Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.5883

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (6):** 496-500 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Nutrient Uptake of Maize and Its Associated Weeds As Influenced by Sequential Application of Herbicides

Shaik Nazreen[1]*, D. Subramanyam[1], N. Sunitha[2] and V. Umamahesh[3]

[1]Department of Agronomy, S.V. Agricultural College, Tirupati, ANGRAU, 517 502

[2]Department of Agronomy, Regional Agricultural Research Station, Tirupati, ANGRAU

[3]Department of Crop Physiology, S.V. Agricultural College, Tirupati, ANGRAU, 517 502

*Corresponding Author E-mail: nazreennaz57@gmail.com

Received: 12.10.2017 | Revised: 16.11.2017 | Accepted: 21.11.2017

ABSTRACT

An experiment was carried out during the kharif season of 2016 at Tiruapti with 10 weed management practices to study the nutrient depletion patterns by kharif maize (Zea mays L.) and associated weeds. Amongst the weed management practices, nutrient depletion by weeds was minimum under hand weeding and maximum (34.22 kg N, 13.67 kg P_2O_5 and 16.17 kg K_2O/ha) in weedy condition, whereas total nutrient uptake by kharif maize was maximum (166.6 kg N, 63.5 kg, P_2O_5 and 191.7 kg K_2O/ha) under the treatment pre-emergence application of alachlor 1000 g/ha fb post-emergence application of halosulfuron-methyl 67.5 g/ha + tembotrione 100 g/ha followed by hand-weeding (165.3 kg N, 62.2 kg P_2O_5 and 118.2 kg, K_2O/ha). The nutrient uptake by crop in weedy condition was least. Chemical weeding checked nutrient drain by weeds significantly compared with weedy check. The reduction in yield due to weeds in unweeded check was 53.62 per cent.

Key words: *Maize, Nutrient uptake, Pre-emergence, Post-emergence, Weed management practices.*

INTRODUCTION

Maize (*Zea mays* L.) is the most widely cultivated cereal crop after rice and wheat in India. Maize is predominantly a rainy season (*Kharif*) crop that constitutes 85% of total maize area in the country. The area under maize cultivation is 9.18 m ha in 2014-15 with productivity, 2.63 t/ha (www.indiastat.com). Maize is sensitive to weeds which occur at 25 to 30 days of crop and severe competition for valuable resources like soil, water, nutrients, solar radiation, thus lowering the productivity of maize. Nutrients are inputs and their drain through weeds can be checked by weed management approach. Weed management in maize needs concentrated efforts to provide weed free environment to the crop. At present pre-emergence herbicides especially Atrazine used continuously for control of weeds in maize.

Cite this article: Nazreen, S., Subramanyam, D., Sunitha, N. and Umamahesh,V., Nutrient Uptake of Maize and Its Associated Weeds As Influenced by Sequential Application Of Herbicides, *Int. J. Pure App. Biosci.* **5(6):** 496-500 (2017). doi: http://dx.doi.org/10.18782/2320-7051.5883

Thus, farmers are in need of post-emergence herbicides for effective control of weeds which occur at 25 to 30 days of crop. The development of wide spectrum herbicide in the recent past has opened up excellent opportunities for chemical weed control. A very few studies have been carried out to quantify the nutrient losses by weeds in winter maize. Keeping this in view, present investigation was carried out to study the effect of pre, post, sequential and combination of pre- and post-emergence herbicides on nutrient losses in *kharif* maize.

MATERIALS AND METHODS

A field experiment was conducted on maize during *kharif,* 2016 at Wetland Farm of S.V. Agricultural College, Tirupati, Andhra Pradesh. The experimental field was heavily infested with mixed flora of sedge, grasses and broad-leaved weeds, *viz. Digitaria sanguinalis* L., *Cyperus rotundus* L., *Boerhavia erecta* L., *Borreria hispida* L., *Trichodesma indicum* L., *Phyllanthus niruri* L., *Digera arvensis* L., *Commelina benghalensis* L., *Cleome viscose* L., *Euphorbia hirta* L. and *Celosia argentea* L. The soil of the experimental field was sandy loam in texture, neutral in reaction (pH 7.4), low in organic carbon (0.25 %), available N (240 kg) but medium in available phosphorus (25.5 kg) and available potassium (285 kg/ha). Ten treatments, *viz.* pre-emergence application of alachlor 1000 g/ha (W_1), post-emergence application of halosulfuron-methyl 67.5 g/ha (W_2), post-emergence application of tembotrione 100 g/ha (W_3), post-emergence application of halosulfuron-methyl g/ha + tembotrione 100 g/ha (W_4), pre-emergence application of alachlor 1000 g/ha + post-emergence application of halosulfuron-methyl 67.5 g/ha (W_5), pre-emergence application of alachlor 1000 g/ha + post-emergence application of tembotrione 100 g/ha (W_6), pre-emergence application of alachlor 1000 g/ha *fb* post-emergence application of halosulfuron-methyl 67.5 g/ha + tembotrione 100 g/ha (W_7), pre-emergence application of atrazine 1000 g/ha + post-emergence application of 2,4-D sodium salt 800 g/ha (W_8), two hand weedings at 20 and 40 DAS (W_9) and unweeded control (W_{10}). These treatments were laid out in randomized block design at 5 % level of significance with three replications. Recommended dose of 200 kg N, 60 kg P_2O_5 and 50 kg K_2O/ha was applied to the crop. Alachlor and atrazine as pre-emergence, 2,4-D sodium salt, halosulfuron-methyl and tembotrione as post-emergence were applied as per treatment. Herbicides were applied by using knap sack sprayer with flat fan nozzle. Weed free treatment was achieved by repeated hand weedings. Randomly five plants were selected from each plot and biometric observations of crop and weed parameters were recorded at periodic intervals. Weed density and dry weight were recorded with a quadrate of 0.25 m^2. Nutrients were estimated using the standard procedures *i.e.* Micro kjeldhal method for Nitrogen, Vando molybdo phosphoric yellow colour method for Phosphorus and Flame photometer method for estimation of Potassium

RESULTS AND DISCUSSIONS

Nutrient uptake by crop

All the weed management practices recorded significant increase in N, P and K uptake by crop (Table 1). The highest nutrient uptake was obtained with pre-emergence application of alachlor 1000 g/ha *fb* post-emergence application of halosulfuron-methyl 67.5 g/ha + tembotrione 100 g/ha, followed by with two hand weedings at 20 and 40 DAS (Fig 1). This might be due to higher crop dry matter accumulation and higher nutrient uptake in corresponding treatments because of reduced competition for nutrient uptake. The nutrient uptake by crop and associated weeds follow an inverse relationship grown in a community. These results are in accordance with the findings of Umesha *et al*[9] .The lowest nutrient uptake *i.e.* nitrogen, phosphorus and potassium by crop was recorded with unweeded check due to poor dry matter production of crop and reduced nutrient uptake as a result of heavy weed competition. These results are in conformity with the findings of *Sinha et al*[7].

Table 1: Effect of sequential application of pre- and post-emergence herbicides on nutrient uptake of maize and its associated weeds

Treatment	Dose (g/ha)	Time of application	Dry matter production (kg/ha)	Nutrient uptake by crop (kg/ha)			Dry weight of weeds (g/m^2)	Nutrient uptake by weeds (kg/ha)			Grain yield (kg/ha)	Net returns (₹/ha)	Benefit-cost ratio
				N	P	K		N	P	K			
Alachlor	1000	1 DAS	9181	106.7	41.3	95.8	117.61 (10.87)	10.53	6.70	7.44	3494	35023	2.34
Halosulfuron-methyl	67.5	20 DAS	7822	67.9	47.4	60.6	110.17 (10.52)	14.80	7.30	7.94	2954	21133	1.69
Tembotrione	100	20 DAS	8626	83.3	37.6	82.3	132.95 (11.55)	15.26	7.53	7.15	3328	29329	2.01
Halosulfuron-methyl + tembotrione (Tank mix)	67.5+100	20 DAS	10025	98.2	52.0	77.7	41.08 (6.45)	3.97	2.42	2.60	3839	32574	1.94
Alachlor *fb* halosulfuron-methyl	1000+67.5	1+20 DAS	10751	140.7	56.2	101.8	32.28 (5.73)	2.44	2.07	2.24	4186	40795	2.26
Alachlor *fb* tembotrione	1000+100	1+20 DAS	11086	152.4	46.6	100.9	71.74 (8.50)	6.22	4.00	3.47	4312	44657	2.46
Alachlor *fb* halosulfuron-methyl+ tembotrione (Tank mix)	1000+67.5+ 100	1+20 DAS	12398	166.6	63.5	191.7	18.71 (4.38)	1.15	0.79	0.81	4863	48572	2.34
Atrazine *fb* 2,4-D Sodium salt	1000+800	1+20 DAS	10422	138.5	53.8	100.2	45.81 (6.81)	3.33	2.76	2.80	4054	44183	2.66
Two hand weedings	-	20 and 40 DAS	11691	165.3	62.2	118.2	11.86 (3.52)	0.83	0.64	0.70	4554	47044	2.46
Unweeded check	-	-	6526	64.0	32.5	52.5	235.05 (15.35)	34.22	13.67	16.17	2255	15440	1.62
CD(P=0.05)													

Figures in parenthesis indicates square root transformed ($\sqrt{X+0.5}$) values

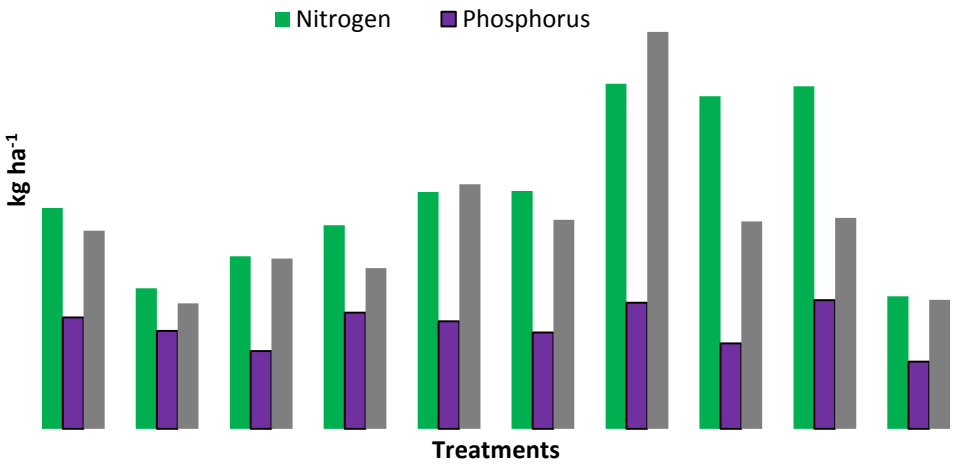

Fig. 1: Uptake of nitrogen, phosphorus and potassium (kg/ha) by maize as influenced by different weed management practices

Nutrient uptake by weeds

Uptake of N, P and K by weeds followed the trend of weed biomass. Lower uptake of nitrogen, phosphorus and potassium by weeds at harvest was recorded with two hand weedings at 20 and 40 DAS (Fig 2) due to effective control of all the categories of weeds, which inturn reduced the accumulation of dry matter in weeds. Pre-emergence application of alachlor *fb* post-emergence application of halosulfuron-methyl + tembotrione was very effective in controlling all the categories of weeds during the entire crop growth period leading to reduced weed dry matter production. These results are in accordance with the findings of Sanjay *et at*[6] and Yakadri *et al*[10]. Heavy weed infestation in unweeded check resulted in increased uptake of nitrogen, phosphorus and potassium by weeds was 34.22, 13.67 and 16.17 kg/ha, respectively.

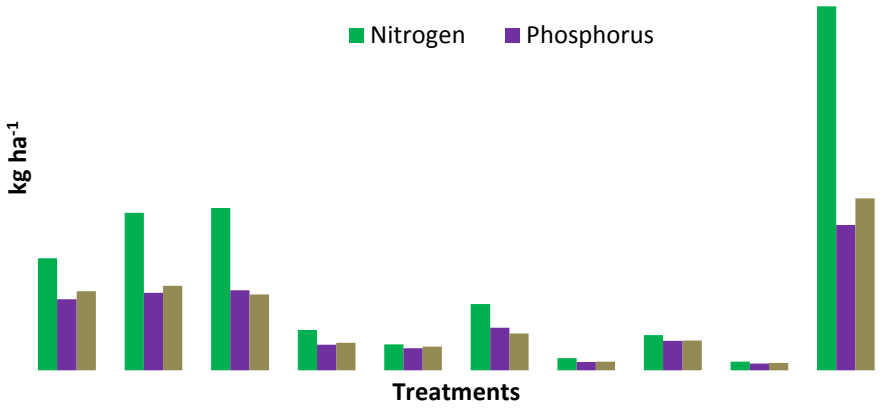

Fig. 2: Uptake of nitrogen, phosphorus and potassium (kg/ha) by weeds in maize as influenced by sequential application of herbicides

It was concluded that all weed management practices were equally effective in controlling weeds and improving nutrient availability to maize crop. Pre-emergence application of alachlor 1000 g/ha *fb* post-emergence application of halosulfuron-methyl 67.5 g/ha + tembotrione 100 g/ha recorded maximum crop dry matter production and grain yield followed by two hand weedings. Lower weed dry matter was achieved with hand weeding twice at 20 and 40 DAS. Because of higher cost of herbicides even though pre-emergence application of alachlor 1000 g/ha *fb* post-emergence application of halosulfuron-methyl 67.5 g/ha + tembotrione 100 g/ha recorded maximum net returns, pre-emergence application of atrazine 1000 g/ha *fb* post-emergence application of 2,4-D Sodium salt 800 g/ha obtained highest benefit-cost ratio.

SUMMARY

A field experiment was conducted to study the nutrient uptake of maize and its associated weeds as influenced by sequential application of herbicides during *kharif* 2016 at Tiruapti, Andhra Pradesh. The highest total uptake of N (166.6 kg), P (63.5 kg) and K (191.7 kg/ha) by crop was recorded with pre-emergence application of alachlor 1000 g/ha *fb* post-emergence application of halosulfuron-methyl 67.5 g/ha + tembotrione 100 g/ha (Tank mix), while lowest uptake of total N (0.83 kg), P (0.64 kg) and K (0.70 kg/ha) by weeds was recorded under two hand weedings. The nutrient uptake by weeds in unweed check was 34.22 kg N, 13.67 kg P_2O_5 and 16.17 kg/ha of K_2O. Weed biomass was reduced significantly with two hand weedings at 20 and 40 DAS.

It was concluded that the treatment with pre-emergence application of alachlor 1000 g/ha *fb* post-emergence application of halosulfuron-methyl 67.5 g/ha + tembotrione 100 g/ha can keep the weed density and dry weight below the economic threshold level and increase the nutrient availability and productivity of maize under irrigated conditions.

REFERENCES

1. Alok Malviya, Nupur Malviya, Bhuwan Singh and Ashok Singh, K. .Integrated weed management in maize (*Zea mays*) under rainfed conditions. *Indian Journal of Dryland Agricultural Research and Development*. **27(1):** 70-73 (2012).
2. Birendra Kumar, Ranvir Kumar, Suman Kalyani and Mizzanul Haque. Integrated weed management studies on weed flora and yield in *kharif* maize. *Trends in Biosciences.* **6(2):** 161-164 (2013).
3. Kamaiah, I., Aravinda Kumar, B.N., Geeta, G.S and Ramesh Babu. Effect of tank mixture herbicides on phytotoxicity, soil dehydrogenase activity and nutrient uptake by weeds in maize (*Zea mays* L.) *Trends in Biosciences*. **7(14):** 1839-1842 (2014).

4. Mahadi, M.A. Growth, nutrient uptake and yield of maize (*Zea mays* L.) as influenced by weed control and poultry manure.*International Journal of Science and Nature*. **5(1):** 94-102 (2014).
5. ParamjeetKour, Anil Kumar, Sharma, B.C., RanjeetKour and Neetu Sharma.Nutrient uptake as influenced by weed management in winter maize + potato intercropping system. *Indian Journal of Weed Science*. **46(4):** 336-341 (2014).
6. Sanjey, D.K., Shrivastava, G.K., Singh, A.P and Kolhe S.S. Weed population, nitrogen removal by weeds and crop yield under maize+blackgram intercropping system in Chhattisgarh plains.*Indian Journal of Weed Science*. **43(3&4):** 203-210 (2011).
7. Sinha, S.P., Prasad, S.M and Singh, S.J. Nutrient utilization by winter maize (*Zea mays* L.) and weeds as influenced by integrated weed management. *Indian Journal of Agronomy*. **50(4):** 303-304 (2005).
8. Sonawane, R.K., Dandge, M.S., Kamble, A.S and Shingrup, P.V. Effect of herbicides on nutrient uptake and yield of *kharif* maize (*Zea mays* L.). *Bioinfolet*. **11(1A):** 136-138 (2014).
9. Umesha, C., Sridhara, S and Aswini. Effect of pre and post emergent herbicides on growth, yield parameters and weed control efficiency in maize (*Zea mays* L.). *Trends in Biosciences*. **8(10):** 2468-2474 (2015).
10. Yakadri, M., Leela Rani, P., Ram Prakash, T., Madhavi, M and Mahesh, N. Weed management in zero till-maize.*Indian Journal of Weed Science*. **47(3):** 240-245 (2015).