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Assessment of the Growth and Yield Parameters of Fillers in Rubber Intercropping

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ABSTRACT: Filler crops are a boon to worldwide floriculture industry. This trend has increased still further because of the green, lively and refreshing image presented by such products and the predicted increase in consumption of floral products. They are being used in floral designs and also serve as a good ground cover for shady locations. Rubber is remunerative plantation crop However as the gestation period is very long even up to seven years the land in the alley spaces remain unutilised. To cultivate these filler crops shade is required which is normally provided with artificial shade nets. This in turn increases the cost of production of these filler crops. Instead of creating shade condition artificially, the natural shade like growing under plantation crops *viz.*, rubber makes a dual benefit for both rubber and filler crops. Hence in this study nine filler crops were grown under rubber plantation in randomized block design with three replications. The different growth and yield parameters were evaluated. Among the different fillers, T_5 (*Dypsis lutesence*) recorded the highest plant height (65.3 cm), maximum dry matter content (104.1 g/plant) and largest petiole length (34.5 cm) whereas the treatment T_3 (*Dracaena fragrans* cv. *Massangeana*) flowered early (10.23 days) with maximum leaf yield (29.7 Nos) and shelf life (32.06 days).

Keywords: Filler crops, growth, rubber, yield.

INTRODUCTION

Rubber is one among the important plantation crop which plays a vital role in income generation of small-scale farmers in the humid and sub-humid tropics. Though rubber is a remunerative plantation crop, seven year gestation period is required for the realisation of latex yield. Till then it remains unproductive and the land use efficiency in these plantations is found to be low (Yang *et al.,* 2020). Intercropping in the alley spaces of rubber is an attractive practice for obtaining economic benefits (Jin *et al.,* 2021). The above ground interference from rubber is imposed by its expanding canopy and below ground by its roots. The combined effect of both these factors will affect the performance of intercrops. Intercropping offers much scope for improving resource capture and productivity of plantation crops such as rubber, by utilizing the wider row spacing (Rodrigo *et al.,* 2001; Maitra *et al.,* 2021; Khanal *et al.,* 2021). The success of intercropping in rubber plantation with semi-perennials or perennials depends mostly on the amount of radiation penetrating the rubber canopy. In general, the rubber canopy is quite dense allowing little radiation to the under storey (Langenberger *et al.,* 2017).

Foliage filler crops are gaining increasing popularity due to diversification of floriculture and lower cost of production compared to the traditional production of cut flowers. There is a great possibility for exploitation of cut foliages because of year-round production, low investment and lesser risk. Ornamental filler crops are the basic and fundamental element of any floral arrangements and provide a glamorous touch to floral designs (Safeena *et al.,* 2019). The perishable decorative greens, which were used earlier at about 5 per cent as fillers, in bouquet making have increased substantially to 20-25 per cent (Bhattacharjee, 2006). Most of the foliage plants are shade loving and by introducing these plants under the shade of rubber will solve the purpose of improving the land use efficiency of rubber plantations as well as to generate additional income. These foliages if grown as mono crop, requires shade for their growth and construction of artificial shade structure increases the cost of cultivation of these cut foliages. But if the natural rubber shade is utilized to grow these shade loving foliages it is possible to cut down the cost of production of these filler crops. Hence, this study was undertaken to exploit the advantage of generating additional income to the rubber growers through intercropping as well as to reduce the production cost of filler crops by eliminating the artificial shade nets.

METHODOLOGY

The study on estimating the growth and yield components of filler crops intercropped with rubber was carried out at Horticultural Research Station (HRS), Tamil Nadu Agricultural University (TNAU), Pechiparai. The experiment was carried out in RBD (Randomized Block Design) with 3 replications and 9 treatments (T_1– *Asparagas,* T_2- *Dracena mahathma*, T_3- *Dracaena fragrans* cv. *Massangeana*, T_4- *Schefflera variegated*, T_5 – *Dypsis lutescens*, T_6- *Philodendron xanadu*, T_7– *Spathiphylum,* T_8– *Syngonium,* T_9– *Calopagonium*). The experimental plot was 4.0 × 3.0

m. The crops were grown in raised beds at a spacing of 90 × 90 cm as per the treatment specification. The first irrigation was given immediately after sowing and next on the third day after sowing. Weekly irrigations were given subsequently during the summer months. The growth and yield parameters were recorded in the filler crops.

RESULTS AND DISCUSSION

A. Plant height

The plant height of the different foliage plants is presented in Table 1. In this experiment, among the different treatments *Dypsis lutescence* (T_5) recorded the highest plant height of 74.6 cm followed by *Asparagus* (65.3 cm) and then *Dracaena mahatma* which recorded 53.0 cm. The increase in plant height and length of *Dypsis* could be due to the rapid growth of the plants, accumulation of more chlorophyll, dark green bigger sized leaf and more number of leaves under shade (Malezieux *et al.*, 2009). Under shading the photosynthetic Table 1. rate increased and the respiration rate decreased and the chloroplast structure developed normally. This is in conformity with the findings of Fan Yanping (2003) in *Spathiphyllum* and (1974) in anthurium.

B. Petiole length

The observations on the petiole length of different foliages showed significant difference between the treatments at all the stages (Table 1). The maximum petiole length of 34.5 cm was recorded in T_5 – *Dypsis lutesence* treatment.

Table 1: Effect of different treatments on biometric traits of different filler crops.

Treatments	Plant height (cm)			Petiole length (cm)			Number of days taken for the emergence	Dry matter production (g plant $^{-1}$)			Shelf life (days)
	Days after planting			Days after planting				Days after planting			
	60	120	180	60	120	180		60	120	180	
T_1 – *Asparagus*	25.7	43.9	65.3	3.1	3.4	3.6	29.80	40.84	50.33	63.2	5.20
T_2 – *Dracaena mahathma*	22.7	35.7	53.0	6.2	7.3	7.9	11.20	51.74	67.20	82.87	14.52
T_3 – *Dracaena fragrans* cv. *Massangeana*	22.7	29.3	42.1	3.8	4.4	4.8	10.23	67.78	78.34	94.10	32.06
T_4 – *Schefflera variegated*	20.3	27.4	35.4	9.2	10.7	11.4	22.70	52.93	62.86	80.41	18.23
T_5 – *Dypsis lutesence*	32.4	49.0	74.6	32.0	33.8	34.5	27.56	82.43	96.6	104.1	17.86
T_6 – *Philodendron Xanadu*	19.3	25.2	31.1	24.4	26.8	27.7	21.56	59.46	68.86	79.66	28.76
T_7 – *Spathiphylum*	19.8	26.1	35.5	6.16	75.6	8.3	28.76	52.00	61.90	71.85	13.80
T_8 – *Syngonium*	19.0	27.0	36.9	10.3	11.4	12.1	27.70	50.86	60.30	74.73	23.02
T_9 – *Calopagonium*	18.5	23.6	28.9	2.7	3.1	3.3	32.20	17.33	21.20	24.00	3.18
Mean	**22.30**	**32.03**	**43.67**	**10.86**	**12.06**	**13.06**	**23.54**	**52.79**	**63.73**	**77.62**	**17.31**
SEd	**0.45**	**0.90**	**5.69**	**0.17**	**0.27**	**0.47**	**0.87**	**2.53**	**1.94**	**2.20**	**0.3196**
CD(P=0.05)	**0.96**	**1.91**	**12.07**	**0.38**	**0.58**	**1.00**	**1.86**	**5.36**	**4.12**	**4.66**	**0.6776**

C. Number of days taken for emergence new leaves

The data recorded on number of days taken for emergence of new leaf are presented in Table 1. The number of days taken for emergence of new leaf was earlier in the treatment T_3 , *Dracaena fragrans* cv. *Massangeana* in which the first emergence of new leaf was noticed on 10.23 days and was closely followed by T_2, *Dracena mahathma* (11.20 days). Emergence of new leaf is an important character in foliage crops. Though earliness is considered as a genetically controlled trait other environmental factors and cultural practices including nutrition of plants can play a major role.

D. Leaf yield

Yield is a complex character which involves the interaction of several intrinsic and external factors. It largely depends upon the uptake of nutrients and water from soil and foliages. The data on leaf yield per plant indicated significant difference between the treatments (Fig. 1).

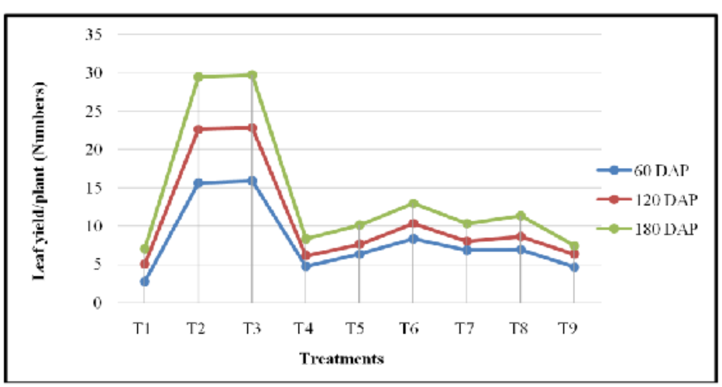

Fig. 1. Effect of different treatments on leaf yield plant^{-1}.

At 60, 120 and 180 DAP leaf yield was the highest (29.7 Nos) in T_3 *Dracaena fragrans cv. Massangeana* which is on par with T_2 *Dracena mahathma*. In this study the different species were grown in shade, mainly for the maintenance of quality in terms of attractive leaf colour. The shade reduces the yield but the reduced yield can be compensated by quality (Rodrigo *et al*., 2001; Srikrishnah *et al.,* 2012). Balsimha (1989) observed that the mean economic yield under open conditions was 8804 kg/ha which was significantly higher when compared to 2586 kg/ha obtained from the crops grown under the shade of arecanut.

E. Dry Matter Production

The observations recorded on dry matter production are presented in Table 1. The total dry matter produced is an indication of the overall efficiency of utilization of resources and better interception of light. The partitioning of total dry matter varied significantly among the treatments. In this experiment total dry matter production increased from 60 to 180 days after planting. The highest dry matter production was noticed in the treatment T_3 *Dracaena fragrans* cv. *Massangeana* **(**Table 1). The increase in dry weight of different foliage crops might be due to increases in number of leaves per plant. Where higher amount of photosynthesis assimilates accumulate during crop growth the dry matter production will be increased as suggested by Vaughan and Malcom, (1985).

F. Shelf life

Keeping cut foliage for a considerable time without much deterioration is critical during decoration. Cut foliage is normally exported *via.* air freight which takes two to three days to reach a particular destination. The data recorded indicated a perceptible variation on shelf life of the foliage plants presented in Table 1. Live cut foliages have a limited life. The majority of cut foliages can be expected to last several days with proper care. This generally requires keeping them in water in shade. The maximum self-life of 32.06 days was observed in T_3 (*Draceana fragrans* cv. *Massangeana*) and is followed by T_6 (*Philodendron xanadu*) which recorded 28.76 days. The control recorded only 3.18 days. Self-life of the cut foliage seems to be an inherent capacity of the cultivar. This variation between varieties with regard to self-life could also be due to differences in the genetic make-up of the cultivars. Similar variation for longevity in cut foliages was also reported previously by Stamps *et al.,* (2005) in ornamental *Asparagus* species and cultivars.

CONCLUSION

The intercropped foliage plants in rubber plantation showed a significant variation for growth and yield parameters. The treatment T_5 *Dypsis lutescence* exhibited better growth characters *viz.,* plant height (74.6 cm) and petiole length (34.5 cm) compared with other treatments. The leaf yield was highest in T_3 *Draceana fragrans* cv. *Massangeana* (29.7). The same species have recorded a shelf life of 32.6 days. As these are cut foliages the number of leaves produced per plant is an important criteria for economical production. Considering these findings with regard to number of leaves and shelf life it could be concluded that T_3 *Draceana fragrans cv. Massangeana* is economic and most suitable crop for enhancing the land use efficiency of rubber plantation by intercropping.

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Conflict of Interest. Nil.

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