HortFlora Research Spectrum, 2(2): 116-120 (April-June 2013) ISSN : 2250-2823

PERFORMANCE OF PLANTING MATERIAL ON GROWTH AND YIELD OF TURMERIC UNDER GUAVA ORCHARD

D.K. Singh*, S. Aswal, G. Aswani and M. K. Shivhare
Krishi Vigyan Kendra, Anta, Baran, Rajasthan-325202
Maharana Pratap University of Agriculture & Technology, Udaipur
**E-mail :dksingh.KVK@gmail.com*

Abstract: The present investigation was conducted to find out the effect of different planting materials i.e. mother rhizome, primary finger, secondary finger and tertiary fingers on plant growth, yield and yield contributing characters along with economics of turmeric cv. Erode Selection-1. All the intercropping systems showed significant enhancement in the height of the tree varying from 1.25 to 3.40 over the sole tree. Among the different intercrops, better growth of the guava tree was observed where mother rhizome turmeric was grown as intercrop followed by primary, secondary and tertiary fingers treatments. Plant height and number of tillers per plant were enhanced in mother rhizome of turmeric (96.68 cm and 4.03, respectively) under shade of guava plant which results maximum survival percentage (98.45%) and its growth and performance was better than other planting materials. The highest number of fingers per plant (13.64), finger length (9.06), finger weight (36.14) and yield (389.47g/plant and 235.41q/ha) were recorded when turmeric were grown under juvenile guava tree which was significantly higher than all other planting materials. All the turmeric planting materials grown under shade of juvenile guava orchards were found most desirable in terms of vegetative growth, yield, gross return, net return and benefit cost ratio than sole crop.

Keywords: *Turmeric, finger, intercrop, guava orchard, economics.*

Turmeric (*Curcurma longa* L.) is one of the important spice crops which can be grown successfully under shade of orchards (Singh, 9). It is used as a spice, food preservative, pickles, colouring agent, and in cosmetic and medicine. Turmeric possesses a thick underground stem rhizome with short blunt fingers (Fig.1). The primary round shape tuber at the base of the aerial stem is known as mother rhizome, which bears primary fingers, secondary finger and further gives rise to tertiary fingers, thus as a whole dense clump is formed (Rao *et al.*, 8). Guava is a popular fruit tree established in Haroti region of Rajasthan. In established orchards monoculture is practiced by the farmers due to shading effect on intercrop. Some shade loving plants like turmeric (*Curcurma longa* L.), ginger (*Zingiber officinalis*) and colocassia (*Colocasia esculenta*) etc. can be grown in successfully as an intercrop in orchards (Haque, *et. al.,* 5). Turmeric, being a sterile triploid, is vegetative propagated by mother rhizome, primary fingers, secondary finger and tertiary fingers. The variable size of planting material significantly influenced the seedling vigour, early growth, yield and seed requirement of turmeric (Singh *et. al.,* 10); Dhatt *et al.,* 4; Meenakshi *et al.,* 6). Therefore, present investigation was planned to standardize the planting material for use as seed of turmeric variety under the shade of guava orchards.

MATERIALS AND METHODS

The experiment was conducted at Krishi Vigyan Kendra, Anta, in a randomized block design with three replications for two consecutive years, i.e. 2009 and 2010. Four types of planting materials i.e. mother rhizome, primary finger, secondary finger and tertiary fingers of turmeric cv. Erode Selection-1were planted separately in open condition as well as under the periphery of 8 years guava variety L-49 on ridges spaced 45 cm apart with plant to plant distance of 20 cm in last week of June. The different planting materials i.e. mother rhizome, primary finger, secondary finger and tertiary fingers of turmeric having a size of 4.5-5.0cm, 6-7cm, 4.5-5.0 and below 3.0 cm,

Received : 23.4.2013 *Accepted : 20.5.2013*

respectively are depicted in Figure1. Recommended cultural operations and plant protection measures were followed to raise a healthy crop. The observations were recorded for plant height (cm), number of tillers/plant, number of leaves per plant,, leaf length (cm), leaf width (cm), yield per plant(g), yield per hectare (q), length, girth and weight of mother rhizome, primary, secondary and tertiary fingers. Ten plants selected randomly and morphological and yield contributing characters were recorded for statistical analysis. Economics was done for each treatment on hectare basis taking into account the market value of each crop to find out the maximum rate of return to investment. For this purpose, cost of ploughing, seed, fertilization, irrigation, human labour were considered in calculation.The data was analyzed as per statistical procedure given by Panse and Sukhatme (7).

RESULTS AND DISCUSSION

Growth attributes like plant height, plant periphery and trunk thickness of guava trees increased significantly with tree age and their percentage increase over the year 2008 was 7.76, 5.18 and 3.23%, respectively (Table 1). Irrespective of the year, all the intercropping systems showed significant enhancement in the height of the tree varying from 1.25 to 3.40 over the sole tree. Among the different intercrops, better growth of the guava tree was observed where mother rhizome turmeric was grown as intercrop followed by primary, secondary and tertiary fingers treatments. Similar trend was also recorded with respect to plant periphery and trunk thickness. On the other hand, the increase in plant periphery due to intercropping did not show any significant difference. Better growth of guava plants in association with intercrops may be attributed to the improved aeration from frequent soil working and to the better response of inputs applied to the intercrops than in sole plantation, where the inter spaces were left uncultivated and did not receive any additional inputs like, manures, fertilizers and irrigation etc. Maximum tree growth in association with mother rhizome treatment was due to coverage of orchards soil to better growth of turmeric plant than other treatments. As black cotton soils are having hard pan below soil surface, low in nitrogen, even a minimal application of inputs and cultural operations helps in better growth and development of plants. Positive influence of intercrops on growth and vigour of trees has been also reported in guava and mango (*Mangifera indica* L.) in past studies in other places (Awasti *et al.,* 1 and Awasti and Saroj, 2).

The results of the experiment were indicated that vegetative and vegetative contributing characters of different planting materials significantly influence the growth of plants (Table 2). The plant height, number of tillers per plant and number of leaves per plants, number of roots, length of roots and survival percentage were significantly influenced by different type of planting material of turmeric but leaf size were not found significant (Fig.2). Intercropping of different type of turmeric under shade of guava orchards performed better than sole crop. Plant height and number of tillers per plant of different type of planting material were enhanced in intercrop and highest plant height and number of tillers per plant was recorded in mother rhizome of turmeric (96.68) and (4.03) under shade of guava plant. Plant height of ginger was gradually increased in intercrop of guava than sole cropping might be due partial shading. Similar increase of plant height of ginger in intercropping of mango was reported by Chaudhary *et al.,* (3). Number of leaves per plant was highest in mother rhizome of turmeric in intercrop (16.16) as well as in sole crop (14.34) in comparison of primary finger, secondary finger and tertiary fingers respectively of turmeric cv. Erode Selection-1. The highest number of roots (13.11) and length of root (10.45cm) was obtained in mother turmeric grown in guava intercrop. Leaf size was largest in turmeric in both condition i.e. in sole and intercrop of mother rhizome. The leaves of tertiary fingers were smallest (29.24cm 7.14cm) and its overall growth was found poor in sole as well as in intercropping system. Haque *et al.* (5)

also reported that the vegetative growths of ginger, turmeric and mukhi kachu were performing well under the juvenile orchards of mango. The survival percentage of plants generated from mother rhizomes were maximum (98.45%) in intercropping of guava than sole crop (98.45%) and its growth and performance was better than other planting materials. Better growth of mother rhizome of turmeric was due to the presence of maximum food materials stored at initial stage.

The yield and yield contributing performance of different planting materials of turmeric under shade of guava as well as sole crop was presented in Table 3 clearly indicated that the yield of all the planting materials were performing better in shade of guava tree. The yield of turmeric in open conditions was reduced in comparison of intercrop due to the less number of fingers per plant, weight of finger, finger size and poor growth and development. Turmeric leaves becomes white in open condition and is very sensitive to sun light. Similar to turmeric the ginger plants produced moderate plant height and higher yield under partial shade than open sunshine (Singh, 9). The highest number of fingers per plant (13.64), finger length (9.06), finger weight (36.14) and yield (389.47g/plant and 235.41q/ha) were recorded when turmeric were grown under juvenile guava tree which was significantly higher than all other planting materials.

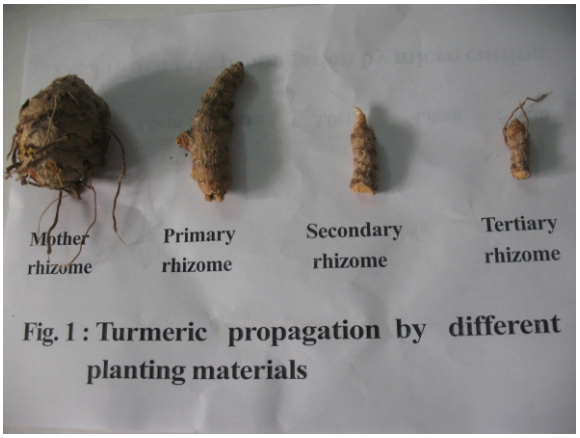

Fig. 1 : Turmeric propagation by different planting materials

Fig 2: Performance of different planting materials on growth of turmeric

The economic performance of different planting material of turmeric in sole and under shade of guava orchards has been presented in Table 3. Cultivation of turmeric in juvenile guava orchards was more beneficial than other crops. Yield of turmeric was reduced in second year in the guava orchard in all the planting material treatment due to the emergence of maximum shoots and branches of guava orchards. The highest cost benefit ratio (5.97) was obtained from mother turmeric rhizome crop grown under guava plant followed by primary finger (4.86), secondary finger (4.77) and tertiary finger (4.56), respectively. Total variable cost of all the planting material was similar to each other due the application of same intercultural operations. The wholesale prices of turmeric and guava fruit were Rs. 15/kg and Rs. 7/kg, respectively in local market.

The present study concluded that planting materials exhibited significant differences on plant growth, rhizome size, yield and net return of turmeric. Mother rhizome and primary fingers are significantly better planting material than secondary and tertiary fingers in terms of plant growth, yield and rhizome size. Therefore, mother rhizome or primary fingers can be used as planting material for raising turmeric crop. Since, primary fingers possesses better storage, more tolerance to wet soil and lower seed requirement (Rao *et al.,* 8) therefore, use of primary fingers as seed material will be immense benefit to the growers without

Table 1: Response of different turmeric planting materials on vegetative growth of guava cv. L-49.

Treatment	Plant height (m)		Mean	Plant Periphery (m)		Mean	Trunk thickness (cm)		Mean
	2009	2010		2009	2010		2009	2010	
Guava (sole)	7.34	7.59	7.46	13.81	13.97	13.89	45.43	45.69	45.56
Guava + Mother rhizome	7.99	8.09	8.04	14.52	14.71	14.61	46.78	46.91	46.84
Guava + Primary finger	7.92	7.98	7.95	14.17	14.23	14.20	46.72	46.82	46.77
Guava + Secondary finger	7.84	7.91	7.87	13.94	13.99	13.96	46.61	46.73	46.67
Guava + Tertiary finger	7.76	7.81	7.78	13.87	13.91	13.89	46.59	46.58	46.58
Mean	7.77	7.876	7.82	14.06	14.16	14.11	46.43	46.55	46.49
CD (P = 0.05)	0.63	0.74	0.59	NS	0.94	0.93	1.01	1.06	1.03

Table 2: Effect of planting materials on growth characteristics of turmeric planted in sole and under shade of guava plant (pooled over year).

Planting material (Rhizome)	Plant height (cm)	No.of tiller/ plant	No. of leaves/ plant	Leaves size (cm)		Root parameter		Survival (%)
				length	width	No of root/ plant	Length	
Mother (sole)	91.54	3.72	14.34	42.42	10.43	11.43	9.31	98.45
Primary (sole)	87.18	3.01	14.31	41.78	10.43	9.87	8.93	94.78
Secondary (sole)	68.12	2.14	13.11	37.33	9.23	7.98	4.21	94.11
Tertiary (sole)	42.73	2.01	8.70	29.24	7.14	4.21	2.4	89.12
Mother + JGT	96.68	4.03	16.16	51.36	12.11	13.11	10.45	98.45
Primary + JGT	92.78	3.68	16.63	51.35	12.10	10.24	9.45	95.47
Secondary + JGT	72.62	2.72	14.32	44.57	9.96	7.89	5.81	95.56
Tertiary +JGT	45.84	2.17	9.74	31.43	8.18	5.76	2.68	91.10
CD (P = 0.05)	7.84	2.14	7.01	NS	NS	8.25	7.98	6.74

Table 3: Effect of planting materials on yield and yield attributes of turmeric planted in sole and under shade of guava plant (pooled over year).

Planting material (Rhizome)	No.of fingers/plant	Length of finger (cm)	Weight of fingers (g)	Yield/plant (g)	Yield/ha (q)
Mother (sole)	12.45	8.96	34.56	384.12	234.13
Primary (sole)	10.13	8.41	32.15	319.13	232.17
Secondary (sole)	8.14	7.83	28.34	289.73	228.78
Tertiary (sole)	4.79	4.21	21.04	192.24	221.22
Mother + JGT	13.64	9.06	36.14	389.47	235.41
Primary + JGT	11.25	8.82	33.24	326.35	232.89
Secondary + JGT	9.16	8.13	29.13	296.93	229.16
Tertiary +JGT	5.14	4.57	22.41	197.14	221.94
CD (P = 0.05)	6.25	5.62	7.34	9.47	3.96

Table 4: Economic performances of sole and intercrop of different planting material of turmeric in sole and under shade of guava orchards.

Planting material (Rhizome)	Yield (q/ha)		Mean yield (q /ha)	Yield of guava (q/ha)	Total Income (Rs)	TVC (Rs)	Net Income (Rs)	BCR
	2009	2010						
Mother (sole)	232.58	235.68	234.13	-	289000	60000	229000	4.81
Primary (sole)	231.33	233.01	232.17	-	286000	60000	226000	4.76
Secondary (sole)	227.47	230.09	228.78	-	280000	60000	220000	4.66
Tertiary (sole)	221.01	221.43	221.22	-	268000	60000	208000	4.46
Mother + JGT	233.81	237.41	235.41	89.78	358500	60000	298500	5.97
Primary + JGT	231.94	233.84	232.89	89.58	292000	60000	232000	4.86
Secondary + JGT	228.47	229.85	229.16	89.78	286500	60000	226500	4.77
Tertiary +JGT	221.41	222.47	221.94	89.80	274000	60000	214000	4.56

Whole sale price of turmeric (Rs.15/kg) and guava (Rs.7/kg) in market.

reduction in yield. The result showed that all the turmeric planting materials grown under shade of juvenile guava orchards were found most desirable in terms of vegetative growth, yield, gross return, net return and benefit cost ratio than sole crop. This gave a positive indication of the prospects of using the space under the juvenile guava tree as commercial proposition. So, our farmers should be motivated to grow turmeric intercropped with guava at juvenile age level in Haroti region of Rajasthan.

REFERENCES

1. Awasti, O.P., Singh, I.S. and More, T.A. (2009). Performance of intercrops during establishment phase of guava orchards. *Indian J.Agric Sci.,* **79**(8): 587-591.
2. Awasti, O.P. and Saroj, P.L.(2004). Economic analysis of mango multistrata intercropping. *Trop. Sci.,* **44**(1):43-47.
3. Chaudhary, A.K., Firoz, Z.A. and Haque, A.F.M.E.(1998). Performance of ginger-legumes intercropping at different spacings of ginger in hilly region. *Bangladesh J. Agril. Res.,* **23**(1): 135-142.
4. Dhatt. A.S., Sidhu, A.S. and Garg, N. (2008). Effect of planting material on plqant growth, yield and rhizome size of turmeric. *Indian J. Hort.,* **65**(2):193-195.
5. Haque, M.E., Roy, A.K. and Sikdar, B. (2004). Performance of ginger, turmeric and mukhi kachu under shade of mango orchard. *The Hort. J.,* **17**(2): 101-107.
6. Meenakshi, N.., Sulikeri, G.S. and Hegde, R.V. (2001). Effect of planting material and P& K nutrition on yield and quality of turmeric. *Karnataka J. Agric. Sci.,* **14:**197-98.
7. Panse, V.G. and Sukhatme, P.V. (1985). *Statistical Methods for Agricultural Workers*. Indian Council of Agriculture Research, New Delhi.
8. Rao, A.M., Jagdeeshwar, R. and Sivaraman, K. (2007). Turmeric. **In:** *Advances in Spices Research: History and Achievements of Spices Research in India since Independence* (Eds., Ravindran, P.N., Babu, K.N. Shiva, K.N. and Kallupurackal, J.A.). Agrobios Publishers, Jodhpur. Pp. 433-91.
9. Singh, D.K. (2001). Performance of turmeric under guava orchards and its effects on fruit quality. National Symp. on Farming System Research in New Millennium. held during 15-17 Oct. 2001 at P.D.F.S.R., Modipuram, Meerut, pp.331.
10. Singh, J., Malik, Y.S., Nehra, B.K. and Pratap, P.S. (2000). Effect of size of seed rhizomes and plant spacing on growth and yield of turmeric (Curcuma Longa L.). *Haryana J. Hortic. Sci.,* **29**: 258-60.