International Journal of Science, Environment and Technology, Vol. 5, No 4, 2016, 2050 – 2056
ISSN 2278-3687 (O)
2277-663X (P)

EFFECT OF INTEGRATED WEED MANAGEMENT ON GROWTH, YIELD, YIELD ATTRIBUTES AND WEED PARAMETERS ON SUMMER MAIZE (*Zea mays* L.) UNDER SOUTH GUJARAT CONDITION

Javid Ehsas[*], L.J. Desai[1], N.B Ahir[2] and JR Joshi[3]
[*,2& 3]M.Sc. (Students), [1]Associate Research Scientist
Department of Agronomy, N.M.C.A., N.A.U., Navsari

Abstract: A field research was carried out during summer 2015 at the College Farm, Navsari Agricultural University, Navsari to evaluate "Integrated weed management study in summer maize (*Zea mays* L.). Ten treatments comprising of weed management practices including cultural, mechanical and chemical treatments were evaluated in randomized block design with three replications. Weed free treatment (T_2) was preformed mostly superior than all the other treatmentsfor growth, yield and yield attributes. Significantly higher grain yield and straw yield (kg/ha) were registered under weed free treatment, which is being statistically at par with pre-emergence application of atrazine @ 0.75 kg/ha + pendimethalin @ 0.75 kg/ha (T_8), pre-emergence application of alachlor @ 1.5 kg/ha + atrazine @ 0.5 kg/ha (T_7), pre-emergence application of atrazine @ 0.75 kg/ha +2, 4-D @0.5 kg/ha (T_9), pre-emergence application of atrazine @ 0.75 kg/ha (T_6) and post-emergence application of atrazine @ 1.5 kg/ha at 30 DAS (T_{10}) which was further at par with T_4 and T_5 for straw yield. At harvest, the significantly lower monocot and sedges were noted under weed control through sugarcane trash mulch @ 5 t/ha (T_4). The significantly minimum dry weight of weeds at harvest and highest WCE were recorded under treatment of pre-emergence application of atrazine @ 0.75 kg/ha + pendimethalin @ 0.75 kg/ha. Significantly lowest values for growth, yield and yield attributes as weed control efficiency registered under weedy check (T_1).
Keywords: Growth, Maize, Yield attributes and yield, Weed control efficiency.

Introduction

Maize (*Zea mays* L.) is the most widely distributed crop of the world. Maize is native of South America, but extensively cultivated in various other countries as well like India, Thailand, Pakistan, China and in several parts of Philippines. As regards to area and production, maize ranks third in world production following wheat and rice. It is widely used for animal feed and industrial raw material in the developed countries, whereas, the developing countries used in general for feed. In Indian Agriculture, maize occupies a prominent position and each part of the maize plant is put to one or the other use and nothing goes as waste.

*Received June 13, 2016 * Published Aug 2, 2016 * www.ijset.net*

Globally, maize is cultivated on an area of 185 million with production of 1018 million tones with a productivity of 5499 kg/ha (FAO, 2013). In India, maize is cultivated on 9.34 million with a production of 24.35 million tones and productivity 2583 kg/ha. Gujarat occupies an area of 461 hectares with a production of 692 tonnes and productivity of 1501 kg/ha. Nutritionally, maize contains 60 to 68% starch and 7 to 15% protein and 1.2 to 5.7 % edible oil.

A number of weed species compete with corn plant and have been observed to reduce yield as much as 65% with delay in weed control. As there are limitations of every weed control method, therefore integrated weed management is a good option for sustainable agriculture.

It involves the combination of all the possible methods to suppress the weeds below economic threshold level, although some methods are effective against weeds, but they prove uneconomical for the farmers or pose environmental hazards. Late-season weed infestations do not reduce corn yield nearly as much as early weed competition. Late weeding results in crop losses, especially if it is carried out after the critical period of weed competition. Maize can withstand weed competition for 3-4 weeks early in the growing season, while weeds that emerge at 6-10 weeks after planting (WAP) do not cause significant maize yield losses. Weeding in maize after the critical period of weed removal can result in up to 83% losses in grain yield.

The cultural, biological and chemical control methods are the most popular means of management of weeds in maize field. IWM involves a combination of cultural, mechanical, biological and chemical methods for an effective and economical weed control that reduces weed interference with the crop, while maintaining acceptable crop yields. To overcome these problems, the present field experiment was planned and conducted to study the "Integrated weed management in summer maize (*Zea mays* L.)" during summer 2015 on College Farm, Department of Agronomy, N.M. College of Agriculture, Navsari Agricultural University, Navsari.

Materials and Methods

Experiment was conducted at College Farm, N.M. College of Agriculture, Navsari Agricultural University, Navsari during summer season of 2015. Navsarifalls under south Gujarat heavy rainfall zone. The climate of this region is known by fairly hot summer, moderately cold winter and humid and warm monsoon having heavy rainfall. Ten treatments comprising of weed management practices *viz*., T_1: Weedy check, T_2: Weed free, T_3: Weed control through soil mulch (Interculturing at 30 and 45 DAS *fb* and weeding), T_4: Weed

control through sugarcane trash mulch @ 5 t/ha, T_5: Pre-emergence application of alachlor @ 1.5 kg /ha, T_6: Pre-emergence application of atrazine @0.75 kg/ha, T_7: Pre-emergence application of alachlor @ 1.5 kg/ha + atrazine @ 0.5 kg/ha, T_8: Pre-emergence application of atrazine @ 0.75 kg/ha + pendimethalin @ 0.75 kg/ha, T_9: Pre-emergence application of atrazine @ 0.75 kg/ha + 2,4-D @ 0.5 kg/ha, T_{10}: Post-emergence application of atrazine @ 1.5 kg/ha, 30 DAS were evaluated in randomized block design with three replications. The soil of the experimental area was clayey in texture, poor in available nitrogen (230 kg/ha), medium in available phosphorus (38kg/ha) appreciably rich in available potash (379 kg/ha). The seed of maize Gujarat maize 6 variety was sown on 13th February, 2015 at a row spacing of 60 x 20 cm using seed rate of 15 kg/ha and fertilized with 120- 60-00 N-P_2O5-K_2O. Pre and post emergence herbicide spray was done using 500 liters of water per hectare. The crop was grown with recommended package of practices for South Gujarat Heavy Rainfall Agro-climatic Zone and was harvested on 16th May 2015.

Results and Discussion

The mean data regarding plant height, dry matter (g/plant), no. of cob/plant, no. of grains /cob, cob length and cob weight of maize at harvest are presented in Table 4.1. Significantly tallest plant at harvest recorded with weed free (T_2) treatment, which was statistically at par with T_8, T_4, T_6 and T_7. Significantly maximum dry matter (g/plant) was registered with weed free (T_2) treatment, which was statistically at par with T_8, T_7, T_6, and T_9. Incase of yield attributes, no. of cobs/plant and cob weight did not exert its significant difference while, no. of grains per cob and cob length were significantly affected by different weed management treatments. Significantly higher no. of grains per cob was recorded with weed free (T_2), which was superior over rest of all other treatments. Among the herbicidal treatments, pre-emergence application of atrazine @ 0.75 kg/ha + pendimethalin @ 0.75 kg/ha as tank mixture (T_8) recorded significantly higher number of grains per cob in maize, which was statistically at par with all other treatments except T_1.The grains per cob affected by different weed management treatments were in the order of T_2> T_8> T_7> T_9> T_{10}> T_6> T_4> T_5> T_3> T_1. The highest cob length achieved by weed free treatment (T_2) being statistically at par with pre-emergence application of atrazine @ 0.75 kg/ha + pendimethalin @ 0.75 kg/ha. The better performance of growth and yield attributing characters under T_2 might be due to effective control of weeds and higher weed control efficiency as well as better availability of moisture, nutrient, light and space to the crop owing to less weeds in these treatments observed in respective treatments, which cumulatively facilitated the crop to utilize more

nutrients and water for better growth and development in terms of various growth and yield attributing characters. The enhanced growth and yield attributes with different weed management treatments was also reported by Mahdi (2014) and Inalli *et al*. (2014), Patel *et al*. (2006) and Mathukia *et al*. (2014) in maize.

Data presented in table-2, revealed that significantly higher grain yield and straw yield (kg/ha) were registered under weed free treatment (T_2), which was being statistically at par with pre-emergence application of atrazine @ 0.75 kg/ha + pendimethalin @ 0.75 kg/ha (T_8), pre-emergence application of alachlor @ 1.5 kg/ha + atrazine @ 0.5 kg/ha (T_7), pre-emergence application of atrazine @ 0.75 kg/ha +2, 4-D @0.5 kg/ha (T_9), pre-emergence application of atrazine @ 0.75 kg/ha (T_6) and post-emergence application of atrazine @ 1.5 kg/ha at 30 DAS (T_{10}) which was further at par with T_4 and T_5 for straw yield. Among herbicide treatment, T_8 recorded significantly higher with grain yield (6267 kg/ha) followed by T_7 and T_9. These findings corroborate the results of Patel *et al*. (2006), Sanodiya *et al*. (2013) and Mathukia *et al*. (2014) in maize.

Significantly lower monocot weeds recoreded under weed control through sugarcane trash mulch @5 t/ha (T_4), which was at par with post emergence application of atrazine @ 1.5 kg/ha, 30 DAS (T_{10}) and weed control through soil mulch (Interculturing at 30 and 45 DAS *fb* HW) (T_3). Significantly minimum number of dicot weeds registered under T_9 and T_{10} which was at par with T_8 and T_3. While, T_4 recorded significantly minimum sedge population, which was at par with weed control through soil mulch interculturing at 30 and 45 DAS *fb* HW. Significantly higher amount of monocot, dicot and sedges were registered with weedy check treatment (T_1). Significantly minimum dry weight of weeds at harvest was recorded under treatment of pre-emergence application of atrazine @ 0.75 kg/ha + pendimethalin @ 0.75 kg/ha (T_8), remained at par with T_7 and T_9. The significantly highest dry weight of weeds was noted under treatment weedy check (T_1). Highest weed control efficiency recorded under the treatment of pre-emergence application of atrazine @ 0.75 kg/ha + pendimethalin @ 0.75 kg/ha (88.97%) followed by T_7 (80.75%) and T_9 (80.25%). Better weed control efficiency of herbicides along with weed free condition might be due to effective weed control obtained under hand weeding, pre-emergence application of herbicides mixture at initial and early growth stage, which resulted into the lowest weed counts and finally reduced the total dry weight of weeds at harvest, ultimately the rapid growth of maize crop as indicated by plant height, which did not allow weeds to grow vigorously due to

smothering effect. Similar results were also reported by Patel *et al*. (2006), Arvadiya *et al*. (2012), Kumar *et al*. (2012) andInalli *et al*. (2014) in maize.

Based on results of the field experimentation, it seems quite logical to conclude that potential production and effective weed control in summer maize can be achieved under weed free condition by hand weeding during crop growth period. In the events that labors are not easily available, another alternative is pre-emergence application of atrazine @ 0.75 kg/ha + pendimethalin @ 0.75 kg/ha also equally effective for effective maize production.

Table 1: Growth and yield attributes as affected by different weed management treatments in maize

Sr. No.	Treatments	Plant height at harvest (cm)	Dry matter (g/plant)	No. of cob /plant	No. of grains /cob	Cob length (cm)	Cob weight (g)
T_1	Weedy check	142.7	123.93	1.13	318.7	12.3	12.68
T_2	Weed free	191.3	162.20	1.53	594.6	19.9	14.15
T_3	Weed control through Soil mulch (Interculturing at 30 and 45 DAS *fb* HW)	163.8	140.13	1.33	450.1	15.6	13.30
T_4	Weed control through trash mulch (Sugarcane trash @ 5 t ha)	169.7	142.93	1.40	466.1	16.8	13.28
T_5	Pre-emergence application of Alachlor @ 1.5 kg/ha	166.4	142.40	1.40	464.3	16.4	13.27
T_6	Pre-emergence application of Atrazine @ (0.75 kg/ha)	168.7	149.93	1.47	467.7	17.9	12.24
T_7	Pre-emergence application of Alachlor @ 1.5 kg/ha+ Atrazine @ 0.5 kg/ha	168.5	150.00	1.40	471.9	18.1	11.99
T_8	Pre-emergence application of Atrazine @ 0.75 kg/ha+ Pendimethalin @ 0.75 kg/ha	181.8	157.33	1.53	503.4	19.0	10.62
T_9	Pre-emergence application of Atrazine @ 0.75 kg/ha + 2, 4-D@ 0.5 kg/ha	166.7	151.47	1.47	489.9	17.8	11.62
T_{10}	Post emergence application of Atrazine @ 1.5 kg/ha,30 DAS	167.3	148.53	1.47	475.7	17.3	12.67
	S.Em. ±	7.14	3.91	0.08	18.22	0.45	905.77
	C.D at 5 %	22.85	12.50	NS	58.30	1.44	NS
	C.V. %	7.33	4.61	9.20	6.71	4.56	15.17

Table 2: Grain and straw yield as well as weed parameters as affected by different weed management treatments in maize

Sr. No.	Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)	Weed population at harvest (m^2)			Dry weight of weeds at harvest (kg/ha)	Weed control efficiency (%)
				Monocot	Dicot	Sedge		
T_1	Weedy check	3505	5526	6.58 (42.33)*	6.24 (38.00)	6.56 (42.00)	360.86	--
T_2	Weed free	6566	8135	1.00	1.00	1.00	0.00	100.00
T_3	Weed control through Soil mulch (Interculturing at 30 and 45 DAS *fb* HW)	5228	5910	3.10 (8.67)	2.76 (6.67)	2.44 (5.00)	161.09	55.05
T_4	Weed control through trash mulch (Sugarcane trash @ 5 t ha)	5513	6752	2.64 (6.00)	4.58 (20.00)	2.06 (3.33)	125.81	64.69
T_5	Pre-emergence application of Alachlor@ 1.5 kg/ha	5460	6536	6.02 (35.33)	3.21 (9.33)	3.82 (13.67)	112.38	68.47
T_6	Pre-emergence application of Atrazine@ (0.75 kg/ha)	5680	6856	6.50 (41.33)	3.46 (11.00)	3.56 (11.67)	110.34	68.86
T_7	Pre-emergence application of Alachlor@ 1.5 kg/ha + Atrazine @ 0.5 kg/ha	5918	7316	4.36 (18.00)	3.46 (11.00)	2.51 (5.33)	68.53	80.75
T_8	Pre-emergence application of Atrazine @ 0.75 kg/ha + Pendimethalin @ 0.75 kg/ha	6267	7921	4.46 (14.00)	2.67 (6.33)	2.63 (6.00)	60.96	82.97
T_9	Pre-emergence application of Atrazine@ 0.75 kg/ha + 2,4-D@ 0.5 kg/ha	5820	7276	4.24 (17.00)	2.64 (6.00)	2.70 (6.33)	70.16	80.25
T_{10}	Post emergence application of Atrazine@ 1.5 kg/ha,30 DAS	5619	6819	3.05 (8.33)	2.64 (6.00)	4.24 (17.00)	142.94	60.30
	S.Em. ±	312.3	505.7	0.14	0.12	0.12	9.66	-
	C.D at 5 %	999.1	1617.7	0.460	0.384	0.398	30.91	-
	C.V. %	9.73	12.68	5.93	6.36	6.83	13.80	-

*Data in parenthesis indicate actual value of weeds and $\sqrt{X+1}$ transformed value those outside.

References

[1] Arvadiya, L.K., Raj, V.C., Patel, T.U. and Arvadiya, M.K. 2012. Influence of plant population and weed management on weed flora and productivity of sweet corn (*Zea mays* L.). *Indian journal of Agronomy*, **57**(2): 162-167.

[2] Inalli, K., Kumar, A.B.A. and Babu, R. 2014. Efficacy of tank mixture herbicides for weed control in maize.*Trends in Biosciences*, **7**(14): 1835-1838.

[3] Kumar, S., Rana, S.S., Chander, N. and Angiras, N. 2012.Management of hardy weeds in maize under mid-hill conditions of Himachal Pradesh.*Indian Journal of Weed Science*, **44**(1): 11-17.

[4] Mahadi M.A. 2014. 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

[5] Mathukia, R.K., Dobariya, V.K., Gohil, B.S. and Chhodavadiya, S.K. 2014. Integrated weed management in *rabi* sweet corn (*Zea mays L.*). *Advance in Crop Science and Technology*, **2**: 139-144.

[6] 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 Journal of Weed Science*, **38**(1&2): 54-57.

[7] Sanodiya, P., Jha, A.K. and Shrivastava, A. 2013. Effect of integrated weed management on seed yield of fodder maize.*Indian Journal of Weed Science*, **45**(3): 214-216.