



Screening of few diploid and triploid mulberry (*Morus spp.*) varieties through propagation, growth and yield parameters

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Abstract

The climatic conditions in South India are favorable for the year round growth of the Mulberry. The quality and quantity of leaf produced by various mulberry varieties have been taken in to consideration in evolving a superior variety. In this paper the performance of six mulberry varieties i.e S13, RFS135, Tr10, Vishala and G2 Mulberry varieties along with one check variety M5 were tested in the field condition for propagation, growth and yield parameters. The plants were pruned at certain height and selected randomly for growth and yield parameters. All the Tests were conducted three times to minimize the error due to environmental fluctuations and also to elucidate the effect of environment on the expression of each character. The experiments were conducted with minimum of 15 replicates per each treatment. One replicate means one explants. Each experiment was repeated four times. The results are expressed as mean \pm standard deviation of four experiments. Observation was recorded regularly. The present data was analyzed for statistical analysis using Two-way ANOVA (Analysis of variance). Similarly the remaining parameters were also analyzed for ANOVA.

Keywords: Propagation parameters, growth and yield parameters, diploid and triploid mulberry varieties

Introduction

Since the very beginning, man has been strived to operate distinct plans and techniques to rescue the crop from various disease by using conventional methods. Unfortunately these methods, no more serviceable towards the current needs. Concerning to attain current needs, it is extremely indispensable to assess mulberry genetic resources for qualitative and quantitative traits.

The conventional breeding programs have come up enormously to the improvement of various varieties and advances in genetic engineering research have built on present day direction to crop improvement. Consequently, crop improvement research has to be a holistic effort where in all disciplines must contribute towards achieving goals. There is necessity to evolve new methods to raise the qualitative and quantitative traits in mulberry. As the global world, new approaches have launched for better production of mulberry crops.

As mulberry is mainly concentrated on leaf production breeders concentrate on all growth parameters associated with its leaf yield while evaluating a mulberry variety. Therefore quantity and quality of foliage plays a vital role in mulberry improvement. Aliev (1966) ^[1] suggested that selection of superior mulberry varieties should be based on number of branches, annual growth of stem, leaf yield and length of internodes.

Suitable selection of the tropical cultivars based on the biochemical properties, disease resistance, plant morphology and their effect on growth and cocoon yield parameters of *B. mori* races in varied agro climatic conditions is essential to select and exploit promising cultivars for better sericulture practice. Keeping this in view extensive research was done on propagation, growth and yield parameters in mulberry.

Materials and methods

1. Propagation parameters

Data collection

Ten plants were randomly selected for morphological measurements at the time of harvest. After 70 days of pruning, five plants were selected randomly and measured for quality and quantity parameters. Total carbohydrate, total protein and chlorophyll contents were studied by chemo assay. Tests were conducted three times to minimize the error due to environmental fluctuations and also to elucidate the effect of environment on the expression of each character. Observations were taken at specific period.

Sprouting and Rooting Percentage

Cuttings of suitable size with 18-20 cm length, 10-12 mm diameter with 3 to 4 active buds were prepared for all the varieties. The cuttings were planted in nursery beds at a distance of 15 cm between cuttings and 20 cm between the rows. The experiment was carried out for 3 years. Observations on sprouting were taken on the 10th day of plantation followed by 15th and 20th days. Sprouting rate was determined based on observation on the 20th day. The observations on rooting were made from the 30th day onwards at an interval of 10 days and final rooting ability was calculated based on the survival rate after 90 days of planting.

2. Growth and yield parameters

Total Plant height (cm)

The total length of the shoots was recorded and effective height of the branches was defined in this study as the length between the tip and the last leaf of that branch. Total height of a plant was calculated by multiplying the average height of the branch with number of branches of the plant.

Number of branches

The branches measuring more than 50 cm was recorded on the 30th day after pruning by counting the number of erect and stout branches growing from each stump.

Inter nodal distance (cm)

Inter nodal distance was measured by taking the total length of the shoot and dividing with the total number of buds.

Weight of 100 fresh leaves (gm)

Hundred leaves from top to bottom of the plant from five randomly selected plants were taken in a polythene cover and were sealed. The samples were weighed in the laboratory immediately after collection. Four replications were taken for each accessions and data was recorded.

Leaf yield/plant (kg)

All the leaves of the plants were harvested between 60th to 70th day after pruning which corresponding to the peak harvest period and weighed immediately and expressed as leaf yield/plant.

Results**Propagation parameters (Sprouting and Rooting percentage)**

Mulberry being a sole food for silkworm (*Bombyx mori*, L) much work has been done on the propagation, growth and yield parameters, which ultimately contribute to the success of silk production. Thus quality and quantity of leaf produced by various mulberry varieties have been taken into consideration in evolving a superior variety. In the present study six mulberry varieties were studied for their propagation parameters such as sprouting and rooting percentage.

The results are mean values of all the parameters. The observations are presented as sprouting and rooting percentage. The variety which is well acclimatized to the local condition and commercially exploited variety is used as a control. In the present study diploid varieties are S13, RFS135, and G2, whereas Tr10 and Vishala are the triploid varieties, were compared with the control variety M5 for propagation parameters.

The data regarding sprouting and rooting percentage among varieties is presented in the Table 1.

The sprouting percentage showed significant difference among the varieties. The highest sprouting percentage was observed in Tr10 (82.00) followed by S13 (76.00), and lowest percentage was observed in RFS 135(61.67). From the table it is clear that the sprouting percentage is high in all the varieties except RFS135, compared to control variety M5. The rooting percentage showed significant difference among the varieties. The highest rooting percentage was observed in Tr10 (78.67) and lowest percentage of rooting was observed in Vishala (44.67). From the result it is clear that the rooting percentage is high in G2, S13 and Tr10 compared to M5, whereas low rooting was observed in Vishala and RFS135 compared to control.

Growth and yield parameters

After pruning, plants were selected randomly and measured for growth and yield parameters include plant height, number of branches, Inter nodal distance, weight of 100 fresh leaves, leaf yield/plant. These parameters were recorded in the selected varieties by taking M5 variety as a

control. The data regarding growth and yield parameters among varieties is presented in the Table 2.

Plant height (cm)

The values presented are mean values showing significant variation among the varieties. The plant height was recorded maximum in the variety Tr10 (233.33 cm) followed by variety Vishala (210.00 cm). The varieties RFS135, S13 and G2 showed less values compared to M5, whereas Vishala and Tr10 showed highest values than M5.

Number of branches

The highest number of branches was recorded in the variety Vishala (14.00) followed by Tr10 (12.67) and lowest value was observed in RFS 135 (7.33). Varieties S13, M5, and G2 showed moderate values (8.00, 8.33 and 9.00) respectively. Vishala and Tr10 showed highest values compared to M5 whereas G2, M5 and RFS135 showed least values over control M5.

Inter nodal distance (cm)

Shorter inter nodal distance was noticed in variety Tr10 (3.70 cm), followed by Vishala (4.50 cm), and G2 (4.60). The variety with long inter nodal distance was observed in RFS135 (6.40 cm). The inter nodal distance of Tr10, Vishala and G2 were shorter compared to M5. S13 and RFS135 showed long inter nodal distance than the control variety M5.

Weight of 100 fresh leaves (gm)

The maximum values was recorded in variety Tr10 (287.00 gm) followed by Vishala (250.00 gm) and lowest values were observed in S13 (157.00 gm). The weight for 100 fresh leaves for the remaining varieties was RFS135 (190.00 gm), G2 (231.00 gm) and the control variety M5 (193.00 gm). Among all the varieties, Tr10, Vishala and G2 recorded highest values compared to control varieties whereas RFS135 and S13 showed least values than M5.

Leaf yield /plant (kg)

Among six accessions Tr10 recorded maximum leaf yield of 3.635 kg/plant followed by Vishala, which is 3.500 kg/plant. Lowest leaf yield/plant was recorded in RFS135 which is 1.151 kg/plant. Tr10, Vishala and G2 recorded highest significant values over control, whereas S13 and RFS135 showed lowest values compared to M5.

Discussion

From the results it is evident that, among all the varieties tested for propagation parameters, Tr10 showed highest significant values in sprouting and rooting percentage than the remaining varieties. Sprouting and rooting are the preliminary factors for proper establishment of plants in the soil. Rooting behaviour of a variety is genetic character and plays a vital role in cultivation of vegetative crops. Survivability of 80% and above is taken as an optimum for selecting the strain. For selection of good variety the factors to be considered include leaf yield, good sprouting and rooting percentage that contribute for successful establishment of plants. Though sprouting and rooting are genetic factors, there are some other abiotic factors such as soil, temperature, spacing between the plants, strain, soil moisture etc., show profound effect on sprouting and rooting.

Similar results were also reported by Bindroo *et al.*, (1996)^[2] who stated that sprouting and rooting parameters plays an important role in selection of a variety. Doss *et al.*, (2000)^[5]; Santhosha Gowda *et al.*, (2012); Yogananda murthy *et al.*, (2012)^[10] have reported that triploids have high sprouting compared to diploids mulberry varieties. Suraksha Chanotra *et al.*, (2019)^[13] recorded variation in time of sprouting among the varieties.

The plant height, weight of 100 fresh leaves and leaf yield/plant was found to be high in Tr10 variety with shorter inter nodal distance compared to the remaining varieties. But the number of branches were found to be more in Vishala variety. Inter nodal distance is one of the important genotypic character which determines total leaf produced by

a plant (Fotadar *et al.*, 1989)^[7]. All the growth and yield parameters are found highest in Tr10 and Vishala varieties than the diploid varieties. The results clearly indicated that no single variety showed better performance in all the parameters. Among all the tested varieties Tr10 and Vishala showed better performance compared to remaining varieties. These findings are in acceptance with the findings of Venkatesh *et al.*, (2014)^[9]; Dheeraj kumar *et al.*, (2016)^[6]; Ravikumar *et al.*, (2019)^[8] who stated that triploid mulberry varieties exhibit maximum shoot height with increased number of branches per plant, fresh leaf weight with shorter inter nodal distance.

Propagation parameters

Table 1: Sprouting and Rooting (%) in diploid and triploid mulberry varieties under field conditions

S. No	Varieties	Sprouting (%)	Rooting (%)
1.	S13	76.00 ±1.00	71.67±1.53
2.	RFS 135	61.67±0.58	58.67±1.53
3.	Tr 10	82.00±2.00	78.67±1.53
4.	Vishala	72.00±2.00	44.67±1.53
5.	G 2	74.00±1.00	69.00±1.00
M5 (control)		66.67±1.53	68.67±1.53

Each value represents the average of 3 replicates (n = 3); mean ± standard deviation (SD)

Growth and yield parameters

Table 2: Growth and Yield parameters in diploid and triploid mulberry varieties under field condition

S. No	Mulberry Varieties	Plant height (cm)	Number of branches	Inter nodal distance (cm)	Weight of 100 fresh leaves (gm)	Leaf yield/Plant (kg)
1.	S13	145.00±1.73	10.33 ±0.58	6.20±0.10	157.00±1.00	1,543.67±188.64
2.	RFS 135	143.33±3.51	7.33 ± 0.58	6.40±0.10	190.00±2.00	1,151.67±97.35
3.	Tr 10	233.33±3.51	12.67± 0.58	3.70±0.10	287.00±1.00	3,635.00±155.16
4.	Vishala	210.00±1.00	14.00± 1.00	4.50 ±0.10	250.00±1.00	3,500.33±256.77
5.	G 2	154.67±2.08	9.00 ± 1.00	4.60±0.10	231.00±1.00	2,079.33±235.12
M 5 (control)		164.67±2.08	8.33 ± 0.58	5.20 ±0.10	193.00±1.00	1,608.00±104.00

Each value represents the average of 3 replicates (n = 3); mean ± standard deviation (SD)

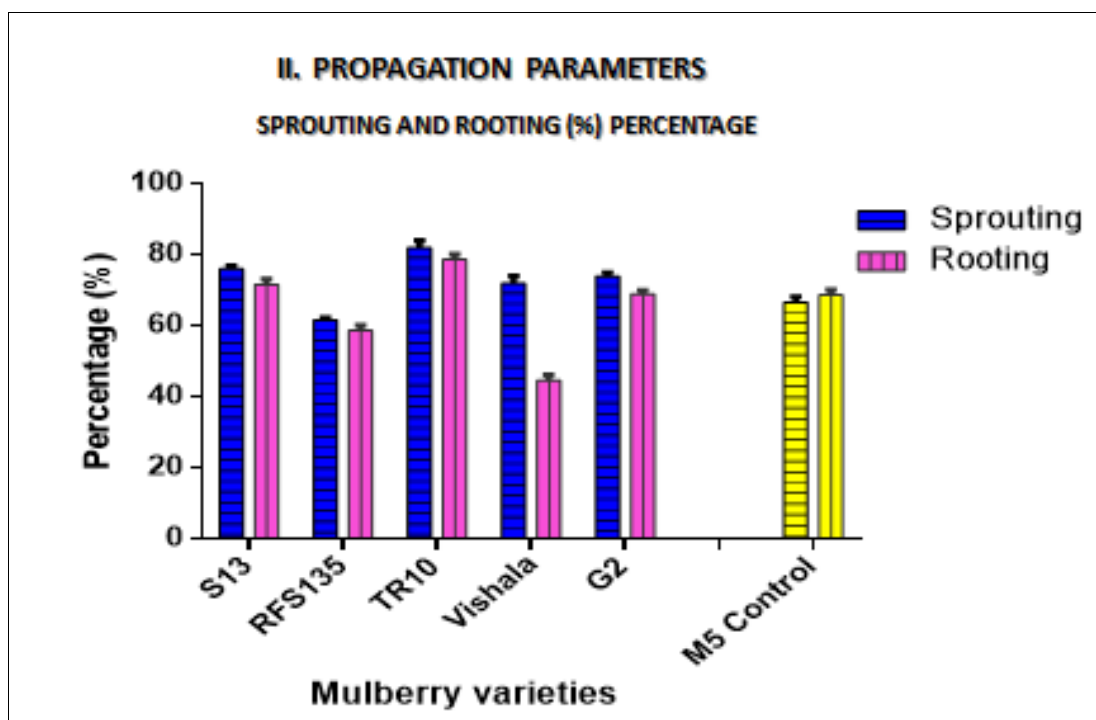


Fig 1

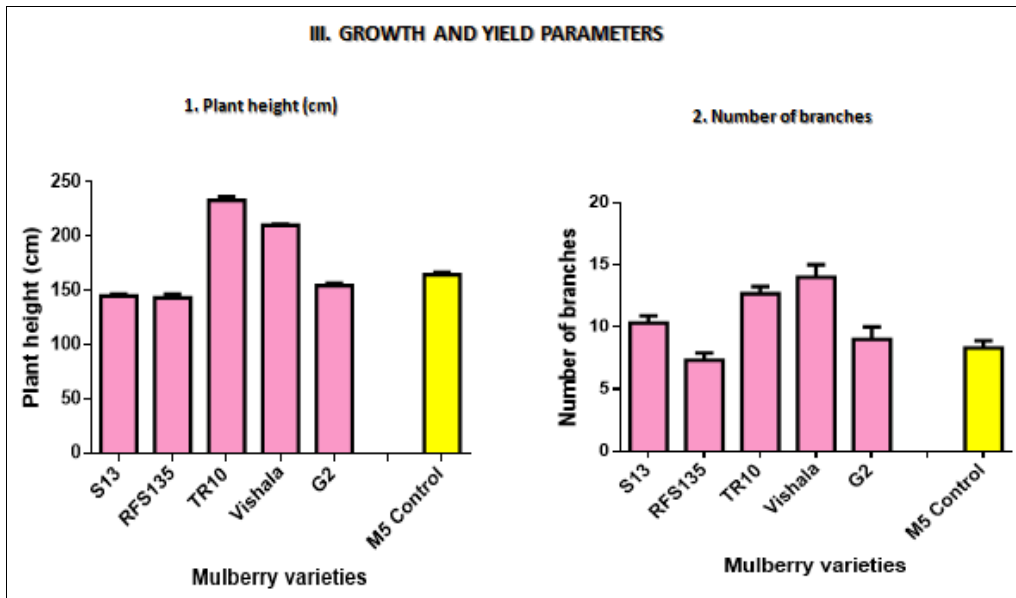


Fig 2

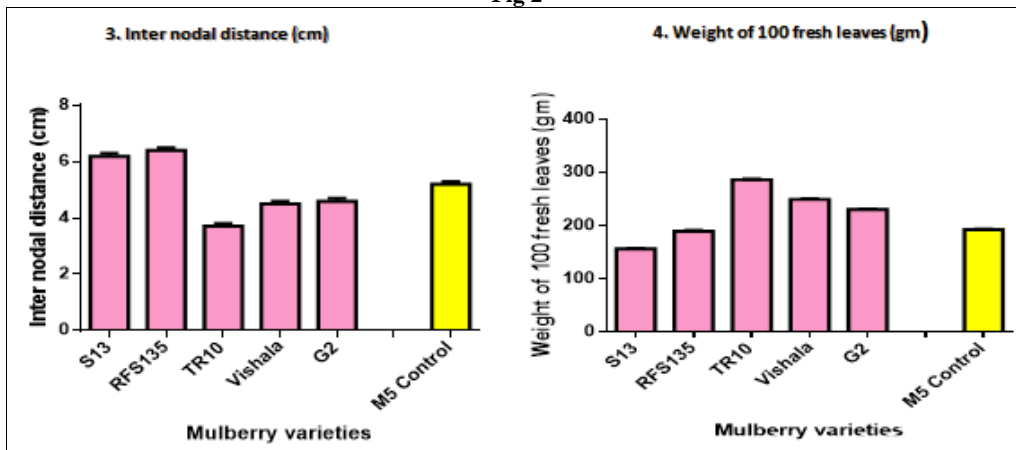


Fig 3

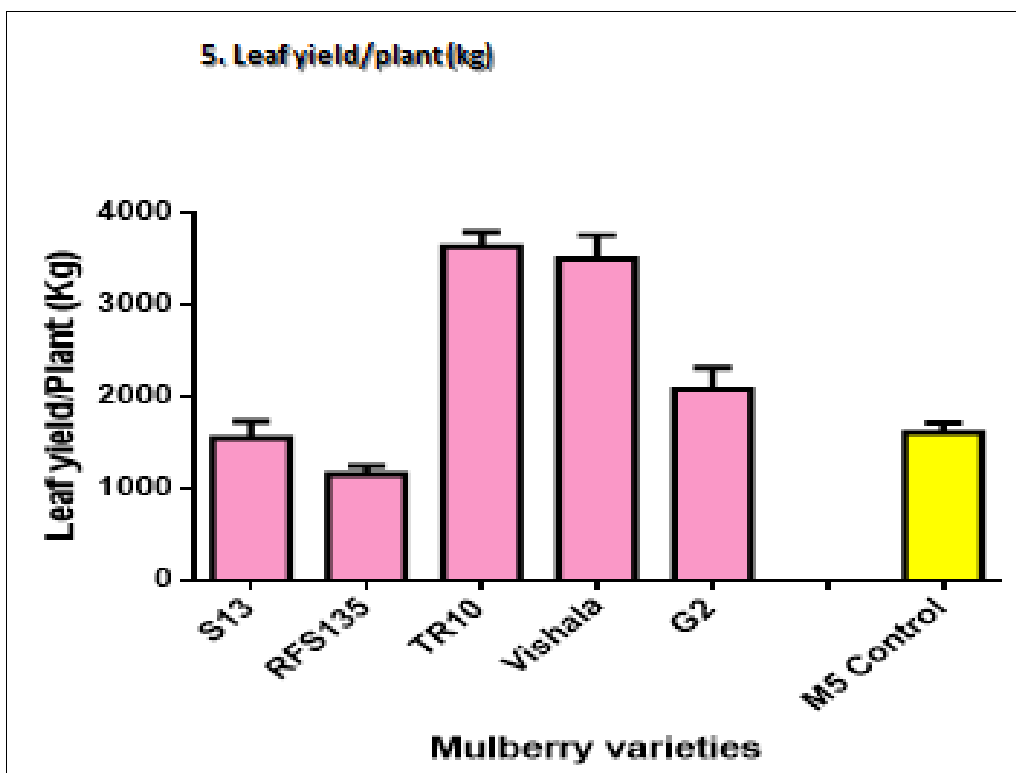


Fig 4

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