International Journal of Agriculture and Crop Sciences.
Available online at www.ijagcs.com
IJACS/2015/8-3/302-306
ISSN 2227-670X ©2015 IJACS Journal

IJACS

Effect of replacing Nicosulfuron and Foramsulfuron plus Cultivation instead of Atrazin and Alachlor in Maize (S.c.704) in the North of Khuzestan in Iran

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ABSTRACT: Efficient methods of weed control with herbicide resistance are essential to deal with stable agricultural purposes. In order to, an experiment was conducted in 2014-2015 in Turkalaki Payame Noor University in the north of Khuzestan in Iran. Experiment treatments were compared in a split plot design by a randomized completely block design with 4 replication. The used variety of maize was Single cross(704). Main factors included 3 levels of cultivation, once, twice and without cultivation. Sub factors were weed control by application of indicated herbicide in 4 levels: Nicosulfuron, Foramsulfuron, Atrazin + Alachlor and no control. The results showed that the highest of weed control and with followed the highest yield by ranged 15.47 ton per hectare related to Nicosulfuron + once cultivation treatment and lowest yield by ranged 10.56 ton per hectare related to Atrazin+ Alachlor +once cultivation treatment. There were between treatments in crop traits on maize phenological stages in the level of probability 1% significant difference and alone the number of leaf in plant in the level of probability 5% significant difference was seen. And also there were difference between treatments in yield and particular yield during the whole growing season the kind of index harvest in the level of probability 1% and all in the level of 5% significant.
Key words: Maize, Integrated management, Weeds, Herbicides replacing, Resistance.

INTRODUCTION

Maize (Zea mays L.) is an important cereal crop of Iran. It is grown for fodder as well as for grain purpose in Iran. Approximately 320,000 hectares of field corn were grown with a production of 2560000 tons an average grain yield of 8000 Kg per hectare in Iran in 2012. Weeds are an important yield limiting factor for maize production in Iran, as in many other countries. Worldwide yield losses in maize due to weeds are estimated to be around 37% (Oerke and Dehne, 2004). Weeds reduce crop yield by competing for light, water, nutrients and carbon dioxide, interfere with harvesting and increase the cost involved in crop production and Yield in maize was reduced as much 86 percent when weeds were not controlled (Sikkema et al., 2009). Controlling weeds is essential to a high-yielding corn crop. If weeds are not controlled, yields can be reduced by as much as 40 to 60 % (Arnold et al., 1990; Moomaw et al., 1983). Weed control practices in maize resulted in 77 to 96.7 percent higher yield than non control weeds (Khan et al., 1998). Weeds can be controlled by cultural, biological, mechanical and chemical measures. Herbicides proved effective in controlling weeds and produced relatively more weight of cobs, number of grains in cob, 1000-grain weight, biological yield and grain yield. Similarly plant population and row spacing also affect the weed population (Malik et al., 2009). Chemical weed control as well as hand weeding significantly increased the grain yield of maize. As there are limitations of every weed control method there integrated weed management is a good option for sustainable agriculture (Khan et al., 2002). The objective of this research was to determine how well selected weed integrated management with new herbicides and in-row cultivation and effect on crop traits, yield and component of yield in maize.

MATERIALS AND METHODS

This study was carried out in Turkalaki Payame Noor University in the north of Khuzestan in Iran during summer 2014. The experimental site had mean soil pH of 7.70 with 22.8, 55.7 and 21.5% clay, silt and sand,

respectively. The experimental was split plot in randomized completely block design (RCBD) design with four replications. Maize variety (Single cross 704) was used in the study as this is the widely used variety used in the area. Soils were fertilized according to recommendation based on soil tests. The field were plowed, fertilized, and leveled before the field maize was planted. The size of each treatment was 6×5 m^2. There were 12 treatments in the experiment with row to row distance of 75 cm, each treatment having eight rows. Distance of seeds inter row was 17 cm. Experimental field was

irrigated as and when needed. Main factor was cultivation in three levels and sub factor was herbicides in four levels. Herbicides included Atrazin (WP80, P80), Alachlor (EC48), Foramsulfuron (OD 22.5) and Nicosulfuron SC4) by the balance (1 Kgha-1), (4 Lha-1), (2.5L/ha) and (2 Lha-1) respectively. The experiment comprised of the following treatments

1-Foramsulfuron + once cultivation
2-Nicosulfuron + once cultivation
3-Atrazin + Alachlor + once cultivation
4-Weedy + once cultivation
5-Foramsufuron + twice cultivation
6-Nicosulfuron + twice cultivation
7-Atrazin + Alachlor + twice cultivation
8-Weedy + twice cultivation
9-Foramsulfuron + non cultivation
10-Nicosulfuron + non cultivation
11-Atrazin + Alachlor + non cultivation
12-Weedy + non cultivation

During the course of experiment, the data were recorded on weed density m^2 26 days after sowing, crop traits and yield included Plant height (cm), Leaf dry weight (grm^{-2}), Plant dry weight (grm^{-2}), Leaf area index (LAI) and Grain yield (tha^{-1}). Each time quadrate having size 0.5×0.5 m^2 was placed randomly four times in each treatment and the weeds inside the quadrate was counted. For recording the grain yield data, two central rows were harvested in each treatment bundled, sun dried and then dried in Oven with a temperature of 70 ° C for 48 hours and weighed. The data recorded were statistically analyzed using MSTAT-C software. The purpose of analysis of variance was to determine the significant effect of treatments on weeds and maize. Duncan's multiple range tests at 1% probability level was applied for mean separation of significant parameters.

RESULTS AND DISCUSSION

Weed density (m^{-2}) 26 days after sowing (15 days after herbicides application).

The data regarding weed population revealed that weed density at 26 days after sowing (DAS) was significantly affected by all weed control treatments (Table 1). The results indicated that maximum weed density 26 days after sowing was recorded in weedy (Table 1). And so Table -2 indicated control percentage for treatments. The data (Table 2) revealed that maximum control percentage for (Cyperus esculentus), Convolvulus arvensis), (Chenopodium album), of treatment Nicosulfuron was 55.63, 74.42, and 100 respectively. Maximum control of (Amaranthus spp) was for treatment Foramsulfuron these results are supported (Khan et al., 1998; Naveed et al., 2008; Moomaw et al., 1983; Arnold et al., 1990).

Plant Height (Cm)

Statistical analysis of the data (Table 3) showed that plant height was significantly affected by different treatments. According to (Table 4) maximum plant height (211.5 cm) was recorded in Nicosulfuron + once cultivation. Plant height is the function of genetic as well as environmental conditions. The difference in plant height is attributed to various intensities of weed competition with maize plant (Kamel et al., 1983). Taller plants were recorded in the treatment was Nicosulfuron was applied. This may be due to fact that application Nicosulfuron, weeds controlled during the early stage of crop growth therefore the available nutrients were used by the crop plants and thus received more nutrients and light which ultimately resulted in taller plants, however the Nicosulfuron showed som chlorosis but had no effect on plant height, leaf number or vigor(Paul, 1997).

Leaf Dry Weight (gr/m^2)

The ANOVA indicated (Table 3) that leaf dry weight was significantly affected different treatments (at 1% probability level). Maximum (LDW) was recorded in Nicosulfuron + once cultivation (261.1 grm^{-2}). Because of weeds controlled by this treatment and reduced competition between crop plant and weeds (Paul, 1997).

Plant Dry Weight (gr/m²)

The results of ANOVA (Table 3) revealed that among treatments was difference significantly. Numeric values presented in (Table 4) indicated that maximum (2325 grm-²) Plant dry weight was recorded in Nicosulfuron + once cultivation. In this treatment the weeds was greater than other controlled (Janjic et al., 1983).

Leaf Area Index (LAI)

Statistical analysis of the data (Table 3) revealed that LAI was significantly affected by different treatments. Perusal of the data shown in (Table 4) revealed that maximum LAI (3.76) was recorded in Nicosulfuron. The present results showed that maize plant population as well as herbicides greatly affects the Leaf area index of maize (Khan et al., 2002). Maximum LAI of maize was noted in this treatment was weeds were controlled (Akhtar et al., 1984).

Leaf is the food manufacturing factory of plants and thus plays a vital role in regulating the plant growth and development. Therefore any change in leaf area is an indicator hence, grain yield of maize can be predicted based on its leaf area, orientation etc.

100-grain Weight

The highest 100 – grain weight (31 gr) was recorded in (Table 3) weedy + twice cultivation. Significantly minimum 100 – grain weight (25.75 gr) was recorded in Atrazin + Lasso + non cultivation. In those treatment where the weeds were controlled, 100 – grain weight were greater as compared to uncontrolled treatments as weeds share the resources with the crop plants. These results were in agreement with Khan et al (2002) and EL- Bially (1995). They reported that weed infestation decreased the 100 – grain weight in maize.

Number of Grain per Row

Number of grains is an important yield contributing trait and can greatly affect the economic return. It could be inferred from the data that maximum (45.33) number of grains per row was obtained in Nicosulfuron+once cultivation. Minimum (33.41) grains per row were recorder in Atrazin + Lasso + once cultivation. From these results it was observed that good weed control was effective to get higher number of grain per row (Adamezewski et al., 1999; Khan et al., 2002; Naveed et al., 2008; Sinha et al., 2001). Also reported less grain per row in uncontrolled plot.

Number of Row in Ear

The results revealed that among treatments have non-significant variance by genetics but affected by environmental factors.

Biological Yield (tha-¹)

The data presented indicated that maximum biological yield (29.55 tha-¹) was recorder in Nicosulfuron + once cultivation. As all vegetative parameters were significantly affected by different treatments, the biological yield was also significantly affected. Because leaf area, number of leaves plant, plant height and number of grains cob ontribute in increasing the biological yield. Ullah et al (2008) and Enan (2009) also reported similar results.

Grain Yield (tha-¹)

The highest grain yield (15.47 tha-¹) was recorder in Nicosulfuron + once cultivation. Higher grain yield was due to more number of grains per cob, grain weight per cob and 100 – grain weight as compared to uncontrolled treatments. As all vegetative parameters were significantly affected by different treatments, the Economical yield grain yield) was significantly affected. Because leaf area index, plant height, total dry weight contribute in increasing the grain yield. Efficiency of chemicals and other weed control practices in increasing grain yield had also been demonstrated by some scientists (Dixit and Gautam, 1996; Khan et al., 2004; Khan et al., 2002; Shinde et al., 2001).

CONCLUSION

Results of study indicated that crop traits and grain yield affected by treatments. Single herbicide application cannot control weeds but integrated control was exceedingly weed control significantly. On the other hand weed integrated control is the greatest help towards sustainable agriculture. Thus for give high yield and

better control of weed with modern methods on base of use of weed integrated management on base of use of integrated methods and sustainable agriculture, The best treatment of weed control that recommending is Nicusulforon+once cultivation in maize field.

Table 1. Weed control percentage with herbicides

Treatments	Cyperus (control percent)	Convolvulus (control percent)	Chenopodium (control percent)	Amarantus (control percent)
Foramsulfuron	26.94	71.47	91.20	100
Nicosulfuron	55.63	74.42	100	93.80
Atrazin+lasso	27.92	36.70	84.88	56.01
Weedy	0	0	0	0

Table 2. Weed density at 26 days after sowing

Treatments	Cyperus (number)	Convolvulus (number)	Chenopodium (number)	Amarantus (number)
Foramsulfuron	1.56	1.28	0	0
Nicosulfuron	1.25	0	0	0
Atrazin+lasso	3	1.41	0	0
Weedy	9.48	2.31	9.25	6.91

Table 3. Results of mean comparisons between treatments

Treatments	100 - grain weight (g)	Number of grain per row	Number of row in ear	Economical yield (tha^{-1})	Biological yield (tha^{-1})
1	28.25bcd	38.42bced	14.99a	12.81c	24.19bcd
2	28.75abc	45.33a	15.16a	15.47a	29.55a
3	25.7cde	33.41f	14.49a	10.65d	20.09f
4	27.75cde	36.33cdef	14.49a	11.46d	21.81def
5	30.25ab	40bc	14.83a	14.10b	26.44bc
6	30.5ab	39.33bcd	14.66a	13.82bc	26.06bc
7	26.25de	37.67bcde	14a	10.87d	19.91f
8	31a	40.17b	14a	13.73bc	26.74b
9	29.25abc	39.41bcd	14.33a	12.96bc	23.88cde
10	28.75abc	41.16b	14.50a	13.45bc	25.56bc
11	25.75e	36.17def	14.83a	10.84d	20.05f
12	29abc	35.33ef	14.16a	11.31d	21.28ef

Means with similar letter(s) in each trait is not significantly different at 1% probability level according to Duncan,s Multiple Range Test.

Table 4. Results of ANOVA of crop traits and maize yield.

Source of variance	df	Plant height(cm)	Leaf dry weight(gr/m^2)	Plant dry weight(gr/m^2)	Leaf area index	Grain yield (tha^{-1})
Block	3	148.86 ns	62.92 ns	12728.48 ns	0.01 ns	0.02 ns
Cultivation	2	837.97**	5019.31**	82036.52**	0.32**	21.35**
Error	6	89.75	85.14	5132.54	0.01	0.62
Herbicide	3	419.49**	19222.22**	387975.42**	0.70**	19.70**
Cultivation× Herbicide	6	348.68**	4750.18**	210904.75**	0.14**	4.09**
Error	27	106.14	115.75	11064.98	0.01	0.32
C.V	-	5.33	5.78	5.21	8.49	4.51

ns and **:nonsignificant and significant at 1% probability level.

REFERENCES

Adamezewski K, Kierzek R, Urban M. 1999. Grass and broadleaf weed control in maize with herbicides Merlin Super 537 sc. Prog. Plant Prot. 39(2): 691-694.

Akhtar M, Ashraf M, Nasir MS .1984. Maize productivity and weed growth as by preemergence and post-emergence herbicide application, J. Agri. Res., 22(3): 245-250.

Arnold RN, Gregory EJ, Smeal D, Murray MW .1990. Annual weed control with selected herbicides in field corn grown in coarse-textured soil, NMSU Agri. Exp. Sta. Res. R., 643.

Dixit A, Gautam KC .1996. Effect of atrazine on growth and yield of winter maize, Ann. Agri. Res., 17(2): 121- 124.

EL-Bially ME .1995. Efficiency of Atrazine with other herbicides used alone, in sequence or as tank mix in maize. Ann-Agri. Sci., 40(2):709-721.

Enan MR .2009. Genotoxicity of the herbicide 2, 4-dichlorophenoxyacetic acid (2, 4-D): Higher plants as monitoring systems, Am.-Eurasian J.Sustain. Agric., 3(3): 452-459

Janjic V, Trifunovic M, Bogdanovic V, Sinzar B, Misovic M.1983. A study on the effect of herbicides on yield and quality of maize grain. Fragments Herboloca Jugoslavica., 12(1): 51-58.

Kamel MS, Abdel-Raouf MS, Mahmud EA, Amir S. 1983. Response of two maize varieties to different plant densities in relation to weed control treatments. Agri. Sci. Moshtohor, 19(1): 79-93.

Khan M, Hag N .2004. Weed control in maize (Zea mays L.) with pre and post emergence herbicides. Pak. J. Weed Sci. Res., 10(12): 39-46.
Khan MA, Marwat KB, Gul H, Naeem K. 2002. Empact of weed management on maize (Zea mays L.) planted at night. Pak. J. WeedSci. Res., 8(1-2): 57-62.
Khan SA, Hussain N, Khan LA, Khan M, Iqbal M .1998. Study on weed control in maize. Sarhad J. Agri., 14(6): 581-586.
Maize (Zea mays L.) J. Agri., 46(2)
Malik MA, Zahoor F, Abbas SH, Ansar M. 2006. Comparative study of different herbicides for control of weeds in rainfed maize(Zea mays L.) Weed Sci. Pak., pp: 62 .
management options in glyphosate-tolerant maize Weed Science. 455.
Moomaw S, Russel R, Alex L .1983. Lay by herbicide application for season-long weed control in irrigated corn (Zea mays L.). Weed
Naveed M, Ahmad R, Nadeem MA, Nadeem SM, Shahzad K .2008. Effect of a new post emergence herbicide application in combination with urea on growth, Yield and weed control in
Nurse RE, Hamill AS, Swanton CJ, Tardif FJ, Sikkema PH. 2007. Weeds control and yield response to foramsulfuron in maize Weed Tech., 21: 453-458.
Oerke EC, Dehne HW .2004. Safeguarding production losses in major crops and the role of crop protection. Crop Prot., 23: 275-285.
Oerke EC. 2005. Crop losses to pest. J. Agri. Sci., 143: 1-13.
Paul R, Salon A, Grinten M .1997. Eastern Gamagrass response to Accent (Nicosulfuron), Basis (Rimsulfuron), and Plateau (Imazapic) herbicides in comparison to fewcommon corn herbicides. USDA. S.R 352. NY14830.
Sci., 31: 137-140.
Shinde SH, Kolage AK, Bhilare RL.2001. Effect of weed control on growth and yield on maize. J. Maharashtra Agri., 26(2): 212-213.
Sikkema PH, Soltani N, Nurse RE, Vyn RJ, Eerd VL, Shropshire C.2009. Weed control, environmental impact and profitability of weed
Sinha SP, Prasad SM, Singh SJ .2001. Response of winter maize (zea Mays) to Singh integrated weed management. Indian J. Agr., 46(3): 485-488.
Ullah W, Khan MA, Arifullah SH, Sadiq M. 2008. Evaluation of integrated weed management practices for maize. Pak.J. Weed Sci. Res.14(1-2): 19-32.