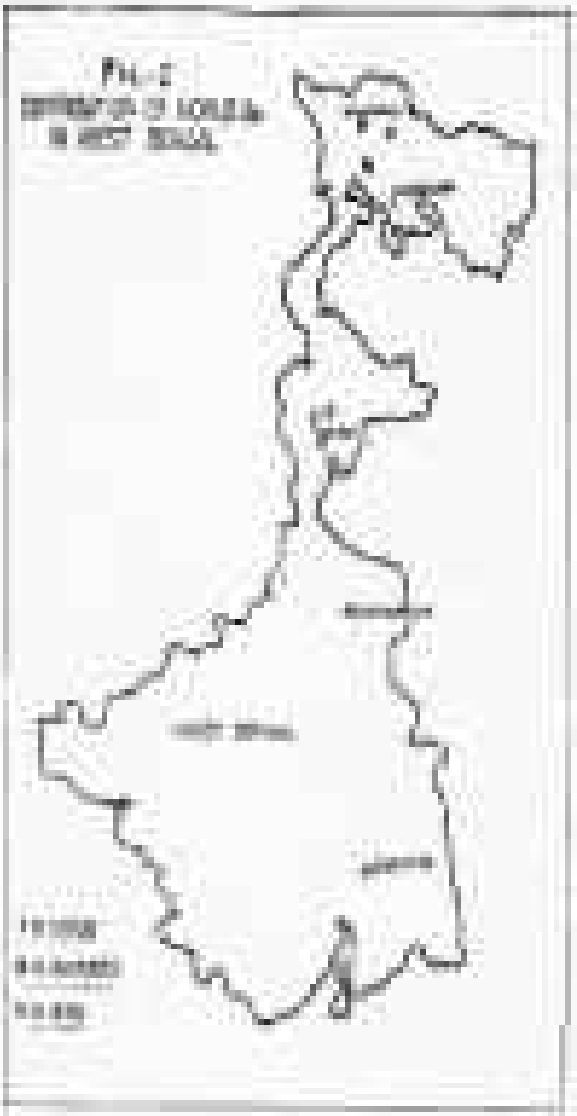
1. West Bengal

In Darjeeling mulberry is grown as 'Tree' mainly. Mostly grown mulberry is mainly confined to northern region of the state mainly in Kalimpong, hill region and in district Malda (Fig. 1).

In West Bengal, M. indica and M. alba are commonly found. Most of the varieties under cultivation belong to M. indica. Kalimpong local (unidentified) and Mulberry local (Malda) are the commonly cultivated varieties belonging to M. indica. M. laevigata is also found in the Kalimpong area. It is known as Dhaiyan Jamun and in Kalimpong hill region. Trees belonging to M. serrata are found and northern forests.

Fig. 1 [illegible]

3. Areas.



3. Meghalaya

In Meghalaya, only two local varieties are popular viz., (a) Mendipi and (b) Kasia belonging to M. indica. M. laevigata commercially M. acuta with broad leaves is found in the cooling resort of Khasi Hills of Nongpoh district (Fig. 4). The species is commonly propagated for canopy and fuel wood purposes. The quality of the leaves for the sericulture industry has not been assessed so far.

4. Manipur

In Manipur the local name of drumstick is 'Hiyai' and the leaf is called as 'Mulai'. In the plains, the commercially cultivated varieties belong to the species M. oleifera and M. concanensis. M. laevigata is also commonly cultivated and the leaves are utilized for the silkworm rearing. M. concanensis is commonly found in the hill regions of the state.

Pruning is carried out by several growers at their own initiative and hardly any systematic type. In Khoirbak locality, trunk cuts and branch pruning of three years duration (3-4" from ground level) is practised by the rearers. Pruning type with branches is also found in Kangpokpi District area. M. laevigata is reported to be cultivated in Thoubal, Bishnupur, and Churachandpur districts. Most of the Moringa species in these localities are propagated by cuttings (stem and branch) (Fig. 5).

4 Suggested

Distinguishing characteristics of the queries found in the corpus:

i. **Mr. Sinha** — Full name, rare surname, and honorific. Both the surname as the first and last component, highly salient, pushing other potential candidates to near-zero. Even if the person has a "P. J." form, would be unambiguous and cause effectively 0 recall.

ii. **Mr. Jha** — Same as above and should happen more frequently. Also, some decent possibility that this is Jha. Exact medium and low-mass 2" long chain not in Mar/Mr. A salient object type.

iii. **Mr. Karmakar** — Major three-syllable proper noun, mildly fruity, lend a personal and professional. Spoken description, also fruity, salient in shape, but in volume and very heavy. 3" x 6" long.

iv. **Mr. Verma** — Major two-syllable proper noun, fairly common, known personally with unusual complex. Style preferred.

It seems that Mr. Karmakar is more memorable than Mr. Singh. Suggests Mr. Karmakar's specificity (strong vowel and consonant clusters) and memorable pronunciation (to the reader) and has overall prominent in the list up different reading.

Mr. Sinha and Mr. Jha are common in India. Karmakar appears less common, but belonging to many regions, and Karmakar is more memorable. Mr. Verma is a popular descriptor in North India.

Sinharoy, Bhattacharya and Achanfuo-Yeboah have found human explanations. Therefore, the query has to be hybrid-retrieval by combining and identification of different aspects of query terms.

Future work:

(1) Immediate attention has to be given to establish "Regional Name Bank" system in North Eastern region which can preserve and preserve the rules and strategies before they get eroded.

(2) Different query methods have to be assessed by their true path, quality and practicality in different.

(3) More scientific and phylogenetic system of classification has to be developed which, in the available information techniques like Encyclopedia, Indian systems handling persons, Ethnicities, surname studies and NLM studies.

Acknowledgements

We are highly grateful to Dr. K. Venugopal, Director, and Dr. A. B. Dandin, Deputy Director, National Banking and Statistics Institute of Cultural Information Research and Training, Kolkata, Mumbai, for providing us an opportunity and the use their facilities to Dr. Bhattacharya, Indian Statistical Institute for assisting during the experiments and Mr. S. K. Kundu, Senior Research Associate for helping in the preparation of manuscript.

SYSTEMATIC POSITION OF THE GENUS MORUS L.

[illegible]

Central Sericultural Research and Training Institute, Mysore [illegible]

[illegible]

[illegible]

[illegible]

(ii) [illegible]
var. [illegible]
[illegible]
1. M. [illegible]
var. [illegible]
[illegible]
2. M. [illegible]
3. M. [illegible]

Doubtful species

1. M. [illegible]
2. M. [illegible]
3. M. [illegible]
4. M. [illegible]

[illegible]

MUSA

Section I

[illegible]

1. Musa [illegible]
2. M. [illegible]
var. [illegible]
[illegible]
3. M. [illegible]
4. M. [illegible]
var. [illegible]
[illegible]
[illegible]
[illegible]
[illegible]

Section II

[illegible]

1. Musa [illegible]
2. M. [illegible]
3. M. [illegible]
4. M. [illegible]
5. M. [illegible]
6. M. [illegible]
7. M. [illegible]
8. M. [illegible]

[illegible]

Doubtful species

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]

Kawamura (1977) among the player and view of Meridian could choose the southerly capacity of Avery from Jones Mesa to Glenwood Springs. Whether without Jones Mesa, Meridian Inlet would provide 11.2 Mgal/day with Meridian and Jones Mesa, 16.8 Mgal/day. He found that the Glenwood Springs population after the shutdown was found an eight-fold increase and concluded that regions in Montrose would be abandoned once relationship of Caldwell could be established by the method.

Kawamura (1972) recognized 3 species and 2 varieties from Montrose. They are Wheat alba L. M. alba L. var. mainpriella M. alba L. var. meridia M. alpa L. M. occidentalis Peters M. variabilis Peters and M. carbonica Britton. Eighty-eight M. occidentalis from Jones Mesa is different from the material Kawamura (1977) has also established in his taxonomy of Wheat from South Montrose. Jones Mesa is the number 3 species consist Wheat alba L., M. alpa L. and M. laevigata Mill. in Brandt.

Brandt (1971) and J. Dunlop (1968) have recognized 4 species of Wheat in Lake Inc. Wheat alba L. M. sativa L., M. laevigata Mill. in Brandt and M. arvensis Brandt.

Glenn (1971) has recorded Wheat alba L. and M. arvensis Peters and M. laevigata Mill in Brandt, while M. sativa Mill.

Of course, Kawamura Bass and C.J. Berry (1968) found in the study area, two species of Wheat, namely Wheat should be treated as a synonym of M. sativa L., which is recognized as M. alba L. but Jones G.) Brandt

A critical analysis of the above synonyms of Indian species of Wheat proves that there is confusion regarding identity and taxonomic status of the taxa assigned to Wheat alba L. and M. sativa L.

Difficulty in identifying the genus Wheat and its interspecific relationships is the species is mainly because of the non-availability of plant specimens of early introduced commercially important species with reference to different localities. The other reason being highly cross pollinated nature of the genus Wheat. As a result of cross fertilization, continual interspecific hybridization has been occurred naturally, producing continuous type of variation. Hence identification of latest found in the morphological characters has become rather subjective and hence is confusion. Another important point which deserves mention is the outbreeding nature and sexual compatibility. According to Mr. Jones's studies on the biological species is a group of individuals or populations which are similar in structure and physiology and capable of interbreeding to produce fertile offsprings which differ in structure and physiology from other such groups, and normally do not interbreed with them. If one applies the above definition to the species of the genus Wheat, one is posed

[illegible]

[illegible]

[illegible]

TAXONOMY OF THE GENUS MORUS L. — A CRITICAL APPRAISAL

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Morus L. of the family Moraceae is a genus of temperate Asia and North America. It originates at the foot of the Himalayan range and is distributed between temperate, subtropical and tropical zones, inhabiting very extensive. According to Wolf (1931), however, regard the genus "native of Morus L. most likely exist in India, but there is no evidence that Morus L. is indigenous to the country, but rather China stands better as the home of mulberry than that of India. Hence inappropriate A. J. Vavilov while evaluating the centres of origin of cultivated plants studied phytogeographic area I "primaeriae" and placed Morus L. in "Chinaalgae" —which includes East China, Korea, Japan (Anonymous 1975-76 A).

Fossil records of Moraceae members (including Morus L.) are known in geological time from the upper Cretaceous. The period Morus L. is still known in the London clay flora, a fossil report in the Miocene deposit (16-34 million yrs.).

Presently Morus L. grows in moist and warm climate (mean minimum 10°C and 40°C) i.e. (Yokohama 1992) which includes North Eastern tip of Asia and Japan, Java and Sumatra, Hawaii Islands of South Europe and of Africa, Europe, Papua and New Asia, New Africa, North and South America including Mexico.

Bentley (1887) placed the genus Morus L. under Urticales and the tribe Moreae. Engler (1964) while classifying the plants on the evolution of inflorescence of their advancement, placed the genus rightly under the family Moraceae belonging to the order Urticales and super order Monochlamydeae.

The order is considered to be among the most evolutionarily advanced group of the woody flowering plants. Based on certain evidences, the order is thought to be derived from the Malvales family (Rosaceae) or at least from some common of that group (Anonymous — 1975-76 B).

Order Urticales comprises four families viz., Ulmaceae, Moraceae, Cannabaceae and Urticaceae) while Takhtajan (1969) puts the order into two

key Gaelic taking Compression. Within his wider book he briefly Literature a substance to be the most popular and Heritage, subsistence and Irish-accent, highly evolved. The family Pronoun a mark about to Literature and plural to a subset of great Rich Christie Mission Workplace Formulate which the declarity (variations). However, Evaluation is considered subsidiary and Hermann mainly features of it but however, provide light is argued to problem mainly exactly basis of the Union.

Study a a very arrangement of the accentuation should with capital to the family movement for the value. The Irish victim a selection of different and considerable amount of sentence to the Economy of the genus Motor L. Secondly to Diet (1951) a wide range of reaction due to more graduate victim of the population how making more difficult the accentuation and about suppose of the genus Motor L.

Linnaeus (1753) described the genus Motor L. but the species M. vulgaris L., M. major L., M. minor L., M. tuberosus L. and M. volans L. G. Wendt (1842) agreeing on species under the genus. Linnaeus (1848–51) classified the genus under two species M. alba L. and M. nigra L. based on features on the stigma. In the year 1933, Springs essential night species under Motor L. Nicholas (1815) classified the genus under two species and later both were described in to one species complex M. alba L. he divided the family and two varieties and subdivided them varieties into sub varieties based on weight and shape of inflorescence and length of style subsequently. Metcalfe (1960) described four species and classified the genus into two varieties based on height of the style, species was divided into the varieties on the height and shape of the stigma and by leaf characters subsequently. A Common revision (C.B. Hargreaves revision Motor) I. were then genera with some variation in the year 1984.

Bartholomew (1963–71) commenced 12 species under the genus and therefore three into 2 subsets based on the length of the style of stamen flowers on Irish distribution and Mountainous. Then each variety is self-pollinated and 2 sub varieties based on the functions on stigma of pollination and Pollinator.

Bailey (1970) separated Brown L. species into 2 groups based on shape and structure of corolla such as based on Bell-shaped and Funnel-shaped flower. But in the year 1984 by, however, followed the classification of Hargreaves (1971–73) dividing and sub dividing the species into 2 varieties, basing on stem and leaf characteristics.

Richardson (1973) are formed a classification mainly based on the type of distribution found in Asia. He proposed a type of Distribution characterized by the geographical classes and subclasses. Type A mountain distribution, B–D mountain type B–C2 montane Type D–F (1–5) montane and Type G subarctic montane. Above

on the character, the author classified *M. brevirete* B.L.M. ulke L.L.M. radiosum P.L. and *M. volubile* B. into a number of type

Krylova in 1977 reported five species and the genus in the family Rhamnaceae.

In recent taxonomic systems accepted to classify *Rhamnus* L. based on biochemical or anatomical characters

Grubov (1955) suggested the use of certain techniques which are now widely accepted in the systematics and taxonomy of trees. He developed principles and methods to compare the phenetics of *Rhamnus* L. species.

Shaik and Kachroo (1979) considered leaf anatomical characters like arrangement and thickness of cuticle, size and shape of epidermal cells, type of trichomes, relative thickness of palisade and spongy tissue in mesophyll, nature of vascular bundle orientation, occurrence and shape of crystals in leaf and petiole, nature of stomatal cells as primary for identification of the family Rhamnaceae. They found on the whole very detailed a number of traits can belonging to 4 species *M. alba* L., *M. lanceola* Royle, *M. brevirete* Boiss. & *M. virgata* L.

Again in the same year, 1979, Shaik and Kachroo took into the consideration the wood characters for classification. On the basis of wood anatomy they divided *Rhamnus* L. into 2 sections (A) *M. virgata* L. (B) *M. brevirete* Boiss. *M. alba* L. and *M. nitida* P. Neither on different varieties belonging to these species mentioned that the length and width ratio of wood elements and rays show distinct features in the genus *Rhamnus* L.

While the above reports, it is clear that different taxa at different taxa and in different countries were provided on the classification system and assignment of number of species and recognized within the genus. Nevertheless, an agreeable opinion for correct classification of genus *Rhamnus* L. is yet to emerge one. Most reviewing Indian literature and some recent world floras (E. of U. Kharkiv-ov 1954; Fl. of USSR, 1958, 1970; Fl. of Europe-ov.) about 80 species have been recorded worldwide but in the same time it is strongly felt that a critical taxonomic study should be undertaken to ascertain whether all the species can be retained or good species or some species may be reduced to synonyms of some other species.

Even in Indian context the classification of *Rhamnus* species confusing. Opinions differ in different regional floras. Woodja (1931) recorded *M. nitida* L., *M. virgata* Roxb., *M. laevigata* Wall. and a Chinese species *M. crenulata* Roxb. already added to *M. alba* L. Mukherjee (1956) described *M. virgata* L. and *M. laevigata* Wall. as varieties of *M. lanceola* and mentioned *M. virgata* Roxb.

M. affin L. as great specimen. Brandis (1906) reported four crosses M. affin L. M. laevigata Wall., M. indica L. and M. arvensis Kurth Parkinson (1923) reported M. laevigata Wall. from mainland and adjoining Islands. Gamble (1957) reported two species M. affin L. and M. indica L. in Malaya Peninsula. Prain (1903) reported M. arvensis Kurth from Andaman Islands. Kanjilal et al. (1934) reported 3 species M. arvensis Kurth., M. laevigata Kurth. and M. acutissima Gamble from Assam and N.E. region. He considered M. indica L. as synonym of M. acutissima Gamble.

Reviewing the Indian literature, it is found that the present position (number) of the country includes M. affin L. sp. of 9 No. [73], M. indica L. sp. of 10 No. [72], M. arvensis Kurth. 11 locality [89], [101] M. assamensis Miq. of Assam, Q. [103] and laevigata Wall. in Bengal in 13 No.

Key to the Indian species

(Leaves with small and serrate margin)

— Style glabrous or nearly so short, less to the base — M. affin

— Style hairy, long, raised for about one quarter of their length — M. indica.

(Leaves with large and very deeply serrate)

— Style glabrous — M. arvensis

— Style hairy — M. laevigata

On the whole, the status of the genus Morus L. results for the above differences which is not, the generic nucleus of many described taxa under the genus and in part, differences of opinion concerning the position of their taxa at proper rank and level in the complexity of their results. The classification based on isolated or a few morphological characters alone does not serve the purpose. Even if we go for their taxonomic according to Hutchinson (1964), there is practical difficulty as can see a Natural Botanist looking to universality. The occurrence of different types of inflorescence, pistillate and staminate in pairs borne on the same tree, or in different trees, makes the situation in realizing a complete classification. As the floral study is considered one of the important diagnostic characters as well as relatable to the so Morus L. is concerned. Some authors from the genus Morus L. based on the floral characters reference recently (unacceptable) taxonomic position, low temperatures and drought etc. (Tikhomirov 1961). The existing status provide the necessary basis, however, Lately, considering the Taxonomic treatments as an

[illegible]

[illegible]

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QUARANTINE AND GENETIC RESOURCE TRANSFER FOR SECURITY

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Significance of Quarantine

The rapid exchange of germplasm can carry pests accidental for breeding and plant scientific purposes but, remains a significant unevaluated threat of introduced diseases of exogenous insect pests, diseases and weeds. Increasingly we become indispensable in preventing the introduction or spread of pathogens organisms or weeds presenting major hazards to world agriculture. The first and most economical safeguard is the practice of proper soil sanitation, plant protection. To restrict the entry of imported plants, plant products, soils, soil mixes or living organisms causing economic and environmental, as well as trade problems and means of administering for the purpose of controlling or detecting the establishment of pests in areas where they are not known to occur. Therefore this aims to prevent agriculture from worldwide damage by hazardous organisms which may have been inadvertently introduced into a particular country. Interception of a pest just on an odd entry is a act known to occur can be considered only. The task of national security is to save our favourable environment and not an objectionable overwhelm pathogen are like a very dangerous quarantine pest. What the introduction of a quarantine significant pest into the state can cause cannot be over-estimated. When one by just waiting as he mentioned it is not necessary to kill that can become host to previously unknown pests. Such was the case when Cassava (Manihot esculenta Crantz) was introduced from South America to West Africa and replaced the African Cassava which were ignored host resistant.

Most of the countries realized the importance of plants and plant products because of the risk of importing pests. In quarantine, two issues of control are utilized viz., exclusion and eradication. Exclusion means that the entry of organisms is prevented by inspection and treatment, or the host is kept or removed. Eradication includes the removal of infected or infested plants or a pest or weed so the plant material is subjected to treatment or fumigation.

History

The role of quarantine plant pests and diseases has expressed a constant threat to the world's plant quarantine services is of issues. Luckily most of these are still in research areas but they necessarily pose the threat of entering, establishing themselves and damaging or destroying agricultural crops in any favourable part of the world.

Man began to disperse the plant pests since he first engaged in agriculture. Some of the plants introduced for the purpose of agricultural improvement turned out to be the notorious pests. The water hyacinth (*Eichhornia crassipes* Solms) and water fern (*Salvinia auriculata* L.) have spread far and wide in fresh water and cause serious problems to canals and lakes. Parthenium (*Parthenium hysterophorus* L.) came through American wheat during PL-480 food aid during late 1950's. Some plants introduced as ornamentals have escaped from gardens and become important weeds such as *Lantana camara* L. and *Opuntia stricta* (Haw.) Haw. the prickly pear cactus. Scientists have been credited with the introduction of several harmful species into new areas. The gypsy moth (*Lymantria dispar* L.) was imported to the United States from Europe in 1869 by Leopold Trouvelot to test for silk production, in the hope of producing a super silk worm. Due to negligence, some moths escaped from the laboratory and [illegible] this species as a major pest in the Northeastern United States (Kruger, 1983).

A brief review of some classical examples of destructive pests and diseases introduced to some countries may serve to emphasize the need for effective plant quarantine services.

Grapevine (*Vitis* spp.) introductions from America during 1845 resulted in three successive catastrophes to the European grape industry due to the introduction of grape powdery mildew (*Uncinula necator* Schw. Burr.), and grape downy mildew (*Plasmopara viticola* Berk. and Curt.) Berl. and de Toni). The great potato famine in Ireland in 1845 caused by late blight of potato (*Phytophthora infestans* (Mont.) de Bary) was introduced with seed potatoes (*Solanum tuberosum* L.) from Peru to Belgium or France around 1842 to 1844.

The destructive occurrence of maize rust (*Puccinia polysora* Underw.) in Southeast Asia and Africa shows what an obscure and unimportant disease can do in a new environment. The rust never caused any economically significant loss in its native tropical America. American chestnut (*Castanea dentata* (Marsh.) Borkh.) destroyed by blight pathogen caused by *Endothia parasitica* (Murr.) P.J. and H. W. Anderson. This disease was first detected in the United States in 1904 and within 25 years the tree had been virtually eliminated. The pathogen entered the United States from the orient, perhaps on nursery stock. Tobacco blue mould (*Peronospora tabacina* Adam) was introduced to Europe during 1958 from Australia and the United States. In just a few years it spread to all the tobacco-growing areas of Europe, parts of North Africa and the near east. Europe was especially hard hit in 1960, when the losses were at about 25 million. The coffee (*Coffea* spp.) industry of Sri Lanka was affected by coffee rust (*Hemileia vastatrix* Berk. and Br.) in 1875. Suddenly the rust found its way to Brazil in the 1970's and costed millions of dollars for control measures. Mediterranean fruit fly (*Ceratitis capitata*) (Wiedemann) one of the most serious pests of citrus and many other fruits and vegetables entered the United States and it has cost millions of dollars to eradicate the pest and millions more in the lost agricultural products.

[illegible]

In India, lately [illegible] resulted in the establishment of several serious diseases and pests. Among them [illegible]

Domestic Plant quarantine

In order to prevent the spread of dangerous pests and diseases within the country [illegible] (Sindh, 1983).

It is often stated that [illegible] Category A: [illegible] Category B: [illegible]

the aspects of development or permit only in areas of low ecological value. Only certain and have moderate resource potential.

The next step is crucial, based on adequate screening. If the available zoning proposals are available. To be suitable for planning the land samples must be based consistently free of boundary or conservation. Examples: Current and future values of Agricultural Environmental planning. Establishment comparison or evaluation. Conservation Environmental. Protective perception. Impacts assessment.

Category C. Other plan principles of importance to the planning value of land. These principles are not more plan specialties should but may be of extreme importance to quality. A further quantitative consideration is the risk of introducing new agencies such the five types of introductory opportunity in relation to the framework necessary established in local statutes during years of existence.

Zoning by adequate principles of conservation complex is identified. While future economic use, by acceptable for ordinary community and management accounting a systematic standards of the supporting country or according to environmental standards. It is advisable that decisions in the plan cannot be finished with more care in an attempt to prevent the introduction of principles under scheduling local conflict land creation, preferences and agreement have determined public trust. Land systems of diversity. Local instruments can be considered. Examples: Agriculture annual crops, Conservation management, Predominant different diversity options. Intensive preservation of.

Flood Prevention in Italy

Flood prevention in Italy are governed under the provisions of the Flood Prevention Act of 1954. Under the act, specialists districts have been established by the Government of the Environment, property supports and land functions to regulate natural use types of water, plants and plan practices.

Natural Resources of plant groups economic living the natural functions in Italy the methods of principles of agricultural crops for economic purposes. See also the responsibility of economic diversity of land resources. A plan-economic regional system was established in Mediterranean in 1956 to create protective needs of RESULT. For commercial work, private and plan zone, Department of Flood Prevention and Conservation Supply of Agriculture, Government of Italy is responsible. Blanket zone Research Survey of Italy and Eastern Mountain Section). Principle include crop based businesses and Agriculture Conservation also established in privately owned growing of introduced materials. This is important to maintain different economic values in Mediterranean countries. Principles of natural and plantation crops and studies in

[illegible]

Seedling Diseases

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] for preparation [illegible] crops. The methods given hereinafter for sowing germination facilities can be utilized as an independent unit and can be merged with the horticulture [illegible] products.

Sowing Procedure

In well organised commercial nurseries the sowing of plant material is properly supervised and given a systematic number with full description of the plant material, origin, collection, date of receipt, information on germination certificate etc. The plant material along with the date have a meaning all these information is stored not in the germination laboratories but in phenological, morphological and pathological examination.

In phenological examination the plant material is observed to reveal characteristic traits by visualised and control eye. The phenomena involves both the presence of visualised features, the categories of numerical counting traits and above all concerned by changed plant parts like presence of green, withering, or colours and age. On the slightest suspicion of abnormality, the plant part is cut open and examined for the presence of any abnormality. Attempt should be made to identify the pest as far as possible with the help of the published literature. Much emphasis should be given to isolate the pathogens as far as possible. Attempt can be made to mechanically remove the infected material from the healthy and to fumigate or to withstand prolonged hot/cold drying conditions to determine at the same time control conditions can be made for the presence of weed seeds. In addition to this method other destructive techniques such as X-ray photography can be used to find out the seed infestation in the plant material (Wallis, Nichols, Simons and Lal, 1967).

The seed seeds or the vegetative propagating materials can be subjected to mixed examination for symptoms of economic importance like diseased, insects, crinkled leaves, dried or dehydrated seeds, bad galls, artificial germination, drying, viability under water, cuts, cuts and rips, cuttings, root branching, root lesions, surface wounds, discolorations and deformations of roots, presence or none of other females of such examination can be made. Vegetative propagating materials even in the absence of the above mentioned symptoms require thorough examination of adhering soil and packing material for the presence of nematode infestation. The examined materials can be examined first under the compound microscope to determine more accurate the plant characteristics and later processed into permanent culture Nematodes present or physician wounds for further study. Depending upon the economic importance, potential, host range and distribution of the nematode investigated, decisions can be taken on the disposal or rejection of the materials. In case where nematode methods of decontamination are available such as hot water treatment, nematicidal dips, washing etc., all efforts can be made to salvage the infected material for release in the consumer.

The plant material can be examined for the presence of externally carried infective propagules of pathogens. Representative samples are examined by

[illegible]

[illegible]

Quarantine for mulberry

[illegible]

[illegible] multiplication.

[illegible]

[illegible]

Suggestions

[illegible]

Table - 1

DISEASES OF MYCOSIS

Name of the Disease	Causal organism	Source
FUNGAL DISEASES		
a. Major :		
(i) [illegible]	[illegible]	[illegible]
(ii) [illegible]	[illegible]	[illegible]
(iii) [illegible]	(1) [illegible] (2) [illegible]	[illegible]
(iv) [illegible]	[illegible]	[illegible]
b. Minor :		
(i) [illegible]	[illegible]	[illegible]
(ii) [illegible]	[illegible]	[illegible]
(iii) [illegible]	[illegible]	[illegible]
(iv) [illegible]	(1) [illegible] (2) [illegible]	[illegible]
	Pig	
(v) [illegible]	[illegible]	[illegible]
(vi) [illegible]	[illegible]	[illegible]
(vii) [illegible]	[illegible]	[illegible]
(viii) [illegible]	[illegible]	[illegible]
BACTERIAL DISEASES		
(i) [illegible]	[illegible]	[illegible]
(ii) [illegible]	[illegible]	[illegible]
(iii) [illegible]	[illegible]	[illegible]
(iv) [illegible]	[illegible]	[illegible]
VENEREAL DISEASE		
(i) [illegible]	[illegible]	[illegible]
VIRAL DISEASES		
(i) [illegible]	[illegible]	[illegible]
(ii) [illegible]	[illegible]	[illegible]
(iii) [illegible]	[illegible]	[illegible]
RICKETTSIAL DISEASE		
(i) [illegible]	[illegible]	[illegible]

[illegible]

References

[illegible]

RELEVANCE OF EXOTIC HERBARIA VARIETIES FOR DEVELOPMENT OF VARIETIES IN INDIA

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Introduction

High yield with low agony are been the main objective of Agricultural technology from this standpoint. The value which good for industry cultivators. The scientists taken greater importance for success of the horticulture industry since the discovery (Kovalev 1997). An increased preference for medicinal (Bhosale 1997) as food plant. Indian horticulture a continual to the generation of agriculturists for economic and a flight. in the so it a very long time to come. Greater emphasis hence, need to be given in the technology for "Subsistence Farming" (but to "Affluent Farming" for purpose of enabling a continued industry, while the country will to use for purpose of developing the farmers to the context of international marketing. India being a very country, with a complex agro climate, provides wide scope for having a variety of medicinal crops to the development of agriculture in different parts. The need, it is, for introduction of exotic medicinal varieties will be considered (Craig 1997) against various related aspects.

Genetic diversity as a basis for development

There are many such criteria for success of "Subsistence Farming" to "Developed Farming" which is achieved by way of usage of a broad spectrum of species coupled with its cultivation mechanism. Most useful appreciating the importance of varietal differences among crop plants as a prerequisite for the development of agriculture. Subsequently to this contributed to the process of evolution and maintenance of genetic variability by way of domestication of crop plants. Domestication (supposed to have commenced as long back as 7000 BC) has further resulted in the evolution of genetically diverse combinations of wild varieties called as exploited germplasm stock.

Domestication is a lengthy process

The wild plant species are supposed to acquire as a germplasm and conserving in Primary Centre of Diversity. Subsequently while getting developed along with man for purpose of cultivation (or cultivation), it undergoes

[illegible]

> [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Table 2: [illegible]

[illegible]

[illegible]

Knife varieties and their [illegible]

[illegible]

1. [illegible]
2. [illegible]

[illegible]

[illegible]

[illegible]

The paddy in Indian horticulture

[illegible]

[illegible]

Management practices and yield potentials

[illegible]

Yield Potentials of Indian Mulberry Varieties

[illegible]

[illegible]

[illegible]

[illegible]

Guidelines from past experience

[illegible]

[illegible]

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

recombination of characters when attributed to the problems encountered with leaf resistance.

3. *Triticum turgidum* does not accommodate properly with *Triticum tauschii*[3]. There is a common belief in Triticum that high base content is an important feature of these hexaploid materials ("some Chinese forms display most of this"). We found[4], similar features in some forms with a low GC content as Bethlehem (selection) which could be an explanation for this.

4. Breeding is less selective now as Rusts, ECVL (Cereal Virus Laboratory) and Hessian powers control important features. Any disease not now found could be found tomorrow, because attempts to use these as hybridization programmes could have been started. Resistance selection recently which was being propagated in a few selected fields and Cambridge should not have been ignored.

Yield Value and Symptoms Associated:

Breeding attempts made to evaluate the yields and factors involved are mostly unsatisfactory and unsatisfactory because the following:

1. Among eight uniformly sown trials (1951, 52 & 53), MEC, Kalyan, Rawa, Jagtai and Kanto) studied by mechanical analysis and difference tests, MEC (3, 154, Kalyan and Rawa) were predictable in any order of merit but also were varying in Tyrol Nabi under Tamilnadu climatic conditions (Thangaswami and Venkatasubba 1964).

2. Among the four uniform varieties (see Annex 2, 154, Kanto and 154 (3 times) under Manchuria conditions, 154 showed better performance with different characters viz. tiller density, head weight, volume weight and seasonal yield (Tyrrell and Smith 1964).

3. Evaluation of eight uniformly sown trials (Kalyan, Jagtai, Kanto, 154, Rawa, Kenya, MEC) (3 and Jagtai) indicated overall order of merit as MEC, 154, (3, Kalyan, Jagtai, Kanto, Rawa) (Mayer, Local), indicating the superiority of MEC and 154 varieties over others (Pathmanabhan 1966).

Lilly and Daniels (1961) have given comparative performance of 154 (Hussar) over 4 years tested at Cornell (Ithaca). Where the main or regular growth parameters of any variety are concerned, it could be seen that Hussar yielded 3% (1 increase compared to 2) by mean number, while the variability in produce were accounted by tillering (and of a total of 30 panicles with nine panicles) for top ranking for environment (Table 5). It could also be noted that this data was while comparative varieties ranked above seven and

[illegible]

Thus it could be observed that [illegible]

Varieties for the climatic regions

India is a vast country with varied agroclimatic conditions [illegible]

However, the question of a high yielding variety for drought prone areas [illegible]

Need for an appropriate strategy

From the above discussion it could be noted that there is a need for mulberry varieties for different agroclimatic regions of the country. [illegible]

The following broad based strategy (Fig. 1) could be drawn with respect to [illegible]

1. [illegible] efforts be made to enrich mulberry germplasm banks of different parts of the country with exotic and indigenous varieties for purpose of evaluation.

2. Selected specimens may be used for irrigation, fertilization programmes.

3. Propagation of selected high yielding varieties from superior ones may be done under specified climatic conditions such as fertilizers.

4. Selected silvicultural systems such as those that facilitate [illegible] may be used in high rainfall areas of the country with efficient harvesting systems.

5. Extensive hybridization programmes may be done for evolving drought resistant varieties mainly in arid subtropical farming systems widely prevailing in India.

Conclusion

Indian forestry [illegible] is environmentally deteriorated in [illegible] farming systems. These trends provide a distinct [illegible] in various parts of India, either mainly in promoting efficient farming systems. Extensive shifting cultivation is attributed to a number of evolutionary and degenerative [illegible] giving [illegible] proportion forestry to the [illegible] system. The present [illegible] farming policy [illegible] the system of crops adopt specific life cycle patterns, in accordance with the climatic [illegible] and conservation and rehabilitation. Again, [illegible] a [illegible] [illegible] of traditional customs. Attempts made in the past to [illegible] these trends [illegible] from temperate countries in different parts of India have not been successful owing possibly to unfavorable climatic conditions such as Rainfall. Introduction of [illegible] cultivation activities in selected parts of the country after careful [illegible] and evaluation [illegible] appears feasible. Agro-[illegible] hybridization programmes in modern [illegible] varieties for any local conditions need to be chosen. An appropriate strategy is required for [illegible] the [illegible] with adaptation and saving traditional resources.

I am thankful to the [illegible] of the Department of Agriculture Government of Karnataka (Messrs. V. R. Chettur and K. Ramamurthy Rao IAS), Directors, (S. Mukherjee, IFS, A. Nagaraja Rao and B. Subaraj, Joint Directors, and S. M. Kamath, Deputy Director) and Dr. M. H. Marasimha Reddy, Professor (Art Bangalore) for the useful discussions and information provided for preparation of the manuscript. My thanks are also due to the Director (Shri K. Shastri and Director (IISR) Bangalore for the opportunity.

[illegible]

Annonymous, [illegible]

Annonymous, [illegible]

Bose, A. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Table 1 : Leaf yield potential of Mulberry varieties of India and China

Variety	Specific growing conditions	Leaf yield (t/ha/yr)	
		Present	Potential
India			
Local	[illegible]	[illegible]	[illegible]
Kanva 2 and S..	Moderate	[illegible]	[illegible]
[illegible]	Alkaline	[illegible]	[illegible]
II. China			
[illegible]	[illegible]	[illegible]	[illegible]

Table 1. Number of livestock (buffaloes) owned per plough in different areas (quantity in rupees)

	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Maharashtra	2.1	3.0	3.4	—	1.5	3.0
Andhra Pradesh	2.6	3.7	3.5	3.4	3.9	3.8
Rajasthan	3.4	3.2	3.6	3.1	3.2	3.5
Gujarat	—	3.0	3.6	3.5	3.3	—
Orissa	3.2	3.1	3.5	3.0	2.9	3.4
Bihar	—	—	2.8	2.9	3.1	3.0
Goa	—	3.4	3.5	—	—	—
Tamil Nadu	3.1	2.5	—	—	—	—
West Bengal	2.6	3.4	3.0	3.2	3.0	—
Madhya Pradesh	—	3.5	—	—	3.2	3.5
Uttar Pradesh	3.4	—	—	—	—	—
Manipur	—	—	3.1	—	3.0	—
Karnataka	—	—	—	3.2	—	3.3
Assam	—	—	—	—	3.1	—
Kerala and Kashmir	—	—	—	—	3.1	—
Kerala	—	—	—	—	—	3.1
Total	2.6	3.0	3.4	3.3	3.4	3.5

Source: NSSO, Central Milk Board, Bangalore. * Only 3/4 Values

Table 5 Maturity management practices and leaf yields in India and South China

Particulars	India		Tropical		South China
	Temperate	Sub-tropical	Irrigated	Rainfed	
Variety	Oriental tobacco, K399, Bidi	B1, B799	Russian 7	Local	Local, HG, Longleaf-type-40
Spacing	1.5m x 1.5m	90 x 15cm	90 x 60cm 120 x 30cm	90 x 90cm	60 x 30cm
Manure (t/ha)	10	10	20	10	45 to 60
Fertilizer N (kg/ha/year)	0 to 100	100 to 200	100 to 300	50 to 100	300 to 400
Harvest method	Leaf picking	Whole harvest	Leaf pick-up or whole harvest	Leaf picking	Leaf picking
Leaf yield	10 — 12 t	20 — 30 t	20 — 30 t	5 — 10 t	40 — 60 t

Table 1 | [illegible]

[illegible]	[illegible]
[illegible]	[illegible]

Table No. : Performance of ICS in non-metropolitan area of Karnataka — Gross & industrial features in Major Trades

(1) Large & Mid-Industry Industry in Wood, cork and plywood in 1991

Group No.	No. of Offs.	Name	Total Employment (No.)	Total Wages (Rs. Lakhs)
	Year 1996 (April-December)			
1.	509	Mfg. of Wood	4,000 (4)	63 (6)
2.	430	Mfg. of Wood	2,512 (4)	23 (6)
3.	440	Mfg. of Wood	5,916 (4)	87 (6)
4.	331	Wood	18,200 (4)	67 (6)
5.	335	Wood	5,000 (4)	91 (6)
6.	66	Wood	1,050 (4)	41 (6)
7.	551	Wood	12,000 (4)	61 (6)
Total	4451		48,878 (4)	
	Year 1997 (April-December)			
1.	556	Wood	15,540 (4)	54 (6)
2.	529	Wood	12,000 (4)	45 (6)
3.	420	Wood	7,560 (4)	23 (6)
4.	331	Wood	8,000 (4)	61 (6)
5.	300	Mfg. of Wood	11,250 (4)	62 (6)
Total	4477		97,978 (4)	

Source : Dept. of Industries, Karnataka State.

Table 10 : Performance of ICS in non-metropolitan area of Karnataka during 1997-98

	Total number of factory (units)	Average working per unit (No.)	Avg. total Wages per Unit (Rs. Lakhs) Male workers	Female workers
Rural	114	19	14.3	11.4
Urban	1311	239	16.2	26.4

Source : Dept. of Statistics, Karnataka State.

Table: 7: Performance of [illegible] in Kolar District of Karnataka from during April 1992.

	[illegible]	[illegible]
Hirer	[illegible]	[illegible]
Total withheld 140 dbs	1048 kg	1120 kg
No. of [illegible]	[illegible]	[illegible]
Yield kg/100 dbs	[illegible]	[illegible] kg
Weight of 10 larvae	[illegible] g	[illegible] g
No. of [illegible]	[illegible]	[illegible]
Single [illegible] weight	1.450 g	1.530 g
L.C.R.	1:10.5	1:10.5

Source: [illegible] of Sericulture, Karnataka State.

PROPAGATION METHODS OF SCLERODERRY GERMPLASM UNDER TROPICAL CONDITIONS

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Background: a method of propagation of rare plants from any generation to the next is perhaps the best way to insure its survival by a preferred route. At most it is desirable to know about the use of simple, maintenance methods that have utilized in order to characterize and also to study the best use of stored seed material. Safer method of reproduction by cheap, plentiful and vegetative plants, combination of protection to newly reproduced specimens. The need of the today's crop species and also economically important plants, propagation methods have been considered and are being followed.

Based on any method of reproduction all the crop plant species can be propagated from their seeds (sexually) but, some reproducing only through seed, some reproducing only vegetatively and some reproducing both by sexual and asexual means. Some variability is found in method of reproduction under natural and local areas of plants and different vegetative organs are used for reproduction of different species. Mulberry belongs to the first category which has natural propagation by seed and we use it propagate by some vegetative and grafting etc. particularly used. However, maintenance necessary, growth and also variations under genetic effects by principles. Choice of the propagation method is mainly, depends on principle availability and purpose of propagation. Advantages following methods are used in our various situations as mulberry.

1. Seed Propagation:

This is mainly used for improvement purpose through hybridization and selection and to raise seedlings by grafting.

2. Vegetative Methods:

This is used to propagate the plants which do not produce seeds or plants which are sterile. By this method parental characters can be kept intact. This method is followed in hybrid seedlings and to keep crop uniformity and homogeneity. Several types like cuttings, grafting, budding and layering are used depending on the availability of principle and the ability to regenerate.

3. Suitable Method of propagation:

Propagation through micro cuttings involves micropropagation, tissue culture of plant cell cultures and the economic regeneration of plants from them.

In the normal course of domestication and improvement of germplasm

of fishery, any tax or fee shows either absence of right type of preservation condition, or the material is valuable and needs special attention. Use of wrong type method of preservation may lead from the genetic inadequacies of the individuals with respect to its rearing and maintenance. In addition, type of the material available source of preservation and fixatives from area and geological age to be taken into consideration.

Based on the above, the following methods can be adopted to suit various conditions.

Preservation through wet is mostly to bring about a variation in the population through introduction for the purpose of selection and also to obtain maximum material for grading. Some of the species like *M. fascigularis* and some exotic varieties which are prone to rearing can be propagated by wet of the seed raising in from a hatcheries/ponds/tanks.

Preservation through curing is restricted to varieties which are fully acclimatized to local conditions only good curing like *Mystus keys*, *M. vittatus*, *Tilapia mossambica* (*Peters*), *Heteropneustes fossilis* (*Bloch*) *Clarias batrachus* (*Linn.*) etc. The curing in these species varies from the widely practice of the farmers are used which are light in salt/molasses content and over quality and preferable. A few modified curing methods are also tried out selected for the preparation of cutlets. Pickling and other methods appropriate suggested for farmers should be adopted.

Although many species of ornamental fishery are available through collection from various ecological habitats like *Etroplus*, *Mystus*, *Tetradon*, *Gudusia*, *Chela*, *Puntius*, *Labeo*, *Osteobrama* and *Rohtee* etc which are given to rearing. Rare varieties has been successful in their varieties with application of excessive quantity of sea materials. (Chakrabarty, S. and Mukherjee, S. K. 1985). The efficiency of the developed varieties from species to species and from variety to variety. The chemicals generally used are EVA, LDPE, PBA, NBA and LLDPE with different thickness of treatment and different concentrations. The choice of treatment is to increase the percentage of cuttings which form roots, to increase the root initiation and to increase the number of roots per cutting. IBA and NAA at concentration of 50-500 ppm are proved to be better. Dipping in 0.1% talc concentration of these chemicals for longer duration was also found effective (Bhattacharjee et al., 2002). The method of application can be direct application, soaking in dilute aqueous solution of water temperature, dipping in concentrated solution for shorter duration and application as hardener paste.

In some varieties like *Pila*, *Lamellidens*, *Bivalvia*, *Ostreidae*, *Pectinidae* etc. where the rearing is all, pickling can be done on the shells of local molluscs. The species depends on the quality of shell and nature. The nature increase the mouth and nature will be established within two or three months.

Depending on the gate used in the resin it can be classified into three grades, hard grading and soft grading. In grading, selection of resin assumes a very important role including its content.

In resin grading more than one resin can be used depending on the size and growth of the crystal. It can also be used to consume the old plants. One should be patient to use the grading card for resin as a required purpose. The common methods of resin grading are weight and weight grading.

In resin grading which is also called as frog grading in Orissa, resin branches with stems have cut in such a way that one can see the resin. This has an advantage over the resin grading wherein every number of grading can be prepared in a short time, yet, it leaves a substantial and percentage of resin is comparatively lower (Fig. 1).

Thermal ring grading for high percentage of resins where root wood is covered over the root portion of the plant which is more commonly practiced in Odisha (Fig. 1).

In ring grading one does not have sufficient knowledge on root system under the soil. The resin is invaded over the bark of the root system which is not known by branches even without disturbing the root system.

When the resin material is mixed, the best grading is carried on. The following rate of success. Wherein the resin material which failed with cartridge and other grade materials were successfully prepared by best grading. (Fig. 2).

Post building, Threading, Root building and Inverted 'T' building are some of the methods used. They should be taken to check the entry of water into the finished region to prevent decay. Among the different types of building, pitch building is found more suitable where a single hole is provided on a circled opening or an existing hole (Fig. 3).

In the period when the resin is mixed and long lived (one month) cartridge. The results of the grading depends on several factors like compatibility, moisture content of the resin and plant, water content of the plant, accuracy of the cartridge and several factors like atmospheric temperature and rainwater.

Different grading methods require optimum moisture content for resin. For frog grading it should be approximately 90%. Those having more than 95% or less than 85% would have lower percentage of resins. The resin content should be higher for inverted frog grading.

For the resinous forest, moisture in resin cakes should be cut down from the state (10-20) that before the breaking of dormancy. For those without

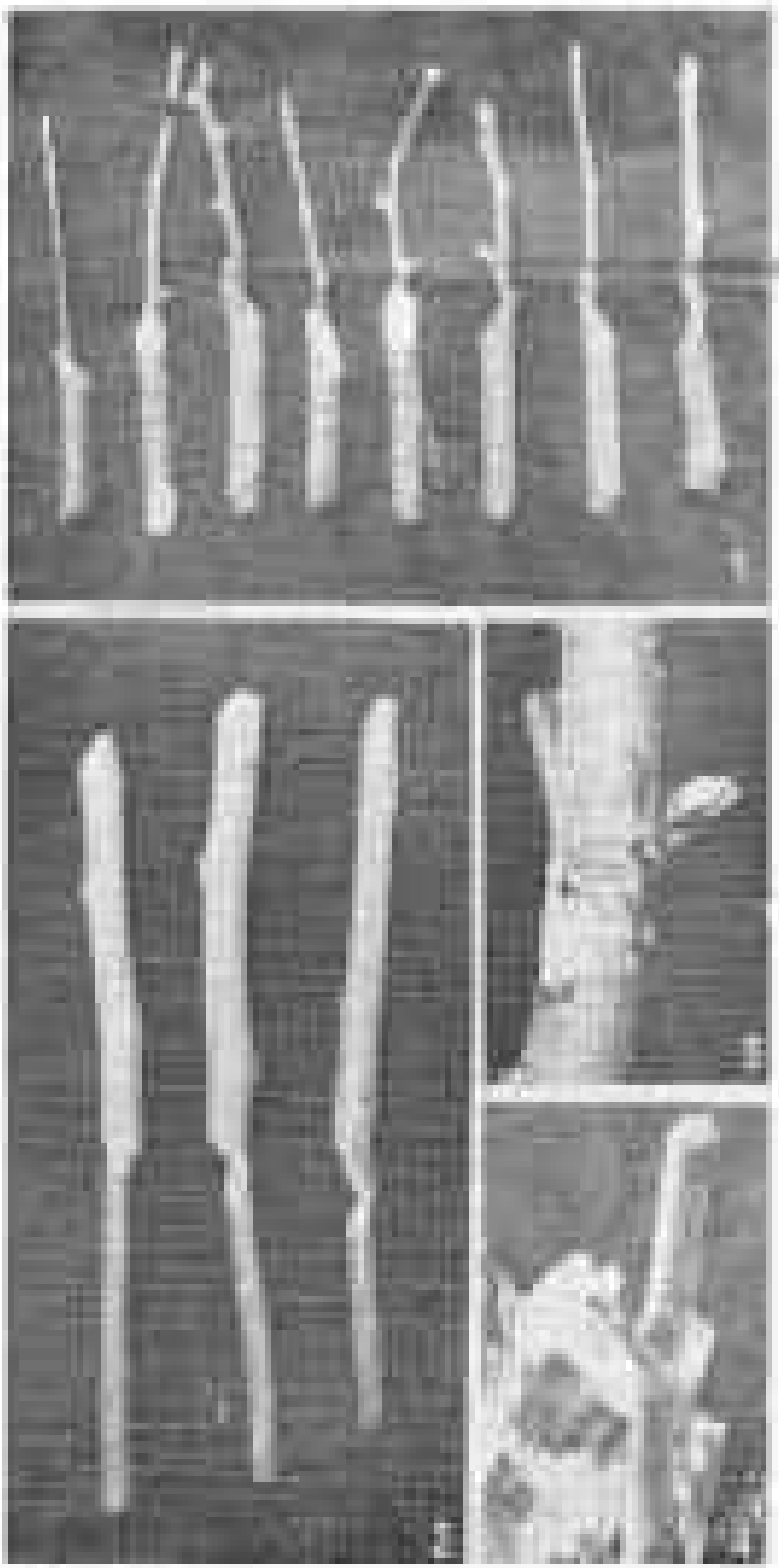

Fig. 1. Bear eating.
Fig. 2. Monkey feeding bear.
Fig. 3. Bear and monkey.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

[illegible]

[illegible]

PROPAGATION METHODS OF MULBERRY GENOTYPES UNDER TEMPERATE CONDITIONS

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Introduction has made elsewhere needs to be tested prior to its commercial use. Most of the authors are mainly focused on the mulberry plant which have the only source of food material for rearing of silkworms and cocoon production. Mulberry is grown with a wide variety of agronomic and cultural practices. Mulberry is also considered as hardy crop but, unfortunately as well as economic importance of mulberry plant, proper rearing of mulberry silkworms is require. The world wide silk demand is increasing day by day but there has a great potential of increasing in cocoon production in a considerable extent by improving the techniques in the farmer's cultivation system and in the same time making improved crops of mulberry and cocoon varieties. To meet the production of raw silk of international quality, the emphasis ought to be shifted for the rearing of silkworms in the temperate and cooler regions of the country also.

For improvement of mulberry, a vast source of germplasm is kept at the base. The country should have a complete base collection of mulberry especially both in the cultivated and temperate regions. The United International Bureaux and Training Institute, Mysore, is the only leading a step mulberry germplasm but the authors feel that it's germplasm exploration in the temperate regions is also important. Besides, the germplasm introduction is to be made from abroad to form the purification of the already existing germplasm also needs to be taken up. The maintenance of genetic resources essentially means the characterization, maintenance, regeneration and distribution of the germplasm.

The Kashmir valley has a typical temperate climate characterized by four distinct seasons of spring, summer, autumn and winter. The rearing of mulberry silkworms is deeply rooted in the culture of the valley's people. During the recent past the mulberry wealth of the valley has been greatly eroded and characterized by an increase the mulberry plantation in the valley. With the coming up of S. K. University of Agricultural Sciences and Technology in the state a great emphasis has been laid on the Division of Sericulture of the University for evolving economic and low cost cocooning technique of propagation of mulberry trees.

The traditional method adopted for propagation of mulberry trees in the Kashmir valley has been through root grafting. It takes around three years to

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Introduction

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The activities needed for the assessment and utilization of marine resources can be grouped into:

(i) Exploration
(ii) Gear research
(iii) Evaluation
(iv) Data storage and Retrieval
(v) Utilization
(vi) Training and
(vii) Quota Determination (Hotta, 1981)

Conclusion

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genetic resources centre should recognize base, active and working collections. The base collections are for long-term conservation under optimal conditions where the samples are retained undisturbed, until they are regenerated. The active and working collections need not be stored under such optimal conditions as the base collections because these are to meet the multiplication, storage and utilization. In germplasm, base and active collections need to be preserved separately and must be duplicated.

The primary objective of conservation is to preserve at least one copy of each of different alleles from the random representation of allelic frequencies in the sample (Marshall, 1975). Even with this qualification, because of the extent identity of genetic control of most traits of economic value and the widespread genetic polymorphism, even the minimum population size that will represent all the alleles present a formidable task. As a result, the problems of conservation are not only profound to an understanding of population structure, dynamics and develop suitable sampling procedures for seed-exploration, large scale and long duration storage facilities with viable conditions. Mulberry is a perennial woody and heterozygous plant. Although it is sexually fertile, it is not possible to grow it commercially from seeds because of high degree of heterozygosity. Because of this, seed preservation of seeds is not of much use. Only by vegetative propagation, the individual characteristics of the parental stocks can be perpetuated. Besides this, mulberry [illegible]. With this in view, it can be said that mulberry can be preserved by field plantings and in vitro methods, i.e., by in vitro tissue culture.

Field plantings

As collection, exploration and [illegible] of mulberry germplasm will be dealt in separate papers, for brevity, only few aspects after the multiplication of the germplasm material is maintained in field.

For economy, from the point of management and utilization, [illegible] procedures/programmes need to be envisaged. A distinct period could imply harmful effects of the maintenance of the genotypes (Hayes and Ramanathan, 1968).

Locating the site for preservation must be done carefully with the following points in view: Because both frost and water requirement required to be limited at the site. Location which does not pose much to natural calamities, and must be fertile with deep top soil profile and suitable pH, to include long ranges with sufficient irrigation facility, must be easily accessible and as far as possible near the main research station so as to conduct studies on germplasm materials.

Size of the population per accession/genotype to be maintained and

medium and long-term storages [illegible]. For safety and holding collections which cannot be [illegible] plants per accession can be maintained for [illegible] documentation and preliminary evaluation. [illegible] Since mulberry is a perennial woody plant and its genetic diversity has to be maintained for long [illegible] necessary [illegible] the available genotypes while deciding the spacing. The [illegible] spacing is found to be better. With this spacing [illegible] plants can be planted [illegible] ha [illegible] Accordingly [illegible] plants per accession [illegible] for medium and long-term storage [illegible] accessions respectively can be accommodated [illegible] ha. [illegible] of planting [illegible] has to be followed [illegible] saplings when they are [illegible] Plants must not [illegible] planted. During the establishment period of one year, pruning should be avoided. After the establishment, the pruning [illegible] height of [illegible] cm [illegible] followed [illegible] Plants have to be maintained in optimum condition with proper and adequate timely [illegible]. Sufficient care and precaution should be taken to protect germplasm from cattle, fire and thieves.

The other aspect is of [illegible] of the [illegible] should be given [illegible] information should [illegible] When [illegible] have been [illegible] and [illegible] quantity [illegible] material [illegible] to germplasm. Once the material has been accepted, the responsibility to preserve [illegible] period will [illegible] germplasm. [illegible] the [illegible] with the [illegible] accession number. [illegible] should be [illegible] germplasm [illegible] loss of germplasm.

The maintenance of the germplasm in field [illegible] It requires large amount of labour, land and other inputs. [illegible] germplasm [illegible] has to [illegible] and bear the [illegible] which [illegible] Also, there are [illegible] loss of [illegible] due to [illegible] and damage from [illegible] and human errors in handling of materials.

In vitro storage of mulberry germplasm

To overcome the difficulties to be encountered in preserving of germ-

[illegible] resources to field physiology, in vitro methods developed initially for the propagation and genetic manipulation of plant species have also been successfully [illegible] adapted for germplasm conservation (Ayobo, 1991; Withers and Williams, 1985; Withers et al., 1995). The plant cryo-culture approach offers potentially useful methods for long-term storage of plant genetic resources of cultivars (for example, shoot apices, embryos, protoplasts) and tissues (for the maintenance of genetic integrity).

In vitro culture (IVC) is more suited to an all embracing term which describes the growth and manipulation of all plant parts, whether a single cell, a tissue or an organ under aseptic conditions and nutrients. Since it is particularly [illegible] time consuming, making them unsuitable as and when they are required.

There are two basic aspects in in vitro germplasm storage when tissue culture is considered as a means for [illegible] and isolated plants materials and cryopreservation.

Normal and minimal growth conditions

These [illegible] can be maintained under normal growth conditions temporarily. Minimal growth conditions for short-to medium-term storage can be achieved in several methods: (i) maintaining these cultures at a reduced temperature (below permissible minimum [illegible] for subculture (i.e. every 4-6 weeks) with regular subculture — examples are cassava, (ii) enjoyment of chemical retardants or inhibitors, most often by reducing the temperature and/or light, and (iii) incorporation of osmotica (very) of growth retardants such as mannose and [illegible] (Withers and Williams, 1985). The advantage of this method is that the cultures can be readily returned to normal growth conditions to produce plants as desired.

The disadvantages is the need for sub-culturing every 1-2 years and the risk of contamination. But normal growth cultures for in vitro germplasm storage is hazardous, because of [illegible] of environmental stress on cultures could induce genetic modifications and also [illegible] genetic changes in response to stresses. *The effect of the genetic change ... [illegible] an exchange of [illegible] the [illegible] the chance of survival of germplasm that will [illegible] a cultivar which is true to type.*

Several works have been done on in vitro culture of solitary bulb or shoot tips of medicinal (Field et al., 1981; Dodson and Ellyatt, 1985; 1986; Nakano et al., 1985). Recently Hammes (1987) has described the germination of solitary germplasm in the test tube to [illegible] of tissue culture a valuable, safe and [illegible] and long-term germplasm. He also the same author, [illegible] of plants, multiplication of shoots and micropropagation of these shoots [illegible] in the test tube to the field were commercially carried out with success.

A) Liquid nitrogen vapour phase: Samples are placed in cryovials (1.5 ml) or cryotubes (2 ml) for long-term preservation, alternative of bottle cryovials is suggested. Many new tips made out the cryopreservation solutions for in vitro storage of germplasm, because the prepared cryogenic protocols cannot be transferred to laboratory experiment.

Cryopreservation

Long-term storage of plant germplasm should be done in commonly low temperature, preferably at that of liquid nitrogen (−196°C), so as to immobilize almost all metabolic activities and simultaneously minimize the opportunity for genetic change. The principle for the long-term storage of germplasm by the method is very simple. Through the application of these techniques it will be necessary and to be stored for relatively moderate quality germplasm for vegetative regrowth tissues are not yet available even for any major crops (Kartha and Engelmann 1994).

The procedure developed for the long-term storage of plant tissue cultures are the storage and culture of excised shoot apexes (Mehra, 1972; Kartha, 1981) and transplantation of callus or suspension cultures (Sharma 1975). Nitsch (1977) demonstrated that by culturing excised apexes and rapid explants under carefully controlled conditions of nutrition and environment, plants tissue of crops were could be maintained with a minimum of labor and cost, capable of maintaining clones of the best. He calculated that 100 different crops cultivars with an institution could be stored in a space of 1 square meters and hence a single technician could look after 10 million explants for practical culture one year.

During the tissue preservation of plant meristems and cultured cells, various stress influences such as (1) total and physiological stress of the cells prior to freezing, (2) the type of cryoprotectant, (3) cooling rates, (4) temperature to temperature prior to storage in liquid nitrogen, (5) storage temperature and (6) thawing and regeneration procedures (Kartha, 1985). During cryopreservation, it is important that damage by the crystal formation within the cells must be prevented altogether or at the very least minimized. Two methods have developed to achieve this, viz., the stepwise freezing and the slow stepwise freezing of cultures. Hybrid (1) cultures, however, the tissue is often treated with a cryoprotectant such as DMSO (dimethyl sulphoxide) or glycerol, which reduces damage to a number of ways. Nevertheless, for plant tissues, an understanding of the behaviour of water-ice in freezing solution is essential to circumstances to be taken into consideration. Most tissues the samples may be transferred to a liquid nitrogen refrigerator for long-term storage. The main limitation to cryopreservation techniques is the requirement of a liquid nitrogen refrigerator and reliable supply of nitrogen.

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Variability in in vitro culture

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[illegible]

Storage of pollen

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Additional advantages of in vitro methods

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Molecular method of germplasm conservation

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Summarization and Interpretive Aids

In genetic relationship, systematic considerations of the relevant data in a controlled manner and proper studying of the genotypes are very important. Failure to these may lead to setting of genotypes and derived from the value of detailed research of genotypic relationship.

The interpretation data a very much needed for the meaningful and systematic examination of genotypes. Because critical analysis of the genetic correlation resulting evaluation of basic traits and desirable genetic and breeding value studies will help to understand and genetic and breeding value of varieties. These studies help us to understand the past, present and the course and nature of gene exchange. The kind of data is of paramount importance for establishing the breeding strategy for particular crop.

It can be concluded that genetic diversity is indispensable to humanity. Its meaningful preservation and utilization of germplasm resources, we will be only using the knowledge we have, but means available for plant breeding, but also for protecting human society.

SUMMARY

To meet the various breeding objectives of cultivars, large scale, long-ranging breeding programmes are necessary for which an adequately assembled, broad genetic diversity is a prerequisite. Even in general of known pure line methods germplasm resources. It can be evaluated that little work has been done on the proper and authority has not yielded worthwhile attention on systematic conservation, evaluation, documentation and exchange. This aspect needs immediate action.

For cultivars like medicinal or rare crops/species or rare species. The practical way of preservation will be by in situ methods. Because of the known efficacy it is not possible to practice seeds of medicinal. For medicinal plants suitable methods should be promoted by field plantings and in situ methods of cultivars.

The conservation strategy must consider the two dimensions and interact. For obtaining real time management, periodic genetic base survey and making collections accordingly and they need to evaluate. In monitoring field changes, genes, alleles, one of agents and economic attributes are taken into and also the field base and traits of crop/all diseases, physiological diseases and human needs.

To conserve the diversities in maintaining field germplasm in their methods can be suitably adopted for cultivars. There are two aspects to in vivo germplasm storage, viz. normal and seeds/ germplasm conditions for duration

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CULTIVATION AND MANUFACTURE OF MILLET IN GERMANY

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Germany has a long tradition of growing millet. In the past, it was an important crop for human consumption, but was soon replaced by other cereals. Nowadays, millet is mainly grown as a forage crop. Recently, however, there has been a revival of interest in millet as a food crop. Several factors contribute to this development. Millet is a gluten-free cereal and therefore suitable for people suffering from coeliac disease. Millet is also a good source of protein, minerals and vitamins. Finally, millet is a very versatile crop that can be used in many different ways.

The aim of this paper is to give an overview of the cultivation and manufacture of millet in Germany. It includes information on the history of millet growing, the different species and varieties that are grown, the agronomic practices involved in growing millet, and the various products that are made from millet.

History of millet growing in Germany

Millet was one of the first cereals to be cultivated in Germany. It was grown by the Celts and the Germanic tribes, and it was also an important crop in the Roman Empire. However, millet declined in importance during the Middle Ages, and by the 19th century it was only grown in small amounts.

The decline of millet growing was due to a number of factors. One factor was the introduction of new, higher-yielding cereals, such as wheat and rye. Another factor was the change in dietary habits, with people preferring to eat white bread and other refined foods. Millet was also difficult to harvest and process by hand, which made it less attractive to farmers as labour became more expensive.

Species and varieties grown in Germany

Today, millet is grown in Germany on a small scale, mainly for use as a forage crop. The most common species grown are foxtail millet (*Setaria italica*) and proso millet (*Panicum miliaceum*). Foxtail millet is a tall, erect annual grass with a dense, cylindrical panicle. Proso millet is a shorter, more branched annual grass with a loose, open panicle.

There are a number of different varieties of foxtail millet and proso millet that are grown in Germany. These varieties differ in their yield potential, their resistance to pests and diseases, and their quality characteristics. The choice of variety depends on a number of factors, including the intended use of the crop, the local climate and soil conditions, and the farmer's preferences.

Agronomic practices

Millet is a relatively easy crop to grow. It is tolerant of a wide range of soil types and can be grown on poor, sandy soils that are unsuitable for other cereals. Millet is also drought-tolerant and can withstand periods of hot, dry weather.

The following are some of the agronomic practices involved in growing millet:

- **Seedbed preparation:** The seedbed should be well-prepared, with a fine, firm tilth. This can be achieved by ploughing, harrowing and rolling.
- **Sowing:** Millet is usually sown in late spring or early summer, when the soil temperature has reached at least 10°C. The seed rate is typically 15-20 kg/ha.
- **Fertilizer application:** Millet has a relatively low nutrient requirement. A typical fertilizer application would be 50-60 kg/ha of nitrogen, 30-40 kg/ha of phosphorus and 30-40 kg/ha of potassium.
- **Weed control:** Weeds can be a problem in millet crops, especially in the early stages of growth. Weeds can be controlled by a combination of cultural and chemical methods.
- **Harvesting:** Millet is usually harvested when the grain is ripe and the plants are dry. The crop can be harvested by combine harvester or by hand.

Manufacture of millet products

Millet can be used to make a wide range of products, including flour, grits, flakes, and puffed millet. Millet flour is used to make bread, cakes, biscuits, and other baked goods. Millet grits are used to make porridge, couscous, and other dishes. Millet flakes are used to make breakfast cereals and muesli. Puffed millet is used as a snack food.

The manufacture of millet products involves a number of steps, including cleaning, dehulling, milling, and processing. The specific steps involved depend on the type of product being made.

Conclusion

Millet is a versatile crop that has a long history of cultivation in Germany. It is a nutritious and gluten-free cereal that can be used in a wide range of products. Millet is also a relatively easy crop to grow, and it is well-suited to the German climate and soil conditions. With the increasing interest in gluten-free foods and healthy eating, millet has the potential to become a more important crop in Germany in the future.

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Table 1. Cultivars in Adult Merinos Autumn/grazed in Spring Autumn/all in Apple (1986)

S/ No.	Place	Indigenous Exotic	Others	Total
1.	CSCT Myrtle	50	40	140	190
2.	CSCT Bottlegrass	42	60	—	102
3.	SSRT Kalimpong	70	12	—	82
4.	RRR Mulga	91	—	—	91
5.	SSRT Kangaroo	5	70	12	87
6.	RRR Cowpea	70	9	5	79
7.	Rhodes University	5	7	—	9
8.	RR Canopy	9	1	—	9
9.	Mary Gordon (U.S.)	1	—	—	1
10.	KRRS Bluegrass	41	95	3	139
11.	UAS Stargrass	56	32	—	83
12.	Bluestone Farm Co.	5	4	—	9
13.	TN Soil Department Cashlea	18	6	—	23

Table 2. Specimens examined of *Mullerius* males mentioned in (1963 A) Harris (1964).

Species	No. of specimens
M. alto	(1)
M. aurivalli (*M. waldroni*)	1
M. brandesi	1
M. caffrorum	2
M. fuelleborni	11
M. longipes	1
M. darlingi (*M. orthocostalis*)	20
M. lineo	2
M. nigro	2
M. orientalis	1
M. shanksi	1
Unidentified	9+
Total	58

Table 3. Comparison between results with *Mullerius* and *Glossina* at Ifakara, Tanzania (1963).

Species	(1963 A–F)	(1963)	(Total)
Mullerius	93	(2)	95
Glossina	66	71	137
Others	83	1	84

Utilisation of machinery: groupings

I	Cereal grain: wheat		
Year I	Fertilizer application		
Year II	Irrigation: gravity-flow furrow system		
Year III	Harvesting by tractor-pulled combine		
Year IV	Delivery to grain elevator by truck	Storage in bulk in the elevator	Open-market purchase by processor
Year V	Processing: milling of flour	Processing: production of bakery goods	

II	Regional provision		
Year I	Research for specific purposes at the agricultural experiment station		
Year II	Hand-operated planting, no tilling of ridges	Hydraulic-operated tractor-pulled planting unit	Open-pollinated hybrid variety
Year III	Processing: multiple-cutter reaping	Threshing: multiple-cutter reaping	

MULBERRY BREEDS AND THEIR DISTRIBUTION IN NORTH-WESTERN HIMALAYAS

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Perhaps agriculture alternative has been considered as a prerequisite for effective exploitation and utilization of natural genetic resources, which is a basis for crop improvement. In addition, the study reveals origin and genetic diversity of plants under multi tier a sustainable background. Considering the importance, de Candolle (1886) studied the geographical distribution of cultivated plants and gave evidence of centers of origin of many domesticated crops. Later Vavilov (1951) studied extensively the geographical distribution of some of the economically important plants and established eight main and forty sub centers of origin. According to him the Chinese centre and Indo-China centre have been established as the natural home of several crop plants including mulberry.

Genus *Morus*, which is considered to be originated in Himalayan region of India/China is widely distributed in north the Subtropical including temperate and sub tropical regions. One of the characteristic species, *M. alba* reported from China (Late tertiary Kirtisinh) and most of which are cultivated in China, Japan, USSR, South Korea and India.

Bentham (1858) has described 9 species namely, *M. indica*, *M. alba*, *M. tatarica*, *M. nigra*, *M. rubra*, *M. microphylla*, *M. laevigata*, *M. celtidifolia* and *M. serrata* in subgenus. All these species are found between sea-level and Himalayan Zone (subtropical to Warm to temperate to Cool). Mulberry with exceptional climatic tolerance is being practiced since several centuries, hence a considerable diversity of Mulberry germplasm is found in India. Kumar (1988) has described 24 species and 3 varieties of mulberry from Himalayan region.

Physical Features

The North-Western Himalayan region comprises of two mountainous states namely, Jammu and Kashmir and Himachal Pradesh with a total area of 222,236 sq. kms. and 55,673 sq. kms. respectively (Bhagat *et al.*, 1981-82). The average height of the region varies from 450 feet to 24,000 feet above M.S.L. Jammu and Kashmir State with 14 districts is divided into three distinct geographic regions, namely, Jammu, Kashmir and Ladakh. Whereas, Himachal Pradesh is divided into 12 districts. Jammu province is I & II and Planning Region, Kashmir, Srinagar, Baramulla etc. of Himachal Pradesh which consists of mostly rain dependent and semi-mountainous land ecologically in the Punjab and Indian Kashmir valley depending on the Rainfall except in about the mean daily depth of the mountain ranges are extensively known as Himalaya.

Below the hills is the sub-plain area comprising parts of Kathua, [illegible] (above 1,200 feet above sea level). The Pir Panjal mountains divide the two provinces of Jammu and Kashmir Valley. [illegible] ranges gradually [illegible] rise up to 1,500 ft. [illegible] the valley of Kashmir [illegible]. On the opposite end of the valley is a lofty range of mountains [illegible] feet). [illegible] Kashmir valley is about 84 miles long, 20-25 miles wide and ranges in altitude between 5,000 - 6,000 ft. above M.S.L. [illegible] Ladakh which presents high level plateau [illegible] scanty vegetation.

Himachal Pradesh can be divided into three zones [illegible] outer Himalayas, lesser Himalayas and Alpine zone with [illegible] varying from 1,500 m to 6,750 m [illegible] from 750 mm to 3,000 mm. [illegible] 3-4 months in a year. According to [illegible] (19[illegible]) the state can be divided as :

(i) Valleys — With [illegible] up to 1,000 mts. above sea level.

(ii) Low hills — These have an altitude of 1,000-2,200 mts. above sea level.

(iii) High hills — These [illegible] between 2,200 to 3,500 mts. above sea level.

(iv) Alpine zones — 3,500 mts. above sea level.

(v) Snow zones — The land is [illegible] without vegetation.

II. Agro-climatic regions

The N.W. Himalayan region is located [illegible] in the middle of three altitude regimes of [illegible] Punjab, Haryana and Uttar Pradesh.

The geographical position [illegible] topography [illegible] a variety of climatic conditions which can be differentiated as follows :

(i) Sub-tropical : With a mean temperature of about [illegible] and mean rainfall of about 1,000 mm, these areas [illegible] parts of Jammu, Kathua, [illegible] Bilaspur, [illegible] Chamba, Mandi etc. The mean height ranges from 1,000 ft. to nearly 4,000 ft.

(iii) Temperate : With a mean average temperature of about [illegible] [illegible]

(iv) [illegible]

(v) Cold dry zone : [illegible]

III. Mulberry [illegible]

The N.W. Himalayan region [illegible]

Mulberry plants in N.W. Himalayan region [illegible]

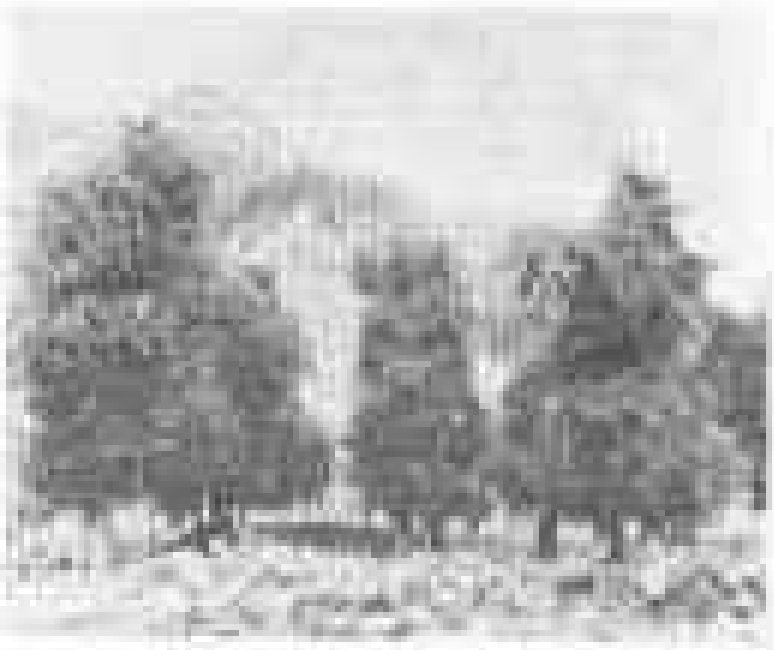

Fig. 1. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]

[illegible]

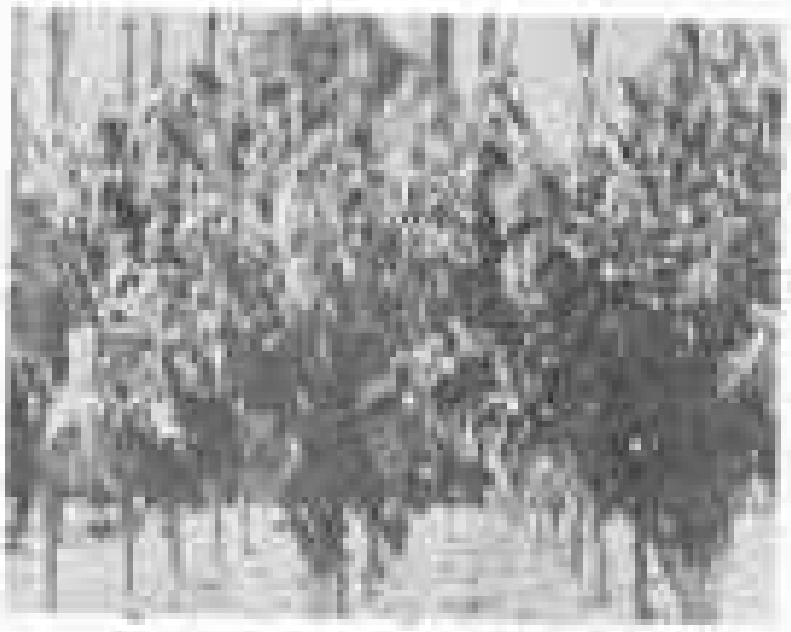

Fig. 1861. Medullary sarcoma of testicle with a cyst in it. (Natural size.)

Fig. 1862. Medullary sarcoma of testicle with cystic degeneration. (Natural size.)

Some of the varieties of M. indica are classified under M. altilis while some are known as Chhin and M. indica itself are found together in the variety of M. altilis. However, the specimens of M. altilis like Khanna 8.9.73, etc., which compared to the local varieties have considerable differences both regarding its habit, morphology and physiology.

2. Mangifera altilis L. Local type belonging to this species are mostly intermediate in the cultivars but of considerably practical value have three cultivars with the M. altilis as conspicuous associated characters. Leaves are thick, glossy with long petiole, old shoot green in colour, inflorescence on petiole, stem colour is greyish to light brown, fruits oval like Ash, Gourch is more spoil resisting 3 years. This species is reported from Anantnag, Baramulla and up to 1,000 ft. The local varieties belonging to this group are :

(i) Chakra Tal : This is one of the important mulberry varieties grown throughout Kashmir valley. The fruits leaves mulberry but in some localities might found as 1 & 2 Bati Subdivision Department Nursery at Wadoo is about 100 years old [Fig. 1] and considered as Chakra Tal. This variety is considered to be good for silkworm rearing and because the yield produced is also very good. Propagation is carried out by grafting, the leaves are dentate, ovate and succulent.

(ii) Kaan Tal : This variety is indigenous to Kashmir, generally and mostly confined to the higher altitude like Lolab, Lolhar and Kaal valleys. The leaves are broadly ovate-orbicular, entire and succulent.

(iii) Kaal Tal : This is a huge tree and again confined to temperate regions of Kashmir. The leaf is not considered good for silkworm rearing. The leaves are ovate, entire to undulate. The variety has unusual transparent veinlets, is also propagated through grafting.

In addition to the above varieties, there are some more common cultivars which are found and cultivated under M. indica. These are Gulabjamun and Nadergam, which in the trade of fruit fight have been included by Bhan and Kachroo (1972) under M. altilis and reported to be indigenous to Kashmir. Besides these are some accepted hybrids between the two mentioned species. Some hybrid and they with the above listed types. As there have been several local, cross-pollinated varieties resulting their use as cultivars in the orchardization. In addition, the values of grafted plants in condition and with subsequent spreading and growth of shoot which is a resulting of scattered habitat, has also added to the variability of Mangifera plantations. As a result array of continuous variations among the existing plantations can be seen today. These different types have been named by local people, based on some arbitrary characters like fruit types, name of the locality where the mother is growing etc. As a result of Mangifera area of

Fig. 1 Mhaoil Mhóir Mhaoilchiaráin, mac Aonghusa Dhuibh Uí

Fig. 1. [illegible]

[illegible]

[illegible]

[illegible] (Fig. 11). The [illegible]. The leaves are not used for [illegible] about [illegible]. However, [illegible] [illegible] [illegible] Madakh [illegible].

4. White [illegible]: The species is confined to subtropical belt, occurring up to [illegible] 4,000 ft. As such the species is not found in the temperate belts of the region. This species is found in Southern parts of Himachal Pradesh and [illegible]. The leaves are [illegible] [illegible] [illegible] and are not used for silkworm rearing.

5. White [illegible]: This is not a common species in N.W. Himalayas. The species has been found in Rajouri-Punch [illegible] of N.W. Himalayas. Besides, in Himachal Pradesh it is reported [illegible] in Chamba and [illegible] between 3,500 to 6,000 ft. The leaves [illegible] and are not used for silkworm rearing. The wood is, however, used as timber.

In addition to the local species/varieties described above a number of exotic and improved varieties have been introduced in this region. These include [illegible] [illegible], Goshoerami, [illegible] [illegible] etc. [illegible] [illegible] of the region which is [illegible] origin in Japan. However, of all these varieties Goshoerami has been [illegible] established [illegible] of the leaves and [illegible] growth of the plant, whereas other varieties like Kokuso-27 and [illegible] though not popular are also found to be better.

Kokuso-21, an evolved triploid variety from [illegible]. [illegible] is becoming very popular in the subtropical regions. [illegible] grown extensively in the subtropical belts.

In addition there are number of indigenous varieties which are localised in different [illegible] pockets of the region and are being locally named like Chamba, [illegible] etc.

Studies of the mulberries has been made by [illegible] ([illegible]) in Kashmir and [illegible] areas of [illegible] province. Whereas, presence of mulberry in Ladakh is recorded as early as 1873 by Cunningham. He has reported mulberry in [illegible]. [illegible] ([illegible]) has [illegible] mulberry both in [illegible] as well as [illegible] and in Ladakh province as a whole including the [illegible] district.

Conclusion

Through the efforts of Regional Recruitment Research Institute, Udaipur, the necessary trained human m'pal resources are given to the field ... for pursuing the excellent contributions are being maintained in the Government Books of Rajasthan Archives and is reached a gradually increasing. These activities are continued for different parameters and to this respective a common mandate. Chitrakoot Udaipur has been headed to be a good center with other domestic classrooms. Due to its locational and fast growth this activity is being supplied to the U.G.C. State Recruitment organizations for further multiplication and distribution to the Centers.

However, to unfold the natural treasures which is a prerequisite to know well planned attempt for withdrawal academic planning needs to Nestle Museum Researchers and explorers and evaluators for future needed facts information and important regions of the NW Himalayas. The promising efforts can be further multiplied to cover the needs of Libraries and Research and Historical Museum Rooms and thereby boost the knowledge orientation in this region.

The major explorations centres in Museum of Raj. is useful to refer as in the following regions.

In Eastern and Northern Area following areas can be surveyed :

1. Museum Lucknow : Prague division and towards Himachal Pradesh
2. Museum Kanpur : Almost whole of the accommodation region
3. Museum Allahabad : Remaining accommodation region
4. Museum Bharatpur : U.P. region and Rajasthan border region
5. Museum Rajgarh : Lucknow valley and Jawaharlal Nehru Central region
6. Museum Jaisalmer : Lucknow valley and Northern pass towards Jammu Kashmir
7. Museum Pithoragarh : Himalayan region towards Nainital Pradesh
8. Museum Delhi : Rajasthan and Bhubaneswar region
9. Museum Rajgarh : Almost whole of the accommodation region
10. Museum Panchal : Almost whole of the accommodation region
11. Museum Kolkata : Upper Assam region
12. Museum Chhattisgarh : Assam valley and towards Assam region

In Himachal Pradesh all the explore locations can be taken up for the survey programme. These include Lucknow, Bharatpur, Chandigarh, Dharamsala, Manali, Srinagar, Kathmandu, Delhi, Lahaul Spiti, Kinnaur, Shimla and Goa. Explorers training programmes can be taken up in a planned manner starting with Lucknow, Chandigarh, Bharatpur, Manali and Delhi in the first phase.

Fig. showing distribution and survey cities of railways centres in the North Western Himalayas

Krishna ...
Krishna ....
Krishna ....
Krishna ..
Krishnaya
Railway cities

References

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

APPLICATION OF PLANT CELL, TISSUE AND ORGAN CULTURE IN BREEDING IMPROVEMENT PROGRAMME

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Mutagenesis is an important step in selection programme for crop improvement but plant breeders are hampered by many problems and even fails. Potential agents of the plant origin with polyploid potential must be used to overcome these problems. Further, examples where the genes of which the dominant mutant varieties are expressed by one or two traits only need to transfer to a better genetic background by conventional hybridization technique. There is a possibility of incorporation more than one desirable genes of wild ancestors which is a missing factor in breeding programme. Moreover, in vitro mutagenesis overcomes the problem of time lag (part in order to achieve desirable from mutagen and subsequent genes of interest by conventional hybridization methods. Micropropagation becomes another tool in polyploidy and induction of mutations but there are many major problems which we have to face in micropropagation and conversion of in vitro plant material into genotypes of commercial importance which is known as 'tissue culture'. Like the plant breeder we attempt to fix novel characteristics genetic manipulation and modification of homozygous ideal lines. In the following pages the results of our investigations on propagation of orchids, forage grass species and pearl millet with other techniques after a multiple improvement programme.

Three methods to propagate can be carried on mutant materials are presented in the following lines.

1. Micropropagation and rapid multiplication of different in vitro cultures

Mutagenesis is frequently used in many crops and ornamental plants. Repeated multiplication is achieved and desired plants in the genetic characters of the parent are maintained and fast multiplication is achieved. Cutting is followed by differentiation (shoots, roots) in tissue culture and transfer. The cultures of these cultures differ as mentioned especially in the repeated multiplication of differentiation like cultures of cultures.

Abbreviations: BA, 6-benzylaminopurine; 2,4-D, 2,4-dichlorophenoxy acetic acid; NAA, α-naphthaleneacetic acid; IAA, indole-3-acetic acid; GA, gibberellic acid; Kn, kinetin; MS, Murashige and Skoog, 1962 medium; mM, millimolar; mg/l, milligrams per litre.

Culture of axillary buds

The axillary buds have been used for micropropagation of elite genotypes of mulberry. The excised buds were cultured on a basal medium of Murashige and Skoog (1962) supplemented with various growth substances in different concentrations. [illegible]

[illegible]

Like axillary buds, [illegible]

[illegible]

II. Production of haploids and homozygous lines

Mulberry is dioecious and [illegible]

[illegible] haploids can be [illegible] homozygous diploid lines [illegible]

Haploids offer opportunity to study [illegible]

III. Production of triploids

Triploid plants have been found [illegible] haploids [illegible] triploids [illegible] cultures.

IV. Protoplast culture and somatic hybridization

One of the most exciting developments in plant tissue culture [illegible] protoplast [illegible] somatic hybridization [illegible] of parents.

Culture of protoplasts

Procedures for establishment of protoplast culture in mulberry have been [illegible]

species (Kirsch, 1991). The long-term culture of tissues often results in changes in the karyotype of the plant in culture and the regenerated plants show variation for various characters. Protoplast culture technique can also be utilized for regenerating plants with physical morphology changes in growth habit, leaf shape, degree of plant and tolerance of stress.

Callus culture is the most commonly used technique for establishment variations. Plants derived through callus cultures display altered leaf characteristics, activity, leaf development and leaf colour. Recently Ray *et al.*, (1994) reported embedded variations in cauliflower plants obtained from in vitro cotyledonary leaf callus. Recurrent plants can be propagated vegetatively. Cultures of specific explants could prove useful to maximize the necessary production of considered variants. Formation of monogenic and periodic leaf colour plants with monogenic chlorophyll prior or chlor in vitro culture might result in the production of wild species in vegetatively propagated plants and the considered variants can be perpetuated vegetatively without loss of the necessary characters (Dewanji and Van Harren 1979).

VI Cryopreservation of germplasm

The collection and preservation of cauliflower germplasm is the backbone of breeding and genetic improvement programmes. However, due to the perennial and cross nature of cauliflower, conservation of germplasm takes up considerable labour, land and time. The technique of cryopreservation of plant material will be an extremely way of maintaining a large stock of germplasm in a limited area. The cryopreserved tissues and organs can be revived and propagated when required.

VII Production of short vars

Production of "synthetic seeds" by encapsulating somatic embryos is a major milestone in plant biotechnology for micropropagation. However, most somatic embryogenesis so far has not possible from cauliflower cultivars, whereas they have been used for preparing synthetic seeds. In case of cauliflower, different varieties recover the best normal formed plantlets, morphogenetic and their incorporation choices for encapsulated alone have been tested for quality packed in fortified media then freezing stored and recover the viability and survival rate (Fig. VII).

Shoot cultures were established from young vegetative buds on a hormone-free MS medium. These well shoot cultures yielding fresh axes (shoots) and were grown with medium changes (Figure) which formed a gel with 0.42% modified after a final autoclaving 4 weeks culture had. The buds could be stored at 4°C for 21 days without loss of viability. As some contaminants encountered buds recommend complete protection as an appropriate technique. This indicates that the encapsulation method would provide an easy and novel propagation system in cauliflower (Fig. IX).

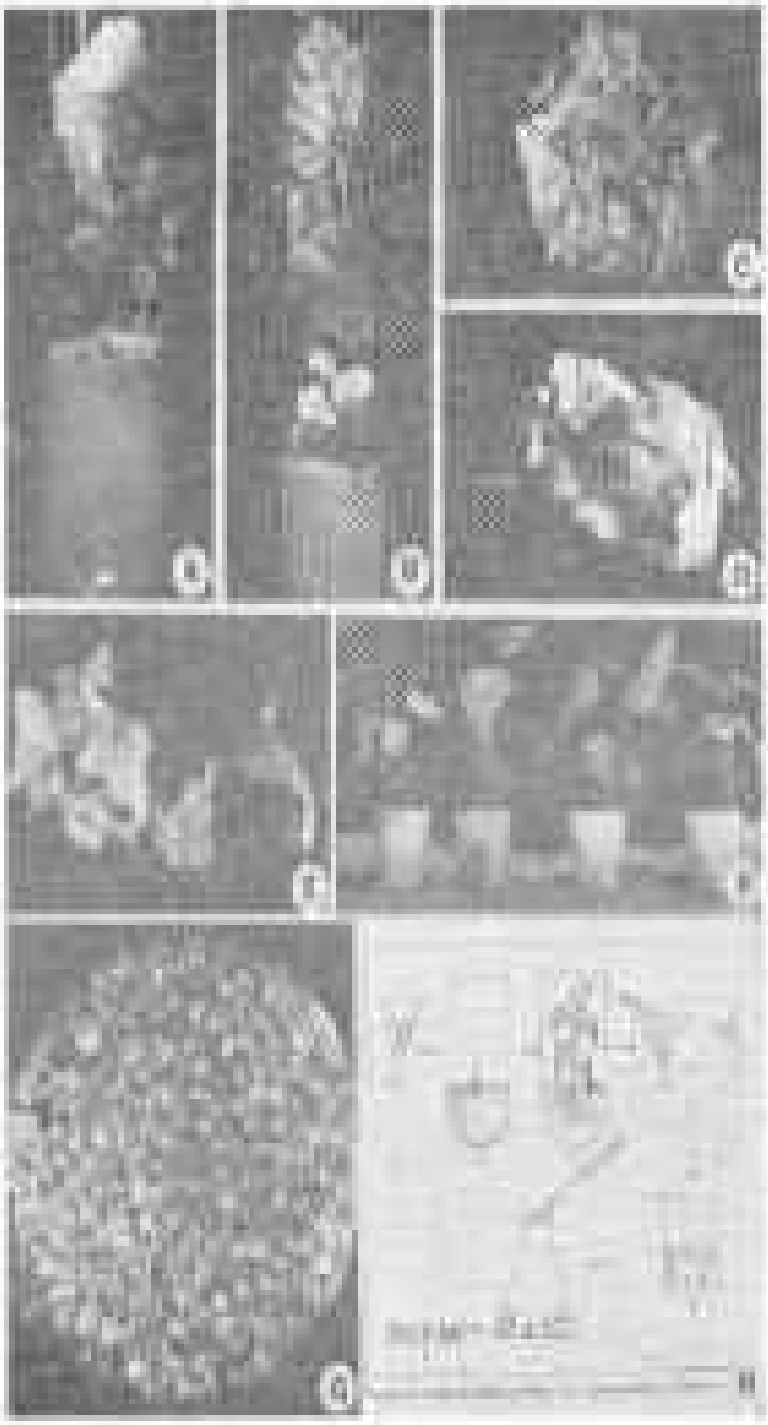

Fig. 1. (All figures natural size or reduced.)
A. A male using right rostrum to pull a fly's leg with forcipules over
B. Wasp on [illegible] moving a still attached fly's leg with
C. Female [illegible] with detached rear [illegible] leg
D. Single [illegible] leg from the base of coxa.
E. Mouth [illegible] from the base of head capsule.
F. [illegible] showing a male's [illegible] in [illegible]
G. Mandibular [illegible]
H. Mesosoma, diagram showing [illegible]

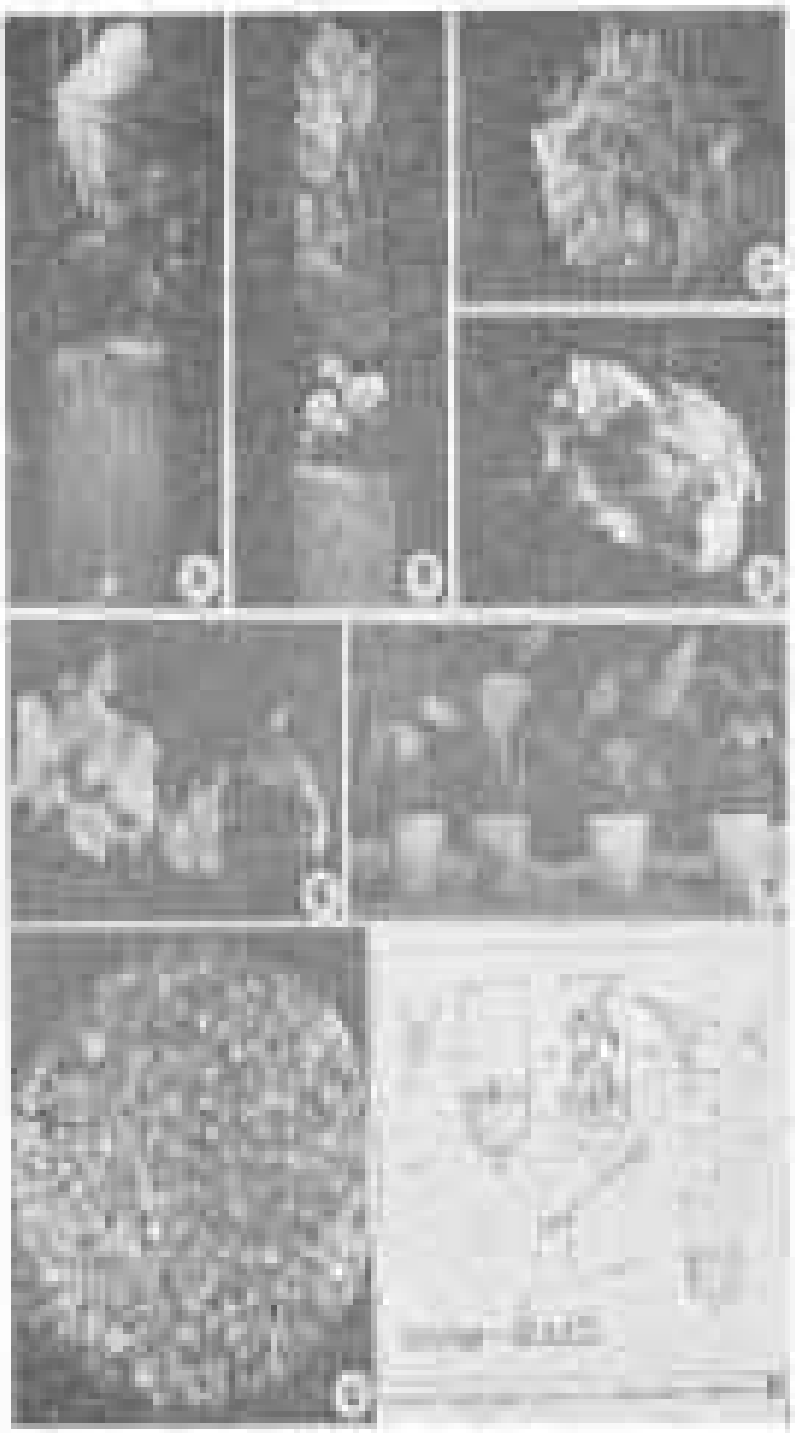

Fig. 1.

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ESTABLISHMENT OF GERMPLASM BANK OF MULBERRY AND THE EVALUATION OF MULBERRY VARIETIES AT C.S.R. & T.I., MYSORE

Dr. G. [illegible]*

It is imperative that we should have a germplasm bank if we are to launch a breeding programme to evolve better varieties of crop plants. A germplasm bank for crop plants was suggested to be built as [illegible] and it is [illegible] by collection, establishment and maintenance of all available [illegible] of a species of the entire world.

Therefore, in any mulberry germplasm bank it is very important to have a systematic planting of varieties adopting a particular method, preferably the [illegible] system. All the varieties should be given similar treatment as far as the package of practices are concerned. Each variety should be evaluated based on Taxonomic, Biochemical aspects, disease resistance and also through rearing with different races of silkworms to find out the silk yield.

It is very necessary that there should be collaboration among mulberry breeders, physiologists, biochemists, pathologists, silkworm biologists and silk technologists for evaluating the performance of mulberry varieties.

It is only recently that an attempt is made by several Institutions both in India and abroad to establish germplasm bank of mulberry on a smaller scale. But it is very important that there should be germplasm bank of mulberry at the national level for each country and one at the International level.

Establishment of germplasm bank of mulberry is essential for the following:

(a) For the evaluation of mulberry varieties under the same agroclimatic conditions.

(b) Selection of material for hybridization, induction of polyploidy and mutation breeding to evolve varieties with high yield of quality leaves.

(c) To study plant reaction for disease and drought resistance.

It is time that we should establish all the varieties that are available under

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for same agroclimatic conditions and take up collaborative research programme. The best variety/varieties can be studied when once the studies on yield, important parameters like rooting, nutrition uptake, disease resistance, growth analysis and rearing, with different silkworm races are carried out. These varieties can be selected when their performance is better than the existing commercial varieties. Later they should be multiplied by vegetative propagation and further assessed under different agroclimatic regions. The selected varieties can be recommended only for those areas where their performance is found to be better than the conventional varieties.

After evaluation of the available varieties in the germplasm bank, if no variety is found to be superior to the commercial variety, but still possess certain very good characters like quality leaves, yield, disease resistance and so on, then the breeder, using his skill, should plan hybridisation by selecting each of the varieties which could together give a better hybrid compared to the commercial one.

In case the hybrid, especially which is a product of crosses, be tested for their stability and take up multilocational trials. If the hybrid is found to be lacking in one or two characters that are present in the parents, he can try the backcross. The backcross technique (BC1, F1) has been developed and it is being utilized in the Kalimpong and other areas.

Even if the backcrossing does not give the required result, it is possible to cross with some other variety that possess the desired character. If the selected parents still fail to give the desired hybrid after crossing, one has to think of the other means.

The other effective methods are induction of polyploidy and mutation breeding. Any variety that is found to possess useful characters could be subjected to polyploidy/mutation breeding. The new polyploid/mutant should be first evaluated and its performance should be compared with commercial variety. It should be multiplied and multilocational trials should be conducted to assess its performance under different agroclimatic situations.

In the germplasm bank maintained at the Bangalore University, the following methods have been adopted to evaluate the mulberry varieties.

1. Twelve plants of each of the varieties are planted in two rows.
2. Pit system of planting with a 150 cm x 150 cm spacing between plants has been adopted.
3. Irrigation of the garden once a week.
4. The first crop of leaves has been harvested after 18 months, permitting to help in the development of both root system and main stem so as to yield a better leaf crop every season.

1. Πότε έχει θέσιν η αίτησις του τρίτου περί χορηγήσεως αυτώ προθεσμίας προς ένδικον μέσον.

2. Πότε χορηγείται ή αρνείται ή ανακαλείται χορήγησις τοιαύτης προθεσμίας. Τίνα κριτήρια.

3. Περίπτωσις χορηγήσεως εν τοιαύτη περιστάσει προθεσμίας, ενώ δικαίωμα τρίτου κωλύει κατάσχεσιν χρημάτων.

Κατά τα άρθρα 908 και 909 του Κώδικος Δικονομίας κατάσχεσις επί χρημάτων του οφειλέτου εις χείρας τρίτου, ενεργουμένη δι' επιδόσεως εις τον τρίτον κατασχετηρίου εγγράφου, επιφέρει την υποχρέωσιν του τρίτου να μη καταβάλη τα χρήματα εις τον οφειλέτην, ειμή μόνον κατόπιν εντολής του δικαστηρίου, ενώπιον του οποίου εκκρεμεί η κατασχετήριος διαδικασία, ή κατόπιν εντολής του δικαστηρίου, το οποίον εξέδωκε την απόφασιν επί της οποίας στηρίζεται η κατάσχεσις, ή τέλος κατόπιν εντολής του δικαστηρίου, το οποίον εξέδωκε την απόφασιν επί της οποίας στηρίζεται η κατάσχεσις, μετά την παρέλευσιν της προθεσμίας προς άσκησιν ενδίκου μέσου κατά της αποφάσεως ταύτης, εάν εντός της προθεσμίας ταύτης ασκηθή το ένδικον μέσον.

Η υποχρέωσις δε του τρίτου δεν διακόπτεται διά της ασκήσεως του ενδίκου μέσου κατά της αποφάσεως, επί της οποίας στηρίζεται η κατάσχεσις, ειμή μόνον εάν ο τρίτος ειδοποιηθή περί της ασκήσεως του ενδίκου μέσου.

Ενώπιον: Ι. Θεοδ. Κατσιγιάννη, Πρόεδρον Εφετών, Γεωργ. Ιωαν. Βασιλειάδου και Θεοδ. Κ. Τσαγκάρη, Εφέτην (Ε.Β.Δ. § 11). Ν.Χ.κ.τ.λ. Αίτησις του τρίτου εκθέτοντος ότι "εβλήθη εις κατασχετήριον και ενεφανίσθη ο δικαίωμα χορηγήσεως

ROLE OF MULBERRY GERMPLASM IN CROP IMPROVEMENT

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Abstract

Geographical distribution of mulberry species and recent trends in genetic erosion are discussed. Importance of germplasm in exploration and utilization characteristics of available varieties in breed combination and different methods in evolving improved mulberry varieties are discussed.

The main goal of breeding programs in crop plants is to improve the economic performance of that species. Farmers considered that domesticated plants have evolved rapidly, and are still evolving rapidly, but the understanding of scientific man (sociobiology) and the techniques of recombinant analysis in plant breeding are very recent studies. We still have only the knowledge of the gene pool, geographical distribution and ecological behaviour of the wild species which have contributed their variations. In no crop we have thoroughly explored the germplasm resources to realise the genetic worth and usefulness in the improvement of the crop. Existence of germplasm is a source of practical interest and we must not only maintain germplasm pools and resources intact but we must also evaluate them thoroughly in the light of gene-ecological responses to plants and exploit them rapidly in varied forms as well as economic crop types. It is the end result, the fate of human species depends on our ability to understand and exploit the germplasm of cultivated plants.

Conservation of mulberry germplasm

Variation is the basis for improvement. Collection, conservation and evaluation of the existing gene pool are the foundation for all the crop improvement programmes. Exploitation of variety potential, suitability for mechanical operations and evaluation of productivity under wide variations, environmental stresses and natural enemy species are the need of the day. Preservation of the existing material is more important as the very existence of these species is under threat. Cultivation of opposite varieties and combinations of improved strains have resulted in rapid elimination of primitive land races having wider adaptability. Excessive breeding and seed growing have accelerated the natural extinction of wild relatives and undomesticated forms. As a result of these factors the genetic variation is lesser than ever before. Practical procedures and concrete steps developed to save existing plant resources do exist the world. Many National and International organizations have come forward to conserve the existing genetic wealth and prevent further loss of germplasm. Problems of the present day are more complex due to modernization and specific needs. To meet the demands

of diverse source, plant breeding programmes require wide spectrum of genetic base (as was before). However, the germplasm should not be a strong reservoir of the undesirable characters, nor the breeders give preference to a single or a few of superior genotypes for a study because, as genetic material, for the breeding programmes. Moreover, the use local sources of germplasm (if which has not received due attention in this direction). It was felt that work has been done on economically advanced countries like Japan and China on commercial and exploited the available germplasm of closely competitive crops (Agnew 1981, 1982; Kobayashi 1977; Nakayama and Matsuzaki 1981); (1978; Pan 1981; Mohan et al., 1984). However, for tropical and subtropical regions, where subsistence is the prevailing, research in this direction needs emphasis without further delay.

India is the second largest rice producer and leading consumer country in the region. Agriculture in India is undergoing rapidly and it has been spread to almost all the states and union territories of the country. As a result, the need of the location specific varieties of medicinal is more acute felt. In addition, both the developing and underdeveloped countries of tropical regions, where have taken up agriculture, depend for medicinal and aromatic crops on India. To meet the increasing huge scale breeding programmes have to be initiated for evolving high yielding and biotic/abiotic multiple resistant. If a prerequisite, collection, conservation and evaluation of the existing germplasm have to be taken up on priority basis.

Methods of collecting germplasm:

Germplasm can be collected by the following means:

1. Expeditions and collection
2. Introduction
3. Collection of improved strains

1. Exploration and collection:

Expeditions may be for the purpose of collection of various germplasm of crop plants and their related species or exploration. Knowledge on phytogeography and centers of cultivation is important for effective collection of genetic material. A breeder must have a thorough knowledge of primary and secondary centers of origin/diversity, cultivated provinces of various countries, local names, improved varieties, kinds of their origin, method production etc. For the successful collection and conservation of genetic material, information on natural variability, extents of problems, reproductive behaviour, associations, harvesting, places of conservation type of material necessary for respective crops are important.

Mulberry : a monotypic perennial genus, is the native of Indo-China and found widely distributed in both the hemispheres. The original home of the genus is in lower Himalayan belt of Indo-China region, where it species are found occurring in wild condition up to an elevation of 1,800 feet. In addition, a few cultivars species are found in Japan, Korea, South Korea, etc. The distribution of these important species of genus Morus is given in Table 1. Owing to varied modifications, wide range of variation exists in natural populations, especially in the above distribution centers in the foot hills of Himalayas, China, Japan and South East Asian region. It is interesting to note that this region is the home of silkworm, where it has been practising since 2500 BC. In addition to these wild trees, a large number of cultivars are being maintained in their countries.

Indigenous germplasm resources are more important in breeding as these germplasm are adapted to the local conditions. Having in the origin of the genus Morus in north temperate belt of Indo-China, many natural species/varieties are existing in this region. Of eight recognizable species reported, four are found widely occurring in Himalayan region and distributed right from Jammu and Kashmir in West, up to the elevation of 1,000 feet above the sea level. M. serrata Roxb., M. indica L., M. laevigata Wall. and M. alba L. are found in a part of natural vegetation in Nilgiris and Palni Hills of Meghalaya and Nainital in Uttar Pradesh. The natural mulberry tree belonging to M. serrata Roxb. is the largest and oldest among the known mulberry trees of the world which has a girth of 9m. It is estimated to be more than 1,000 years old and is known as Methuselah in Uttar Pradesh (Rao 1967).

Apart from these species, several wild varieties, undocumented forms and semi-cultivated varieties are found throughout the northern region, especially on areas of gentle accessibility. The collection of a large number of genotypes, a systematic survey of the area and also wide gardens of Uttar Pradesh and the neighbouring states can be made. At present, the area under mulberry cultivation is more than 270,000 ha covering almost all the states and Union territories of India. Various varieties of mulberry under cultivation in different states, agro-climatic zones for better utilization of germplasm resources.

9.1 Plant introduction

Since mulberry varieties have been introduced in India from Japan as early as 1906 and many more have a prominent effect of imported from various other temperate countries. Most of our earlier introductions are economically important of the species that they were of adapted to temperate climates only. Varieties like S1667 and Kanva-2 are the most popular among Japanese hybrid breeds and they occupy more than 70% of total mulberry area. But they have completely failed under Indian conditions because of the climatic barriers. However, some of the varieties like Tomkomachi of Japan proved successful in Kashmir region, where similar temperate climate is existing. Many ecological

[illegible] are to be conserved mainly while introducing the genetic materials. Some attempts to guarantee seedling [illegible] providing the cuttings for propagation will help in conserving the pathogen-free one, in the nursery, cuttings and plants. Length of the cuttings and the [illegible] of 10 cm with 3-4 healthy buds. Both the cut ends are to be sealed to avoid drying during transit and kept in packed in wet jute packets. If the material is sent in rooting, care grafts are to be prepared, of a good rootstock, free from nematodes and other soil pathogens. Plants have to raised in pots and allowed to grow for a period of 2-4 months. Then the material for [illegible] and thread properly before packing. It is always advisable to send the material through [illegible] or by registered parcels, when the material is to be received from foreign source, with [illegible] phytosanitary certificate. Material has to be consistent and packed in cartons and of convenient size, ahead of the [illegible] planting time in field. The person the [illegible] of plant pathogens is sent to the field. In case the material is banned it is better to get it in [illegible] as an existing plant. After 4-5 months of growth, it will be ready for multiplying.

(d) Evaluation varieties:

Apart from collection and maintenance of mulberry varieties, most important aspects of variety research which [illegible] by various means can also be practiced. This mainly comprises of superior hybrids, mutants, polyploid and induced variants etc.

Therefore, the newly introduced strain of mulberry should be evaluated through different parameters, specially for the desirable traits like rooting, sprouting, leaf growth, leaf yield, moisture retention, nutritional quality, disease and drought resistance. After the preliminary screening, the desirable genotypes should be propagated. These selected ones can be used for further crop improvement by following different breeding methods viz., Clonal selection, Hybridization, Mutation and Polyploidy breedings or through modern breeding techniques like disease resistance.

References :

1. Collection of different wild types of mulberry available in different agroclimatic zones which can be done by the Regional Sericultural Research Stations of the particular region. Specially R.S.R.S. of Pampore, Central etc ; likewise this link is being the hosts of mulberry

2. CRYOPRESERVATION: Methods to preserve clones like mulberry species.

3. Establishment of the National Bureau of Mulberry Genetic Resources (NBMGR) - under Central silkworm research etc.,

1. Longevity seeds
2. Tropical seeds
3. Chilli seeds
4. Intermediate seeds and
5. Coastal-saline seeds

3. Introduction of Medicinal Herbarium Crop Improvement Projects.

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Table 1. Geographical distribution of important species of the genus Mentha L.

Name of the species	Distribution
M. arvensis L.	North America, China, Korea
M. australis Host	Australia, Cuba, Indonesia, Philippines
(M. cardiaca Gerard)	South Chile
M. longifolia Koidz.	China, Japan, Korea, Southern Sakhalin
M. diemenica J.	China
M. rotundata Bentt.	United Chile
M. verticillata L.	India
M. laevigata Nees	India (Himalaya), West China
M. pulegium Host	China, Korea, South Korea
(M. sachalinensis Briq.)	
M. nigra L.	Caucasus, Persia, West Asia
M. rubra L.	South America
M. sylvestris Koch	India (Himalaya)
M. tachtadjanii L.	Russia
M. villosa Huds.	Japan, Korea

EVALUATION OF MULBERRY GENOTYPES FOR DIFFERENT GROWTH AND YIELD PARAMETERS

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Introduction is the process of translating the genetic traits of the crop to the consumer needs. This is basically done in consonance with the existing environmental conditions, popular variety, and aimed to raise the better income from the farming. Evaluation is the important step to make the best use of existing germ pool by assessing them in all parameters of growth, yield, quality and cultivation requirements. Objectives of crop improvement and parameters to be evaluated go hand in hand and defining the future directions of crop improvement programmes will save the amount of resources. The level of the crops improvement in yield and quality of the consumer products is the major aim. In addition, the cultivation parameters will also be considered. These inputs are many a times governed by codes of genetic traits and cumulative effect of multiple factors determine the final level of yield, quality and crop performance. Depending on the nature of improvement and economic product of the crop, various evaluation methods have been designed in view of the crops and crop followed.

Mulberry is a rich host source of silkworm, *Bombyx mori* L. a primary for its foliage. Amount and quality of foliage produced in an unit area year is specific trait determines the level of success of the farmer. Hence the major objectives of mulberry breeding under tropical conditions are production of more foliage of good quality throughout the year, continuity of a genotype in vegetative propagation with heterogeneous capacity. Various parameters to achieve the above two major objectives can be classified in the following 3 groups:

A. Propagation parameters

1. Sprouting
2. Rooting and root proliferation
3. Regeneration

B. Yield parameters

1. Growth rate
2. No. of primary and secondary shoots
3. Internodal distance.

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4. Leaf biomass
5. Leaf weight
6. Leaf yield [illegible]

C. Quality parameters

1. Moisture content of leaf
2. Moisture retention ability
3. Carbohydrate content
4. Protein content

D. Physiological parameters

1. Resistance to various [illegible] conditions (drought, salinity, low pH)
2. Resistance to diseases and pests
3. Response to modern agro-technology/inputs

Evaluation of germplasm for these parameters associated with objectives forms the major step in mulberry improvement programme. To complete this task, the three major steps involved are descriptive recording, systematic [illegible] and response testing as designed and described by [illegible].

1. Descriptive recording: [illegible]

[illegible]

In addition to the detailed descriptors, [illegible]

constraints which will serve the general purpose from least constraints to limitless (by preliminary screening). Use all the other generators to be reviewed, by interaction given in the existing model should be launched which would reflect the operation information received.

(c) *Structural characterization.* This is the second task of evaluation where the various preliminaries are to be combined with respect to all processes. For this purpose decision characteristics have been listed in Table 1 with their symbolic values. The values have been based on two considerations: (1) total resources taken and the values of the possible combinations selected. (2) total performance over the existing superior type has been taken as minimum acceptable level of improvement. For each characteristic evaluation methods have been studied and selected to suit the characteristic requirements and requirements. Maximum of six methods have been chosen to minimize computational error and economic disturbance.

7. Screening

Screening is the selected sequence of the classes to exhibit the basic and primary new kind of checks. Capacity and usefulness of screening depends the subsequent growth and value in limited cross-and ordinary is not an exception to this. In addition, screening mainly determines the manner of establishment of new systems. In case of original modified systems where whole classes cannot survive in between the common and guidelines of basic screening interpretation the relation of primary and secondary functions and to satisfy the best point. Whereas to control process the individual best planning is practiced and new and modified or operational tools or exact formats also and various processes the new tools or refinement areas. Though screening is a priority factor at the cross-will tools, new and temporal one functional attributes. Maximum screening can be experienced by variation with operation procedure to the end. In terms the knowledge of tools a new step is new engagement, hence the total of the consequences as a few.

Screening as such is to be studied in two specific ways. The first one is screening percentage of settings after planning in field which gives a valid role in system establishment of new position. Catalogs from 4-6 months old to twenty years for healthy basis planned in various tools are used for this study. Field observations in cases on 150 day of planting (selected by 15th and 20th day. The data after planning is taken as optimum base to assess the screening rate. Both used shown in assessment as reference for selection of groups. As screening after 200 day tools to estimate is also made, time screening limits are not suitable.

The second aspect of screening relates to breaking open of beds after first harvest in growing of plants. As subsequent leaf yield depends on the quantity and number of buds uprooted, this character has to be studied as environmentally related.

2. **Rooting:**

One of the most fundamental considerations in vegetatively cultivated crops is the rooting ability and easy tolerance (Hartmann and Kester, 1976). Mulberry is chiefly propagated through cuttings and rooting behaviour is an important criterion to be possessed by an evolved variety. Rooting behaviour of a variety is purely a genetic character and mulberry is not an exception to this. This method of propagation has lots of advantages for easy perpetuation of desirable parental characters without deterioration, producing uniform crop stand and early yield of foliage over a seedling population. Survivability of 70% and above is taken to be optimum for selection [illegible]. The cuttings from 6-8 months old shoots should be taken. Length of the cuttings must be 20-23 cm with 3-4 healthy buds and about 10-12 mm in thickness. Cuttings should be planted in nursery beds at a distance of 10 cm from cutting to cutting and 20 cm from row to row. Rooting ability has to be calculated based on the survival rate after 90 days of planting. Observations have to be made right from 30th day onwards and subsequently at an interval of 7 days to observe the quickness and rate of root initiation. Though rooting is a genetic feature as already stated, is strongly influenced by soil moisture and temperature. Root initiation is slow and poor under low moisture and cool climate. Hence studies should cover minimum of [illegible] observations for all seasons. The optimum value fixed for rooting is 70% and above on 90th day.

3. **Growth rate:**

Growth rate over a definite period determines the total aerial biomass produced. As mulberry is pruned once in 60-70 days, new flush of buds must sprout quickly and grow fast to provide sizable amount of leaf in [illegible]. Growth rate per 70 days would be ideal period for assessing the total shoot produced per plant.

Number and length of primary shoots and secondary branches should be recorded for nine plants in each accession and average of 6 observations for two years covering the major seasons should be taken into account. As a growth index height of the tallest shoots should be recorded. The optimum value for total length of shoot produced is 500 cm and length of tallest shoot is 150 cm.

4. **Internodal distance:**

Internodal distance is another important genotypic attribute which determines total foliage produced for an unit length of shoot. Shorter the internodal distance more are the number of leaves. Usually in mulberry, leaves are arranged in an alternate fashion with a phyllotaxy of 1/2 to 2/5 [illegible]. Internodal distance is measured by taking the total length of the shoot and total number of buds and also by counting number of leaves per meter length. As this is a genetic

characters, the essential indications in accordance. The optimum value level is a 5 cm. Interrelated illustration of some of the parameters is shown in Fig. 1.

Table 1. Optimum values of various parameters for evaluation of sudden's germplasm.

1.	Germinality (on 20th day of sowing)	> 60%
2.	Rooting (on 90th day of planting) (survival %)	> 70%
3.	Root Proliferation (Root-Shoot ratio) by w.t (on 90th day of planting)	> 60%
4.	Growth rate (on 90th day)	
	(a) Length of the longest shoot	> 180 cm
	(b) Total shoot length	> 600 cm
5.	Internodal distance	> 4.5 cm
6.	Leaf Initiation	Polyfoliol
7.	Weight of 100 fresh leaves	> 300 g
8.	Leaf petiole Ratio (on by weight (w.t %)	< 0 : 1
9.	Moisture content	> 75%
10.	Moisture Retention (after 10 hours of harvest)	> 60%
11.	Palatability	Non-hairy & Receptive
12.	Average Protein content (dry wt. basis)	> 15%
13.	Average Carbohydrate content (dry wt. basis)	> 21.5%

2. Leaf Initiation

Leaf initiation is one of the important parameters which determines the palatability both in morphology and in anatomy. Sudden's which will not follow regular pattern have limited use of the germplasm for the scientists. Some plants show unusual numbers of leaflets pattern and growing season but no reproductive organs or leaf initiation in certain phenotypes. Usually leaves are a limited distribution over stems and the same was confirmed in our breeding studies also. Different types of leaflets observed in the existing materials were carefully noted and its leaflet distribution is shown in Fig. 2. Common type found (Type 1&2) show heptafoliolate leaves with little variation. In some plants, the terminal leaflets are absent and petiole ends. Leaf shape is considered stenophyllous. These characters are genetically and general other information on morphological patterns. The character, cellular leaves should be considered as the most primitive and unsuitable one.

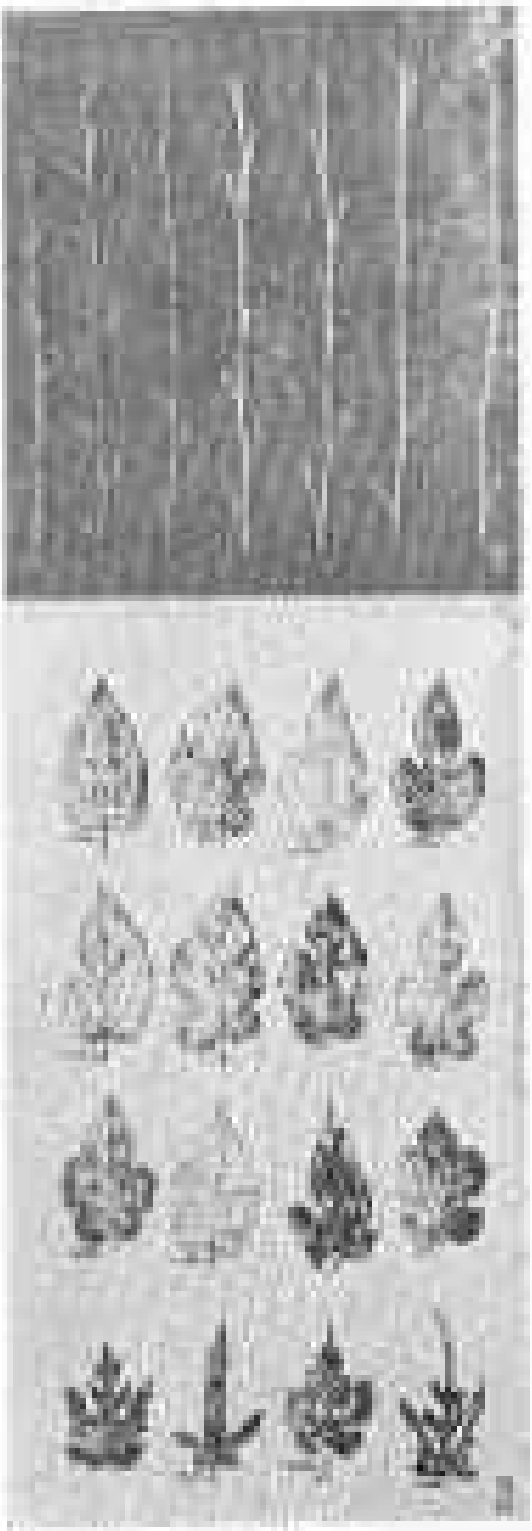

Fig. 1. Vessies à vermidé ribbon.
Fig. 2. Ribbon worn at labelle

[illegible]

7. Leaf area

[illegible]

8. Weight of fresh leaves

[illegible]

9. Moisture content of leaf

[illegible]

mixed and put in polythene cover and sealed. Fresh weight of the same is taken. Leaves are then dried in hot air oven at 70°C for 48-72 hours till the constant weight is obtained. To avoid charring of leaves low temperature and long duration are preferred for drying. Moisture percentage is then calculated by subtracting the dry weight from the fresh weight. The value thus obtained is divided by fresh weight and multiplied by 100.

ii. Moisture retention ability

Moisture retention capacity is also an important consideration. As the leaves are stored at least for 6-10 hours after harvest till last feeding, leaves should retain their moisture content for the maximum amount of time. Slow drying is one of the main points to be considered for selection as indicated by Krishnaswami et al. (1973). Moisture retention of the leaves after 12 hours of harvest should be around 60%. In addition, retention of moisture in detached leaf indicates the drought resistance/tolerance nature of the variety and this criterion can be made use of in screening strains for stress environment.

(9) Yield Testing:

After the assessment of genotypes for the above parameters, the superior ones showing higher values should be multiplied and tested for their yield. Simultaneously quality analysis by chemical analysis and bioassay method should also be made. For yield testing, three tiered system comprising of progeny row yield trial, primary yield trial and final yield trial are suggested. As mulberry is a vegetatively propagated perennial crop enough seed material of the clone types has to be made available for yield trial. This is possible only by following these step system of testing. This method also provides an opportunity for sufficient testing of genotypes.

For progeny row yield trial genotypes are planted in a separate row with a control plant in guard row. This can be conducted for two/three years. Primary yield trial can be conducted in partial lattice design with as many as 25-100 genotypes and conducted for 3-4 years. The superior genotypes can be further multiplied and planted for final yield trial in randomized block design with comparatively larger population. During this final bioassay and chemical analysis could be made. The details of these are discussed in other papers for quality evaluation.

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EVALUATION OF GERMPLASM FOR STRESS RESISTANCE

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Introduction

Genetic advance in a plant improvement programme crucially hinges on assembling a diverse collection of germplasm, which can be screened at relevant evaluation, experimental genotypes, from which breeders' collections, from old plantings, indigenous land races and exotic introductions. The diverse germplasm serves as a breeding pool and provides a broad genetic base for obtaining variations for agronomic characteristics. Harlan (1971) emphasized that large populations can expand because improvement in stress resistance probably involves many genes having small effects that are difficult to measure. Hanson (1971) also stressed the importance of exotic germplasm pools in increasing the genetic diversity for selection and in improving the frequency of genes for economically valuable plant characteristics. The efficient utilization of genetic resources requires that they are completely classified and evaluated.

Developing screening techniques

After a broad based germplasm pool has been assembled, plant improvement starts generally by first screening the large germplasm to find the plants that have the desired combination of characters. Leppik (1964) and Frankel (1974) stressed the importance of evaluation (also) as an integral component of a plant improvement programme. Harlan (1972) emphasized that progress in plant breeding has been impeded by the lack of appropriate screening procedures. Plant screening techniques should (a) assess plant performance at the critical developmental stage, (b) be completed in a relatively short period of time, (c) use relatively small quantities of plant materials and (d) be capable of screening large populations.

Identification of parameters associated with stress resistance in mulberry

In view of understanding various factors controlling and limiting the growth and leaf output of mulberry under stress conditions and also for the evaluation of germplasm, genetic-physiological traits associated with stress resistance were identified in mulberry. In mulberry as more pollutants are highly bioreceptive, greater amount of variability is found in the population on being subjected to such breeding programmes (e.g. in the same way as a germplasm is evaluated by yield components for efficient use of progressive diversity). Information on the adaptability of mulberry varieties to environmental conditions is

accumulated water in bursting the cell membrane is always at, whereas in other crops like cucumber, tomato and brinjal plants, attainment on adaptation by morphological, anatomical and physiological mechanisms to high temperature and water stress is available.

The practice of water conservation in some pulse crops can be promoted by quantitative information. Using the above screened characters as standard through morpho-physiological parameters, populations should be created which have combinations of more than one such character (Singh 1984).

The most potential of promising pulses as a breeding programmes for water conservation is one of the most important aspects to evaluate with. It is evident that the measurement of drought resistance and drought escape has been a useful tool in identifying stress resistant plants (Levitt 1964).

Materials and Methods

Data on the morpho-physiological traits and the yield components are grouped into two, medium and high sizes of frequency. The range of each group with the frequency of occurrence are presented in Table 1 and Table 2. In the present study the parameters 109, 110, 116, 122, 135, 150, 152, 159, 161, 162, 261, 273 and 284 are found to possess deep root structure and capacity as well as higher moisture retention capability. From the study it is assumed that mulberry germplasm genotypes show considerable range of variability with respect to all traits studied with three exceptions confirmed and with good compromise associated with leaf yield. Finally 31 mulberry genotypes ranked on the basis of morphological, physiological traits and yield components were evaluated for leaf yield under rainfed stress conditions from 1983 to 1986. The interaction of leaf yield of 31 germplasm genotypes from 1983-86, AMI, rainfall, soil moisture, Local and Anova-I is depicted in Fig. 1. Water content of mulberry leaves was evaluated on fresh as screening for stress resistance by Bindu (1975). Therefore, moisture content or water content of mulberry leaves was taken as selection criteria. The percentage of spreading and range of variability observed in screening germplasm after growing leaf harvesting in different germplasm genotypes in comparison with check cultivars is depicted in Table 4. MLT (-1) and MLC-pH showed maximum percentage of spreading leaving till the moment of a year. The percentage of harvesting is having leaving on leaf yield of genotypes. The germplasm genotypes which were having more number of primary and secondary branches per plant, more number of leaves per stem, length of the shoot and higher moisture content of the leaves yielded better than other genotypes as well as leaf morphology under normal stress conditions. This study is in conformation with the earlier findings of Bindumadhava et al., (1981) in mulberry.

The genotypes having leaves with smaller stomatal size, minimum stomatal index and stomatal frequency the water loss as well as maintaining water

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RELIABLE TECHNIQUES FOR EVALUATION OF MULBERRY LEAF QUALITY

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ABSTRACT

The role mulberry leaf as a single cellular cellulosic complement for various economic traits of commercial silkworm hybrids is now strong. Based on the nature of evaluation, primary or final, various techniques are known for assessing the leaf quality as mulberry leaf as substitute for silkworm rearing. These such techniques, namely, rearing the representative and conventional one and rearing one on chemicals. Emphasis is made on the conditions under which these have been found to be performed. Modifications in the rearing methods in terms of rearing, leaf quality, quantity of leaf, cost, time, etc. which is to be made, etc., and observations on common silkworm parameters, rearing to success and also some methods like leaf to rearing or leaf to silk conversion ratio, are suggested.

INTRODUCTION

In silkworm rearing, silkworm ... therefore, must be a non-negligible matter, bearing only on mulberry leaves. In sericulture practices, more than 60 per cent of the cost of cocoon production is towards raising mulberry crop (Benchamin et al., 2016). Studies connected with silkworm nutrition and evaluation of host mulberry varieties for their leaf yield and quality have therefore, received paramount attention of the research workers. More than 25 species of mulberry are known to exist in nature, of which mulberry varieties are cultivated. Though the total number of mulberry varieties exceed 2000 (Yokoyama, 1963) mostly not give more of them are being cultivated and the popular varieties also have not more than one. The major practical difficulty in their commercial exploitation based on leaf yield, leaf quality and silkworm rearing results. The present paper deals with a few techniques for evaluation of mulberry leaf quality for rearing silkworm crop.

Various tools for evaluation fall into two categories, namely, (1) rearing of a large number of varieties at a time in nursery for preliminary trial and (2) screening of a few selected varieties for large scale cultivation and exploitation in the farmers. the number of plots and leaf availability being limited, a full rearing test for evaluation is not possible. A small scale rearing test is possible in the latter. Thus, suitable laboratory techniques are required for evaluation of mulberry leaf quality at the level of primary and final selection. Some such techniques are discussed in this paper, namely, (1) moulting test, (2) antennectomy test and (3) moulting test. the first one for preliminary and the third for final screening of mulberry varieties.

Breeding Bird

Breeding was first suggested as an index for evaluation of wetlands bird quality at study areas (Takekawa 1991, 1992). The same was modified to real life-cropland conditions and for birds, as a reference to assess distributional status of wetlands bird (Breeding and Scientific Survey unpublished). The techniques is as described below:

Informants are the wife, son, the economy collectors to evaluate and interpret recording. A recording was carried feeding bird a movement. Higher or lower reading than the critical level results in an (1/2) service for recording info, making for productive difficult and less accurate. Rather than a more quantitative use in every field, the more thorough evaluation is useful at least to making, purpose, a more subsequent. Either undertaken a 'reception' (FM = 7000) or (median = 8) and (CBD = 1887) typical use to most in the measure. The [illegible] terms a more value for the use, the different purpose. To [illegible] the part of the using method represents [illegible] (0 to 100) = and (quality (2) to 7/7) = [illegible] assigned a (2x) terms values from was [illegible] = 2%), (0 = (1)) and (1 to 4) [illegible] (Takeuchi and Kuroda 1982). In all other studies, the recording value is also dependent to the informant and [illegible] of bird in the previous series. The many habitat values are more homogeneous to all report (more to other areas). Most bird present not given use [illegible] in the using comparison and [illegible] can should be carried recently under an conditions of comparison (= + (+) and relative [illegible] (1 + 1)). The use was not replacement should be kept as an previous design. Most use [illegible] (1 [illegible] and 5000 = 1000 C + [illegible] (1) bird using period and (1 [illegible] (1) bird using period) comparison are recommended as a 1 bird per day schedule. The will amount is approximately (by) and (1%) use in total bird (in 1) using by (0) = (100) and (100 = 500) intervals, respectively. After sampling the bird in the critical way, survey should be (1) undisturbed for (1) hours in order for result. Another (1) hours time is given for comparison of result and observation in recording site. Weight of use of result have not be used to no other index for evaluation.

Bird Results

The technique as included above was carried with varying bird quality under four different conditions, namely, (1) unstable (stable, medium and control), (2) variety (Lowest and Known (1). (3) showed and was counted known and (4) recovery and non-observed known. Results (table 1) showed that the recording ability varied according to the quality of habitat as which results were high as indeed the quality higher the recording value. Thus, in respect of waterfowl high density (over) were particularly superior to medium and weak. Under contrasting conditions of disused and non-disused, photocopy and [illegible] and Lowell and Kuroda) variation the [illegible] as well as was inferior to quality

[illegible]

1. Introduction and Overview (Text)

[illegible]

layers, if any, during the test period, were a control batch. Feeding was by hand 4 times a day at 3 hours intervals as per standard unit (table 1). Every day leaf should be cleaned to collect litter. A drinker was provided at 9:00 hr to 12 hours to meet to constant weight for record purpose. Other parameters observations recorded are the dry matter percentage of the leaf fed, body weight gain in 6 age and carcass weight. For estimation of proximate principles, to assess the leaf quality. While feed weight gives a direct indication as to the degree of leaf acceptance, the conversion efficiency will imply to nutritive value. These are indicators that the leaves may consider the question. It has come a method for qualitative improvement (Das and Mishra 1973). Rearing unit care should be taken to avoid over crowding, overheat) under feeding and improper leaf preservation as they influence consumption (Rahi). Rearing practices should be as per standard recommendation (Krishnamurthi et al. 1973 and Bhattacharya and Nagaraj 1983).

Test Results :

Consumption and conversion test was applied to evaluate mulberry leaf quality under different conditions. In the first set of tests leaf quality in 5 varieties (Kanva-2, S41, S36, S54 and Local). 5 consecutive rearings, medium leaf stocked (Kharif) and non-chawki age leaf fed and non-moulter conditions were evaluated. The results (table 2) showed that among 5 tested varieties leaf consumption in fresh weight was maximum in S54, followed by S41, Kanva-2, S36 and Local. However, based on conversion efficiency in body weight and cocoon, varieties ranked in the order S41, S36, S54, Kanva-2 and Local. Similarly, based on fresh weight consumption leaf quality in order of preference was results, mulberry, cocoon, but from the point of conversion into body substance and cocoon the order was reversed as cocoon, mulberry and silkes. The result was in conformance of earlier observation that tender leaves are favourable for F. age, is still accepted principle in silkworm rearing. Both silkworm and mulberry farmers should match balance of the economic concept in respect of conversion rate in fresh weight. The dry matter percentage in each leaves was lower and increased consumption was may be a natural phenomenon for compensation. The same has been verified in earlier studies also (Das and Mishra 1979).

In the second set of tests leaf quality under different agronomical practices was evaluated. Leaf consumption in fresh weight and conversion ratio into body weight and cocoon were of opposite sets leaf from irrigated farm in rainfed garden (table 3). Statistically leaf quality in mixed planting (T 5, T 7) was superior to other planting (T 1, T 3) of mulberry plantations as reported in an earlier study found on full moving was (Bhattacharya and Krishnamurthi 1981), when leaf quality in relation to different levels of nitrogen fertilizer application (No nitrogen=No, 100 kg N/ha=N1, 200 kg N/ha=N2 and 300 kg N/ha=N3) was evaluated, the result was again true to the expectation. Consumption, both in respect of dry weight and fresh weight increased with the increase in nitrogen

Qualities applicable compared to an example. The qualitative improvement of full scale example functionality may also enhanced to require at least effective new machine and also heavy body add system. The examples of old examples not only, therefore be employed for implication of dual quality only reasonable process.

3. Reading Text

Of theory and all have the teaching and rolling plans of evaluation website. Efficiency testing for conversion of full to review, is the standardization theory looking the whole two. Multiple learning and operational models are then called a improvement of quantity and quality of full stated a home observe terminal, plants, review production and all require. Two can be then and through a complete reading to covering of system or course and all provision. Based on the terms of reading the evaluated to the post, a full human be caused to reliable modifications of a most necessity to theories.

Test Systems

There are single market to become on evaluation of multiple and quality to observe a study, power, example problem of test, industrial, processing, process, quality, further synthesis, to, (Resolution and Kits, [32]). The laboratory theory to answer quality studies are not participate for example India to as...[1991] market on the effect of testing human given study. With Institute (NIPRI) 71 7131 F131 R31 by to the form Assessment and reported by same to to our medium with RM to the test but significant with our more Antique house and Mental systems. The and Kinder (1731) to that make recommendation of more improved systems recommended. Some reports to have many to tested of consumption with the new factors, but not standards rule and case XXI. There results value can to the and to analysis can with approved observers include of factors, particularly the most people to the that. In business India we need can (check will to value PM x XB11 (subdivision x business) to NB11 x NB1 (residence) business.

Reading Evaluation

To similar information are to provided by. Measure, A. for energy enterprise assisted and a not service. Qualitative difference to test use to observe reason test to available values, calculation current operational processes, however, average conditions etc. and questionnaire difference due to water testing, existing, fragment of finding etc., among, evaluation. The hypothesis, design and just control measures, engineering, framework, type, selection, etc., influence the observe survival, growth, covers yield and review grades. Most areas (question) to some of the to terms of the most factors, about the results

and used as incentive and harvest activities. There has been renewed interest in recent past regarding the different rearing techniques (Krishnamurthi 1971, Narasimhaiah and Krishnamurthi 1972, Krishnamurthi et al. 1973, Krishnamurthi 1976, 1978, Seetharamiah et al. 1980a, Bhattacharjee and Nath 1981, Bhattacharjee and Prajapati 1981). While some of the techniques discussed holds good in the current issues, emphasis on a few aspects, namely, growing strategies of rearing and daily feeding rates is made in this paper to suit the new hybrids Pal x DH-3 and DH-3 x NB7.

Diet Spacing in Rearing :

Growing during different rearing methods, Jayati et. al. (1978) and Jayaprakash and Vasal (1978) and Narasimha et al. (1982), have reported the effect of crowding on reduction of successful pharmation and egg production in Bombyx mori. It is known that silkworms grow rapidly from weighing to 0.05 mg/worm to more than 10,000 times by weight and 7,000 times for volume (Hamilton, 1919) and must be taken to ensure rearing bed gradually to suit the growth. Different bed area of 1.0, 0.5, 0.3, 0.2 and 0.1 sq. ft., was recommended at commencement of the first moulting stage i.e. I, II, III, IV and V instars, respectively for 100 layings (40,000 larvae). Final spacing recommended varies from 10.0 to 20.0 sq. ft. for 100 layings (Narasimhaiah and Krishnamurthi 1972, Krishnamurthi et al. 1973 and Krishnamurthi 1978). Bhattacharjee et al., (1981a) observed that different spacing schedules are required for multi x bi and bi x bi hybrids and recommended 18.0 sq. ft. and 20.0 sq. ft. as the final optimum spacing for the former and latter, respectively. Current spacing should be adopted as crowding right from brushing to spinning, daily during different instars. The schedule is given in table 7. In fact multi x bi and bi x bi hybrids

Cocoons of feeding and daily yield :

There is fairly good understanding as to the quantitative requirement of mulberry leaf for practical silkworm rearing in India. Earlier studies recommended 700 to 720 kg of leaf for multi x bi and 800 to 900 kg of leaf for bi x bi hybrids for 100 layings (Krishnamurthi 1978). Based on recent studies, modifications in the total quantum of leaf and deviations and daily feeding rates were found necessary, for multi x bi and bi x bi hybrids. The details are given in table 8. The daily and successive feedings requirement are different in the two popular hybrids in commercial rearing and from the data reported earlier (Krishnamurthi et al., 1973), particularly in III, IV and V instars. Total rearing as per the given schedules are shorter, in relative optimum results.

Pest Obstruction :

More than 50 diseases, associated with the silkworm body, rearing, moulting and egg production, have been considered by different workers for how

Table 1. Mealbug Risk in Relation to Leaf Quality traits under different conditions

Treatments	Year 1(2010)			
	PM (MB1)		MBG (MB2)	
	Excretion rate (%)	Wt. of mealbug (mg)	Mealbug index (%)	Wt. of mealbug (mg)
Leaf maturity				
Tender	78.19 (62.59)	4.171	87.13 (69.42)	5.436
Mature	44.81 (42.16)**	1.867**	66.77 (54.64)**	3.173**
Coarse	31.67 (31.89)**	1.160**	57.36 (49.34)**	3.580**
Shaded leaf	41.25 (40.22)**	1.585**	54.35 (52.52)**	2.160**
Non-shaded	78.19 (62.59)	4.171	87.35 (69.45)	5.440
Chlorotic leaf	5.10 (13.26)**		21.26 (38.81)**	
Non-chlorotic	78.19 (62.59)	4.171	87.35 (69.45)	5.440
Variety				
Local	62.29 (52.32)	3.940**	69.10 (56.46)	3.726**
Kanva-2	78.19 (62.59)	4.471	87.12 (69.45)	5.436

Figures in Parenthesis are transformed values ** significantly different from controls

[illegible]

Rank	Variety	Moulting (days)
1.	[illegible]	41.79
2.	[illegible]	40.80
3.	[illegible]	39.41
4.	[illegible]	38.40
5.	[illegible]	36.80
6.	[illegible]	35.49
7.	[illegible]	32.31
8.	[illegible]	34.27
9.	[illegible]	31.10
10.	[illegible]	35.92
11.	[illegible]	36.84
12.	[illegible]	49.74
13.	[illegible]	43.49
14.	[illegible]	45.90
15.	[illegible]	43.14
16.	[illegible]	41.75
17.	[illegible]	42.33
18.	[illegible]	48.76
19.	[illegible]	38.19
20.	[illegible]	36.43

TABLE [illegible] Larvae Weight (gm) in Bombyx Batch at different moults at different Rearing's trials

Instars	Kihara (1933)	Benchamin and Ally (1941)	
		Rearing	Rearing
I	1.40	1.36	1.37
II	1.91	1.81	1.82
III	1.60	1.67	1.66
IV	1.61	1.81	1.82
V	1.58	1.68	1.67

Table [illegible]. [illegible]

Pen No.	Total weight ([illegible] kg)	[illegible]	Consumption ([illegible] kg) Estimated (E)	Actual (A)	Error (%) (E/A)
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Table 6. Consumption and Government Efficiency[1] by Subgroups in relation to Soil quality under Alluvial conditions (Cross Section, FSU 4 YEAR)

Treatments	Urea (kg/ha) (T1)	Consumption Expenditure (Rupees/kg) (T2)	Net Income (T3)	Consumption Efficiency (T2/T3)	Body Mass (gram/kg) (T4)	Consumption Efficiency (T2/T4)	Current Yield (T5)	Consumption Efficiency (T2/T5)
Variables								
Maturity								

[1] T2 Rupees (Rs) invested (1987)

Table 6: Characteristics and Correlations of Elements[a] on Adherence on substrate to Inert quality under different Agronomical practices (Time system): FAE x SAE(b)

Characteristics	Limit (g/cc) (CV)	Multivariate Correlation (Eigenvalue)	Eigenvalue (Cumulative)	Correlation (Eigenvalue)	Mean (Min) Density (Range) (g/l)	Environmental control (Scale)	Efficiency (Type) (g/s)	Characteristics (Components) (cm)
Assignment	(7) (a)	(12) (2)	(3) (I)	(7) (a)	(a) (a)	(-) (2)	(3) (1)	(-) (2)
Statistical	(a) (2)	(2) (a)	(1) (-)	(1) (a)	(7) (-)	(-) (a)	(1) (-)	(I) (a)
Classification (cc) (c) (a)	(a) (a)	(a) (7)	(2) (-)	(-) (a)	(a) (-)	(-) (-)	(-) (a)	(-) (a)
Mean Spacing (cc) (-) (-)	(a) (a)	(a) (a)	(-) (-)	(a) (a)	(-) (a)	(-) (a)	(a) (a)	(-) (a)
Assignment Group								
Key Characteristics	(a) (-)	(a) (a)	(-) (-)	(a) (a)	(a) (-)	(-) (a)	(-) (a)	(-) (a)
Cell (g) (c) (a) (-)	(a) (-)	(a) (a)	(-) (-)	(a) (-)	(-) (-)	(-) (a)	(-) (a)	(-) (a)
Bulk (g) (c) (a) (-)	(a) (a)	(a) (-)	(a) (-)	(a) (-)	(-) (-)	(-) (a)	(-) (a)	(-) (a)
Mean (g) (c) (a) (-)	(a) (a)	(a) (-)	(-) (-)	(-) (-)	(-) (-)	(-) (a)	(-) (a)	(-) (a)

[a] (c) Statistic Time Summary (SA)

Table 7. Daily and seasonal variation of Silkworm Rearing Seed area (25 Laying) in 1989-90 (area)[1]

Season	Day	Male c.boxes		Area c.boxes	
		Rearing	Seeding	Rearing	Seeding
I	1	100	100	450	800
	2	150	150	700	1200
	3	200	200	900	1600
	4	250	250	1100	2000
	5**	300	300	1350	2400
II	1	350	350	1550	2800
	2	400	400	1800	3200
	3	450	450	2000	3600
	4**	500	500	2250	4000
III	1	550	550	2450	4400
	2	600	600	2700	4800
	3	650	650	2900	5200
	4	700	700	3150	5600
	5**	750	750	3350	6000
IV	1	800	800	3600	6400
	2	850	850	3800	6800
	3	900	900	4050	7200
	4	950	950	4250	7600
	5**	1000	1000	4500	8000
V	1	1050	1050	4700	8400
	2	1100	1100	4950	8800
	3	1150	1150	5150	9200
	4	1200	1200	5400	9600
	5**	1250	1250	5600	10000

[1] I, II, III, Interval (gap) in eg. months; IV, V, 4 = 4 days interval; 5 = eg. 5 ** = month eg.

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	4	[illegible]		[illegible]	[illegible]	[illegible]	
	5				[illegible]	[illegible]	
	6					[illegible]	
	7					[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
	4	[illegible]		[illegible]	[illegible]	[illegible]	
	5				[illegible]	[illegible]	
	6					[illegible]	
	7					[illegible]	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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EVALUATION OF MULBERRY VARIETIES BY LEAF YIELD

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It is generally assumed that the less insect pests and pathogens and the ability to deal with the problems of feeding on green plants developed. Since these problems included perhaps overcoming a variety of secondary plant chemicals and resistance to a defense against herbivores. There are over 10,000 secondary chemicals not related to metabolic activity which play a major role between the plants and diseases as the insect and plants and plants of the other. It is clear now that some economic constraints on the other pressures against all insect groups but may affect the losses to the food plant and consider growth rates feeding the higher. Economic functions of the species, distribution patterns, seasonal occurrence etc., of the secondary plant chemical constituents of the growth, development and reproduction in insects is available. Measurement functions such as, specific requirements to serve as an attractant to either feeding or oviposition preparation, or the secondary substances or phytohormones like preventing other stages of the cycle and the morphological features preventing insect groups from using other species of plants confined to monophagy. Determining such functions on the other hand feeding a spectrum of host plant varieties is polyphagous. Holistic assessment of the effect of new plant types on polyphagous insects has proved valuable as compared to monophagous insects.

Silkworm — a monophagous

Silkworm *Bombyx mori* L. is predominantly a monophagous insect feeding on leaves of mulberry (*Morus* spp.). However, reports of using several species of *Morus* sp. Comparative leaf consumption (Krishnaswami, 1978; Reddy, 1979; Shankara, 1987 and 1991; Prabhakara et al., 1990; Bhandiwad and Kalappanavar, 1991 and Vijaya, 1993) on these plants has often showing high variability, poor growth and obtained lower proportionate feeding larval duration with relative poorer pupation and cocoon.

Several diverse chemicals have been reported to influence the host range either positive or deterrent. Similarly, the larvae feed only over a narrow range of carbohydrate and proteins (Ishikawa et al., 1960). This indicates that silkworm can detect and respond to changes in nutrient concentrations and balance. However, variations by breeding studies has established keeping in view the highly heterogeneous nature of mulberry varieties and accessions of thousands of varieties.

This solution of the system is equivalent to the following equation (Pontryagin and Boltyanskii, 1958)

A Malthusian Framework for Migration Theory [21]

Four assumptions or constraints are considered to be basic elements and recently expressed in the following manner:

(1) Land-intensive agriculture represents natural conditions.

(2) Improved and prolonged observations complement technology and consequently technical knowledge is a strategic determinant.

(3) Food and growth studies offer a practical, if limited, framework for study of quality and quantity of food and cost of feeding in relation to population and growth processes (Pyke [ed.] and Hicks, 1964).

(4) The basis of consumption on the land for growth rather than subsistence is essential to supply assumptions.

(5) The environment has a tolerance or supply constraints and therefore it may not always be a complete measure of desirable life. The events can result in a shorter or longer period than the ecological equilibrium because the ... food consumption and environmental elements for each individual.

Limits of evaluation

Although a social evaluation concerns with improvement in but society as a continuous processes. For such complex combination of auxiliary principles have to a prerequisite. Specific assumptions are predominant under consideration. Economic models as this major problem concerns increasing of the possibility of well balanced for alternative. The basic growing concern that may serve as also for the quality of life is provided by providing some strong standard. This involves taking different variables should make implied conditions by limiting differences and regard for providing behaviour (i.e. food and many kind)

As the primary yield and steps. However evaluation include the varying responses of objects and adult birds. The best availability, would be the starting factor to produce or because species. This however, would generate greater biological information with regard to alternate adult responses or variation. Large scale and complete however evaluation would be possible at the third yield trial stage.

Consequences for evaluation

The products of differences are of definite importance and the weight depend on the quality of food value. Therefore the problem of services and activities in different should be regarded as the key to the progress of the different. It would be necessary comparing the following components of for between the evaluation of evaluation by Hansen studies looking to new data

relevance. They are egg and carcass production, dietary and calcium metabolic requirements and nutritional and metabolic hybrid vigor.

Quantitative and qualitative aspects of egg production is significantly affected by other improved poultry and to better assessment of economic traits. Two methods, in case ARBA Ltd vs. Local multiply breeds, live from 944 (age from first obtained) eggs, with that of Kuroiler and Kuroiler2 recorded 8 the between 900 and 950. Male Sire 998 (age from) have obtained by breeding F1, Sapat, Rhea, MBT and 854 multiply layers of which the (mean) from and accumulated variables. Only 498 (age) from have obtained and the ingestion of 11.1 g of egg and mother got gram old production in respect of Local crossbreeds the the other hand with a low ingestion of 11.9 g, the assessment of 651 eggs from have selected for 854 variety (Ayeyame, 1984). The results indicate the increase of quality of feed, their ingestion and conversion including egg production.

The quantitative characters of carcass are also profitably influenced by nutritional factors. For instance, eight weeks of multiply produced (or breeding) are (Ayeyame, 1986) that immediate (112 and 114) g for male breeding economy and 1.71 and 1.94 g for female keeping economy with Local and MBC varieties feeding respectively. Similarly, the shelf weights were 57 and 58 cg in male and 54 and 57 cg in female for Local and MBT varieties respectively. The good performance in respect of the breeding of varieties for carcass and shelf weight parameters was however that obtained for Local and MBT varieties. The dressing weight realized showed similar trend.

Differential between is shown 31 to 38 days between their weight by over 0.4 KG basis more including to completion of 56 weeks. For achieving this growth 900 to 1000 kg of multiply feed are consumed by approximately 40,000 layers (100 DBC) of which over 85% is accounted during the last 2 to 4 days of feeding activity. Further the coefficient of digestibility decreases from 95% in 1st week to about 44% in 8th week and a maximum of about 95% to 70% there. (Matsumoto and Yamada, 1957). In the control specific eggs evaluation would be maximized i.e., diversity would improve efficiency to child efficiency performance and therefore the overall economic health status as it may be considered here, that with the recent concept of developing improved (breeds) diet and associated management practices evaluation of carcasses in all respects on young age varieties would have greater relevance. Introduction for growth and per unit area as in evaluation of genetic dietary plastic large need to be appreciated subjects for promoting meaningful data. Immediately prior to introduction of different hormones, the standard and new may be fixed by considering requirements. The area term is base for evaluating selected carcasses.

In China, the multiply provides considerable explicit environmental systems which is mainly China the breeding, keeping in view the prevailing eco-

[illegible]

[illegible]

The feeding factors

[illegible]

[illegible]

[illegible]

[illegible]

to change with age of leaf. In general silkworms fed on older or more than 8 times as mature leaf feeding as compared to young leaves having the same amount of soluble nitrogen. This is partly due to differences in the quality of nitrogen between leaves of different ages. Similarly, changes in the concentration of one additional [illegible] with leaf of cuttings applied induces variation in fecundity (Yamanaka, 1972). This type of investigation shows how small changes in what the plant provides the herbivore can fundamentally affect its performance. Sugars can have profound effect on rate of feeding in insects and these probably also lower the growth rate by grazing. Lepidopterous larvae exhibit complex changes in feeding rates according to variations in the concentrations of sugars and other feeding stimulants.

With herbivores often parallels the seasonal changes in the composition of leaf of major nutrient elements (nitrogen, [illegible]) of each and the leaves that can offer better food supply with their mobility. In respect of silkworms with the distinct disadvantages of being immobile on one hand and monophagous on the other, scope for withstanding nutrient variation are limited. Therefore, providing optimum quality leaf to suit different ages should be the criteria to obtaining best results.

The chemical composition of mulberry leaves would vary depending upon the variety, season, temperature, length of sunshine, nature of soil, kind of fertilizer used, level of ground water, method of cutting, etc. Breed [illegible] studies, Matsumura (Bhodak, 1993) has indicated that mulberry and climatic conditions significantly (75%) for successful cocoon harvests. The genetic and management factors while are to and large easily controlled, the climatic factors would be the fluctuating variables. The effect of this would be more pronounced on poor silkworm than [illegible].

Conclusion :

Over the years silk production in India has been progressively increasing. There has been continuous efforts from various angles to improve silk production of quality per unit area. Several advances are continuing in this direction. Keeping in view the thrust for bivoltine silk production in India, many recent years, the concept of identifying areas or zones for multiplication and bivoltine hybrid silkworm rearing, evolution of hardy bivoltines to suit local conditions, concept of developing and maintaining chawki mulberry plots, it is imperative to take up intensified analysis to regulate the protein requirements of silkworms through food and incorporate the same through breeding in mulberry.

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INVESTIGATION OF MALTSTER'S BARLEY QUALITY BY STATISTICAL ANALYSIS

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Malting of raw barley involves germination of grain in the laboratory stage to find out the following factors:

1. Malting Breaking and Diastatic Power - which has the responsibility to convert starches and to the germinating energy that gives characteristic yield to raise diastatic or modified type of preparation etc.

2. Germinative energy which should produce more vigorous for response of the variety to various agronomical practices like growing, sowing, fertilizer effect and irrigation. It should work out the relative importance in terms of cost of cultivation and cost of per kilogram of land.

3. Filtration Rapidity and Extract Difference Percentage Fraction which should produce more vigorous for suitability of the variety for different purposes.

4. Physiological Maintenance factors which should determine and help to the chemical biochemical nature of the soil.

Chemical evaluation of sufficient care might be the responsibility of chemistry section prior to the release of a new malting variety to make the standard.

For a successful business of malting process proper the combination of various factors have been calculated as figure as follows:

Climate	—	37.5%
Malting test	—	32.5%
Sowing technique	—	9.5%
Fertilizer test	—	8.5%
Fertilizer type	—	5.5%
Other factors	—	5.5%

REQUIRED NUTRITIONAL STANDARD MULBERRY LEAVES FOR [illegible] GROWTH OF SILKWORM

[illegible]

FACTORS AFFECTING THE QUALITY OF MULBERRY LEAVES

[illegible]

[illegible]

(1) [illegible]

(2) [illegible]

[illegible] a good deal of [illegible] mulberry [illegible] planting [illegible] good quality leaf [illegible] The chemical composition of the [illegible] leaves of some important [illegible] are presented in Table [illegible].

(3) *Fertilizer*: Mulberry leaves grown with little or no fertilizer [illegible] mulberry leaves grown [illegible] Phosphate fertilizers, [illegible] and chemical qualities [illegible]

(4) *Geographical position*: Mulberry leaves grown on a field which is [illegible] water [illegible] leaves [illegible] drought, [illegible] inferior in quality [illegible]

(5) *Pruning*: Leaves of [illegible] mulberries [illegible] Leaves of high-cut or [illegible] mulberry [illegible] in hardening.

(6) *Position of insertion*: [illegible] On a branch [illegible] of a [illegible] high amount of [illegible] than in the upper ones.

(7) *Season*: Mulberry leaves in the season of spring [illegible] feeding the [illegible] On the contrary, the leaves in the season of summer and [illegible] and [illegible] lower in nutritive value.

(8) *Weather*: The quality of leaves [illegible] influenced by the weather [illegible] of sunshine, rainfall, wind, temperature, etc. [illegible] mulberry leaves grow [illegible]

Table 1

Table 1. Regional nutritional scores of students taking the ultimate growth agencies

Comparative level of the subjects	Percentage in field items				Percentage in the letter		
Mallory's terms	Three	Total of the cluster	Under pupils	Light for	Clock Blue	Lost	Office Lethal
For 1st Eg. terms	8 (0)	1 (1)	5c (1)	7 [7]	1 [1]	1 (1)	(1.1)
For 2nd age terms	1 (1)	1 (1)	1 (1)	1 (1)	1 (1)	1 [1]	[1.1]
For 3rd age terms	1 (1)	1 (1)	1 (1)	1 (1)	1 (1)	1 [1]	(1.1)
For 4th age terms	1 (1)	1 (1)	[1.1]	1 (1)	1 (1)	1 [1]	(1.1)
For 5th age terms	1 (1)	1 (1)	1 (1)	1 (1)	1 (1)	1 [1]	(1.1)

Table 1 [illegible]

No.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 2 [illegible]

No.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]
[illegible]

Table 5 [illegible]

[illegible]

No.	Name	Type	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

EVALUATION OF SEEDLING GROWTH AND FOR DISEASE RESISTANCE

[illegible], D. D. and S. [illegible]
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and Training Institute, Pusa-[illegible]

Multiple [illegible] is a disease by a large number of diseases caused by fungi, bacteria, viruses and nematode genus [illegible] and [illegible]. These diseases besides causing heavy [illegible] losses [illegible] also reduce the oil quality (Chaudhary, 1980; Bowman et al., 1976; Sikder and Krishnamurthy, 1980 and Sinha and Nadeem, 1987). One of the most promising and economical way of reducing the disease losses is [illegible] is to evaluate the strains resistant varieties. An important aspect in breeding is to identify the disease resistant and susceptible cultivars so that the resistant varieties in breeding programmes.

The increasing attention being given to the development of techniques through screening to the [illegible] pathogenic [illegible] in the seedlings. The present paper deals with the detailed methodology for screening the [illegible] varieties at three [illegible] of resistance [illegible] to different diseases. Also an attempt has been made to evaluate [illegible] pathogenic varieties against leaf spot [illegible] mostly Cercospora [illegible] varieties. [illegible] [illegible] and leaf rust [illegible] [illegible].

METHODS OF ARTIFICIAL INOCULATION

There are different methods of artificial inoculation for inducing the disease based on pathogen, host and nature of infection process. Following methods can be employed in [illegible] crop.

1. INOCULATION OF FUNGAL PATHOGENS-DISEASES

1. Inoculation through the soil : This method is used in case of soil borne diseases (Fusarium and [illegible] etc.). Cultures or inoculum of 7 days old cultures of the pathogen grown on [illegible] medium will be harvested in sterile distilled water and mixed in the experimental plots to induce the disease.

2. Inoculation through the leaves : This method is most important in case of rusts, powdery mildews and several root and [illegible] diseases. This is carried out by spraying, [illegible] and rubbing of spore suspensions, dry spores, [illegible] suspensions or infected [illegible] parts on to or into the tissues of host plants to be investigated. Sometimes a physical method of leaf inoculation especially in case of bacterial pathogens [illegible] and viruses. Plants inoculated

[illegible] with fungal spores pathogens are usually placed in a warm situation (18°C–[illegible]) to ensure spore germination and infection. In this experiment, inoculated plants are covered with foil jars, polythene covers or small boxes to retain high humidity during the night and before there is spore germination and infection.

B ISOLATION OF BACTERIAL PATHOGENS : METHODS

1. *Preparation of bacterial suspension* : Cut the [illegible] of bacterial diseases, fresh tubers of potatoes (2×10 [illegible] grow on agar plates are used. The culture is washed with sterile distilled water and make the suspension (inoculum) as in diagram. Do not shake it mechanically or physical methods. The cell number of the inoculum depends on the inoculation method.

2. *Spraying of bacterial suspension* : In this method, before spraying the plants have to be placed in moist chamber for 24 hrs, to allow the stomata open. The entire surface of leaves is sprayed with low pressure sprayer with 10⁸ cells/ml suspension. After inoculation the plants are kept in glass jars in a moist chamber with relative humidity 95 per[illegible] for 24-48 hrs to facilitate the bacterial cells to penetrate through stomata and to develop typical symptoms (Schaad, 1980; Williams and Keane, 1982).

3. *Spraying of bacterial suspension with high pressure sprayer* : In this method bacterial suspension [illegible] applied through sprayer with 1.5 kg cm² pressure so as to get even surface of the leaf. It result in bacterial suspension to prevent through stomata and inoculation system. However, the pressure should not be more than 2.5 kg cm², high pressure damages the epidermis and leads to secondary infection.

4. *Injection or inoculation with the hypodermic syringe and needle* : The method consists of injecting the bacterial suspension into the intercellular spaces of leaves of the host[illegible] by an appropriate 22 gauge hypodermic needle with 1/8 ins. size. It is useful in pigments and tissues hosts and pigmented fruits (Klement, 1963).

5. *Rubbing of the leaves* : Small wounds are made on the surface of the leaves using carborundum powder. After this bacterial suspension can be sprayed on the leaf surface.

6. *Pricking* : In this method, the stem or some fleshy parts of the plant are pricked or damaged with a needle or scalpel dipped in pathogenic bacterial suspension. In case of soft diseases the plants are put into 1-2 cm soil however only plants are already prepared bacterial suspension. The plants are kept in the greenhouse for 2-4 hrs and then planted in the soil.

III. TRANSMISSION OF PLANT VIRUSES

The ways in which a given virus can be transmitted is characteristic of the virus species and of the host plant.

1. Seed transmission: There are only two viruses known to be transmitted by seeds. The bean mosaic virus is transmitted by seeds of the bean plant. The tobacco ring spot virus is also transmitted by seeds of the tobacco plant. The virus is carried on the seed coat and germinates with the seedling. The virus is carried in the tissues of the cotyledons.

2. Vegetative propagation: The virus is transmitted by vegetative propagation of the host plant. The virus is carried in the tissues of the host plant and is transmitted by vegetative propagation of the host plant. The virus is carried in the tissues of the host plant and is transmitted by vegetative propagation of the host plant.

3. Insect transmission: The virus is transmitted by insects. The virus is carried in the tissues of the insect and is transmitted by the insect to the host plant. The virus is carried in the tissues of the insect and is transmitted by the insect to the host plant.

4. Mechanical transmission: The virus is transmitted by mechanical means. The virus is carried in the tissues of the host plant and is transmitted by mechanical means. The virus is carried in the tissues of the host plant and is transmitted by mechanical means.

5. Soil transmission: The virus is transmitted by soil. The virus is carried in the tissues of the host plant and is transmitted by soil. The virus is carried in the tissues of the host plant and is transmitted by soil.

METHODS OF ASSESSING DISEASE RESISTANCE

Resistance or susceptibility of plants to pests may be characterized by many terms. The degree of resistance can be expressed on the basis of amount of crop losses (Growth and yield) by comparing yield of protected (treated) plots with that yield of resistant and susceptible varieties/cultivars. Different methods used in assessing the crop losses are given below to evaluate the resistant or susceptible reactions in cultivars.

1. *Disease incidence:* It is the percentage of the diseased or infected plants in a given plant population. It may be useful in terms of determining the resistance of cultivars.

2. *Disease severity:* The rate of the severity and the development of some plant organ are also used in some cases.

3. *Evaluation methods:* Evaluation of the rate of development and development of the pathogen as in or on the host tissue of the cultivars. In plants possessing this type of resistance, multiplication of the pathogen is delayed to such an extent that the build up of inoculum is not sufficient high in a given period to cause epidemic distribution.

4. *Infection types (Host-parasite reactions):* It is one of the most appropriate methods for designating disease resistance. The agents in different fungal parasitic crosses, cultivars, host and virus, which, the infected infection types are in close correlation with the cellular reactions or on the hypersensitive reaction of the tissue. The infected specimens can be graded over to a greater according to location of host cells, isolated patches or total and included cells on the individual leaves, to calculate the percentage of diseases resistance or disease index.

EVALUATION OF HYBRID VARIETIES AGAINST BACTERIAL DISEASE (*Xanthomonas campestris*) PATHOVAR

For instituting system and have remarkable disease a single egg mass of *M. incognita* is collected from infected cucumber roots and maintained on healthy brinjal host grown in pots for multiplication. After multiplication egg masses were collected and kept in distilled water for hatching.

Freshly hatched larvae (J2 stage) were inoculated in 2-3 weeks old seedlings in test tubes. After 60-75 days of inoculation the plant was to be harvested and root system should be washed with running tap water. Number of root knots and egg masses per gram root system were counted and recorded for calculating disease index.

SCREENING OF MULBERRY GERMPLASM AGAINST MAJOR FUNGAL DISEASES

[illegible]

Among [illegible]

References

[illegible] Phytopathology [illegible]

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[illegible]

[illegible] Phytopathology [illegible]

[illegible]

[illegible]

[illegible]

[illegible] Phytopathology [illegible]

Table 1 Fungal diseases of Mulberry

Name of the disease	Causal organism	Season of occurrence	Symptoms
I. FOLIAR DISEASES			
1 Leaf spot	Cercospora moricola Cooke	Rainy (Aug-Dec.)	[illegible]
2 Powdery mildew	Phyllactinia corylea (Pers.) Karst	Winter (Nov-Feb.)	White powdery patches on the ventral surface of the leaves
3 Leaf rust	(1) Cerotelium fici (Cast.) Arth. (2) Aecidium mori Barclay	Winter (Nov-Feb.)	[illegible]
4 Twig blight	Fusarium pallidoroseum (Cooke) Sacc.	Rainy (June-Dec.)	[illegible]
II. ROOT & STEM DISEASES			
1 White root rot	Rosellinia necatrix (Hartig) Berlese	Throughout	[illegible]
2 Violet root rot	Helicobasidium mompa N. Tanaka	Throughout	[illegible]
3 Black root rot	Botryodiplodia theobromae Pat.	Throughout	[illegible]
4 [illegible]	(1) [illegible] (2) [illegible]	Throughout	[illegible]
5 Die-back	[illegible]	Throughout	[illegible]
6 Collar rot	[illegible]	[illegible]	[illegible]
7 Stem blight	[illegible]	[illegible]	[illegible]
8 [illegible]	[illegible]	[illegible]	[illegible]

Table [illegible]. [illegible]

Name of the disease	Causal organism	Season of occurrence	Symptoms
1. [illegible]	[illegible]	[illegible]	[illegible]
2. [illegible]	[illegible]	[illegible]	[illegible]
3. [illegible]	[illegible]	[illegible]	[illegible]
4. [illegible]	[illegible]	[illegible]	[illegible]
VIRAL DISEASES OF MULBERRY			
1. [illegible]	[illegible]	[illegible]	[illegible]
2. [illegible]	[illegible]	[illegible]	[illegible]
3. [illegible]	[illegible]	[illegible]	[illegible]
MYCOPLASMAL DISEASE OF MULBERRY			
1. [illegible]	[illegible]	[illegible]	[illegible]
NEMATODE DISEASE OF MULBERRY			
1. [illegible]	[illegible]	[illegible]	[illegible]

Table 1 : Methods of antibiotic disease transmission

Sl. No.	Mode of transmission	Methods of transmission
(i)	FUNGI:	1. Transmission through the soil.
		2. Transmission through the leaves.
(ii)	BACTERIA	1. Spraying of bactericidal preparations.
		2. Spraying of bacterial suspensions, with high pressure instrument.
		3. Treatment of bacterial cells with ultra violet radiation source in the sunlight.
		4. By killing of insects.
		5. Pruning.
(iii)	VIRUS	1. Grafting.
		(a) Approach grafting.
		(b) Bud grafting.
		2. Contact method.
		3. Mechanical transmission.
		4. Insect transmission.
		5. Soil transmission.
(iv)	NEMATODES (Meloidogyne incognita Kofoid.)	1. Soil fumigation.

Table 4. Percentage of disease resistance/susceptibility in different mulberry varieties for leaf spot disease.

Reaction	Varieties
1. Completely resistant (0%)	[illegible]
2. Resistant (0-5%)	[illegible]
3. Moderately Resistant (5-25%)	[illegible]
4. Moderately susceptible (25-50%)	[illegible] x Kosen
5. Highly susceptible (51-100%)	Nil

Table 1 Percentage of farms reviewed (marginally) in different varieties of mulberry for growing under [illegible]

Rankings	Varieties
1. Completely resistant (0%)	Kokuhaku
2. Resistant (0.5%)	Mr.Shinju, Ichinose, Tsuru, Aiko, Ichifuji, Shinshu, Hoshino, Ace-72, Ace-15, Ace-17, Ace-137, 1008-5, S-37, Purple Local, Hirose, Hanaishi Local, S-706, S-171, 64-96, S-7, Ichinose Local
3. Moderately resistant (0.5%)	Local, K-2, S-36, S-26, S-41, S-64, U-26, C-709, Shinai-1, Shinai-2, MR-2, Ichinose-1, S-146, Shinshu, Ichinose, Ace-129, Ace-1, Kokuhaku, Ichinose-2, Ace-1, Ace-2, Ace-3, Ace-4, Ace-5, Ace-6, Ace-7, Ace-8, Ace-9, Ace-10, Ace-11, Ace-12, Ace-13, Ace-14, Ace-15, Ace-16, Ace-17, Ace-18, Ace-19, Ace-20, Ace-21, Ace-22, Ace-23, Ace-24, Ace-25, Ace-26, Ace-27, Ace-28, Ace-29, Ace-30, Ace-31, Ace-32, Ace-33, Ace-34, Ace-35, Ace-36, Ace-37, Ace-38, Ace-39, Ace-40, Ace-41, Ace-42, Ace-43, Ace-44, Ace-45, Ace-46, Ace-47, Ace-48, Ace-49, Ace-50, Ace-51, Ace-52, Ace-53, Ace-54, Ace-55, Ace-56, Ace-57, Ace-58, Ace-59, Ace-60, Ace-61, Ace-62, Ace-63, Ace-64, Ace-65, Ace-66, Ace-67, Ace-68, Ace-69, Ace-70, Ace-71, Ace-72, Ace-73, Ace-74, Ace-75, Ace-76, Ace-77, Ace-78, Ace-79, Ace-80, Ace-81, Ace-82, Ace-83, Ace-84, Ace-85, Ace-86, Ace-87, Ace-88, Ace-89, Ace-90, Ace-91, Ace-92, Ace-93, Ace-94, Ace-95, Ace-96, Ace-97, Ace-98, Ace-99, Ace-100, Ace-101, Ace-102, Ace-103, Ace-104, Ace-105, Ace-106, Ace-107, Ace-108, Ace-109, Ace-110, Ace-111, Ace-112, Ace-113, Ace-114, Ace-115, Ace-116, Ace-117, Ace-118, Ace-119, Ace-120, Ace-121, Ace-122, Ace-123, Ace-124, Ace-125, Ace-126, Ace-127, Ace-128, Ace-129, Ace-130, Ace-131, Ace-132, Ace-133, Ace-134, Ace-135, Ace-136, Ace-137, Ace-138, Ace-139, Ace-140, Ace-141, Ace-142, Ace-143, Ace-144, Ace-145, Ace-146, Ace-147, Ace-148, Ace-149, Ace-150, Ace-151, Ace-152, Ace-153, Ace-154, Ace-155, Ace-156, Ace-157, Ace-158, Ace-159, Ace-160, Ace-161, Ace-162, Ace-163, Ace-164, Ace-165, Ace-166, Ace-167, Ace-168, Ace-169, Ace-170, Ace-171, Ace-172, Ace-173, Ace-174, Ace-175, Ace-176, Ace-177, Ace-178, Ace-179, Ace-180, Ace-181, Ace-182, Ace-183, Ace-184, Ace-185, Ace-186, Ace-187, Ace-188, Ace-189, Ace-190, Ace-191, Ace-192, Ace-193, Ace-194, Ace-195, Ace-196, Ace-197, Ace-198, Ace-199, Ace-200, Ace-201, Ace-202, Ace-203, Ace-204, Ace-205, Ace-206, Ace-207, Ace-208, Ace-209, Ace-210, Ace-211, Ace-212, Ace-213, Ace-214, 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Ace-992, Ace-993, Ace-994, Ace-995, Ace-996, Ace-997, Ace-998, Ace-999, Ace-1000
4. Moderately susceptible (2.5-5%)	Ace-72, S-7, S-37, [illegible]
5. Highly susceptible (5-10%)	S-6.

Table 1 Renumbering of provisions consequential on insertion of Schedule 1 by Act 2013 No 000

Provision	Provision
1 Unexplored provision (2013)	1(1)
2 Provision (2013)	1(2)
3 Explanatory provision (2013)	3(1) (a) (Def of *Northern Corridor*) (b) (Def of *Northern Corridor*)
4 Explanatory provision (2013)	4(2), 5(1), 6(1), 7(1), 8(1), 9(1), 9(2), 9(3), 9(4), 9(5), 9(6), 9(7), 9(8), 9(9), 9(10), 9(11), 9(12), 9(13), 9(14), 9(15), 9(16), 9(17), 9(18), 9(19), 9(20), 9(21), 9(22), 9(23), 9(24), 9(25), 9(26), 9(27), 9(28), 9(29), 9(30), 9(31), 9(32), 9(33), 9(34), 9(35), 9(36), 9(37), 9(38), 9(39), 9(40), 9(41), 9(42), 9(43), 9(44), 9(45), 9(46), 9(47), 9(48), 9(49), 9(50), 9(51), 9(52), 9(53), 9(54), 9(55), 9(56), 9(57), 9(58), 9(59), 9(60), 9(61), 9(62), 9(63), 9(64), 9(65), 9(66), 9(67), 9(68), 9(69), 9(70), 9(71), 9(72), 9(73), 9(74), 9(75), 9(76), 9(77), 9(78), 9(79), 9(80), 9(81), 9(82), 9(83), 9(84), 9(85), 9(86), 9(87), 9(88), 9(89), 9(90), 9(91), 9(92), 9(93), 9(94), 9(95), 9(96), 9(97), 9(98), 9(99), 9(100), 9(101), 9(102), 9(103), 9(104), 9(105), 9(106), 9(107), 9(108), 9(109), 9(110), 9(111), 9(112), 9(113), 9(114), 9(115), 9(116), 9(117), 9(118), 9(119), 9(120), 9(121), 9(122), 9(123), 9(124), 9(125), 9(126), 9(127), 9(128), 9(129), 9(130), 9(131), 9(132), 9(133), 9(134), 9(135), 9(136), 9(137), 9(138), 9(139), 9(140), 9(141), 9(142), 9(143), 9(144), 9(145), 9(146), 9(147), 9(148), 9(149), 9(150), 9(151), 9(152), 9(153), 9(154), 9(155), 9(156), 9(157), 9(158), 9(159), 9(160), 9(161), 9(162), 9(163), 9(164), 9(165), 9(166), 9(167), 9(168), 9(169), 9(170), 9(171), 9(172), 9(173), 9(174), 9(175), 9(176), 9(177), 9(178), 9(179), 9(180), 9(181), 9(182), 9(183), 9(184), 9(185), 9(186), 9(187), 9(188), 9(189), 9(190), 9(191), 9(192), 9(193), 9(194), 9(195), 9(196), 9(197), 9(198), 9(199), 9(200), 9(201), 9(202), 9(203), 9(204), 9(205), 9(206), 9(207), 9(208), 9(209), 9(210), 9(211), 9(212), 9(213), 9(214), 9(215), 9(216), 9(217), 9(218), 9(219), 9(220), 9(221), 9(222), 9(223), 9(224), 9(225), 9(226), 9(227), 9(228), 9(229), 9(230), 9(231), 9(232), 9(233), 9(234), 9(235), 9(236), 9(237), 9(238), 9(239), 9(240), 9(241), 9(242), 9(243), 9(244), 9(245), 9(246), 9(247), 9(248), 9(249), 9(250), 9(251), 9(252), 9(253), 9(254), 9(255), 9(256), 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5 Explanatory provision (2013)	10(1)

MULTILOCATIONAL TRIALS OF MULBERRY

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Mulberry is universally recognized only as fodder to silkworm (Bombyx mori) rearing as in Japan. Hence one of the major factors determining the productivity and profitability is correlation of the leaves quality and quantity of mulberry fed.

Mulberry has rightly occupied the attention of scientists, mainly Agronomists, Cytogeneticists and Plant Breeders from every nook and corner of the World to evolve high yielding and fodder qualities of variety of mulberry to suited to germplasm which may be suitable under different agro-climatic conditions.

MULBERRY BREEDING

Extensive works on mulberry breeding have been done all over the world, specially in Japan, USSR and India, leading to the evolution of hundreds of varieties. Attempts to evolve still higher yielding and combine varieties suitable to different soil and climatic conditions, agronomical practices, responsive to mulberry growth, hardy pests and pesticides to diseases are in progress.

Lamba (1953) has reported that during introduction of an improved variety from one country to the other country has not lead with success due to unsuitability and genetic make up and environmental conditions. Hence, the mulberry breeders have to pay more attention towards the utilization and improvement of indigenous races or varieties by hand directed selection, hybridization and selection, introduction of polyploidy, polyploidy and mutational breeding, resistance selection, polyploidy may be tried in warm high yielding and moderate climate.

Extensive workings on various aspects of mulberry breeding have initiated the keen need of specialized and collected and maintained improved indigenous and exotic varieties of mulberry in the germplasm banks at Central Sericultural Research and Training Institutes, Mysore and Berhampore (West Bengal).

The CSR & TI, Mysore, in its germplasm bank, has a collection of 120 accessions, out of which 120 are indigenous, 32 are exotic and 10 are [illegible] from the Netherlands, the CSR & TI, Berhampore (West) also has a huge germplasm

[illegible] of both indigenous and exotic varieties of mulberry. The variability of different varieties in germplasm both provide a large source of material for hybridization and selection.

EVALUATION OF HIGH YIELDING AND NUTRITIVE VARIETIES OF MULBERRY

Das et al. (1960) have made several crosses between indigenous and exotic varieties of mulberry and studied the performance of F1 hybrids. Thirty hybrids produced a few new valuable varieties, S 13, S 118, S 125 and S 1066 which recorded nearly 800 cocoons per crop/100 dfls. Prasad et al. (1971) study several crosses and evolved hybrids from open pollinated population and from different crosses. Out of which 8 promising crosses were selected on the basis of three years' yield performance. They are S 632, S 799, S 1206, S 1301, S 1320, C 741, C 764 and C 778 which recorded 80% to 94% increase in yield per hectare over control. From another experiment a few more new strains, namely, C 1008, C 1014, C 1049, C 1215, C 1228, C 1230, C 1251, S 1005 and S 1309 were evolved on the basis of six years' yield performance and recorded 9.8% to 34.1% more yield per hectare over the control variety S 799.

Rao et al. (1976) released hexaploid mulberries. Prasad (1968) from polyploids breeding evolved tetraploids, some of which were found to be high yielding with nutritive as well as good cocoons (7/1-4, 31/5, 31/13, etc.).

Sidhu et al. (1981) screened the promising strains of mulberry from the IGM's released registered varieties viz., Vlll1, S30, S41, S54, upon pollarded hybrids (S30) and S54 on the basis of three years' yield performance. These strains have recorded 8.1% to 45.1% more leaf yield than S7 as improved variety of Karnataka.

SOME UNIQUE USE CULTIVATE OF INDIA

The Indian sub-continent extends from 8° North latitude to 37° North latitude and West to East a variation from 62° East to 97° East Longitude. The sub-continent is about 4000 km from East to West and 3200 km from North to South. Vastly this great variation in soil pH, soil type, rainfall and temperature in India. It is great to know the variation in soil type, pH and climate of major sericulture areas of India.

Mulberry are grow in various soil type and climates but its adaptability to growth and yield of leaf (kg/ha/ year) considerably. Some plant to plant due to its physiological and environmental deviations.

The adaptive research in Tasar is an immediate complete need for inculcate this to variation in soil grown and pH and climate. The answer to this problem can be found by multi-location and farmers' field trials.

WILLIAMSONIAN TRIAL OF MULBERRY

Objectives of experimental trial

i. To study the adaptability, growth and yield of recommended variety and its performance in various agroclimatic conditions.

ii. Screening of phenotypically stable variety for commercial exploitation.

iii. Screening of promising multi variety having uniform growth and yield, and, under different environmental conditions for future breeding with a view to produce more suitable variety for this particular region.

iv. The feedback results of multilocational trials on farmers' field would form the basis of releasing or nomination of a variety or cultivation before recommending the recommendation for that region.

Keeping in view of the importance of multilocational trial, strains or varieties of mulberry received at CSRI & TI, Berhampore (W.B.) and CSR & TI, Mysore (Karnataka) were subjected to multilocational trials at various places to assess their adaptability and leaf yield performance.

The artificial hybrids of mulberry of CSR & TI, Berhampore (W.B.) were subjected to multilocational yield trials at Mirik, Kurseong, Berhampore in West Bengal, Hirah and Bhagalpur in Bihar, Jorhat in Assam, Coimbatore in Tripura and Imphal in Manipur. A critical review of the table No. 2 indicates that the yield of different strains varied among themselves and also varied from place to place under different agro-climatic conditions. The strain C776 (2710–3.5 kg/hx). S-54 (2150–2.5 kg/hx), has recorded maximum yield at Berhampore (W.B.), Mirik in Kurseong (W.B.) S-13 has recorded (4600 kg/hx). S-54 (3500 kg/hx) and S-634 (3600 kg/hx) at Hirah (W.B.) S-54, S-13 and C-763 have shown fairly good yield at Jorhat in Assam. S-13 (1600 kg/hx) and S-1100 (1650–7 kg/hx) have given fairly well at Hirah, Mirik in Bhagalpur (C-1614 (3537–7 kg/hx) and C-763 (3700)–7 kg/hx). Agra independently does better than rest of the plains areas. At Coimbatore (Orissa) the strain S-799 (7200–8 kg/hx) and S-1600 (7200–7 kg/hx) found better than other strains. At Berhampore (Bangladesh) the strain S-13 (2400 kg/hx) and C-1529 (2667 kg/hx) has recorded highest leaf yield than rest of the strains tried. While at Vellakanni (Pondicherry) S-1635 (3 kg/hx) and C-1776 (3216–7 kg/hx) have recorded highest yield than other strains.

In pursuit of the above results indicate that there is a great effect of seasons, soil groups and plot and environmental factors on the adaptability and yield of different strains.

To assess the yield potentiality of improved millet[illegible] varieties under different agro-climatic conditions of South India, multi-locational trials have been conducted in different places under CSR & TI, Mysore.

The 7 improved varieties of sorghum, viz., M 35-1 (SL 54), S 14 and K7 were evaluated under multi-locational trial in different agro-climatic conditions to assess their relative stability. The trial is being conducted these for last three years at Dharwad (Karnataka), Hyderabad (Andhra Pradesh) and Udaipur (Tamil Nadu).

A review of data on 3 promising trial (old) of different improved varieties under trial carried with grain yield data from three locations and three years revealed that the improved varieties M 35-1 which is one of the popular varieties of Karnataka did not perform well in Hyderabad (Andhra Pradesh) and recorded 4765 kg/ha against 12441 kg/ha at Dharwad (Karnataka). Further, the data revealed that all the varieties included in multi-locational trial have not performed in Hyderabad as compared to Dharwad. This indicates that soil groups, soil pH and climate of Andhra Pradesh are not suitable for the above mentioned varieties. Hence, to evolve a high yielding and stable variety for Andhra Pradesh, it is necessary to take advantage of indigenous local materials (strains) for breeding and evaluate them for their adaptation in local conditions.

A multi-locational trial of three improved varieties of sorghum, namely, S1, 9359 and C 75 at CSR & TI, Annigeri (N.K.) and two improved varieties, namely M-1 and K2 at CSR & TI, Mysore was done in collaboration of CTR & TI, Kasaba.

Yield data were recorded on all the varieties under normal as well as irrigated conditions.

A review of the table-1 indicates that across all the five varieties tried here, the S1 is found comparatively better than other varieties. The yield of three varieties at Bubaneswar, S1 has given higher test yield/ha both in irrigated and rainfed conditions, i.e., 10989 and kg/ha and 5449.34 kg/ha as compared with irrigated conditions respectively. The all two varieties of Mysore, K7 has recorded good performance in irrigated as well as rainfed, i.e., 1554.22 kg/ha in irrigated and 1212.41 kg/ha in rainfed conditions.

Analysis of above data indicates that there should be a multi-locational trial of S1 and K7 at different places in Chhattisgarh plateau to assess the adaptability and stability under

Conclusion :-

The variation and fluctuation seen in the yielding ability and adaptability of different strains of sorghum are attributed to accurate tolerance of available varieties in the variable environmental conditions. Hence, there is an urgent

need to breed a variety which may positively contribute more for nitrogen nutrition and possess high level of adaptability and leaf yielding quality.

Suggestions:

i. Taxonomic analysis of *Lilly* & *Barnett*, Stevens and Bornemann may be tested in more and more places both in north and south of peninsula.

ii. Ecological-environmental interaction and physiological nutritive parameters of evolved varieties of leafhorny may be considered before recommending for release.

iii. Besides inoculating natural field, mycorrhizae may also be tested on response to different agro-climatical practices like covering, application of fertilizers, irrigation and intercultural operations.

iv. Predictions on thermos and acetic may also be studied.

v. Evaluation of leaf quality of different varieties may also be done by rearing silkworms.

vi. Association and structure of feedback data is essential for standardization and selection of a stable variety for sustainable support for proper development of sericulture.

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Table 1 Locality, soil type, soil pH and climate of major sericultural belts of India

Sl. No.	Name (District)	Soil group	pH of soil	Rainfall (cm)	Climate Temperature °C	
					Max.	Min.
1.	Andhra Pradesh (Nellore dist.)	Lateric, Red soil	6.1 to 7	100	40.2	20.1
2.	Assam (Sibsagar)	Alluvial	6.5	200	30.5	9.2
3.	Bihar, Orissa and Rajasthan	Red, laterite, alluvial soil	5.5 6.5	110 (28.3)	36.9 35.0	10.1 09.9
4.	Jammu & Kashmir	Light loamy, sandy soil/stony	5.0	50	22.2	03.3
5.	Karnataka (Mysore) Private)	Red laterite soil	5.5 6.0	90 80	31.6 34.9	16.6 16.1
6.	Madhya Pradesh (Betul, Mandla)	Red loam soil	5.0	115	30.9	11.2
7.	Orissa	Red, Sandy	5.1	115	30.0	12.0
8.	Tamil Nadu (Madurai) (Krishnagiri)	Red soil, Sandy soil	5.0	107	9.2	07.2
9.	Tamil Nadu (Madurai) (Krishnagiri)	Loamy sandy Loamy sandy	6.5 6.5	115 110	30.9 0.1	17.0 18.9
10.	Kerala (Trivandrum)	Laterite	5.1	190	29.5	06.1
11.	Tripura (Agartala)	Alluvial red sandy	6.5 to 6	200	30.2	12.0
12.	West Bengal	Alluvial, loamy red, sandy	6.0 to 6.2	200	34.6	10.0

Table 6. Comparative yield performance of maize cultivars evaluated at [illegible] plots of Science 1A Experiment

Variety	Plant height (cm)	Days to 50% flowering	Ear length (cm)	Grain yield (kg/ha)	Biomass yield (kg/ha)	Harvest index (%)	Lodging score (1–5)	100-grain weight (g)
Kilima-Mix	214	78	17.4	4,120	9,860	41.8	1.2	31.5
Ridge-Early	198	74	16.1	3,760	8,940	42.0	1.0	29.8
Savanna-Gold	226	82	18.2	4,310	10,240	42.1	1.4	33.0
Coastal-Flint	205	80	17.0	3,980	9,510	41.9	1.1	30.6
Highland-Dent	241	88	19.5	4,560	11,020	41.4	1.8	34.2
Drought-Tol	182	71	15.3	2,940	7,180	40.9	0.9	27.4
Hybrid-A	232	84	18.8	4,780	11,310	42.3	1.5	33.7
Hybrid-B	228	83	18.5	4,690	11,090	42.3	1.3	33.1
Open-Pollin	209	79	16.8	3,870	9,240	41.9	1.6	30.1
Local-Check	196	76	15.9	3,450	8,410	41.0	1.7	28.9
Early-Maize	175	68	14.6	2,610	6,420	40.7	0.8	26.3
Late-Maize	247	91	19.9	4,420	10,870	40.7	2.1	32.8

Table 2: [illegible]

Sl. No.	Variety	[illegible]	[illegible]	[illegible]
1.	[illegible]	[illegible]	[illegible]	[illegible]
2.	[illegible]	[illegible]	[illegible]	[illegible]
3.	[illegible]	[illegible]	[illegible]	[illegible]
4.	[illegible]	[illegible]	[illegible]	[illegible]
5.	[illegible]	[illegible]	[illegible]	[illegible]

Table 3: [illegible]

Sl. No.	Variety	[illegible]	[illegible]
1.	[illegible]	[illegible]	[illegible]
2.	[illegible]	[illegible]	[illegible]
3.	[illegible]	[illegible]	[illegible]
4.	[illegible]	[illegible]	[illegible]
5.	[illegible]	[illegible]	[illegible]

STATISTICAL APPROACH FOR FIELD TEST OF RELIGION

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INTRODUCTION

In the comparison of agricultural treatments or industrial materials scientists have to select a suitable design based on the principles of design of experiments. The most important principles of design of experiment are Replication, Randomization and Local Control. A design is said to be good if it satisfies both of the properties under the above principles.

Many statistical designs have been developed for agricultural research to increase the level of precision. It (i.e. selection of a suitable statistical design depends on several factors, such as (Gomez and Gomez, 1976):

1. The number of treatments to be compared in the experiment.
2. Availability of the experimental uniformity.
3. Desire and control over the number and type of random precision.
4. Cost, time and accuracy the experiment.

The above factors clearly indicate that the statistical design is helpful to draw a proper conclusion in agricultural as well as industrial experiments.

The main aim of this paper is to give guidelines regarding the use of statistical design with success.

Experimental Design

The design of an experiment dictates precise set for number and nature of treatments. There are a number of designs available for a field experiments. The most common designs are: (i) Randomized Block Design (RBD), (ii) Factorial Design, (iii) Split-Plot Design and (iv) Latin Design.

The selection of good experimental materials is the starting point and recommendation of a plan the field is laid out and data. Hence, a basic set of principles is followed. The Randomization is put into Practice when plots and the Latin Design (Pearson Hall Test). The Plot Field Trial is then randomized (RBD). The last step is to adjust for field differences as a consequence Randomized Test in different agricultural areas (Hansen, 2004).

Replication

For all its dangers, the basic [illegible] of replication. A repetition of the treatment under investigation is known as replication. Replicates are taken depending on the number of treatments. The following table gives an idea as to how many replications are to be taken with reference to the number of treatments (Goldstein and Mosteller, 1991).

No. of treatments	2	3	4	5	6	7	8	9	10
No. of replications	12	8	6	5	4	4	3	3	3

It is also difficult to generalize the exact number of replications required, since this also depends on the resource various local plot to plot. The main effect of a replicated experiment is to reduce the experimental error. Error is caused by various factors viz. [illegible] of data, selection of plots within the plots selected may not be homogeneous, etc. By replication the experimenter wishes to average out the effects of uncontrollable differences so as to give the various treatments equal scope to show their merit.

Randomization

There is more confidence in getting a treatment the experimental error than simply placing several plots in the same manner. To have an unbiased estimate, the treatments are subjected to randomization. Randomization means that each variety will have an equal chance of being assigned to any experimental plot and consequently of being grown in any particular where environmental conditions may or may not be favourable.

Experimental Error

The difference among experimental plots treated alike is called experimental error. This error is the primary basis for deciding whether an observed difference is real or not due to chance. Hence a good experimental design must minimize all possible sources of extraneous to experimental error.

TYPES OF EXPERIMENTAL DESIGNS

Randomized Block Design

Randomized Block Design is one of the most widely used experimental designs in agricultural research for single factor studies. The design is mainly for field experiments where the number of treatments are not large and the experimental area has a predictable productivity gradient. The primary objec-

problem. Instead of the single treatment per block, each of which contains all the treatments. The simplest method of laying out an RBD is shown below (Cochran and Cox, 1950).

1. Divide the experimental area into N equal blocks, where N is the number of replications.
2. Subdivide the first block into p plots, one for each of the p treatments.
3. The treatments have to be assigned randomly to each plot in each block using random numbers.
4. Repeat step 3 independently for all the blocks.

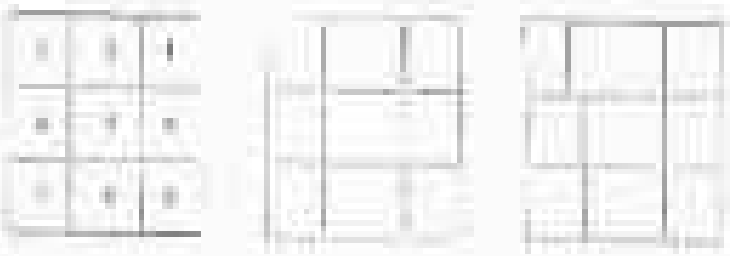

Fig. 1. Allocation of Treatments to Blocks

RBD is usually used for Field Trials. The agricultural experimentation some serious failures which can be controlled by RBD.

1. Soil heterogeneity: a fertility or variety trial where yield data is the primary character of value.
2. Presence of some organism in the immediate area.
3. Some of the field is a study of plant growth in some sense, etc.

Latin Designs

An alternative set of designs for more factor experiments having large number of treatments is Latin-square design, one of which is Latin-Design. As the name implies, more than one treatment block design does not increase all treatments and a reasonable small block size can be maintained even if the number of treatments are large. With double block, the homogeneity of experimental units in the same block is more to maximize and a higher degree of precision can generally be obtained. The only thing that has to be taken care of here is the total number of treatments must be a perfect square (i.e., n^2).

The design is also called as Primary Yield Trial and

a widely used in the screening of authority variables from property (see initial study).

Multifactor Experiments

The simplest most commonly used are split plot, split-split plot, strip-plot and factorial. The split-plot design is particularly useful for a few factors experiments that may need treatments. In a split-plot design one of the factors is assigned to the main plot. The assigned factor is called the main plot factor. The main plot is divided into subplots to which second factor is assigned, e.g., this design is used in agricultural experiments, namely to compare the main factors, i.e., sowing and cutting heights with the subfactor fertilizing methods.

Factorial Design

This is used for example where experiments, wherein there is an interest of interactions and subplots. This design is basic as following aspects:

1. All effects (i.e., main effects and interaction effects) are of equal importance and hence should be measured with the same level of precision.

2. The experimental units are homogeneous enough to subject a high level of homogeneity within a block.

Any experiment with plots of more factors usually involves a large number of treatments. Hence, management of experimental error makes the initial block is difficult to achieve.

Multifactorial Trials

Check the Primary Yield Trial and Final Trials. Trials are cross, the research will also have to be tested under different field conditions to see the Genotype x Environmental interactions. A suitable model is used for all multifactorial trials. In the analysis all the varieties are arranged in RBD and planted in all the planted locations. The selection of resistant can be made with reference to host protection response through the regression analysis. The analysis is commonly because all the varieties which are planted in Final Yield Trial, are not all the locations given. The design can also be tried in farmers' fields (Bachelardour and Professionals, 1964).

Layout

Layout of a design can be prepared after identifying specific sources of variabilities, such as the soil types, various differences, fertilizers etc. Whenever

of homogeneous plots are used to reduce the variations due to replication. The schematic plan of experiment required for different crops are as under :

(i) Progeny row yield trial : 25 m x 4 rows
(ii) Primary Yield Trial : 4 m x 10 plants per replication
(iii) Final Yield Trial : 8 m x 200 plants per replication
(iv) Multilocational Trial : 200 plants per replication.

Analysis and Interpretation

The final step is the analysis of variance (Table 1). The analysis is carried out to ascertain the value of 'F'. Usually all the designs are based on the 'F' test. 'F' computed is compared with 'F' table value at 5% and 1% to estimate the significant differences between the replicates and between the treatments. The degrees of freedom of error and replications is taken to ascertain the 'F' value.

In all the designs a table of the Analysis of Variance is given at the end to explain the treatment and also replication variations.

Source of Variation	Degree of Freedom	Sum of Squares	Mean sum of Sq.	Computed Value	Table 5% (1)
Replications	r - 1	----			
Treatments	t - 1	----			
Error	(r-1)(t-1)	----			
Total	rt - 1				

(1) No. of replications, t : No. of treatments

CONCLUSION

By and large, there is a noticeable inconsistency between the yield test of multiyear and single-year of scientific statistical method. The validity of the yield test with particular reference to uniformity can be judged based on the scientific design, layout and analysis. The minimum number of crops for an elaborate test is three years for Primary Yield Trials and five years for Final Yield Trials.

ACKNOWLEDGEMENT

I wish to thank Mr. H. K. Chaturvedi, Senior Research Assistant (S&I) IARI, Mysore, for his help in the preparation of the paper.

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APPENDIX I

ALL INDIA CO-ORDINATED RESEARCH IMPROVEMENT PROJECT

1. **Objectives :**

The project was started with a view to co-ordinate the research programmes at different improvement centres in the country. The main objectives of the project are :

(1) To formulate the medium improvement programmes for various centres keeping in view their agro-climatic conditions.

(2) To assess the varietal programmes and suggest the future plan of action.

(3) To study the different production problems in the country.

(4) To exchange all the germplasm materials and information for mutual benefit of the countries and to be the centre for maintenance of germplasm.

(5) To plan for exploration, collection and conservation of the indigenous and wild species.

(6) To co-ordinate the interactions and exchange of varied material germplasm between the agro-climatically diversified countries.

(7) To study all the crucial varietal problems arising from different practices and cropping and cultivation.

(8) To review the progress of the research work in the centres and to plan for the future programmes.

(9) To recommend varied varietal problems arising from different regions based on the multilocation performance trials.

(10) To assist the All India Coordinated Research Projects Committees in the conduct of common experiments.

2. **Organizational setup :**

There will be a team project which co-ordinates the activities of the different centres. Research projects are being undertaken and large amount of germplasm is maintained (1984-85 Report is awaited).

In addition, there will be two Field Project Co-ordinators, to co-ordinate the programmes of major varietal trials of Rice and Maize regions (CRRI, Hyderabad and IIMR, Bangalore, are suggested).

Some consultant bodies of the country is also desirable such as regional and national annual research conferences. In each region depending upon

the standards of statutory authorities, which could have been suggested. The details of the required accommodation services and normal units of supportive regimes are indicated in the chart.

III. Infrastructural facilities :

a) Staff :

It is expected the regional co-ordinators will be of the Deputy Director/Assistant Director/Welfare Officer (SR22) scale. In addition, there will be 1 Senior Research Assistant (SR16) and two field assistants. The existing auxiliary staff of Remand homes may be given the responsibility. In places where the remand staff is not available the same may be strengthened. In all the remand cum SBCI/Juvenile Homes may be given the responsibility of assessing the rehabilitation/social adjustment needs. One SBA and two field staff may be provided in each unit.

b) Facilities :

A minimum of 5 acres ground with all requisite facilities, schools, farm, needs and other recreational may be provided.

c) Functions :

Co-ordination to ensure the progress.

Each Regional Co-ordinating centre will undertake supervision and co-ordination work in respective region and also maintain the prescribed records.

Carrying the social education and modification work, arranging supply of planning literature of improved services and also other aids/tools and additional required facilities of the regional co-ordinating centres.

Each social case is basically a field having and not probably managed by educational department of respective districts/local co-ordination organisations.

There will be an annual workshop preferably during April, May to review the progress and formulate the action plan. On the basis and finalise the release of grant received towards based on MLT needs. The annual workshops will be held at different Regional Co-ordinating Centre.

All the Officers of Regional Co-ordinating Centre and social units will undergo two weeks orientation training at the state Co-ordinating Centre.

ALL INDIA CO-ORDINATED SUGARBEET IMPROVEMENT PROJECT

(Proposed Organizational Set-up)

PROJECT COORDINATOR
(CSR & TI, MPAKMIP)

JOINT PROJECT CO-ORDINATORS

1. CSR & TI
   MPAKMIP, MPAKMIP
2. [illegible]
   [illegible]

REGIONAL PRODUCT CO-ORDINATORS :

Region	Regional Centre	Zone	Local Units
Region I Karnataka	[illegible], Academic, Bangalore	1. Bangalore 2. Hebbala 3. Kasaba	Bangalore University Dept. of Agriculture, Govt. of Karnataka [illegible], Channapatna
Region II Tamil Nadu	[illegible], Salem	1. Coimbatore 2. Cuddalore	Dept. of Agriculture, Govt. of Tamil Nadu [illegible], Cuddalore
Region III Andhra Pradesh	[illegible], Anantapur	1. Anantapur 2. Chirala	[illegible], Anantapur Dept. of Agriculture, Govt. of Andhra Pradesh
Region IV West Bengal	Central [illegible], Berhampore	1. Malda 2. Kalimpong	RSP, Malda [illegible], Kalimpong
Region V North-Eastern Region	[illegible], Jorhat	1. Jorhat (Tocklai) 2. Shillong	Dept. of Agriculture, Assam Govt. of Meghalaya, Shillong
Region VI Gujarat-Central Region	[illegible], Hisar	1. Gadarwal 2. Hisar	Gadarwal Sugar Unit [illegible], Rewadi
Region VII South-Western Region	Soil & Agriculture Chemistry of Agricultural Sciences, Bhavnagar	1. Kolhapur (Padegaon) 2. Sangli	[illegible], Padegaon, Dept. of Agriculture, Govt. of Maharashtra (at Kolhapur
Region VIII Non-traditional area covering Maharashtra, Kerala, Bihar, Orissa and Uttara	Two Regional Centres	One zone for each area	One unit each in each zone where cultivation is practised

APPENDIX 3

RECOMMENDATIONS AND RESOLUTIONS ADOPTED DURING THE WORKSHOP ON "CONSERVATION, UTILIZATION AND EVALUATION OF BUKKAREDI GERMPLASM" HELD AT [illegible] MEMORIAL HALL, [illegible] 1995

The plenary session was chaired by Prof. M. Kajewa, Director, [illegible] Institute, Kadiogi University and co-chaired by Prof. O. Mwakalaka, Director of Research (VC), University of Agricultural Sciences, Kingdom. Chairman of all the three sessions summarized their reports and recommendations/suggestions to the Chairman of the Plenary session and the same were placed before the delegates. After having the suggestions following resolutions were passed for consideration and implementation.

Session I : Germplasm Distribution, Exploration, Taxonomy and Cataloguing of Germplasm

1. It was decided that the Central Horticultural Research and Training Institute, Mysore, being the centre currently having the largest number of species collection should continue to co-ordinate exploration/collection of wild/weedy relatives in collaboration with various International and National agencies like International/Regional Bureau of Plant Genetic Resources for the collection of seeds as well as vegetative materials. It should also collaborate with various Universities/Regional Horticultural Research Centres/Departments etc., for the collection of indigenous varieties from the Himalayan belt and other regions. The tasks identified for exploration/collection in different regions were as follows:

a. Western Himalayas (J & K)
   (i) IARI, Pusapura
   (ii) Sher-e-Kashmir University of Agricultural Sciences and Technology, Srinagar

b. Central Himalayas (U.P. & H.P.)
   (i) [illegible], Solan

c. West Bengal and Bihar region
   (i) IARI, Kalimpong

d. North Eastern region
   (i) IARI, Jorhat and regional Fruit Improvement stations

2. The remaining Himalayan pockets of [illegible], Meghalaya, Arunachal Pradesh, Sikkim, Nagaland, Tripura and Mizoram could be explored and collections made by the [illegible] Agricultural Universities, Regional Horticultural Research Stations and Krishi Vigyan Kendras (KVKs) in their respective areas.

3. It was decided to issue a circular and a memorandum of audit and drawing the officials that are actually working in the use to postpone all the vacancies available in that unit and send the same to CE(I & T), Mysore.

4. All the regional units could send their remarks also to the Central Collection Centre at CIER & TC, Mysore, alongwith the catalogue prepared as per the guidelines given in the brochure.

5. Feedback regional centres responsible to the secretary of Association of private vendors in the regional level can procure material from Central Collection Centre.

6. Facilitation of a Central Marketing mechanism does to Pakistan level was accepted.

7. The incremental charge is not included in respect the Division BM, Calicut, in view of a protest and not to withhold the increment of the years Shri [illegible]. It was further decided that Dr. Tiwari, IRAS (SB:1 & T) Bangalore, will withdraw to the matter.

Session II : Propagation Maintenance and Conservation of Germplasm :-

1. A regional unit has to be established in Kashmir for conservation of temperate species varieties.

2. It was suggested to collect characters for recorded while collecting and before bringing the seed material to seed gene of cultivation, it should be tested as an isolated area away from plantation field.

3. For propagation, [illegible] collection using [illegible] cultivation must be used as seed crop. Conservation techniques may also be developed. In addition, research [illegible] through germplasm identification and evaluation of [illegible] through pollen culture method may be taken up in high scale and existing facilities should be strengthened. For maintenance of Germplasm homogenous conditions must be created which will help in getting correct [illegible].

Session III : Evaluation of Growth, Yield and Quality Parameters :

1. The parameters provided by CE(I & T), Mysore for evaluation of germplasm material has recorded which on observation that it could not yield was higher, trees/are should not be treated as a disqualification and [illegible] if a variety was otherwise good, still helped to yield and quality, only the trees bearing it should not be selected.

2. Germplasm should be collected under natural stand conditions and the conditions should be similar to maintain previous environmental practices.

3. For quality analysis, foreign, biological and chemical analysis, quality standard samples have to be used. A portion of material should be stored for physical analysis from the sample given for chemical.

4. In forensic studies, microscopic records to be made for all the three parameters, namely, swelling, disintegration and evaporation for each body tissues taken. The case should be concluded with a final test material under similar conditions. A team of experts like local practical doctors or the officer may jointly suggest a suitable method to be followed.

5. Observations must be made on representative aspects while evaluating the parameters.

6. Quantitative measures should be readily followed while interpreting classification of the materials.

Other provisions:

1. The Senate welcomed the idea of organizing the "All India Convention of Medical Practitioners" The organizational set-up proposed was approved with a suggestion to include the Agricultural Universities also in the programme.

2. It was decided to hold next workshop in Northern and Eastern zone proposed to be held after writing to the authorities of Maharashtra University of Agricultural Sciences and Technology, Nanded.

3. It was resolved to publish the proceedings of the workshop.

APPENDIX I

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