Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.4023

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (5):** 649-652 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Nutrient Uptake in Turmeric Crop under Drip and Micro Sprinkler Fertigation and Its Effect on Fresh Rhizome Yield

H. A. Archana[1*] and N. Maragatham[2]

[1]Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore, 641003

[2]Professor and Head, Department of Farm Management, Tamil Nadu Agricultural University

*Corresponding Author E-mail: nancyarchu@gmail.com

Received: 10.06.2017 | Revised: 18.07.2017 | Accepted: 23.07.2017

ABSTRACT

A field experiment was conducted to study the nutrient uptake in turmeric under drip and micro sprinkler fertigation and its effects on fresh rhizome yield during July-February of 2015-16 at Tamil Nadu Agricultural University. The treatments comprised of two micro irrigation systems (drip and micro sprinkler) with three irrigation levels viz., 80, 100 and 120% of evaporation from a Class A Pan evaporimeter and two levels of fertigation viz., 75 and 100% RDF with water soluble fertilizers (WSF) (urea, MAP and MOP). Surface irrigation (5 cm depth) + soil application of fertilizers at 100% RDF was the control. The result indicated that higher turmeric yield was noticed under drip irrigation at 120% PE + fertigation with 100% RDF which is statistically on par with micro sprinkler irrigation at 120% PE + fertigation with 100% RDF. This may be due to maximum uptake of nitrogen, phosphorus and potassium in irrigation at 120% PE + fertigation with 100% RDF in drip and micro sprinkler systems.

Key words: *Nutrient, uptake, evaporation, turmeric, yield*

INTRODUCTION

Turmeric is a highly input responsive crop. Its extended crop growth period and nutrient exhaustion requires sufficient amount of nutrients and irrigation to produce higher yields with improved quality. Response of turmeric to increased levels of fertilizers has been significant[1]. Balanced nutritionwith efficient irrigation method and their interaction may ensure good crop growth and yield. Information on combined effect of irrigation and nutrient levels on uptake of nitrogen, phosphorus and potassium is scarce. Hence, an experiment was conducted to study the nutrient uptake in turmeric under drip and micro sprinkler fertigation and its effects on fresh rhizome yield during 2015-16.

MATERIAL AND METHODS

A field experiment was conducted during 2015 - 2016 at Tamil Nadu Agricultural University, Coimbatore to assess nutrient uptake in turmeric under drip and micro sprinkler fertigation and its effect on fresh rhizome yield.

Cite this article: Archana, H.A. and Maragatham, N., Nutrient uptake in turmeric crop under drip and micro sprinkler fertigation and its effect on fresh rhizome yield, *Int. J. Pure App. Biosci.* **5(5):** 649-652 (2017). doi: http://dx.doi.org/10.18782/2320-7051.4023

The site of the experiment is situated at 11°83' N latitude and 76°71'E longitude at an elevation of 426.7 m above mean sea level (MSL). The experiment was laid out in randomised block design with three replications. During turmeric crop growing period, a total rainfall of 307.07 mm in 22 rainy days was received. The monthly mean maximum pan evaporation of 6.90 mm was observed during September month.The details of the treatments were as follows,

T_1 : DI at 120% PE + fertigation with WSF at 100% RDF
T_2 : DI at 120% PE + fertigation with WSF at 75% RDF
T_3 : DI at 100% PE + fertigation with WSF at 100% RDF
T_4 : DI at 100% PE + fertigation with WSF at 75% RDF
T_5 : DI at 80% PE + fertigation with WSF at 100% RDF
T_6 : DI at 80% PE + fertigation with WSF at 75% RDF
T_7 : MSI at 120% PE + fertigation with WSF at 100% RDF
T_8 : MSI at 120% PE + fertigation with WSF at 75% RDF
T_9 : MSI at 100% PE + fertigation with WSF at 100% RDF
T_{10} : MSI at 100% PE + fertigation with WSF at 75% RDF
T_{11} : MSI at 80% PE + fertigation with WSF at 100% RDF
T_{12} : MSI at 80% PE + fertigation with WSF at 75% RDF
T_{13} : Surface irrigation (5 cm depth) + soil application of fertilizers at 100% RDF

DI - Drip irrigation NF - Normal fertilizers WSF - Water soluble fertilizers
PE - Pan evaporation DAP - Days after planting MSI - Micro sprinkler irrigation
RDF - Recommended Dose of Fertilizers = 150:60:108 N: P_2O_5: K_2O kg/ha

Turmeric leaf samples were collected at 120 and 180 days after planting and at harvest stages dried at 55°C for 6-8 hours in a hot air oven. The third youngest leaf was taken randomly from ten plants in each plot as standard leaf for nutrient estimation. The leaf nutrient content *viz.*, nitrogen content[2], phosphorus content and potassium content[3] were estimated from the turmeric leaves and nutrient uptake was obtained by multiplying nutrient concentration with dry matter accumulation. The data collected were subjected to statistical analysis following a standard procedure[4].

RESULTS AND DISCUSSION

Irrigation and fertigation levels under drip and micro sprinkler systems showed significant influence on the uptake of nitrogen, phosphorus and potassium in turmeric crop at all the stages of the crop. Nutrient uptake data are furnished in Table 1.

Table 1: Effect of drip and micro sprinkler fertigation on nitrogen uptake in turmeric

	Nitrogen uptake (kg ha^{-1})			Phosphorus uptake (kg ha^{-1})			Potassium uptake (kg ha^{-1})		
	120 DAP	180 DAP	At harvest	120 DAP	180 DAP	At harvest	120 DAP	180 DAP	At harvest
T_1	60.86	78.82	62.45	9.76	12.50	9.69	52.82	71.13	60.30
T_2	47.33	66.85	50.65	7.59	10.60	7.86	41.07	60.32	48.90
T_3	57.49	74.32	57.37	9.22	11.78	8.90	49.89	67.07	55.39
T_4	45.10	64.44	48.68	7.23	10.22	7.55	39.14	58.16	47.01
T_5	50.19	68.11	51.71	8.05	10.80	8.02	43.56	61.46	49.93
T_6	38.97	55.89	42.43	6.25	8.86	6.58	33.82	50.44	40.97
T_7	60.08	78.63	61.78	9.64	12.47	9.59	52.14	70.96	59.65
T_8	46.64	66.53	49.99	7.48	10.55	7.76	40.48	60.04	48.27
T_9	57.39	74.24	56.93	9.20	11.77	8.83	49.81	66.99	54.97
T_{10}	44.77	64.03	48.20	7.18	10.15	7.48	38.86	57.78	46.54
T_{11}	49.70	67.98	51.53	7.97	10.78	8.00	43.13	61.35	49.75
T_{12}	38.82	55.57	42.36	6.23	8.81	6.57	33.69	50.14	40.90
T_{13}	39.17	56.69	42.54	6.28	8.99	6.60	33.99	51.16	41.08
SEd	2.58	2.76	2.20	0.41	0.44	0.34	2.24	2.49	2.12
CD (P=0.05)	5.33	5.69	4.54	0.86	0.90	0.70	4.63	5.14	4.38

Nitrogen uptake

Nitrogen uptake by turmeric was maximum under drip irrigation at 120% PE with fertigation at 100% RDF as WSF (T_1) at all the stages of the crop. This was comparable with micro sprinkler irrigation at 120% PE with fertigation at 100% RDF as WSF (T_1). Turmeric crop registered higher uptake of nitrogen in its growth period during 180 DAP. Significant lower nitrogen uptake was recorded in surface irrigation (5 cm depth) at 0.8 IW/ CPE ratio with soil application at 100% RDF as normal fertilizer (T_{13}) compared to T_1 and T_7. Higher doses of nitrogen played role in synthesis of protein which is important for buildup of new cells and consequently influenced the total dry matter production[5].

Phosphorus uptake

There was a steady increase in phosphorus uptake up to 180 DAP which thereafter declined. Higher phosphorus uptake was observed under fertigation at 125% RDF with drip system with irrigation at 125% PE (T_1) at all the stages of the crop. However, it was on par with micro sprinkler irrigation at 100% PE with fertigation at 100% RDF (T_7). Values recorded under surface irrigation shows significantly lower nitrogen uptake at all the stages of the crop. There were 31.89 and 31.17% increased phosphorous uptake noticed under drip and micro sprinkler fertigation with 125% PE with 100% RDF, respectively over surface irrigation.

Potassium uptake

Potassium uptake by turmeric was influenced by irrigation and fertilizer levels under drip and micro sprinkler system. The results showed that there was an increment in potassium uptake from 60 to 180 DAP at all the treatments which thereafter decreased. Total uptake of potassium was maximum under drip irrigation at 120% PE with 100% RDF (T_1). This was on par with micro sprinkler irrigation at 120% PE with 100% RDF (T_7). Compared to T_1 and T_7 significantly lower potassium uptake was estimated in surface irrigation with soil applied fertilizes at all the stages.

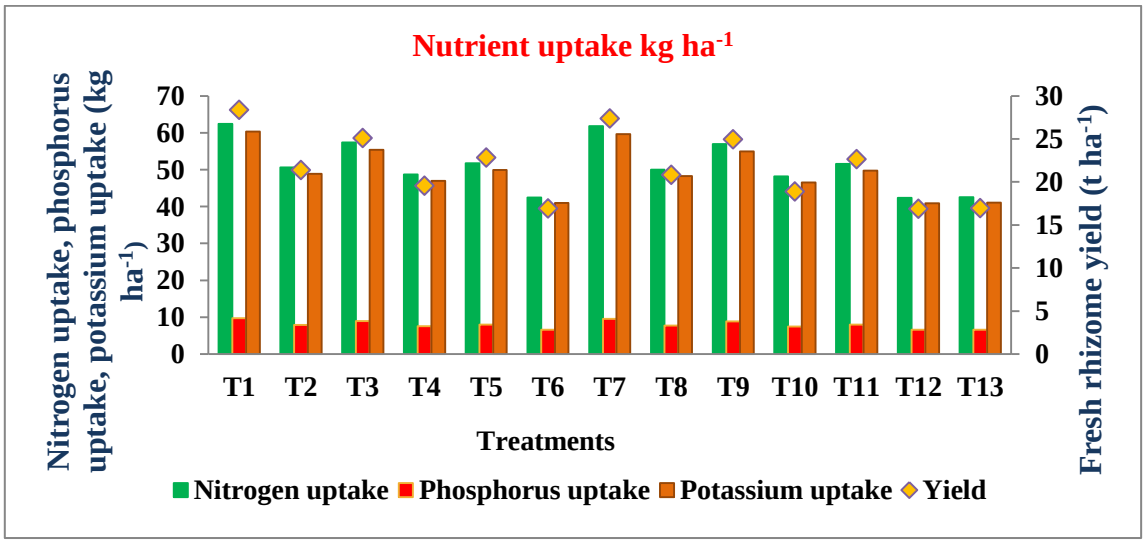

Fig. 1: Nutrient uptake in turmeric under drip and micro sprinkler fertigation and its effects on fresh rhizome yield

Nutrient uptake on yield

Increased level nitrogen along with phosphorus and potassium uptake contributed to the improved growth. Higher fresh rhizome yield (28.37 t ha^{-1}) was attained under drip irrigation with 120% PE+ fertigation with 100% RDF. This was comparable with micro sprinkler irrigation at 120% PE with 100% RDF (T_7) (27.37 t ha^{-1}). The uptake of nitrogen, phosphorus and potassium was significantly increased with higher rate of application. Higher uptake of nutrients was attributed to better availability of nutrients which was reflected in better growth and

rhizome yield[6]. Response of turmeric to increased levels of fertilizers has been significant[7]. Unlike surface irrigation and conventional fertilizer application, fertigation results in uniform distribution of nutrient solution in the root zone, thereby increasing the fertilizer use efficiency, since the uptake of nutrients by the plant roots depends on their availability in the root system[8]. It also enhanced the overall root activity, improved the mobility of nutritive elements and their uptake.

CONCLUSION

The results of the present study clearly indicated that maximum uptake of nitrogen, phosphorus and potassium were noticed under drip irrigation at 120% PE + fertigation with WSF at 100% RDF which significantly increase the yield of turmeric crop compared to surface irrigation.

REFERENCES

1. Parthasarathy, V.A., Dinesh, R., Srinivasan, V. and Hamza, S., Integrated nutrient management in major spices. *Indian J. Fert.*, **6:** 110-128 (2010).
2. Humphries, K.C., Mineral components and analysis. In: Modern methods of plant analysis (Eds: Paech, Kt and M.O.Tracy). *Springer Verlag*., pp. 468-502 (1956).
3. Jackson, M.L., Soil chemical analysis. Prentice Hall of India Private Ltd., New Delhi. 2 Ed. Indian Reprint (1973).
4. Panse, V.G., and Sukhatme, P.V., Statistical methods for agriculture workers. Indian Council of Agricultural Research,New Delhi, pp. 155(1985).
5. Sunil A.S., and Angadi, S.S., Response of turmeric (*Curcuma longa* L.) varieties to irrigation methods and graded levels of fertilizer Sunil. Res. *Environ. Life Sci.*, **7(4)**: 237- 242 (2014).
6. Ajithkumar, K., and Jayachandran, B.K., Effect of major nutrients on yield of ginger (*Zingiber officinale* Rose.) intercropped in coconut garden. *J. Spices and Aromatic Crops*, **10(1):** 17-23(2001).
7. Aulakh, M.S., and Malhi, S.S., Interactions of nitrogen with other nutrients and water: effect in crop yield and quality, nutrient use efficiency, carbon sequestration and environmental pollution. *Adv. Agron.*, **86:** 341-409 (2005).
8. Rao, C.S., Fertigation- Applying fertilizers through drip irrigation systems. In: Proceedings of all India seminar on modern irrigation techniques, Bangalore, Karnataka, India (1996).