

A Study of Natural Sex Expression and Its Variation in Different Popular Indian Archaic Cultivars of Mulberry (*Morus*, spp.) in Mysore, Karnataka

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Abstract: Sex expression is phenotypic outcome of genotypic expression in plants. Sex expressions are very distinct in flowering plants and appear in the later part of their life cycle and it forms the key character in selection of plants in any plant breeding experiments. Such Sex expression may not remain the same in all plants even in same genera are even in same species and it varies naturally such study is preliminary study to be conceded in selection of cultivar for any experiment.

Keywords: Sex expression, Phenotype, Genotype, *Morus*, and Cultivars

INTRODUCTION

Mulberry plant belongs to the genus *Morus* of the family Moraceae under the order Urticales. The genus *Morus* comprises of about 68 recognized species [1]. Mulberry is an important economical crop since it being the sole feed for domesticated silkworm, *Bombyx mori* L. The systematic cultivation of mulberry, as food plant of *Bombyx mori* L. is the first step in the production of mulberry silk. The total area under mulberry in India is 1, 87,000 hectares of which only 28,781 hectares is irrigated. It is raised as a bush plantation in Karnataka and West Bengal [2].

In any research on Mulberry it might be simple breeding experiment or an advance research like gene transfer for improvement of attributes like yield etc depends on basic studies of Sex expression in different varieties. The phenomenon of sex in plants was established for the first time by Camerarius through his observations on mulberry plants [3]. Hooker has described the various species of mulberry as monoecious or dioecious, while Engler [4]. Prantl placed the genus *Morus* under dioecious flower bearing group [5]. Bounocore studied the sex expression in cultivars of *M. alba* and recorded the occurrence of bisexual flowers [6]. Schafner based on his observations of frequent sex reversal in mulberry, holds the view that dioecious or unisexuality of *Morus* is not caused by hereditary differences but by a physico – chemical or physiological conditions, since both male

and female individuals were potentially bisexual [7]. Hotta described the flowers of mulberry as unisexual, rarely bisexual, monoecious or dioecious. Breeding programmes for crop improvement need adequate and specific information about gene pool [8]. Mulberry being a highly heterozygous plant shows diverse sex behaviour. Considering various parameters, particularly floral characters, mulberry has been classified variously in different systems by taxonomists. In mulberry there are monoecious even dioecious plants, they may have unisexual as while as bisexual flowers it depends on variety we choose for the study, so here we have attempted to study natural sex expression in twelve popular varieties of Mulberry in India, Because it forms the basis for selecting of plants for any experiments.

MATERIALS AND METHODS

Twelve popular cultivars Were identified by using Catalogue on mulberry (*Moru* spp.) germplasm, CSGRC, Hosur, Tamilnadu and were collected from the germplasm of Central Sericultural Research and Training Institute (CSR&TI), Mysore listed in Table 1. They were maintained and studied in the experimental plots of Department of Studies in Sericulture Science, Manasagangothri, University of Mysore, Mysore. Plants where grown till flowering stage and plants were checked for various attributes like type of flowers presence and absences of stamen, pistil etc. To deduce or to conclude whether the plants are monoecious or dioecious and the plants where photographed.

Photographs of a twig showing catkins of Set - I and Set - II cultivars are presented in Plate 1 and Plate 2, respectively.

RESULT AND DISCUSSION

Among all 12 cultivars studied for natural sex expression Cultivars S₃₄ and S₁₃ showed male flowers and plants were dioecious DD, and RFS135 usually produced male flowers even some times flowers which

were bisexual ,cultivar Ber.S1 and Ber.C776 produced male flowers even female flowers and bisexual flowers in this plants were monoecious as while dioecious cultivar M5 and V1 produced inflorescences with male and female flower ML and Suj-1 produced inflorescences with both female flowers and bisexual flowers S36 and Kajli Produced inflorescences with only female flowers.

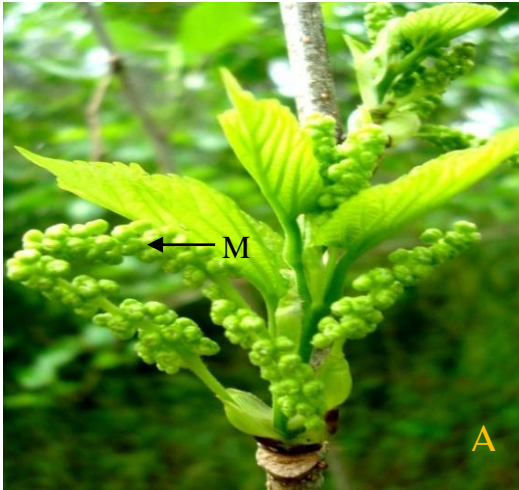
Table 1: Names (with accession number), sex and sex types of twelve selected mulberry cultivars

Sex type	Cultivars (Set – I)			Cultivars (Set – II)	
	Abbrev	Name	Short	Name	Short
Inflorescences	iation	(Accession No.)	name	(Accession No.)	name
Male	MALE	Selection- 34 (MI 0160)	S34	Selection-13 (MI 0012)	S13
Male - Bisexual	MLBI	Dehradun (MI 0021)	DD	Rain fed selection- 135 (MI 0048)	RFS ₁₃₅
Male - Female - Bisexual	MFBI	Berhampore-S1 (ME 0065)	Ber.S ₁	Berhampore - C776 (MI 0158)	Ber.C ₇₇₆
Male - Female	MLFL	Mysore -5(Kanva-2) (MI 0014)	M5	Victory -1 (MI 0308)	V1
Female - Bisexual	FLBI	Mysore local (MI 0052)	ML	Sujanpur -1 (MI 0034)	Suj-1
Female	FEML	Selection – 36 (MI 0013)	S36	Kajli (MI 00680)	Kajli

Table-2: Meteorological data for the year 2004 to 2007 at Mysore (Temperature, humidity and rainfall)

Year	Temperature (°C)								Relative humidity (RH)						Rainfall (mm)					
	2004		2005		2006		2007		2004		2005		2006		2007		2004	2005	2006	2007
Month	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max				
Jan.	14	30	15.3	29.9	13	29.3	12	30.0	50	91	60	92	40	92	50	92	0.0	9.2	0.0	0.0
Feb.	15	33	17.3	32.2	12	31.2	14	31.1	39	85	51	91	32	88	54	91	0.0	4.5	0.0	0.0
Mar.	18	36	19.2	33.3	18	32.7	17	34.8	39	83	49	84	41	89	38	89	7.0	0.0	174.1	0.0
Apr.	20	35	21.0	34.0	20	35.5	18	35.7	57	89	54	86	46	88	37	87	103.0	68.1	11.3	0.0
May	19	30	20.8	34.5	19	34.2	18	34.2	76	92	57	91	57	92	47	90	255.2	111.9	93.3	155.1
June	19	30	20.4	30.7	19	30.4	17	30.8	68	91	61	89	66	91	63	91	57.5	45.4	125.9	61.0
July	19	29	19.4	29.1	18	29.3	17	29.1	73	92	65	91	63	91	67	92	132.6	97.1	35.7	27.6
Aug.	19	29	18.9	28.6	18	29.4	16	28.5	71	91	70	89	58	90	68	91	30.1	135.0	33.5	68.5
Sept.	20	30	18.7	29.2	18	29.8	16	29.2	71	92	78	94	59	92	68	91	165.5	93.5	47.1	86.7
Oct.	19	29	18.4	28.8	18	30.1	15	29.6	70	93	78	93	61	92	66	93	119.3	448.8	75.7	244.2
Nov.	17	28	15.7	27.1	17	29.4	13	29.2	70	93	69	90	62	91	58	85	39.7	94.4	27.0	8.6
Dec.	13	29	14.2	28.0	13	28.8	12	28.0	58	92	52	91	49	92	55	92	0.0	42.1	0.0	16.4
Range	13 to 36		14.2 to 34.5		12 to 35.5		12 to 35.7		39 to 93		51 to 94		32 to 92		37 to 93		999.9	1150.0	623.6	668.1

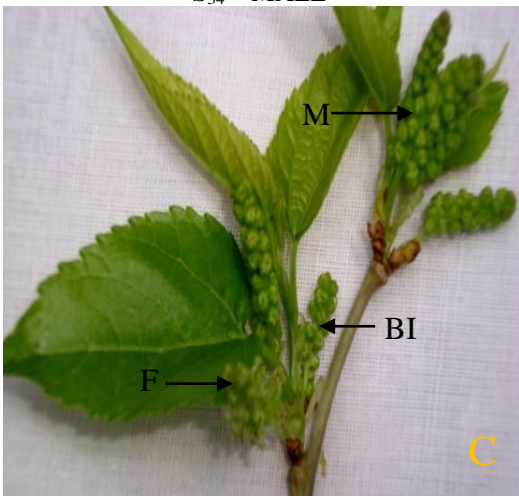
Source: Naganahalli Meteorological Centre, Srirangapattana Taluk, Mandya District.



S₃₄ - MALE



DD - MLBI



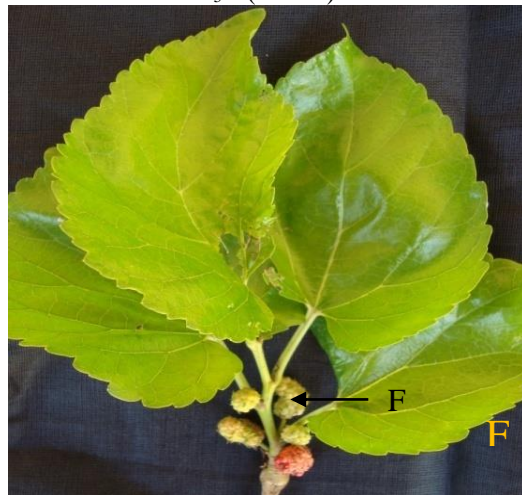
Ber.S₁ - MFBI



M₅ - (MLFL) FEML

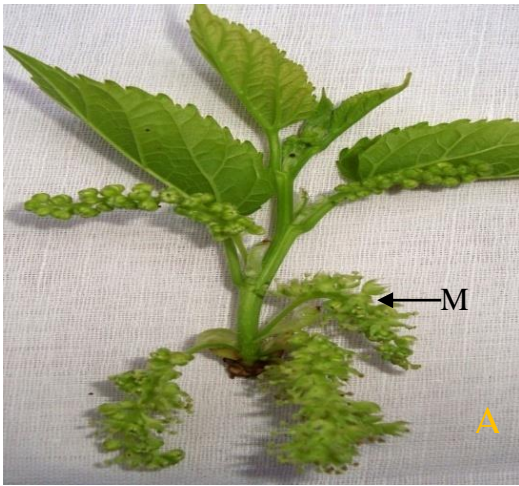


Mysore Local - (FLBI) FEML

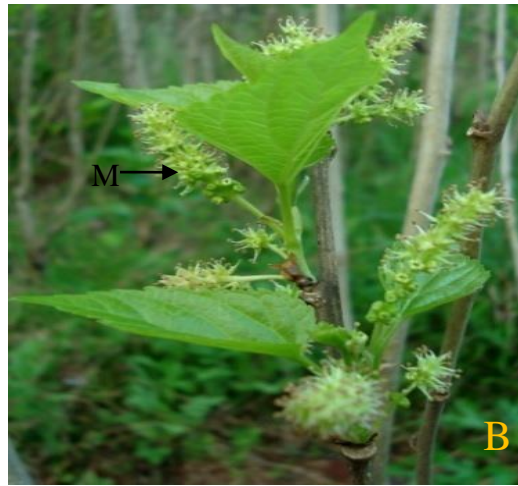


S₃₆ - FEML

PLATE - 1



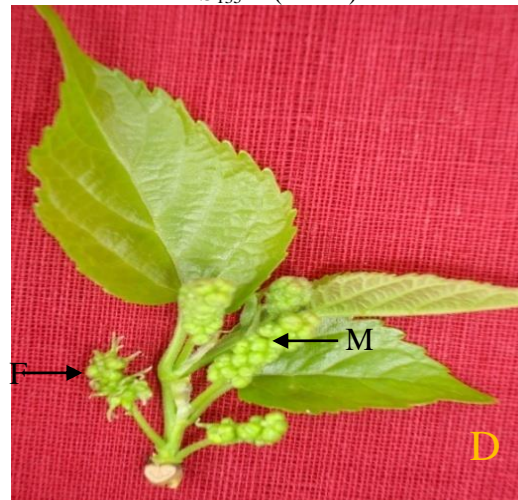
S₁₃ - MALE



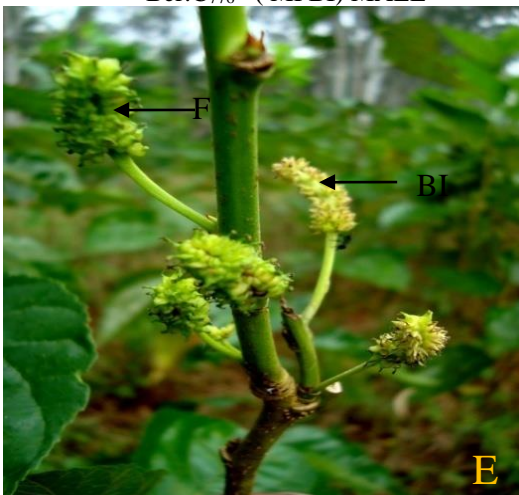
RFS₁₃₅ - (MLBI) MALE



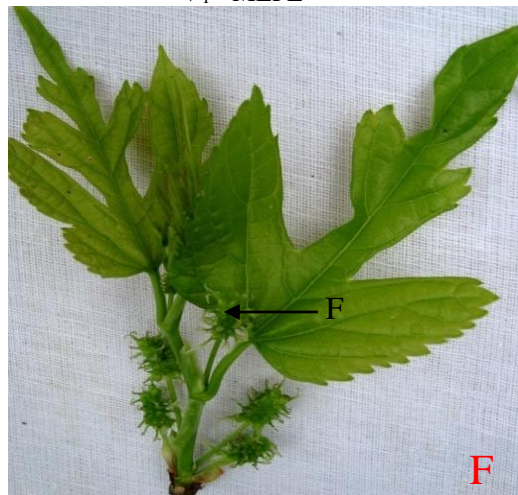
Ber.C₇₇₆ - (MFBI) MALE



V₁ - MLFL



Sujanpur-1 - FLBI



Kajli - FEML

PLATE - 2

Fig: showing Inflorescences with different types of flowers

Mulberry continues to be enigmatic as far as its sexual behaviour is concerned. Generally, it is dioecious but frequently behaves as monoecious. Bindroo *et al.* have rightly pointed out that understanding the sex expression in mulberry is more

precisely a confusing exercise and information on inheritance of sex and sexual plasticity are still to be unravelled [10]. A variety behaving as female in one region may produce male flowers in other region and

vice versa or a variety behaving as male in one year may produce female flowers during second year.

A perusal of literature revealed that the change in the ratio of male to female flowers in monoecious plants occur due to the influence of environmental factors. Though, there are various reports on the sexual polymorphism in mulberry [11-13].

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