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Growth and Nutrient Uptake in Turmeric (*Cucurma Longa* L.) Under Different Weed Management Practices

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***Abstract* – A field study in turmeric was conducted at Department of Agronomy, College of Agriculture, O.U.A.T during *kharif*, 2014 with seven weed management treatments including control and was replicated three times in Randomised Block Design. The results revealed that application of Propaquizafop (P) @ 150g ha^{-1} produced significantly the highest fresh and cured rhizome yield of 299.70 and 51.46 q ha^{-1}, respectively with corresponding highest values of leaf area index (1.25), leaf area duration (36.90), rhizome (46.17g plant^{-1}) and root (9.01g plant^{-1}) dry weight, respectively.**

***Keywords* – Root, Rhizome, Turmeric, Yield.**

I. Introduction

Turmeric (*Curcuma longa* L.), an herbaceous perennial plant, belonging to the family Zinziberaceae under the order Scitaminae is one of the most valuable spices all over the world. It is an important commercial spice crop grown in India in an area of 1,49,410 ha with a productivity of 5,27,960 tonnes [1]. Though India leads in production of turmeric with 75% of global production, its average productivity is quite low, mainly due to the competition offered by weeds which reduce yield by 30-75% [2]. Turmeric is being grown during rainy season and is a long duration crop faces a large number of weeds competing for nutrients, moisture and space causing considerable yield reduction[3]. Chemical method of weed control is quite affordable and more effective due weed control from early stage of growth. Proper selection of herbicide is important as its efficiency differs from chemical to chemical. Other methods like hand weeding is also effective than control but costs more due to reduced labour availability and increased labour cost.

II. Materials and Methods

A field experiment was conducted at Agronomy Main Research Farm during *kharif* 2014 at College of Agriculture, Orissa University of Agriculture and Technology. The experiment comprising of seven treatments such as T_1- Propaquizafop (P) @ 50g ha^{-1}, T_2- Propaquizafop (P) @ 62.5 g ha^{-1}, T_3- Propaquizafop (P) @ 100g ha^{-1}, T_4- Propaquizafop (P) @ 150g ha^{-1}, T_5- Femoxaprop @ 100g ha^{-1}, T_6- 2 hand weeding at 25 & and 50 days after planting, T_7- Control was laid in RBD with three replication. The soil of the experimental site was sandy loam in texture with pH 5.96, organic carbon 0.57% and EC of 0.129 dS m^{-1}. The available nitrogen, phosphorus, potassium of the experimental site was 225.7, 39.6, 129.3 kg ha^{-1}, respectively. Turmeric variety Roma was grown at a spacing of 60 cm X 30 cm. Recommended dose of fertilizer 180-90-90 kg N, P_2O_5, K_2O were applied to all the treatments. The entire dose of FYM 10t ha^{-1}, P and 1/3rd K were applied as basal. Nitrogen was applied in 3 split doses at 40, 80 and 120 days after sowing (DAS) whereas, the remaining K applied at 80 and 120 DAS. The herbicides were sprayed as per treatment schedule using spray volume of 500L ha^{-1}.

III. Results and Discussion

A. Leaf Area Index

Leaf area index varied with increase in age up to 150 DAS and then declined thereafter. The treatment with Propaquizafop (P) @ 150g ha^{-1} recorded the highest (1.25) leaf area index which was significantly at par with Propaquizafop (P) @ 100g ha^{-1} (1.21) and femoxaprop @100g ha^{-1} (1.19), the same trend was also seen at harvest. Propaquizafop (P) @ 150g ha^{-1} controlled the weeds at all the stages and thus helps the turmeric crop to grow better with higher leaf expansion, finally resulting in higher values of leaf area index. The reduction in the LAI in turmeric due to weed competition was also observed by the earlier scientists[3].

B. Leaf Area Duration

The leaf area duration (LAD) is the total amount of leaf area present over a particular period of growth. LAD is an important growth parameter that influences competition. LAD values were highest in Propaquizafop (P) @ 150g ha^{-1} followed by the application of Propaquizafop (P) @ 100g ha^{-1} (Table 1). Control plot with no weed control measure recorded the lowest LAD. The use of Propaquizafop (P) @ 150g ha^{-1} was found to be more effective by decreasing crop weed competition and thereby increasing the LAD, particularly at later phases of crop development, which subsequently resulted in higher yield. Earlier workers noticed decreased LAD due to weed competition. Thus, any attempt to increase the LAD values through the use of appropriate herbicides is a feasible approach[4].

C. Weight of Haulms

Propaquizafop applied at 150g ha^{-1} resulted in highest haulms dry weight of 5q.72 q ha^{-1} which was at par with Propaquizafop applied at 100g ha^{-1} and Femoxaprop @ 100g ha^{-1} with corresponding values of 50.00 and 46.67 q ha^{-1} and the lowest dry weight (35.02 q ha^{-1}) was recorded at control

D. Rhizome Yield

Yield is the reflection of all growth and yield attributing character. Significantly the highest fresh rhizome yield was recorded in treatment Propaquizafop applied at 150g

ha^{-1} (299.70 q ha^{-1}). The same treatment also recorded significantly the highest cured rhizome. Significantly the lowest fresh (135.90) and cured rhizome yield (20 q ha^{-1}) was recorded in un-weeded control plot. Weeds grow luxuriantly and compete with the crop and results in decreased yield of rhizome[5]. The reduced yield due to weed impact also in confirmative with the results of earlier workers [1], [6].

E. Nutrient Uptake

Propaquizafop (P) @ 150g ha^{-1} recorded the highest utilization of 187.45 kg N, 29.39 kg P and 228.50 kg K ha^{-1} by rhizome and 88.96 N, 12.41 P and 55.34K kg ha^{-1} by haulms which was at par with Propaquizafop (P) @ 100g ha^{-1} and Femoxaprop @ 100g ha^{-1} with corresponding values of 170.95, 25.39 & 228.50 and 166.93, 25.91 & 203.80 kg ha^{-1}, respectively, while the unweeded control plot resulted in the lowest nutrient uptake.(Table-2) The nutrient uptake by haulms showed similar trend with that of uptake by rhizome. This result was in confirmative with earlier workers [7].

IV. Conclusion

Application of Propaquizafop (P) @ 150g ha^{-1}performed better result which was followed by application of Propaquizafop (P) @ 100g ha^{-1} and Femoxaprop @ 100 g ha^{-1}.

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Table-1 Leaf area index, leaf area duration and yield as influenced by different weed management practices in turmeric

Treatments	Leaf area index			Leaf area duration		Rhizome Yield (q ha^{-1})	
	150 DAS	180 DAS	210 DAS	150-180 DAS	180-210 DAS	Fresh	Dry
T_1 - Propaquizafop (P) @ 50g ha^{-1}	1.1	1.09	1.00	32.85	31.35	243.30	37.50
T_2 - Propaquizafop (P) @ 62.5 g ha^{-1}	1.12	1.1	1.08	33.30	32.70	252.80	42.81
T_3- Propaquizafop (P) @ 100g ha^{-1}	1.21	1.19	1.17	36.00	35.40	272.50	51.49
T_4- Propaquizafop (P) @ 150g ha^{-1}	1.25	1.21	1.20	36.90	36.15	299.70	55.46
T_5 - Femoxaprop @ 100g ha^{-1}	1.19	1.17	1.15	35.40	34.80	265.30	49.83
T_6 - 2 Hand weeding	1.05	1.00	0.90	30.75	28.50	231.10	46.77
T_7 – Control	0.90	0.88	0.80	26.70	25.20	135.90	20.54
SEm+	0.02	0.017	0.018	0.535	0.468	7.007	1.00
CD (p= 0.05)	0.06	0.05	0.055	1.6	1.4	21.59	3.083

Table-2 Weight of rhizome and weight of root and nutrient uptake as influenced by different weed management practices in turmeric

Treatments	Weight of rhizome		Weight of root		Nutrient uptake					
					Rhizome			Haulms		
	Fresh	Dry	Fresh	Dry	N	P	K	N	P	K
T_1 - Propaquizafop (P) @ 50g ha^{-1}	201.30	33.20	313.00	7.23	110.63	16.13	139.50	62.49	8.15	38.94
T_2 - Propaquizafop (P) @ 62.5 g ha^{-1}	222.70	35.60	34.90	7.83	133.14	19.69	165.67	67.45	9.09	42.58
T_3- Propaquizafop (P) @ 100g ha^{-1}	284.23	43.60	46.31	8.83	170.95	25.23	205.96	72.00	10.50	50.50
T_4- Propaquizafop (P) @ 150g ha^{-1}	301.30	46.70	49.17	9.01	187.45	29.39	228.50	88.96	12.41	55.34
T_5 - Femoxaprop @ 100g ha^{-1}	275.10	40.90	41.60	8.71	166.93	25.91	203.80	76.07	10.73	46.20
T_6 - 2 Hand weeding	198.70	38.70	38.43	8.48	98.68	17.30	135.63	49.22	5.29	29.29
T_7 – Control	89.40	14.19	20.18	3.00	22.80	5.34	41.29	33.97	3.50	18.91
SEm+	7.064	1.836	1.690	0.145	6.932	1.405	8.361	5.691	0.645	2.916
CD (p= 0.05)	21.767	5.659	5.207	0.448	20.96	4.16	24.81	16.96	1.91	8.69