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Effect of Weed Management Practices on Weed Biomass and Grain Yield of Hybrid Maize in Northern Bangladesh

[1]Shamima Sultana, [2]Md. Asaduzzaman, [3]Nahyan Ahmed and [4]Md. Fazlul Karim

[1]Department of Agriculture, College of Development Agriculture, Dhaka, Bangladesh
[2]Department of Agronomy, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh
[3]Teritory officer, Bayer Crop Science Ltd, Bangladesh
[4]Department of Agronomy, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh

Abstract: A field experiment was conducted in farmer's field at Thakurgoan district of Bangladesh during March to May 2010. The experiment was comprised of six weed management tactics including untreated control and these were T_1= Control, T_2= No weeding + Earthing up at 30 DAE (Days after emergence) T_3 = Spading along with hand weeding at 20 DAE + Earthing up at 30 DAE, T_4 = two spading along with hand weeding at 10 and 20 DAE + Earthing up at 30 DAE, T_5 = application of pre emergence herbicide magnum gold (mencozeb) @ 2 ml L^{-1} water) + Earthing up at 30 DAE and T_6 = Application of post-emergence herbicide (U-46 (2,4 D amine) @ 6 ml L^{-1} water) + Earthing up at 30 DAE. The best weed control efficiency was observed when pre-emergence herbicide (magnum gold) + Earthing up at 30 DAE were followed. The highest grain yield was obtained from T_4 treatment where two spading along with hand weeding at 10 and 20 DAE + earthing up at 30 DAE was done. On the contrary in control condition the lowest seed yields (6.01 t ha^{-1}) was harvested and among the weed species *Echinochola crusgalli, Jussiaea repens* and *Cynodon dactylon* were found dominant.

Key words: Weed · Pre-emergence · Post-emergence and Biomass

INTRODUCTION

Maize (*Zea mays*) stands third in position of consumption among cereal crops in Bangladesh. It can be grown throughout the year because its C_4 characteristics. Hybrid maize has been introduced in Bangladesh due to its yield potentiality, therefore the area and production of hybrid maize is increasing day by day in Bangladesh. Although the potential yield of hybrid maize is 10.0-10.5 t ha^{-1} but the yield is lower at farmer's levels which is 5.3-6 t ha^{-1} [1]. Among many reasons, weeds are one of the most important responsible factors limiting maize production in Bangladesh. Weeds cause enormous losses to crops even more than other pests worldwide that on an average, 37.3 % of crop produce is damaged if weeds are not controlled in Bangladesh [2]. Crops valued approximately 59665.7 million($ 1455 million) Bangladesh Taka might be lost annually due to unrestricted growth of weeds in the country but the other pest may cause a loss of 9.66 million tons of food valued at 56711.12 million ($ 1383 million) Bangladeshi Taka every year if they are not controlled in the crop fields. Weed infestation caused 12.8 to 29.2% yield loss in maize [3]. Therefore, weeding should be done to ensure optimum grain yield. Moreover, during *kharif* (dry) season weeds grow vigorously and compete with the crop for nutrients, space and solar radiation resulting in yield reduction [4]. So, weed management may help in reducing the crop weed competition and increase opportunity for plant to absorb more nutrients. Thus weed control at proper stage improve the productivity.

Weed control in maize is carried out by mechanical and/or chemical methods. Although both methods are effective in controlling weeds but they increase production costs and have some disadvantages or side effects when applied intensively [5,6]. Therefore this experiment was carried out to find out the proper agronomic management along with both pre and post emergence herbicides to reduce the costs and risks of intensive weed control in maize field.

Correspondoning Author: Md. Asaduzzaman, Department of Agronomy, Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh, E-mail: asad_sau@yahoo.com

MATERIALS AND METHODS

Study Site: The experiment was conducted at a farmer's field of Thakurgoan district of Bangladesh during the *kharif* (dry) season 2011, The experiment area was situated at northern part of Bangladesh and located under the AEZ (Agro-ecological Zone) no. 1. The climate of experimental site was under sub tropical.

Treatment and Plant Material: The experiment consisted six weeding management practices viz. T_1= Control, T_2= No weeding + Earthing up at 30 DAE (Days after emergence) T_3 = Spading as a intercultural operation along with hand weeding at 20 DAE + Earthing up at 30 DAE, T_4 = two spadings along with hand weeding at 10 and 20 DAE + Earthing up at 30 DAE, T_5 = application of pre emergence herbicide magnum gold(mencozeb) 2 ml L^{-1} water) + Earthing up at 30 DAE and T_6 = Application of post-emergence herbicide U-46 (2,4 D amine) @ 6 ml L^{-1} water) + Earthing up at 30 DAE. The experiment was conducted as an experimental and demonstration plot in a farmer filed which was laid out in Randomized Completely Block Design (RCBD) with three replications in a farmer's field. BARI Hybrid Maize 5 was used as test variety of hybrid maize. The land was opened with the tractor drawn disc plough. Ploughed soil was then brought into desirable tilth by 4 operations of ploughing and harrowing with country plough and ladder. The plots were separated on a day before planting and urea, Triple super phosphorus, muriate of potash, zinc sulphate and boric acid was applied as a source of N, P, K, Zn and B and the application rate were 250, 50, 110, 45, 5 and 1 kg ha^{-1}, respectively. Seeds were sown on 5 March, 2010 at 75 cm x 25 cm spacing.

Intercultural Operation: Two irrigations by using sprinklers one after sowing another was at teaseling stage were given for uniform emergence and growth of the crop. Weeding operation was done as per treatment.

Data Collection and Statistical Analysis: Weed samples were collected using 50 cm x 50 cm quadrat from randomly selected two places from each plot at 10, 20 and 30 days after emergence. Number and dry weight of weeds were recorded. Weed control efficiency (WCE) was calculated according to the following formula. WCE (%) = (A-B/A) X 100, where A = Dry weight of weeds in no weeding plots and B = Dry weight of weeds in treated plots. The crop was harvested at June 17, 2010. Yield and yield contributing characters were recorded and analyzed statistically and mean separations were done by least significance test (LSD) test at $P = 0.05$ level of significance.

RESULTS AND DISCUSSION

Weed Flora: Number of identified species ranged between 17- 21 and the common weed flora infesting the maize field were *Paspatum commersonii, Eleusine indica, Digitaria sanguinalis, Cynodon dactylon, Amaranthus viridis, Echinochola crusgalli, Jussiaea repens*. Among the weed species the problem weeds belonged to three species: *Echinochola crusgalli, Jussiaea repens and Cynodon dactylon* were found dominant.

Number and Dry Weights of Weeds and Their Control Efficiency: Irrespective of treatment differences, at 10 DAE the treatment T_5 produced less number of weeds 100 m^{-2} and dry weight of weeds (2.60 g m^{-2})(Table 1). On the contrary, the highest number (356) and large weed biomass accumulation (5.20 g m^{-2}) at 10 DAE was recorded in control plots which were statistically identical with T_2, T_3 and T_6. Similar trend also reported by Rahman *et al*. (2008). Interestingly at 20 DAE, T_4 gave the lowest number of weed flora (48.33) along with lowest dry weight (1.07 g) of weeds which was statistically similar with T_5. Similarly the lowest number of weeds (51 weeds m^{-2}) and dry weight (3.50 g m^{-2}) weed were obtained from T_4 at

Table 1: Weed flora and dry weight of hybrid maize as affected by weeding method

	10 DAE		20 DAE		30 DAE		
Treatment	No. of weeds (m^{-2})	Dry weight (gm^{-2})	No. of weeds (m^{-2})	Dry weight (gm^{-2})	No. of weeds (m^{-2})	Dry weight (gm^{-2})	WCE (%)
T_1	356	5.20	360.0	51.1	345.30	103.5	-
T_2	352	5.00	344.6	42.2	301.00	101.0	-
T_3	347	4.70	311.0	41.6	74.30	4.7	95.3
T_4	331	4.50	48.3	1.0	51.30	3.5	96.6
T_5	100	2.60	110.0	7.6	125.00	39.0	61.3
T_6	338	4.60	345.3	50.5	293.00	92.4	8.4
CV (%)	6.85	11.67	10.9	16.5	13.54	12.8	-

(P=0.05)

Table 2: Effect of weed management on the yield attributes and yield of hybrid maize

Treatment	Plant height (cm)	No. of grains ear^{-1}	Test weight (g)	Grain yield (t ha^{-1})
T_1	157.70	520	269.40	6.01
T_2	149.90	540	274.30	6.96
T_3	159.20	544	275.00	7.15
T_4	177.00	568	286.60	7.47
T_5	148.90	545	281.00	7.24
T_6	147.60	522	277.00	7.11
CV (%)	2.71	2.34	3.45	0.35

(P=0.05)

30 DAE while both the highest number and dry weight of weeds were always remained the same in control treatment. This result also supported by Nedim *et al.* [7] in maize and Sultana *et al.* [8] in mungbean. The highest weed control efficiency was recorded in T_4 and lowest was in T_6 and the figures were 96.39 % and 8.49% accordingly.

Effect on Yield and Yield Contributing Characters: Weed management had a significant effect on plant height, grains ear^{-1}and grain yield of maize except 1000 grains weight. Treatment T_4 produced the tallest plant (177 cm) and the maximum number of grains ear^{-1} (568) (Table 2) and it might be due to the weed free condition that helped the crop to produce more dry matter in turn more grains ear^{-1}. Whereas, the shortest plants (147.67 cm) w as observed in T_6 followed by T_5 and T_2. This findings are in confirmed with Hurle *et al*. [9] on maize. Control treatment produced the lowest number of grains ear^{-1} (520). Significantly higher grain yield (7.47 ha^{-1}) was harvested in treatment T_4. This result is justified by Hurle *et al*. [9] who reported a good efficacy in controlling the entire spectrum of weeds in maize could be minimizing by two spading along with hand weeding at 10 and 20 DAE + Earthing up at 30 DAE. Application of pre-emergence herbicide besides earthing up at 30 days after emergence produced significantly higher seed yield (7.47 t ha^{-1}) of maize and post-emergence herbicides also beneficial for obtaining higher yield in maize over control through suppressed the grasses weeds named *Echinochola crusgalli, Jussiaea repens and Cynodon dactylon* On the contrary, the lowest yield attributes and grain yield (6.01 t ha^{-1}) were obtained from control plots where neither weeding nor earthing up was performed. Covarelli *et al.* [10] also stated that the low seed yield values always gave at control levels. It is also noticed that the exclusively intercultural operations like spading and earthing up also beneficial for controlling weeds from maize field thus grain yield produced in treatment T_3, T_4 and T_5 were statistically identical.

CONCLUSION

According to the present results obtained in the weed control variants from maize crops at Thakurgoan district, pre-emergence application of magnum gold (ncozeb) 2 ml L^{-1} water followed by earthing up at 30 days after emergence would be beneficial for getting grain yield of maize.

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