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Yield Performance of Turmeric Varieties Intercropped with Mulberry Plantations

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Abstract: Turmeric is grown as medicinal plant in Pakistan whereas mulberry is cultivated mainly for silkworm rearing. The study was conducted to assess the potential of turmeric varieties as intercrop with mulberry. Turmeric intercropping with mulberry plantation was grown to evaluate four varieties and planting distance of turmeric rhizomes on the basis turmeric yield performance. Three planting distances (20, 40 and 60 cm) for each variety were maintained with three replications in Randomized Complete Block Design. The results showed that turmeric yield was higher when grown with 40 cm planting distance. The comparative performance of varieties indicated that Kesari was the best variety with respect to yield tons/ha (50.33 ± 2.517) to be grown with mulberry as an intercrop with planting distance of 40 cm. Kasturi and CA69 having medium duration growth habit are suitable for cultivation as intercrop with mulberry. The study emphasizes that mulberry plantations may be intercropped with turmeric to harvest the maximum potential of resources.

Key words: Turmeric production · Mulberry intercropping

INTRODUCTION

Turmeric is the underground rhizome of *Curcuma longa,* a perennial herb of ginger family. It is grown as an annual, on raised beds for ease in harvesting of rhizomes. The plant is propagated by dividing suckers and by planting small pieces of rhizome. The processed turmeric powder is used as a spice, natural colorant and herbal medicine in Indian subcontinent. It is also used in mixed pickles, particularly the mustard pickles, chutneys and Indian rice dishes. Turmeric is also used as an herbal medicine in the treatment of ulcers and liver disorders. It is cultivated in Pakistan as spice crop in various parts of the country. There are three types of varieties i.e. long duration, medium duration and short duration depending on their time for maturity [1]. Turmeric can be grown under diverse tropical conditions with altitudes ranging from sea level to 1500 m above sea level. It requires a well-drained sandy or clay loam soil and temperature ranging between 20-30°C with annual rainfall of 1500 mm or more [2]. Turmeric possesses anti-bacterial and antiseptic properties. Mulberry is cultivated mainly for rearing of silkworms for the production of animal fiber in the form of cocoons which on processing yields silk fiber. Mulberry also serves as animal fodder, its fruit is very delicious and twigs have multiple uses.

The research work carried out by various researchers showed that better net profit can be obtained from intercropping of mulberry with turmeric. Tikadar [3] investigated economics of intercropping turmeric and mulberry plants and concluded that higher net profit resulted from intercropping turmeric in mulberry plantation as compared to sole crops.

Sericulture is practiced as part time farming by most of the farming community as it is a seasonal activity. Mulberry plantations on state lands as well as farm lands are not under intensive farming. There is great potential in mulberry cultivation in Pakistan. The multiple utilization of mulberry crop certainly favours farmers' economy and encourage them to grow mulberry [4]. Mulberry is being extensively utilized in sericulture for rearing of silkworms, animal forage due to its high nutritive value of leaves and mulberry twigs in decoration articles. The perusal of literature indicated that a large number of crops belonging to different categories can be grown in mulberry plantations. Groundnut, Green Gram, Cowpea, Black Gram, Soybean, Fenugreek, French bean, Pea, Lentil, Spinach, Methi, okra, carrot, garlic and cauliflower, potato, spinach,

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turmeric and turnip have been tried as intercrops with mulberry by various researchers and reported positive results [5-7]. Medicinal plants are highly anticipated for their beneficial effects and are valuable source of herbal medicines [8].

The selection of these intercrops depends on type of mulberry plantation, pruning level, type of cultivation, growth stage of mulberry and variety of mulberry. The sole crop of mulberry in Pakistan is not much desirable because silkworm rearing activity is based on autumn and spring. Thus mulberry plantations in irrigated areas have to compete for cultivation with other crops which offer more return to the farmers. Therefore, it is imperative to popularize such system of cultivation where farmers would have advantage of getting two crops simultaneously from the same field. The farmers practicing sericulture can be motivated to grow mulberry on productive lands and get the benefit of intercrop without compromising mulberry leaf yield. Mulberry plantations are maintained with different spacing and pruning levels making it suitable for intercrops. There is need to work out the suitability of intercrops in mulberry plantations in order to increase the area under mulberry cultivation with maximizing net profit of the farmers engaged in sericulture. Keeping in view the significance of mulberry as well as turmeric, the current study was undertaken to evaluate four varieties of turmeric as intercrop in mulberry plantation to assess the potential of turmeric varieties to grow under mulberry.

MATERIALS AND METHODS

The field experiment was carried out at the Sericulture Research Demonstration Plot No.79 at Changa Manga. The experiment was conducted in medium deep black clay soil under irrigated condition. The experiment was conducted to assess the potential of four turmeric varieties in mulberry plantation. The experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Planting design of turmeric was 45 cm between the rows of mulberry. A 60 cm ridge was prepared between mulberry plantations. The height of the ridge was maintained about 20 cm. Turmeric seed-rhizomes of 30 g each with 1-2 buds were planted at a 10c m depth. The spacing between turmeric plants 20, 40 and 60 cm was maintained. Seed-rhizomes were planted in single row pattern. Four varieties (CLL 326, Kesari, Kasturi and CA 69) were intercropped with mulberry variety Chinese Husung. The mulberry garden was pruned at ground level, ploughed once in between rows with wooden plough and treatments were imposed as per the plan. The mulberry plants were pruned again at ground level during first week of December. At 165 days after planting (DAP), turmeric was harvested by manual digging of underground tubers. The tubers were separated from the plants and cleaned. The green turmeric rhizomes were collected, weighed and the data were subjected to Analysis of Variance (ANOVA). Means were compared to determine the significance.

RESULTS AND DISCUSSION

The performance of turmeric varieties as intercrops in mulberry plantations was investigated to find out the potential of these varieties as intercrops. Data illustrated that Kesari gives mean maximum yield tons/ha (49.78 ± 4.893) as an intercrop (Table 1). The results showed that planting of turmeric at 40 cm distance gives higher yield as compared to 20 cm and 60 cm (Table 2). Kesari indicated best yield performance (50.33 ± 2.517) at planting distance of 40 cm in comparison with CLL 326, Kasturi and CA 69 (Table 3). The performance of turmeric varieties as intercrops depend on their growing duration, type and age of mulberry plantation,

According to Willey [9] intercropping results in increased crop yield. This can be explained by the difference in needs of growth resources of component crops. This difference in nutrient requirement lessens the inter-crop competition which maximizes the degree of complementarities between the component crops. Muralidharan [10] also reported that growth and yield of turmeric is higher when planted under areca-nut garden as compared to an open space.

According to Rao *et al.* [11] turmeric can be grouped into three types based on its maturity period. These varieties differ in various aspects such as rhizome yield, volatile oil content and curcumin level. Short duration types are known as Kasturi which mature in seven months and are good yielders of dried rhizomes. Their rhizomes possess pleasant aroma and rich in volatile oil content but low in curcumin and used in culinary preparation. Medium duration types mature in eight months and are known as Kesari. These are high yielders of fresh rhizomes than kasturi types and rich in curcumin and volatile oil. Long duration types mature in nine months and are moderately good both for rhizome yield and other quality constituents. Mehta and Patel [12] also found that among eleven cultivars studied in Gujarat conditions, Kesar gave the highest mean yield of rhizome/ha (10.86 tons/ha) showing a stability parameter value greater than one. These findings were reaffirmed in present study as Kesari gave mean maximum yield as an intercrop with mulberry.

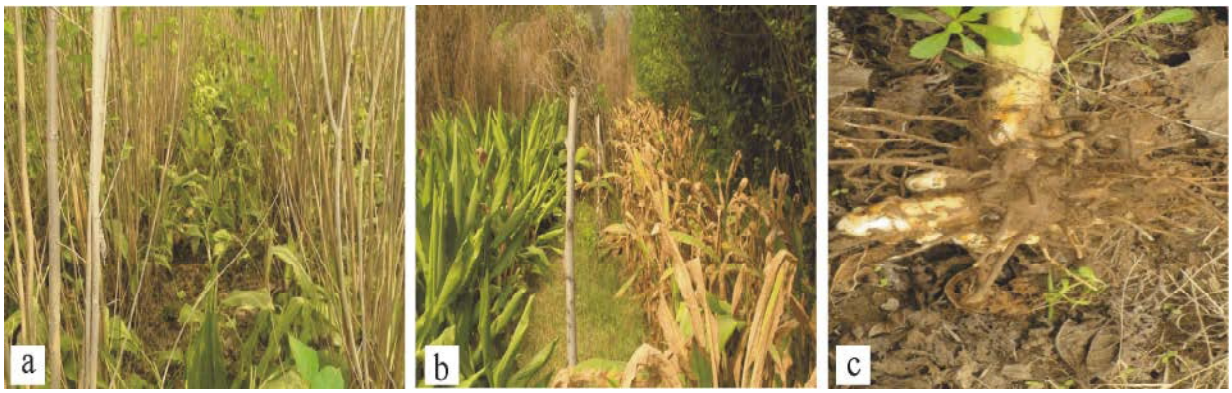

Fig. 1: Turmeric intercropped with mulberry (a.) early stages (b.) late stages (c.) mature rhizomes

Table 1: Overall Yield Performance (tons/ha) of Four Varieties of Turmeric Grown as Intercrops with Mulberry Plantations

Turmeric Varieties	Yield tons/ha) (Mean ± SD)
CLL 326	43.44 ± 6.710 b
Kesari	49.78 ± 4.893 a
Kasturi	41.89 ± 3.586 b
CA 69	46.78 ± 6.648 a

Table 2: Overall Yield Performances (tons/ha) of Four Varieties of Turmeric Grown as Intercrops with Mulberry Plantations

Planting Distance	Yield (Mean ± SD)
20 cm	45.83 ± 3.973 b
40 cm	49.33 ± 4.579 a
60 cm	39.00 ± 3.075 c

Table 3: Mean Yield (tons/ha) of Turmeric Varieties Grown in Mulberry Plantations at Three Planting Distances (20, 40 and 60 cm)

Planting Distance	Variety	Yield (Mean ± SD)
20 cm	CLL 326	41.33 ± 2.517
	Kesari	49.00 ± 2.000
	Kasturi	44.00 ± 2.646
	CA 69	49.00 ± 2.000
40 cm	CLL 326	51.00 ± 4.000
	Kesari	50.33 ± 2.517
	Kasturi	43.33 ± 2.517
	CA 69	52.67 ± 3.215
60 cm	CLL 326	38.00 ±4.583
	Kesari	41.00 ±3.000
	Kasturi	38.33 ±3.055
	CA 69	38.67 ±2.082

Turmeric yield as an intercrop is governed by the adaptation of different varieties to various shade levels. The variation in the performance of turmeric varieties may be attributed to their shade tolerance characters Turmeric varieties show shade tolerance responsewhen grown under shady plants [13]. In present study Kesari and CA69 varieties gave higher yields (46.78 ± 4.89 and 46.78 ± 6.648 tons/ha, respectively) as compared to CLL326 and Kasturi as an intercrop with mulberry.

Proper plant spacing can improve the yield of turmeric. Like other factors it greatly influences yield contributing traits and also affects the overall yield of turmeric [14, 15]. Islam *et al.* [16] demonstrated that highest yield (16.98 t/ha) and average highest yield (17.87 tons/ha) of turmeric was obtained from closer plant spacing (45×10cm^2). Choudhury *et al.* [17] conducted an experiment with three spacing i.e. 50×20, 50×15 and 50×25 cm^2. It was found that closer spacing (50×15) gave higher yield of turmeric. In present study, seed rhizomes were planted at spacing distance of 20, 40 and 60cm. Results showed that mean maximum yields were obtained at plant spacing of 40 cm (Tables 2 and 3).

Intercropping can help the farmers by providing alternate source of income from same piece of land. Mulberry is the base crop in sericulture. Other crops are also grown with mulberry, which are termed as intercrops [18].

CONCLUSION

The yield of turmeric intercropping with mulberry plantations is affected by planting distance of turmeric rhizomes and varieties. All four varieties of turmeric variably responded to planting distances (20, 40 and 60 cm). The higher turmeric yield was observed with 40 cm planting distance. Kesari was the best variety with respect to yield tons/ha (50.33 ± 2.517) grown as intercrop with mulberry at planting distance of 40 cm. Kasturi and CA69 having medium duration growth habit also indicated their suitbility for cultivation as intercrop with mulberry. The present study emphasizes on the utilization of mulberry plantations for intercropping with turmeric.

REFERENCES

1. FAO., 2005. Herbs, spices and essential oils-Post-harvest operations in developing countries. UNIDO and FAO, 2005.
2. Tikadar, A., 1992. Turmeric as an intercrop with mulberry. Ind. Silk., 30(5): 20-25.
3. Mohan, R., 1988. Using legumes as intercrop with silkworm food plant. Ind. silk, pp: 37-38.
4. Shankar, M.A., K.N. Ravi, B. Puttaswamy, T.B. Puttaraju and M.C. Devaiah, 1994. Minor millets and pulses in mulberry garden. Ind. Silk, 33(5): 13-14.
5. Koul, A., A. Gupta, D. Singh and S.P. Gupta, 1996. Intercropping of vegetables n mulberry. Indian. J. Seric, 4(2): 48-51.
6. Farooqi, A.A. and B.S. Sree Ramu, 2001. Cultivation of Medicinal and Aromatic Crops, University Press, Delhi, pp: 9-10.
7. Willey, R.W., 1979. Intercropping-its importance and research needs. Part I. Competition and yield advantages. Field Crop Abstr., 32: 1-10.
8. Muralidharan, A., 1980. Biomass productivity, plant interactions and economics of intercropping in arecanut. Ph. D. Thesis, University of Agricultural Sciences, Bangalore.
9. Rao, M.R., R.K. Reddy and M. Subbarayudu, 1975. Promising turmeric types of Andhra Pradesh. Indian Spices, 2(2): 2-5.
10. Mehta, K.G. and R.H. Patel, 1983. Stability parameters for rhizome yield in *Curcuma longa* Linn. Indian Cocoa, Arecanut and Spices Journal, 6(4): 98-99.
11. Nybe, E.V., M. Raj and K.V. Peter, 2007. Horticulture Science series. New India publishing, 5: 104.
12. Aiyadural, S.G., 1966. A Review of Research on Spices and Cashewnut in India, Ernakelam 6, Indian Council of Agricultural Research, India.
13. Purseglove, J.W., E.G. Brown, C.L. Green and S.R. Robbins, 1981. Spices. Longman Group Limited. Longman Inc. New York, 2: 537-539.
14. Islam, F., M.R. Karim, M. Shahjahan, M.O. Hoque, M.R. Alam and M.A. Hossain, 2002. Study on the effect of plant spacing on the production of Turmeric at Farmer's Field. Asian Journal of Plant Sciences, 1(6): 616-617.
15. Choudhury, A.K., A.F.M.E. Hoque, Z.A. Firoz and M.A. Quayyum, 2000. Performance of Turmeric-Legume intercropping system. Bangladesh J. Agric. Res., 25: 325-332.
16. Gangawar, S.K. and K. Thangavelu, 1991. Earning before harvest of mulberry leaf by intercropping. Indian Silk, 39(6): 13-15.