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RESEARCH ARTICLE

STUDIES ON SEX EXPRESSION IN GRAFT HYBRIDIZED MULBERRY (M₅ X V1).

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Abstract

Sericulture is being practiced in India since time immemorial. Sex expression is the genetic modification due to phenotypic outcome. Many external variables may modify sex expression in mulberry. Variety M₅(Female) is maintained as stock and bud from victory-1 as scion. Intermixing of female and male was observed in different ratios male, female and intermixing of characters due to repeated pruning and bud grafting. After 7th generation, the fully grown plants of V1 exhibited completely expressed femaleness.

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Introduction:-

Mulberry generally exhibit sex expression due to external variables like mineral nutrition, light, temperature, grafting and application of hormones and chemicals on the differential production of pistillate and staminate flowers. Mulberry is strictly unisexual and occasionally bisexual and due to abiotic factors sex characters vary from season to season. Further, mulberry is polygenic in nature and retention of characters in a plant is a herculean task.

Sex expression in mulberry was recovered in more than 301 varieties (Tikader et al, 1995) collected from diverse geographical origins, evolved varieties and polyploids. Due to its plasticity, taxonomy of mulberry is confusing and some species behave differently in varied regions (Bindroo, et al, 2003). The role of breeder become limited due to unique behavior of mulberry. Several genotypes available in nature but all are not suitable for feeding the silkworm due to lack of one or other important morpho-economic trait.

Sex expression is the unique and essential component in mulberry breeding programme for the induction of variability in mulberry. Present study is the first of its kind where complete transformation of sex expression in V1 is noticed and objective is to evolve an appropriate strategy for mulberry breeding in local condition.

Materials and methods:-

Mulberry cuttings M₅ procured from Karnataka state Sericulture Research and Development Institute (KSSRDI), Thalagattapura, Bangalore and varieties are authenticated by the institute.

Plants of both M₅ and V-1 are grown in Visveswarapura College of science, K.R.Road, Bangalore 4. Clones of M₅ and V-1 selected from three years old mulberry and five cuttings of each variety was planted in the germplasm bank of the college by following the recommended package of practices (Jolly, 1987). In the present investigation, M₅ used as a stock to which scion (Bud) of V-1 is grafted.

Single bud in clone is removed from the stock (M₅) and is replaced with bud of the stock (V-1). Plants are potted and provide common agro-climatic condition in the germplasm. Plants are grown till flowering stage and characters such as type of flower and absence of stamen, pistil etc. were recorded. Grafting methodology was followed up to 6th generation and plants were photographed. In 7th generation, only the clones of scion are potted by providing common agro-climatic conditions. After 7th generation, clones of graft hybrid were grown independently (six generations) and observations were recorded. Through open pollination fruits were set and seeds extracted from the fruits to study the viability and fertility.

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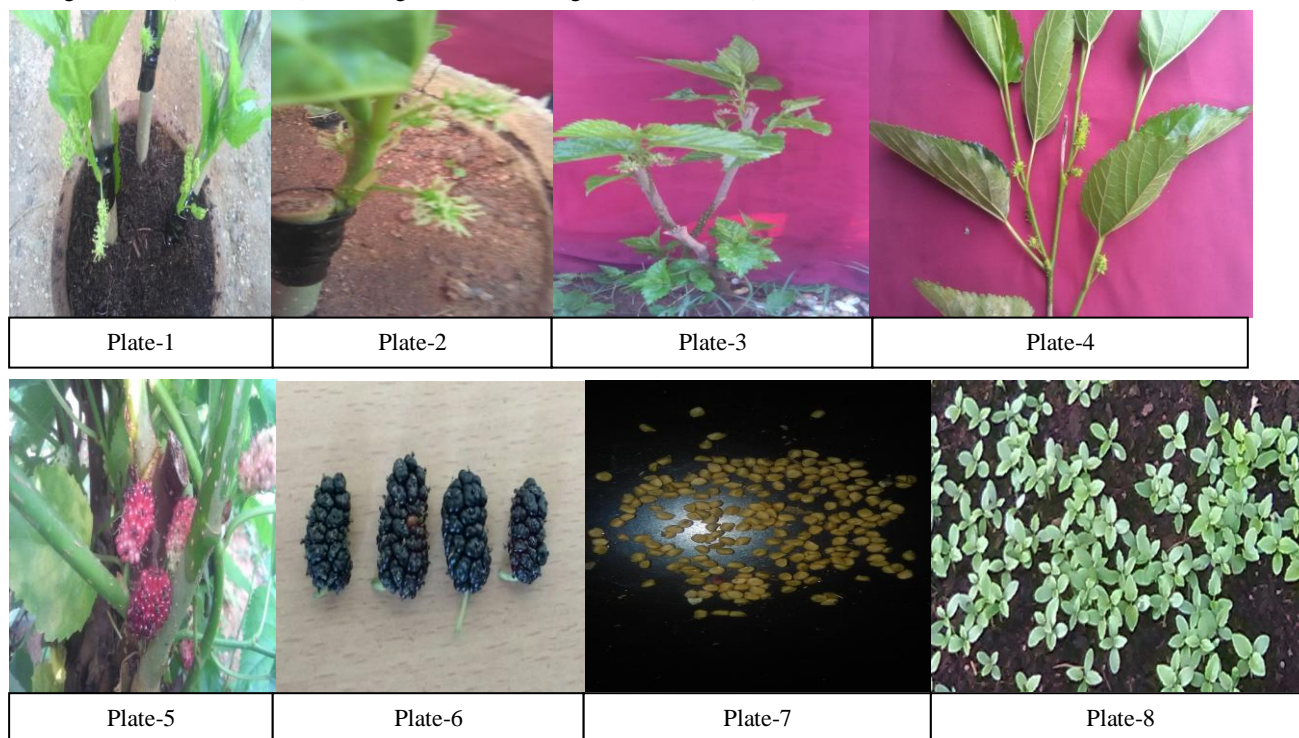
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Result and discussion:-

In the present investigation, observations on sex expression in graft-hybridization between M₅ (Female) and V1(Male) were noticed. Performance and acclimatization of these varieties in the field is exemplary and efforts have been made to completely transform sex expression in V1 in 7th generation.

Bud from the fully grown branch is removed and grafted with the stock M₅ in the first generation (Plate-1). Scion is allowed to grow for 3 months and during this period, intermixing of female and male catkins was observed in the ratio 6:4. After 3 months, bud is removed from the branch and grafted with the stock cuttings of M₅ and grown for 2nd generation. Out of 36 catkins counted, 23 females and 13 males observed. Graft hybridization is followed up to 7th generation and after 7th generation, clones of the scion planted in the pots (Plate-2). All the potted clones after sprouting produced female catkins (Plate-3). Originally V1 is a male plant, predominantly produce male flowers and occasionally female flowers and due to repeated graft hybridization between the stock (M₅) and scion (V1) complete genetic transformation has taken place. Further, graft hybrid is grown for 6 generations and the progenies produced female catkin only (Plate-4). Flowers were subjected to open pollination, fruit is set in all the plants resembling the M₅ (Plate-5&6). It is believed that gibberellic acid is responsible for sex expression in mulberry and the hormone present in the stock is transported to the scion and the graft hybrid obtained is dominated by the M₅ stock. Seeds collected from the fruits showed fertility more than 80% (Plate-7&8).

Seeds extracted from the sex expression in 124 varieties studied, encompassed male, female and bisexual flower (Jolly, et al,1986). Predominated female flower may be due to high temperature, long day and full day light (Minamizawa, 1963). Mulberry is highly amenable to vegetative propagation through grafting and hybridization. Repeated pruning of mulberry cuttings, wound (stress related) leads to genetic variation (grandbastien, 1998).



Conclusion:-

It is novel attempt by the breeder and graft hybridization up to 7th generation, complete dominance by M₅ on V1. It is indicative of expression of sex from maleness to femaleness. Characters with respect to sex expression are fixed in V-1 and are an important achievement in the field of mulberry breeding. From the available reports, only the seasonal variation in sex expression was noticed and complete and permanent stability in transforming the sex character is noticed for the first time.

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