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Weed management in fodder maize (*Zea mays* L.) with newer herbicides

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Abstract
A field experiment was conducted at College Farm, Navsari Agricultural University, Navsari during *rabi* seasons of 2016-17 to find out the best chemical weed management practices in fodder maize (*Zea mays* L.). Eleven treatments were tested in randomized block design with three replications. Treatments consisted of pre-emergence (PE) and post-emergence (PoE) herbicides applications along with weed free (HW at 20 and 40 DAS) and weedy check. Experimental results indicated that treatment weed free (HW at 20 and 40 DAS) has recorded highest weed control efficiency (76.5%) followed by PoE of tank mix formulation of Atrazine 0.5 kg/ha + Topramezone 0.025 kg/ha at 20 DAS (73.9%). Green and dry fodder yield was significantly higher (785 q/ha and 269 q/ha, respectively) with weed free (HW at 20 and 40 DAS) and it was closely followed by application Atrazine 0.5 kg/ha + Topramezone 0.025 kg/ha tank mix at 20 DAS (748 q/ha and 249 q/ha respectively).

Keywords: Topramezone, Tembotrione, Weed flora, Weed control efficiency, Stale Seed Bed

1. Introduction
The production of good quality fodder and forage is of great importance for the development of livestock industry in the country. Fodder plays an important role in economizing the cost of production of livestock products especially of milk. Green fodder is the essential component of feeding high yielding milch animals to obtain optimum level of milk production. Maize (*Zea mays* L.) is one of the most important dual purpose cereal crops all over the world. The green fodder maize (African Tall) contains dry matter (22.2%), crude protein (7.1%), crude fiber (30.2%), in-vitro dry matter digestibility (65.0%), neutral detergent fiber (67.6%), acid detergent fibre (38.3%) and total ash (6.0) (Chaudhary *et al*. 2012) [2]. Farmers usually give prime importance to few cultural practices and neglect other factors like weed control. Maize crop gets infested with variety of weeds and subjected to heavy weed competition, which often inflicts huge losses. The quantities of growth factors used by weeds are thus unavailable to the crop, the extent of nutrient loss varies from 30-40% of the applied nutrients (Mundra *et al*., 2002) [9]. Management of weeds by hand weeding and mechanical weeding though effective, some time, it may be restricted due to moist soil and time consuming. Chemical weed control has been proved effective in reducing weed competition in the early stages and increasing crop yields.

2. Materials and Methods
A field experiment was conducted during *rabi* season at College Farm, N.M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, 2016-17. The experiment was laid out in randomized block design with eleven treatments (Table: 1) replicated thrice. Before sowing, field was thoroughly ploughed, leveled and fertilized with recommended doses of NPK at the rate of 80+40+00 kg/ha. The basal dose of fertilizers, consisting of full dose of P_2O_5 through SSP and half of N through urea was applied manually. The remaining dose of N was supplied at 30 days after sowing. All the recommended package of practices was adopted to raise the crop except weed control. All the herbicides were applied as pre-emergence using a knapsack sprayer fitted with a flat fan nozzle attached with the hood of sprayer by mixing in 500 L of water/ha as per treatment. Sowing of fodder maize (*cv*. African Tall) month of November both the year of investigation at 30 cm apart row spacing. Pre-emergence and Post-emergence herbicides dissolved in 500 lit water/ha were applied at before 48 hours after sowing and at 20 DAS. Weed population was counted at 20 and 40 DAS by using a quadrate of 1 m x 1 m (1 m^2) size from the randomly in net plot. The entire weeds uprooted and cut

close to the transition of root and shoot in each plot from 1 m^2 area and collected for dry matter accumulation (biomass). The samples were first dried in sun and then kept in oven at 60°C for 48 hours till constant weight was obtained. The plot wise weight of all weed samples was taken and total dry weight of weeds at 40 DAS and harvest were expressed in g/m^2 & kg/ha, respectively. Green fodder yield was recorded each net plot at immediately after harvest, while dry fodder yield was recorded at plant are sundried about 20 day after harvest. Square root transformation was done for weed population using the formula (X+1). Weed control efficiency (WCE) and weed index (WI) were calculated using formulae as suggested by Kumar and Gill (1969) [6]. Cost of cultivation, gross returns, net returns and benefit cost ratio for each treatment were calculated by taking into consideration of total costs incurred and returns obtained.

Table 1: Weed population at 20 and 40 DAS as influence by weed management in fodder maize (Pooled data)

Treatment	Dose (kg/ha)	Weed count at 20 DAS						Weed count at 40 DAS					
		Monocot weed		Dicot weed		Sedge weed		Monocot weed		Dicot weed		Sedge weed	
Stale seed bed (destroy one flush of weeds)	-	2.5	(5.7)	2.8	(7.3)	3.6	(12.3)	5.5	(29.3)	4.9	(23.6)	6.8	(46.0)
Smother Crop (Lucerne)	-	4.0	(15.7)	3.6	(12.7)	5.0	(24.0)	4.4	(18.7)	4.1	(16.3)	5.5	(29.0)
Atrazine (PE)	1.0	2.9	(8.0)	3.3	(10.7)	5.0	(24.3)	4.0	(15.3)	4.5	(19.3)	5.9	(34.0)
Pendimethalin (PE)	1.0	2.8	(7.3)	4.1	(15.7)	5.2	(27.0)	3.9	(14.3)	4.7	(22.0)	6.4	(40.0)
Topramezone at 20 DAS	0.025	5.9	(35.0)	5.2	(26.0)	6.2	(38.7)	3.3	(9.7)	4.4	(18.7)	4.1	(16.0)
Tembotrione at 20 DAS	0.12	5.9	(35.3)	5.4	(29.3)	6.2	(38.0)	3.2	(10.0)	4.2	(17.0)	4.5	(19.3)
Atrazine + Pendimethalin tank mix (PE)	0.5 + 0.5	2.6	(6.7)	3.1	(8.7)	4.6	(20.7)	3.8	(14.0)	4.4	(19.0)	6.1	(37.0)
Atrazine + Topramezone tank mix at 20 DAS	0.5 + 0.025	5.8	(34.0)	5.5	(30.0)	6.5	(42.3)	2.2	(4.0)	2.9	(8.3)	3.6	(12.7)
Atrazine + Tembotrione tank mix at 20 DAS	0.5 + 0.12	6.2	(37.3)	5.2	(27.3)	6.4	(41.7)	2.4	(5.3)	3.8	(14.7)	4.0	(16.3)
Weed free (20 & 40 DAS)	-	6.0	(35.3)	5.3	(28.0)	6.3	(40.3)	2.2	(4.0)	2.4	(5.3)	4.0	(15.7)
Weedy check	-	6.4	(40.7)	5.4	(28.7)	6.8	(46.7)	7.3	(52.0)	6.2	(38.0)	7.8	(60.0)
S.Em.±		0.4		0.4		0.4		0.3		0.4		0.4	
C.D. at 5%		1.1		1.2		1.3		0.9		1.1		1.2	
C.V.%		13.3		15.2		14.1		14.6		15.5		13.0	

Figure in parenthesis refers to original value and outside the parenthesis indicates transformed () value

3. Result and Dissection

Weed flora

Weed flora in the present experiment comprising of major 10 weed species included monocots, dicots and sedges. The percentage wise distribution of weeds observed under experimental field were *Echinochloa colonum* L. (15.80%), *Echinochloa crus-galli* L. (19.26%) amongst monocot; dicot weed like *Convolvulus arvensis* L. (4.31%), *Euphorbia hirta* L. (1.72%), *Tridax procumbens* L. (1.15%), *Digera arvensis* L. (3.45%), *Portulaca oleracea* L. (0.86%), *Physalis minima* L. (2.89%), *Trianthema portulacastrum* L. (8.91%), other weeds (1.65%) and sedges like *Cyperus rotundus* L. (40.23%).

Weed Count

At 20 DAS, Stale seed bed (W_1) and application of Atrazine 1.0 kg/ha or Pendimethalin 1.0 kg/ha as pre emergence (W_1, W_3, W_4 and W_7) was significantly reduced weeds population compared to weedy check. It clearly indicated that in Stale seed bed have remove first flush of weed and pre emergence application of herbicides inhibited the growth of newly germinated weed seeds and/or seedlings. Further, at 40 DAS, weed free (HW at 20 & 40 DAS: W_{10}) treatment and application of Atrazine 0.5 kg/ha + Top rame zone 0.025 kg/ha tank mix at 20 DAS (W_8) was equally effective by dropping down the weed population of monocots and sedge. Whereas, the dicot weed population was found to be lower under weed free (HW at 20 and 40 DAS: W_{10}). Significantly maximum number of monocot, dicots and sedges were found under treatment weedy check (W_{11}) during all the growth stages. This might have been due to uninterrupted growth of weeds by utilizing the growth resource like moisture, nutrient, sun light to the full extent and offering stiff competition to the crop. It clearly indicated that pre and post emergence application of herbicides and hand weeding at 20 and 40 DAS as evidenced by less number of weeds and weed biomass which might have increased the resource availability and space for sufficient growth and development of crop plant and it is in agreement with Gopinath and Kundu (2008) [4], Sanodiya *et al*. (2013) [13], Deshmukh *et al*. (2014) [3], Madhavi *et al*. (2014) [7]. Samanth *et al*. (2015) [12].

Weed dry weight

All weed management practices significantly alter the dry weight of weeds at 40 DAS and at harvest during experimentation. Weed dry matter is a better parameter to measure weed competition than weed density as it measures more precisely the growth resources utilized by weeds (Padmavati *et al.*, 1995) [10]. At 40 DAS, treatment weed free (HW at 20 and 40 DAS: W_{10}) produced less weed dry matter (13.8 g/m^2), this might be due to the periodical removal of weeds at regular interval through hand weeding at 20 and 40 DAS accounted for less count of monocot, dicot and sedge weeds under treatment (W_{10}), it was at par with treatment W_8 and W_9. Further, similar trend was also observed at harvest during the investigation. The lower dry matter in these treatments might be due to better efficacy and prolonged effectiveness of applied HPPD inhibiting herbicides which reduced weed growth and hence, resulted in rapid depletion of carbohydrate synthesis of weeds, already germinated has rapid respiration, bleaching of chlorophyll pigment, reduction in leaf area and diminution of photosynthesis process and it is in agreement with Bollman *et al*. (2008) [1] and Roy *et al*. (2008) [11]. Significantly highest dry weight of weeds was recorded with treatment weedy check (W_{11}) at 40 DAS and at harvest. Different weed management treatments exerted their remarkable effect on weed control efficiency and weed index (Table 2).

Table 2: Total weed population at 20 and 40 DAS, dry weight of weed at 40 DAS (g/m^2), at harvest (kg/ha), Weed control efficiency (%), weed index (%) and fodder yield (q/ha) as influence by different weed management in fodder maize

Treatment	Dose (kg/ha)	Total weed at 20 DAS		Total weed at 40 DAS		Dry weight of weed at 40 DAS (g/m^2)	Dry weight of weed at harvest (kg/ha)	Weed control efficiency (%)	Weed Index (%)	Fodder yield (q/ha)
Stale seed bed (destroy one flush of weeds)	-	5.1	(25.3)	10.0	(99.0)	3.6	5.5	4.9	6.8	633
Smother Crop (Lucerne)	-	7.2	(52.3)	8.1	(64.0)	5.0	4.4	4.1	5.5	654
Atrazine (PE)	1.0	6.6	(43.0)	8.3	(68.7)	5.0	4.0	4.5	5.9	662
Pendimethaline (PE)	1.0	7.1	(50.0)	8.8	(76.3)	5.2	3.9	4.7	6.4	656
Topramezone at 20 DAS	0.025	10.0	(99.7)	6.7	(44.3)	6.2	3.3	4.4	4.1	655
Tembotrione at 20 DAS	0.12	10.1	(102.7)	6.8	(46.3)	6.2	3.2	4.2	4.5	660
Atrazine +Pendimethaline tank mix (PE)	0.5 + 0.5	6.1	(36.0)	8.4	(70.0)	4.6	3.8	4.4	6.1	722
Atrazine + Topramezone tank mix at 20 DAS	0.5 + 0.025	10.4	(106.3)	5.1	(25.0)	6.5	2.2	2.9	3.6	748
Atrazine + Tembotrione tank mix at 20 DAS	0.5 + 0.12	10.3	(106.3)	5.8	(36.3)	6.4	2.4	3.8	4.0	735
Weed free (20 & 40 DAS)	-	10.2	(103.7)	5.0	(25.0)	6.3	2.2	2.4	4.0	785
Weedy check	-	10.8	(116.0)	12.3	(150.0)	6.8	7.3	6.2	7.8	525
S.Em.±		0.4		0.4		0.4	0.3	0.4	0.4	40
C.D. at 5%		1.4		1.3		1.3	0.9	1.1	1.2	120
C.V.%		9.3		9.7		14.1	14.6	15.5	13.0	10.4

Figure in parenthesis refers to original value and outside the parenthesis indicates transformed () value

Weed indices

Among various weed management treatments, the lowest weed index and highest weed control efficiency were recorded under weed free W_{10} and it was closely followed by Atrazine 0.5 kg/ha + Topramezone 0.025 kg/ha tank mix at 20 DAS (W_8). These results indicate that in addition to post-emergence herbicides, imposition of W_{10} ultimately provided weed free and congenial environment as the outcome of improved weed control efficiency of fodder maize crop. These results are in accordance with the results indicated by Kolage *et al.* (2004) [5], Tripati *et al.* (2005) [14], Malviya *et al.* (2012) [8] and Madhavi *et al.* (2014) [7].

4. References

1. Bollman JD, Boerbcom CM, Becker RL, Fritz VA. Efficacy and tolerance to HPPD-inhibiting herbicides in sweet corn. Weed Technology. 2008; 22:666-674.
2. Chaudhary DP, Kumar A, Mandhania SS, Srivastava P, Kumar RS. Maize as Fodder? An alternative approach, Directorate of Maize Research, Pusa Campus, New Delhi, Technical Bulletin 2012/04, 32.
3. Deshmukh JP, Shingrup PV, Dandge MS, Bhale VM, Paslawar AN. Integrated weed management in maize (*Zea mays* L.). Biennial conference on "Emerging challenge in weed management" Organized by Indian Society of Weed Science, 2014.
4. Gopinath KA, Kundu S. Effect of dose and time of atrazine application on weeds in maize (*Zea mays* L.) under mid-hill conditions of North Western Himalayas. Indian Journal of Agriculture Science. 2008; 48(3):254-257.
5. Kolage AK, Shinde SH, Bhilare RL. Weed management in *kharif* maize. Journal of Maharashtra Agricultural Universities. 2004; 29(1):110-111.
6. Kumar V, Gill GS. Weed index a new method for reporting weed control trails. Indian Journal of Agronomy. 1969; 16(2):96-98.
7. Madhavi M, Ramprakash T, Srinivas A, Yakadri M. To prame zone (33.6% SC) + Atrazine (50%) WP tank mix efficacy on maize. Biennial conference on "Emerging challenge in weed management" Organized by Indian Society of Weed Science. 2014.
8. Malviya A, Malviya N, Singh B, Singh AK. Integrated weed management in maize (*Zea mays* L.) under rainfed conditions. Indian Journal of Dryland Agriculture Research & Development. 2012; 27(1):70-73.
9. Mundra SL, Vyas AK, Malival PL. Effect of weed and nutrient management on nutrient uptake by maize (*Zea mays* L.) and weeds. Indian Journal of Agronomy. 2002; 47(3):378-383.
10. Padmavati P, Satyanarayana V, Chandrasekhar Rao P, Latchanna G, Varaprasad PV. Integrated weed management system in soybean (*Glycine max* L.). Journal of Oil Seed Research. 1995; 12(2):282-285.
11. Roy DK, Singh D, Sinha NK, Pandy DN. Weed management in winter maize + potato intercropping system. Indian Journal of Weed Science. 2008; 40(1&2):41-43.
12. Samanth TK, Dhir BC, Mohanty B. Weed growth, yield components, productivity, economics and nutrient uptake of maize (*Zea mays* L.) as influenced by various herbicide applications under rainfed condition. Indian Journal of Weed Science. 2015; 2(1):79-83.
13. Sanodiya P, Jha AK, Shrivastava A. Effect of integrated weed management on seed yield of fodder maize. Indian Journal of Weed Science. 2013; 45(3):214-216.
14. Tripathi AK, Tewari AN, Prasad A. Integrated weed management in rainy season maize (*Zea mays* L.) in Central Uttar Pradesh. Indian Journal of Weed Science. 2005; 37(3&4):269-270.