e-planet **20** (2): 129-132 (December 2022)

Effect of weed management practices in maize on yield, quality and soil nutrients under south Gujarat conditions

J. ALI*, L. J. DESAI, J. SHIRZAD AND A. SHARIFI

Department of Agronomy, Faculty of Agriculture, Bamiyan University, Afghanistan.

**javidali.ehsas@gmail.com*

Date of Receipt: 09.02.2022 Date of Acceptance: 12.09.2022

ABSTRACT

The field research was conducted during summer 2015 at the College Farm, Navsari Agricultural University, Navsari on clayey soil. There were ten treatments, involving two pre-emergences, three tank mixtures, one post-emergence, one soil mulching, one sugarcane trash mulching, and weed free and weedy check evaluated in randomized block design with three replications. Significantly higher grain and straw yield were registered under weed free condition, which was statistically at par with atrazine @ 0.75 kg ha^{-1} + pendimethalin @ 0.75 kg ha^{-1} as PE, alachlor @ 1.5 kg ha^{-1} + atrazine @ 0.5 kg ha^{-1} as PE, atrazine @ 0.75 kg ha^{-1} + 2.4 D 0.5 @ kg ha^{-1} as PE, atrazine @ 0.75 kg ha^{-1} as PE and atrazine as PoE @ 1.5 kg ha^{-1} at 30 DAS, while weed control through sugarcane trash mulch @ 5 t ha^{-1} and alachlor @ 1.5 kg ha^{-1} PE were also at par in case of straw yield. Weed management failed to exert its significant effects on protein content (%). Weed free produced significantly higher protein yield. Available nitrogen and phosphorus were recorded significantly higher values under weed free condition, which was statistically at par with weed control carried out through sugarcane trash mulch @ 5 t ha^{-1} followed by interculturing at 30 and 45 DAS followed by HW and atrazine @ 0.75 kg ha^{-1} + pendimethalin @ 0.75 kg ha^{-1}, PE while available K_2O failed to exert its significant influence due to weed management. Weed free condition because of effective weed management strategy is important for achieving the soil quality and production traits.

Key words: Available nutrients, quality, soil mulch, tank mixture, yield

INTRODUCTION

Maize (*Zea mays* L.) is the staple food and plays an important role in the economy of India and other countries. Beside its use for human food, it is a source for number of industrial products like animal feed, maize corn starch, corn oil, baby corn and popcorn etc. In India, maize is grown over an area of 9.34 million ha with an annual production of about 24.35 million tons and an average productivity of about 2583 kg ha^{-1}. Maize crop occupies an area of 461 hectares with a production of 692 tons and productivity of 1501 kg ha^{-1} (IIMR, 2014). Grain yield in maize can be severely reduced by competition with weeds (Najafi and Tollenaar, 2005). Managing for increased competitive ability of crops with weeds is an important component of integrated weed management systems (Mohler, 2001). Today, high-yielding agriculture heavily depends on herbicides, as they constitute a vital and integral component of weed management practices (Baghestani et al., 2005). However, there are very few herbicide options available for weed control in maize. The infestation of these weeds is increasing day by day in the maize-growing areas of the state especially where the farmers are using atrazine year after year. So, to widen the weed control spectrum, it

is imperative to use combination of herbicides having different mode of action (Manjith Kumar and Angadi, 2014; Ehsas et al., 2019; Prasad et al., 2019). Therefore, tank-mix combinations of herbicides, pre and post emergence herbicides were tried in the present investigation to study the effects of different weed management strategies on the yield and quality of maize.

MATERIALS AND METHODS

The field research was carried out during summer 2015 at the College Farm, Navsari Agricultural University, Navsari on clayey soil having a pH 7.98 and poor in available nitrogen (230 kg ha^{-1}), medium in available phosphorus (38 kg ha^{-1}) and considerably rich in available potash (379 kg ha^{-1}). Ten treatments comprising of weed management practices viz., weedy check, weed free, interculturing at 30 and 45 DAS followed by hand weeding, sugarcane trash mulch @ 5 t ha^{-1}, alachlor @ 1.5 kg ha^{-1} PE, atrazine @ 0.75 kg ha^{-1} PE, alachlor @ 1.5 kg ha^{-1} + atrazine @ 0.5 kg ha^{-1} PE, atrazine @ 0.75 kg ha^{-1} + pendimethalin @ 0.75 kg ha^{-1} PE, atrazine @ 0.75 kg ha^{-1} + 2.4 D @ 0.5 kg ha^{-1} PE, atrazine @ 1.5 kg ha^{-1}, PoE 30 DAS were evaluated in randomized block design with three replications. Gujarat Maize 6 was sown during second week of February keeping row to row spacing of 60 cm and plant to plant spacing of 20 cm (15 kg ha^{-1} seed rate). The crop was harvested in the second week of May. The crop was fertilized with 120 kg N and 60 kg P_2O_5 through urea and single super phosphate, respectively. The required quantity of half N and whole P_2O_5 was drilled at the time of sowing. The remaining half N was band placed in two equal splits at knee high and tasseling stages. Herbicides were applied as per treatment with backpack power sprayer using 600-liter water per hectare. Pre-emergence application of herbicides was made within 24 hours of sowing. Post-emergence application was made on the emergence of broadleaf weeds at 30 DAS. Weed counts and dry weight were recorded at two spots using a quadrate. Yields were harvested from net plot. Economics of the treatments was computed based upon prevalent prices. Keeping all these aspects in view, an attempt was made to find out the economical and effective herbicides weed management in maize under south Gujarat condition.

RESULTS AND DISCUSSION

Effect on yield

The grain and straw yield (kg ha^{-1}) were significantly influenced by different weed management treatments. Significantly higher grain and straw yield were registered under weed free treatment (6566 and 8135 kg ha^{-1}, respectively), which was statistically at par with atrazine @ 0.75 kg ha^{-1} + pendimethalin @ 0.75 kg ha^{-1} (6267 and 7921 kg ha^{-1}) as PE, alachlor @ 1.5 kg ha^{-1} + atrazine @ 0.5 kg ha^{-1} (5918 and 7316 kg ha^{-1}) as PE, atrazine @ 0.75 kg ha^{-1} + 2.4 D 0.5 @ kg ha^{-1} (5820 and 7276 kg ha^{-1}) as PE, atrazine @ 0.75 kg ha^{-1} (5680 and 6856 kg ha^{-1}) as PE and atrazine as PoE @ 1.5 kg ha^{-1} at 30 DAS (5619 and 6819 kg ha^{-1}), while weed control through sugarcane trash mulch @ 5 t ha^{-1} and alachlor @ 1.5 kg ha^{-1} PE were also at par in case of straw yield. Among herbicide treatment, T8 recorded significantly higher with grain yield (6267 kg ha^{-1}) followed by T7 and T9. The lowest grain and straw yield (3505 and 5526 kg ha^{-1}, respectively) were recorded under weedy check (T1). The better performance of yield under weed free condition might be due to effective control of weeds and higher weed control efficiency as well as lower weed index observed, which cumulatively facilitated the crop to utilize more nutrients and water for better growth and development in terms of various yield attributing characters. These findings corroborate the results of Mathukia et al. (2014), Dobariya et al. (2015), Samant et al. (2015) and Ehsas et al. (2019) in maize.

Effect on quality

Significant enhancement in protein content and protein yield of maize was obtained under weed free treatment as compared to weedy check. Weed management in maize failed to exert its significant effects on protein content (%), but the minimum protein content (9.75%) with alachlor @ 1.5 kg ha^{-1} + Atrazine @ 0.5 kg ha^{-1} PE, while the maximum under atrazine @ 0.75 kg ha^{-1} + pendimethalin @ 0.75 kg ha^{-1} PE (Table 1).

Table 1. Yield, protein content, protein yield and soil available nutrients as influenced by weed management in maize

	Treatments	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Protein content (%)	Protein yield (kg ha^{-1})	Available nitrogen (kg ha^{-1})	Available phosphorus (kg ha^{-1})	Available potassium (kg ha^{-1})
T1	Weedy check	3505	5526	327.6	171.3	29.4	267.8	327.6
T2	Weed free	6566	8135	660.3	205.7	34.1	349.4	660.3
T3	Weed control through soil mulch (Interculturing at 30 and 45 DAS followed by HW)	5228	5910	517.2	189.4	32.4	334.6	517.2
T4	Weed control through sugarcane trash mulch @ 5 t ha^{-1}	5513	6752	549.6	198.6	33.7	345.9	549.6
T5	Pre-emergence application of Alachlor @ 1.5 kg ha^{-1}	5460	6536	541.3	183.1	29.9	328.0	541.3
T6	Pre-emergence application of Atrazine @ (0.75 kg ha^{-1})	5680	6856	561.3	176.3	30.0	317.4	561.3
T7	Pre-emergence application of Alachlor @ 1.5 kg ha^{-1} + Atrazine @ 0.5 kg ha^{-1}	5918	7316	577.3	186.3	29.5	328.6	577.3
T8	Pre-emergence application of Atrazine @ 0.75 kg ha^{-1} + Pendimethalin @ 0.75 kg ha^{-1}	6267	7921	626.5	189.4	32.0	330.8	626.5
T9	Pre-emergence application of Atrazine @ 0.75 kg ha^{-1} + 2.4 D 0.5 @ kg ha^{-1}	5820	7276	577.6	185.0	29.4	327.2	577.6
T10	Post emergence application of Atrazine@ 1.5 kg ha^{-1}, 30 DAS	5619	6819	549.2	180.8	30.1	323.8	549.2
	S.Em. ±	312.3	505.7	33.48	5.45	1.08	18.26	33.48
	C.D at 5 %	999.1	1617.7	107.1	17.4	3.5	NS	107.1
	C.V. %	9.73	12.68	10.57	5.06	6.05	9.72	10.57

Weed free produced significantly maximum protein yield (660.3 kg ha^{-1}), which was statistically at par with treatment T8, T9, T7 and T6 with the protein yield of 626.5, 577.6, 577.3 and 561.3 kg ha^{-1}, respectively. This could be due to higher uptake of nitrogen consequent to higher mineralization of soil nitrogen. The result confirms the findings of Patel et al. (2006) and Yeganehpoor et al. (2013) in maize.

Effect on soil nutrients

After harvest of crop, available nitrogen and phosphorus were recorded the maximum values under weed free conditions (205.7 and 34.1 kg ha^{-1}), which was statistically at par with weed control carried out through sugarcane trash mulch@ 5 t ha^{-1} followed by interculturing at 30 and 45 DAS followed by HW and atrazine @ 0.75 kg ha^{-1} + pendimethalin @ 0.75 kg ha^{-1} , PE, which registered 198.6, 189.4 and 189.4 kg ha^{-1} available nitrogen and 33.7, 32.4 and 32.0 kg ha^{-1} available respectively (Table 1). Available K_2O kg ha^{-1} after harvest of crop was failed to exert its significant influence due to weed management. It might be due to efficient weed management prevent nutrient loss by weeds. Mulching with sugarcane trace increased soil organic matter and microbial respiration that increase microbial activity on nitrogen availability of nutrients. Similar findings were also reported by Manjith Kumar and Angadi (2014).

Weed free condition as a result of effective weed management strategy is very important for achieving the soil quality parameters available nitrogen and phosphorus and production traits like grain and straw yields.

REFERENCES

Baghestani, M.A., E, Soufizadeh S., Eskandari, A., Pour Azar, R., Veysi, M. and Nassirzadeh, N. 2007. Efficacy evaluation of some dual-purpose herbicides to control weeds in maize (*Zea mays* L.). *Crop Prot*. **26**: 936-942.

Dobariya, V.K., Mathukia, R.K., Gohil, B.S. and Shivran, A. 2015. Integrated weed management in rabi sweet corn (*Zea mays var. Saccharata*). *J. Eco-friendly Agric*. **10**(1): 70-83.

Ehsas, J.A., Salihy, A.R., Jalali, M.N., Ghafari, S.R., Samim, M.M. and Ebrahimi, N. 2019. Response of weed management to grain yield and nutrients uptake in maize (*Zea mays* L.). *e-planet* **17** (1): 9-12.

Firehiwot, E.M., Achenef, T.B. and Hbitamu, B.D. 2015. Effects of coffee husk and nitrogen levels on yield and yield attributes of maize (*Zea mays* L.). *e-planet* **13** (2): 1-9

IIMR. 2014. Director's Review. Indian Institute of Maize Research, ICAR, New Delhi, India.

Jawid, A.E., Salihy, A.R., Jalali, M.N., Ghafari, S.R., Samim, M. and Ebrahimi, N. 2019. Response of weed management to grain yield and nutrients uptake in maize (*Zea mays* L.). *e-planet* **17** (1): 9-12

Mangal, M.Q., Beher, U., Mujididi, N.U., Meena and Varghese. 2016. Evaluation of performance of maize (*Zea mays* L.) varieties under varying planting geometry under Kandahar situations in Afghanistan. *e-planet* **14** (1): 58-68.

Manjith Kumar, B.R. and Angadi, S.S. 2014. Effect of tillage, mulching and weed management on performance of maize (*Zea mays*) in Karnataka. *Indian J. Dryland Agric. Res. Dev.* **29**(1): 57- 62.

Mathukia, R.K., Dobariya, V.K., Gohil, B.S. and Chhodavadiya, S.K. 2014. Integrated weed management in rabi sweet corn (*Zea mays* L. *var. saccharatasturt*). *Adv. Crop Sci. Technol*. **2**: 139.

Mohler, C.L. 2001. Enhancing the competitive ability of crops. In: *Ecological Management of Agricultural Weeds,* (M. Liebman, C.L. Mohler and C.P. Staver, Eds.). Cambridge University Press, Cambridge, U.K., pp. 269-374.

Najafi, H. and Tollenaar, T. 2005. Response of corn at leaf stages to shading by redroot pigweed (*Amaranthus retroflexus* L.). *Iran. J. Weed Sci.* **1**: 127-140.

Patel, V.J., Upadhyay, P.N., Patel, J.B. and Meisuriya, M.I. 2006. Effect of herbicide mixture on weeds in kharif maize (*Zea mays* L.) under middle Gujarat condition. *Indian J. Weed Sci*. **38**(1,2): 54-57.

Prasad, S.M., Saha, S., Chourasia, M., Sarangi, D.R., Sahoo, T.R., Sethy, S. and Mohanta, R.K. 2019. Effect of integrated weed management in rainfed upland rice of Odisha. *e-planet* **17** (2): 106-110.

Samant, T.K., Dhir, B.C. and Mohanty, B. 2015. Weed growth, yield components, productivity, economics and nutrient uptake of maize (*Zea mays* L.) as influenced by various herbicide applications under rainfed condition. Scholars *J. Agric. Vet. Sci.* **2**(1B):79-83.

Yeganehpoor, F., Salmasi. S.Z., Abedi, G., Samadiyan, S. and Beyginiya,V. 2015. Effects of cover crops and weed management on corn yield. *J. Saudi Soc. Agric. Sci.* **14**: 178–18.