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Growth and yield of turmeric (*Curcuma longa* L.) intercropped in poplar (*Populus deltoides* Bartram ex Marshall) plantation at Punjab

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Abstract

The effect of planting dates and methods of planting of turmeric (*Curcuma longa*) intercropped in poplar (clone *Udai*) (*Poplulus deltoides*) plantation was studied at Ludhiana (Punjab, India). The treatments consisted of three planting dates namely, 20th March, 20th April and 20th May and two methods of planting, namely, ridge and flat method (60 cm x 10 cm) in poplar plantation. The study revealed that in first year of plantation (2004-05), a fresh rhizome yield of 9.96 t ha^{-1} was obtained in 20th April planting which was significantly more than that of 20th May planting (9.45 t ha^{-1}). During 2005-06, a fresh rhizome yield of 8.15, 11.61 and 13.95 t ha^{-1} was produced in 20th March, 20th April and 20th May planting dates, respectively. During 2006-07, the yields were lower and the differences in fresh rhizome yield due to 20th May (6.33 t ha^{-1}) and 20th April (6.43 t ha^{-1}) planting were not significant but both the planting dates were significantly better than 20th March (5.6 t ha^{-1}) planting. The ridge method of planting produced 8.0%, 11.0% and 9.8% more yield which was significantly higher than flat method of planting during 2004-05, 2005-06 and 2006-07, respectively.

Keywords: *Curcuma longa*, growth and yield, intercropping, planting pattern, poplar, *Papulus deltaides,* turmeric.

Information on the performance of different crops in compact poplar (*Populus deltoides* Bartram ex Marshall) plantation in Punjab is not available. An earlier study revealed that fresh rhizome yield of turmeric (*Curcuma longa* L.) decreased significantly as the age of poplar increases (Gill *et al*. 2004). Keeping this in view, a trial was undertaken at Ludhiana to study the effect of different planting dates and methods on the growth and yield of turmeric in compact poplar plantation.

The poplar (clone *Udai*) plantation was established during March 2004 at 5 m x 4 m spacing at Research Farm, Department of Agronomy, Punjab Agricultural University, Ludhiana (Punjab) in an area of about 0.7 ha. The soil of experimental site was normal with respect to pH and EC, low in organic

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carbon and available nitrogen and medium in available P and K in the plough layer and the contents of these nutrients in soil decreased with increase in depth up to 90 cm of soil profile. The bulk density and particle density increased with increase in depth of plough layer.

Turmeric (var. Rajapuri) was planted in the poplar plantation during first, second and third year of plantation. The treatments consisted of three planting dates of turmeric namely, 20th March, 20th April and 20th May and two methods of planting of turmeric namely, ridge and flat method. The crop could not be planted on 20th March during 2004-05 but was only planted during 10th April since the poplar plantation was established during the last week of March. But during 2005-06 and 2006-07, turmeric was planted as per the treatments. Farmyard manure @ 30 t ha^{-1} was applied at the time of field preparation. The crop was planted both in ridge and flat methods at 60 cm x 10 cm. Two hoeings were given and earthing up was done after each hoeing to keep the crop free from weeds. Turmeric was raised as irrigated crop and the crop was harvested during the first week of February. Plant height, number of leaves plant^{-1}, number of rhizomes plant^{-1} and weight rhizome^{-1} were recorded during harvest. Analysis of variance was done following factorial experiments in RBD with three replications.

Effect of planting date

During 2004-05, the effect of planting dates on fresh rhizome yield of turmeric was significant (Table 1). The 20th April planting date produced fresh rhizome yield of 9.96 t ha^{-1} which was significantly more than that of 20th May planting date (9.45 t ha^{-1}). During 2005-06, each delay in planting date increased the fresh rhizome yield significantly and fresh rhizome yields of 8.15, 11.61 and 13.95 t ha^{-1} were produced in 20th March, 20th April and 20th May planting dates, respectively. During third year, fresh turmeric rhizome yields of 5.60, 6.43 and 6.33 t ha^{-1} were produced in 20th March, 20th April and 20th May planting dates, respectively. The differences in fresh rhizome yield due to 20th May and 20th April planting dates were not significant but both planting dates were significantly better than 20th March planting date. The fresh turmeric yield decreased during the third year in poplar plantation which might be attributed to increased poplar growth with age.

Different planting dates of turmeric in poplar plantation did not influence the growth and yield attributing characters of turmeric (plant height, number of leaves plant^{-1}, number of rhizomes plant^{-1} and weight of rhizome) recorded at harvest during 2004-05 (Table 1). But during 2005-06, plant height increased significantly with each delay in planting and maximum plant height was recorded in turmeric planted on 20th May. The differences in the number of rhizomes plant^{-1} of 20th May (7.9) and 20th April (7.8) were not significant but both treatments were significantly better than 20th March (6.5) planting date of turmeric. A similar trend was observed in the weight of rhizome though the differences were not significant. Different planting dates did not influence significantly the number of leaves plant^{-1}. During 2006-07, plant height increased with each delay in planting date and maximum plant height was recorded in 20th May planting date which was significantly better than 20th March planting date but statistically on par with 20th April planting date. The differences in weight of rhizomes per plant due to 20th May and 20th April planting dates were not significant but both treatments were significantly superior to 20th March planting date. Different planting dates of turmeric did not influence significantly the number of leaves and number of rhizomes plant^{-1}.

Effect of planting method

The effect of planting method of turmeric on fresh rhizome yield in poplar plantation was significant. The ridge method of planting turmeric produced significantly higher yield than flat method of planting. The ridge method of planting produced fresh rhizome yields of 10.08, 11.82 and 6.40 t ha^{-1} as

Table 1. Growth and yield of turmeric as influenced by planting dates and methods in poplar plantation

Treatment	Plant height (cm)	No. of leaves plant^{-1}	No. of rhizomes plant^{-1}	Weight rhizome^{-1}	Fresh yield (t ha^{-1})
			2004-05		
Planting date					
20 April	42.09	10.07	8.35	7.80	9.96
20 May	42.70	10.00	8.61	7.24	9.45
CD (P=0.05)	NS	NS	NS	NS	0.48
Planting method					
Ridge	43.50	10.25	8.22	7.83	10.08
Flat	41.29	9.82	8.74	7.21	9.33
CD (P=0.05)	2.02	NS	NS	NS	0.48
			2005-06		
Planting date					
20 March	81.6	8.5	6.5	18.14	8.15
20 April	92.3	7.8	7.8	15.68	11.61
20 May	110.8	8.5	7.9	16.68	13.95
CD (P=0.05)	6.0	NS	1.1	NS	0.69
Planting method					
Ridge	98.6	8.3	7.7	16.70	11.82
Flat	91.2	8.2	7.1	16.81	10.64
CD (P=0.05)	4.9	NS	NS	NS	0.57
			2006-07		
Planting date					
20 March	39.67	7.8	12.9	3.54	5.60
20 April	42.26	7.7	11.5	4.50	6.43
20 May	47.06	8.1	11.5	4.95	6.33
CD (P=0.05)	5.80	NS	NS	0.95	0.51
Planting method					
Ridge	46.08	8.0	13.2	4.20	6.40
Flat	41.24	7.7	10.7	4.40	5.83
CD (P=0.05)	4.80	NS	1.6	NS	0.42

compared to 9.33, 10.64 and 5.83 t ha^{-1} in flat method of planting during 2004-05, 2005-06 and 2006-07, respectively (Table 1).

The effect of planting method of turmeric on plant height in poplar was significant. The plant height of ridge planted crop was significantly higher than flat planted crop during all the three years of study. A similar trend was recorded in the number of rhizomes plant^{-1} in all the years of study though the differences were significant during 2006-07 only. The number of leaves plant^{-1} was also higher in ridge method of planting than flat method though the differences were not significant. The increased turmeric plant height, higher number of leaves plant^{-1} and more number of rhizomes plant^{-1} in this planting method resulted in higher turmeric yield in ridge method of planting than flat method. The study indicated that turmeric can be grown in poplar plantation up to 3 years though the yield decreases in the third year and crop should be planted on ridges in the third week of April in the first year whereas in the second and third years, it should be planted in the third week of May.

References

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