



Modification of sex - expression in mulberry by gibberellic acid

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ABSTRACT

Sex modification in female cultivars like Kajli and S₃₆ by foliar application of GA₃ at 100, 200 and 400 ppm concentrations was studied. The height of the plants increased and the number of days decreased with increasing concentration of GA₃. Gibberellic acid, at all concentrations decreased the production of female and increasing of male and mixed flowers respectively. The pollen viability is moderate and seed set percentage decreased with increasing concentrations of GA₃.

Keywords: Mulberry, Sex modification, Gibberellic acid, plant height, seed set, pollen viability.

INTRODUCTION

Mulberry is a perennial and heterozygous plant which exhibit polymorphism in sex expression. In the same species dioecious (exclusively male and exclusively female) or monoecious (predominantly male, predominantly female and mixed type) or non flowering types exist, mulberry is the chief food of silkworm *Bimbyx mori* L. which differ in the number of functional carpels or stamens, in stamen corpelloids in degree of gamopetals and in sexual functionability (Jolly et al., 1986; B. B. Bindroo et al., 2003). Many authors have reported the sex expression in different genotypes occurring in different parts of the world (Buonocore 1941; Minamizawa, 1963; Jolly et al. 1986; Tikader et al. 1999; Kumar, 2000). The change in sex expression with changes in temperature, photoperiod, C/N ratio etc., in some genotypes indicates that the sex expression in mulberry may be related to physiological activities of the plant in relation to its environment (Heslop-Harrison 1957, Lange 1961).

Plant growth regulator Gibberellic acid act as determining factors in the sex reversal of many agricultural crops has been reported (Bisaria and Singh 1974; De Sarkar and Datta, 1989; Ghose and Sen, 1975; Jaiswal and Kumar, 1980). They have demonstrated that the exogenous application of Gibberellins may shift the tendency towards the maleness of the plants.

Many workers have attempted to modify the sex of mulberry by grafting (Minamizawa, 1963) and by exogenous application of growth regulators (Ogure et al. 1980; Jaiswal et al. 1986), Ravindran et al. 1987) and other chemicals (Dwivedi et al. 1984; Sikdar 1988). But the effect of plant growth regulator on sex modification in mulberry is scanty and still inadequate. Therefore, the present investigation was undertaken to elucidate the suitable means for the modification of sex in two popular cultivars like Kajli and S₃₆.

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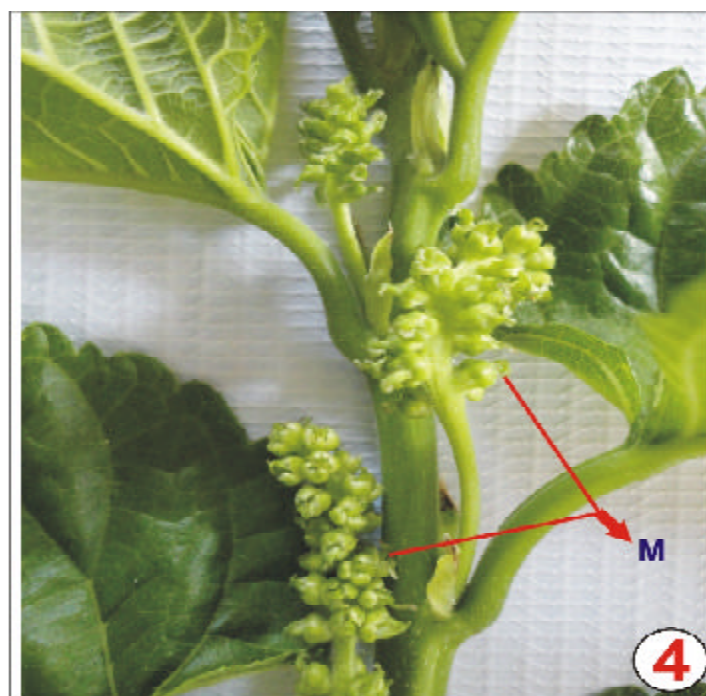
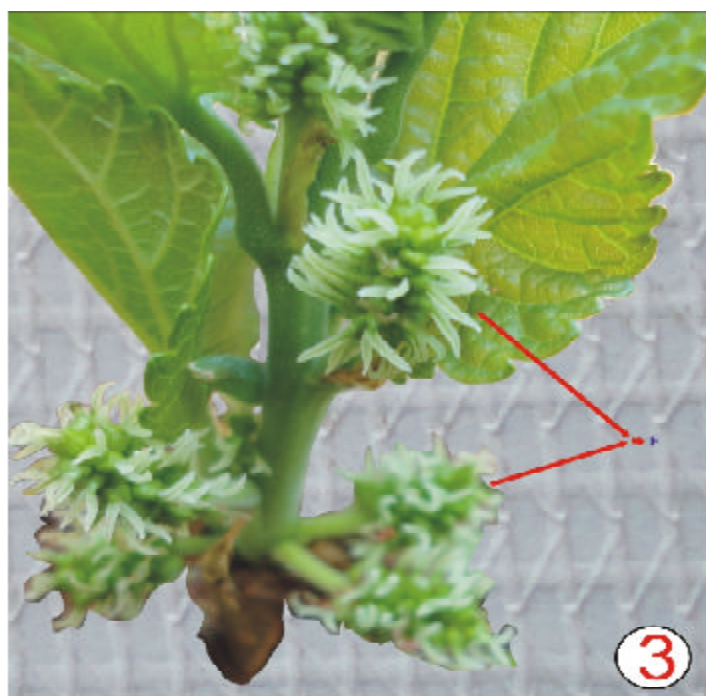
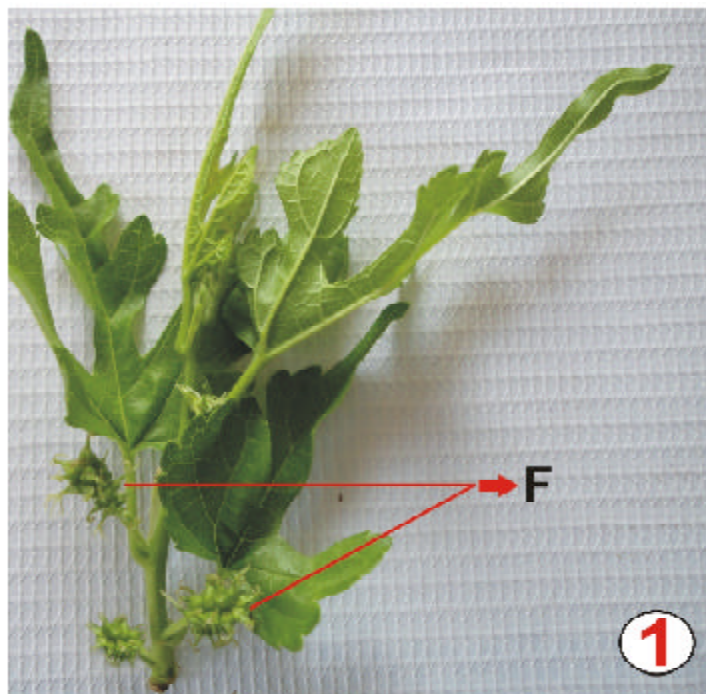
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MATERIAL AND METHODS

The experiment was conducted by spraying Gibberellic acid with three different concentration (100, 200 and 400 ppm) to the two female cultivars Kajli and S₃₆, selected from the germplasm bank of Department of studies in Sericulture Science, University of Mysore, Mysore. Aqueous solution of GA₃ (100, 200 and 400 ppm) mixed with Tween-20 (at 0.02% as wetting agent) was sprayed on the physiologically female plants (Kajli and S₃₆) of mulberry, four times at regular weekly intervals. Spraying was done early in the morning of the day and control plants are sprayed with distilled water. Treated plants were pruned after 15 days of last spraying. Observations on nature of inflorescences, plant height, days taken for sprouting, length of the inflorescence, seed set and pollen viability, was studied by using 1% acetocarmine and Alexander staining methods.

RESULTS AND DISCUSSION

After the second spraying the leaves of treated plants showed senescence and withered. Both the cultivars exhibited enhanced plant height as well as elongation of inflorescences. In Kajli and S₃₆ treated cultivars has remarkable influence on the sex expression. It showed male, mixed inflorescences with male and female flowers emerging from the node were recorded. Numbers of female, male and mixed inflorescences are given in table 1. At 100 ppm concentration Kajli showed male and mixed inflorescences and S₃₆ showed male and female inflorescences. Plants treated with 200 ppm concentration Kajli and S₃₆ produced male, female and mixed inflorescences whereas at 400 ppm concentration Kajli showed male, mixed inflorescences and female, mixed inflorescences were observed in S₃₆. In general, the number of days for sprouting of buds decreased with increasing concentrations of Gibberellic acid, which indicates the shortened, the onset of flowering. Seed set percentage was reduced in treated plants. The number of inflorescence ranges from 4 to 9 appeared on each new branch treated with 200 ppm, but the number varied from 3 to 9 in a few cases and male, mixed inflorescences were higher in



Figs 1-4 ---

1. Control showing female inflorescence of kajli
2. Induced male and mixed inflorescence
3. Control showing female inflorescence of S_{36} and
4. Induced male inflorescences.

Table.1. Effect of Gibberellic acid (GA₃) on sex expression in Kajli and S₃₆ cultivars of mulberry

Cultiver	Concn. (ppm)	Plant height (cm)	Days taken for sprouting	Sex			Length of catkin			Weight of sorosis (gm)	Seed set (%)	Pollen fertility (%)
				♂	♀	♂♀	♂	♀	♂♀			
Kajli	0	67.78±0.83	10.22±0.83	-	5.61±0.60	-	-	2.13±0.10	-	0.79±0.03	73.69±1.26	-
	100	83.67±0.86	09.88±0.60	01.88±0.33	-	3.55±0.52	2.15±0.14	-	1.85±0.11	-	-	65.0±01.22
	200	91.00±0.86	09.33±0.70	04.10±0.70	1.25±0.46	1.88±0.78	2.46±0.12	1.72±0.19	1.78±0.33	0.84±0.01	54.28±1.26	68.33±1.41
	400	96.0 ± 01.11	09.0±0.70	03.0±0.70	-	1.22±0.44	2.58±0.07	-	1.74±0.13	-	-	69.77±1.30
S ₃₆	0	68.31±2.12	10.05±0.78	-	6.53±0.50	-	-	1.17±0.13	-	0.90±0.01	68.63±1.70	-
	100	85.75±3.33	09.55±0.72	01.33±0.57	3.22±0.70	-	2.15±0.14	1.34±0.08	-	1.24±0.03	62.71±0.93	65.0±01.22
	200	88.50±3.31	09.33±0.70	05.21±0.70	1.33±0.50	1.44±0.72	2.26±0.12	1.72±0.19	1.81±0.15	1.18±0.06	48.41±2.98	67.43±3.46
	400	97.50±2.50	09.0±0.70	-	2.55±0.52	1.22±0.44	-	1.32±0.37	1.72±0.11	1.04±0.02	44.62±0.94	-

comparison. In 100 and 200 ppm concentration, the number of inflorescences ranges from 2 - 4. Induced male and mixed inflorescences were very much compact and smaller in size with varied in number of flowers as in the control female plants. The pollen of such flowers was smaller and failed to germinate.

However, the most of the induced male flowers abscised, fruit setting took place on the remaining females. In mixed inflorescences along with female flowers 8 or 10 male flowers are appeared. In the opinion of the Dwivedi et al. (1985) the modification of sex expression in female plants of *Morus alba* L. is due to the imbalance between endogenous level of hormones and probably due to blockage of action of ethylene wholly or partially. The relative endogenous balance of ethylene and GAs (Mohan Ram and Jaiswal, 1974; Chailakhyan 1979) control sex expression in many plans. Exogenous application of GA strongly suggests the possible role of endogenous GAs in male sex expression. ‘Ostiemasa’ a monoecious cultivar sets only male flowers cluster. But it is to be noted that the effect of exogenous GA to modify sex is so promising (Jaiswal and Kumar 1980). They found that the pollen formed in the induced male flower were smaller in size in comparison to normal ones and failed to germinate in *Morus nigra* L.

Predominance of either auxin or gibberellins in the vicinity of developing buds at the meristamatic zone ultimately governs either the maleness or the femaleness of the plants (Das et al.1994). At 400 ppm concentration of Gibberellic acid is most effective to change the sex of the female mulberry plants.

Further investigations are under progress to elucidate the role of hormones on sex expression in mulberry.

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