Proceedings of Placrosym XV (2002): 406-409

FEASIBILITY STUDIES ON INTERCROPPING OF RUBBER (*Hevea brasiliensis*) WITH TEA (*Camellia sinensis*) IN DOOARS AREA OF WEST BENGAL: 1. INITIAL GROWTH AND YIELD PERFORMANCE

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ABSTRACT

To study the feasibility of intercropping rubber with tea, an experiment was conducted at Regional Experiment Station, Nagarakata (West Bengal) during the year 1999. During the first three years of the experimentation it was observed that rubber and tea were growing well without competing each other for space, nutrients and soil moisture. Maximum growth (22.16cm) of rubber was observed in the treatment where rubber was planted at a spacing of 12m x 2.4m along with tea at normal spacing (100cm x 60cm). However, in pure rubber plots at normal spacing growth of rubber were low (16.83cm). It may be due to interplant competing for light and nutrients. Tea plants were growing well in all the treatments.

INTRODUCTION

In order to meet the growing demand of natural rubber in India, the Rubber Board has started expanding rubber cultivation to the non-traditional areas. Northern part of West Bengal has been identified as suitable area for cultivation of rubber and more than 300 ha has already been brought under plantation. The northern part of Jalpaiguri district (WB) being a tea-growing belt, there is little scope for getting suitable land exclusively for rubber cultivation. The soil requirement for both rubber and tea is almost same and tea needs partial shade. As the rubber is planted in wide row spacing resulting in large inter row space left un-utilized during immature phase, there is scope for intercropping of rubber with tea, particularly in areas where tea is to be replanted. By this both the plantation crops can co-exist without competing with each other for the limited land resource and thereby increasing land resource use efficiency and generating more employment. It was reported in China by Deng Xiaobao (1994) that the fresh weight, dry weight, total length and total surface area of sucking roots of rubber trees in the soil between 0-10cm level in the rubber-tea intercropping plantations was 198%, 165%, 312% and 322% of that of monoculture rubber, respectively, whilst the root system of monoculture rubber stands is only 50% of that of rubber tea intercropping sands. In China, many combinations have been tried in rubber plantations and found that rubber/tea combination has attracted the most extensive studies and has been deemed as the more desirable combination (Lin *et al.*, 1994). The scope and feasibility of intercropping rubber with tea has already been proved in Sri Lanka. However, so, far, no such studies have been initiated in India. Hence, feasibility studies of intercropping rubber with tea under the agro-climatic conditions of northern part of West Bengal have been initiated.

MATERIALS AND METHODS

The experiment was started during the year 1999 at Regional Experiment Station, Nagrakata, which is located at latitude of 26° 54'N, longitude of 88° 25'E, and at an elevation of 69m MSL. The soil of the experimental site is well-drained sandy loam and acidic in reaction (pH 4-4.5) and high in organics but deficit in available phosphorous and potash content. Climate in the northern region of West Bengal is sub-humid with annual rainfall of 3300 mm and mean temperature of 22°C. About 77 per cent of annual rainfall is received between May to September and least during November to March. Mean maximum temperature is 28°C, which rises as high as 31.5°C during July. Maximum temperature remains above 30°C during May to October. Mean minimum temperature is 16.5°C and it dips to as low as 5°C during the cold period. It is interesting to note that during November to March the temperature range between maximum and minimum is wider (12-15°C). At the same time less than 60mm rainfall is received during the period. So, the plants suffered from unfavourable hydrothermal conditions during the seasons. The experiment was laid out in a randomized block design with four replications. The plot size was 45m x 20m. The treatments comprised of T-1: Pure rubber (4.9m x 4.9m), T-2: Rubber + Tea (10m x 2.4m

rubber spacing), T-3: Rubber + Tea (12m x 2.4m rubber spacing), T-4: Rubber + Tea (3m x 3m x 18m rubber spacing), T-5: Rubber + Tea (9.6m x 4.9m rubber spacing), T-6: Pure tea (1.0m x 0.6m). For tea was a common spacing of 1 x 0.6m was followed. The clone selected for rubber was RRII 105 and Tea-TV 23. Different growth parameters were recorded from both rubber and tea. Rubber girth data were recorded at quarterly interval in March, June, Sept., and Dec. Rubber plant height, number of primary branches and branching height were recorded at yearly interval. Tea collar diameter recorded at monthly interval band branching number counted after thumb pruning and frame formation pruning at the age of 6 months and one year respectively. Plot wise tea green leaves yield was recorded at weekly interval from April to December and different tea yield contributing characters viz. plucking point/plant, plucking density and individual shoot weight were recorded at quarterly interval. Tea green leaves produced per plots were converted to individual bush yield and then converted to kg/ha by multiplying with tea plant population/ha of respective treatment. Tea pruning cycle and different cultural operations and pest control methods were followed as per standard packages of practices laid out by the Tea Research Association, Tocklai, India. Life saving irrigation was given to tea during October to March to overcome soil moisture stress.

RESULTS AND DISCUSSION

A. Growth performance of rubber:

Growth of rubber varied significantly among the different treatments. Maximum girth (22.16cm) was observed in T-3 where rubber was planted at a spacing of 12m x 2.4m with tea and the lowest girth (16.83cm) was observed in pure rubber plots at normal spacing (4.9m x 4.9m) (Table-1, Fig.1). It may be due to inter plant competition for light, nutrients and soil moisture. Other growth parameters of rubber viz. plant height, branching height and number of branches did not vary significantly among the treatments. However, in all the cases, low growth was observed in pure rubber plots. It may be due to water stress during dry period, as pure rubber plots were not irrigated. Tea has been irrigated once during dry period and rubber plants also received water indirectly while irrigating tea plants. However the irrigation was very limited and provided as a life saving irrigation to tea plants.

B. GROWTH AND YIELD PERFORMANCE OF TEA:

Growth of tea did not show any significant variation in different treatments. Tea plants were growing well in all the rubber + tea planting combinations. Maximum tea collar diameter increment (12.04mm) was observed in pure tea plots (Table-2, Fig. 2).

Tea green leaves yield (kg/ha) during the second year of plantations was recorded at weekly interval and yield components were recorded at quarterly interval. Maximum tea green leaves yield (2135 kg/ha) was recorded in pure tea plots followed by T-5 (2005 kg/ha) where tea was planted within the rubber spacing of 12m x 2.4m. However, no significant variations in tea yield and yield component were recorded among the treatments. In the rubber/tea combination, the more sunlight provided to the intercrop by rubber leaf fall in early spring is favorable for higher tea

Table 1. Effect of growth of rubber on intercropping with tea

Treatments	Girth (cm)	Plant height (cm)	Branching height (cm)	Number of main branch	Annual girth increment (cm)
T-1 (Pure rubber)	16.83	560	310	5	8.06
T-2 (R + T)	19.56	615	322	6	9.52
T-3 (R + T)	22.16	667	369	6	10.37
T-4 (R + T)	20.07	610	326	6	9.65
T-5 (R + T)	20.09	567	357	6	10.06
T-6 (Pure tea)	00	00	00	00	00
SEm±	1.05	35.75	42.14	0.55	0.40
CD (P=0.05)	3.24	NS	NS	NS	1.23

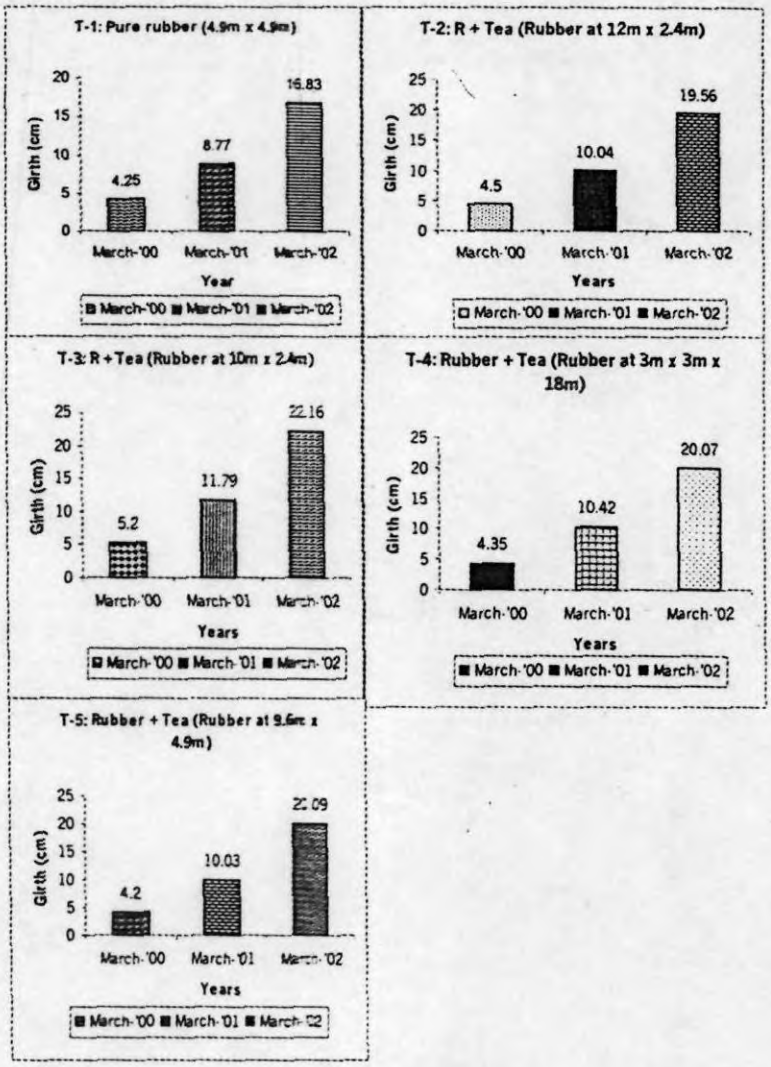

Fig. 1. Girth of rubber

Table 2. Effect of growth and yield of tea on intercropping with rubber

Treatments	Tea collar diameter (mm)	Annual increment in collar diameter (mm)	Tea green leaves yield (kg/ha)	Tea yield component		
				No. of bud/bush	Bud/100g m leaves	Bud wt. (gm)
T-1 (Pure rubber)	00	00	00	00	00	00
T-2 (R + T)	22.92	11.26	1897	20.14	83	1.19
T-3 (R + T)	22.28	10.53	2005	20.42	84	1.22
T-4 (R + T)	22.87	11.90	1966	21.03	78	1.22
T-5 (R + T)	23.98	11.82	1998	20.93	85	1.20
T-6 (Pure tea)	23.30	12.04	2135	19.66	84	1.25
CV (%)	5.06	9.71	13.89	11.15	4.89	8.40
CD (p=0.05)	NS	NS	NS	NS	NS	NS

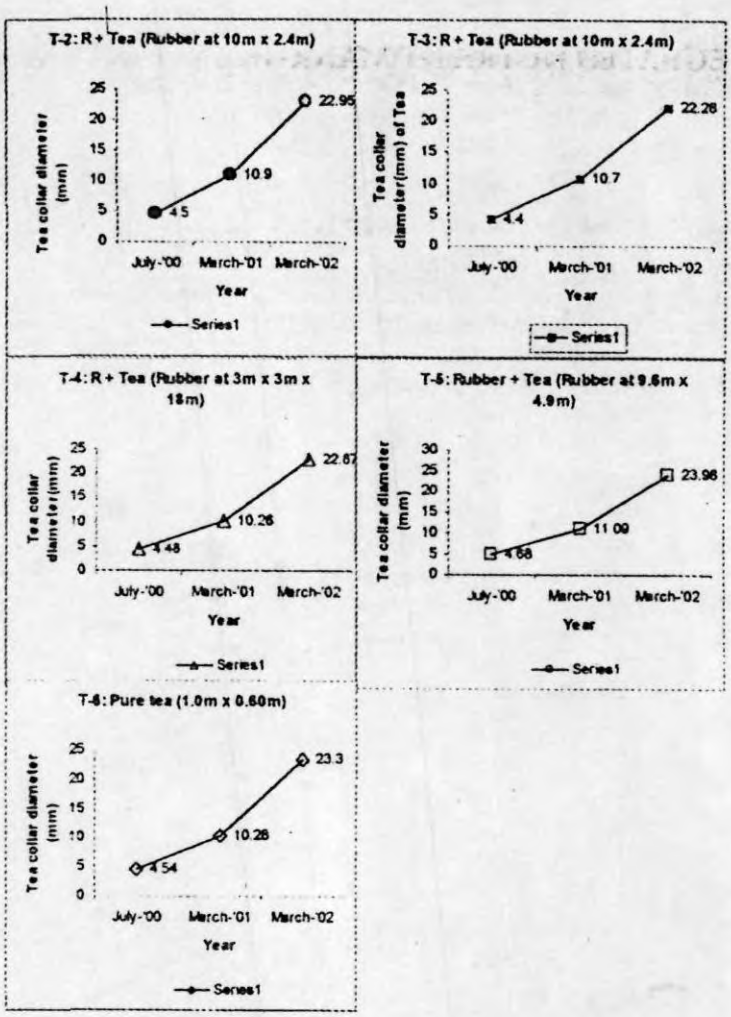

Fig. 2. Tea collar diameter

production in the spring season (Bu Cuotai, 1984 and Zhou and Li, 1991).

CONCLUSION

During the initial growth period, no significant variation in different growth parameters were observed in tea due to differential planting pattern with rubber. However, significant growth in respect of girth and annual girth increment was noticed in rubber while intercropping with tea. Pure rubber plots recorded lowest girth and girth increment. Pure tea plots recorded higher tea green leaves yield as compared to intercrop plots; however the variation was not significant. Tea plants were growing very well in all plots and on an average 11 mm annual mean collar diameter was recorded.

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