

RESPONSE OF MAIZE CROP TO VARIOUS HERBICIDES

Fazli Subhan¹, Nasir-ud-Din¹, Abdul Azim² and Zubair Shah²

ABSTRACT

An experiment was conducted at Agricultural Research Institute Tarnab, Peshawar, Pakistan during 2006 to study the effect of some pre- and post-emergence herbicides on controlling weeds in maize (*Zea mays* L.). The experiment comprised of nine treatments having seven herbicides, hand weeding and a weedy check. Herbicides Primextra gold 720 Sc (atrazine + S-metolachlor) @ 1.44, Atrazine 38 Sc @0.76, and Dual gold 960 EC (S-metolachlor) @ 1.92 kg ha⁻¹ were used both as pre-and post-em, while Stomp 330 E (pendimethalin) @ 0.75 kg ha⁻¹ was applied only as pre-em. The data were recorded on weeds density m⁻², dry weed biomass g m⁻², plant height (cm), days to 50% silking and maturity, 1000 grain weight (g) and grain yield (kg ha⁻¹). The herbicides significantly affected weed density, dry weeds biomass, 1000 grain weight and grain yield, while the other parameters showed non-significant differences. Pre-emergence applications were better as compared to post-emergence applications. The most effective pre emergence herbicides in reducing weed density and increasing maize grain yield were Dual gold 960 EC and Primextra gold 720 EC. Dual gold, Primextra gold, Atrazine, Stomp and hand weeding produced grain yield of 4248, 3610, 3400, 3171 and 2804 kg ha⁻¹ as compared to 2579 kg ha⁻¹ for untreated control plot. 1000 grain weight was also higher in Dual gold and Primextra gold treated plots than other weed control treatments and weedy control. It was concluded that Dual gold and Primextra gold were most effective herbicides in controlling weeds and increasing maize grain yield.

Key words: Post-emergence, pre-emergence, Primextra gold, Dual gold

INTRODUCTION

Maize (*Zea mays* L.) is the third most important cereal crop after wheat and rice in Pakistan and mostly consumed as human food and animal feed and provides raw material for food industry. According to estimation, 75% of the

¹Agricultural Research Institute Tarnab, Peshawar Pakistan.

²Cereal Crops Research Institute, Pirsabak, Nowshera-Pakistan.

total production of maize is used as food by the farming community and remaining finds its way in starch manufacturing industry, poultry feed and food grain sales (Muhammad, 1979). In Pakistan total area under maize crop during 2004-5 was 981.8 thousands hectares and production was 2797 thousand tons with average yield of 2849 ha⁻¹. During the same year, total area and production in NWFP was 498.6 thousands hectares and 855.5 thousand tons with an average yield of 1716 kg ha⁻¹ (Anonymous 2006). Like other crops, the average maize yield is low in Pakistan as compared to other maize growing countries. The reasons for low yield are many, but one of the most serious but less noticeable causes is the presence of weed infestation. In NWFP the losses due to weeds are approximately 20-40% (Anonymous, 2001). Weeds are problem particularly for those farmers who have large holdings. Because of acute shortage of labor and frequent monsoon rains during the early growth period of maize, hand weeding or mechanical weeding operations are usually delayed or left altogether. In such a situation, herbicides offer the most effective and economical method of weed control and increase crop yield. Weed control in maize through the use of herbicides has received little attention in Pakistan, and particularly in NWFP, while elsewhere in the world the herbicides have shown a promise in weed management in maize. Several reports address the importance of herbicides in maize. Miller and Libby (1999) concluded that corn yield responded positively when weeds were controlled by herbicides. Becker and Staniforth (1981) obtained higher yield in maize with weedicides as compared to cultural weed control. Jehangeri *et al.* (1984) reported that application of selective herbicides provided 65 to 90% weed control and gave 100-150% more maize yield than weedy check. In view of the importance of the problem, an experiment was designed to investigate the efficacy of different herbicides in controlling weeds and consequent effects on various agronomic parameters including yield and yield components of maize crop.

MATERIALS AND METHODS

Herbicidal efficacy was tested through pre and post-emergence herbicidal applications in comparison with hand weeding and weedy check in maize crop during the crop season 2006 at Agricultural Research Institute Tarnab, Peshawar, Pakistan in randomized complete block design. The plot size was 5 x 3.75 m². The plant population in each plot was maintained at 65000 plants per hectare. Thinning was done in order to maintain plant population constant in each treatment. A basal doze of 120:80:30 kg NPK ha⁻¹ fertilizers were applied. Full dose of phosphorus, potash and half dose of nitrogenous fertilizer were applied at sowing time, while remaining half of Nitrogen was applied before silking. The details of treatments are provided in Table-1.

Table-1. Detail of herbicidal treatments in the experiment.

Treatments	Common name	Application time	Dose L ha ⁻¹
PrimextraGold 720 SC	atrazine + S-metolachlor	Pre-emergence	1.44
-do-	-do-	Post emergence	-do-
Atrazine 38 SC	atrazine	Pre-emergence	0.76
-do-	-do-	Post-emergence	-do-
Dual Gold 960 EC	S-metolachlor	Pre-emergence	1.92
-do-	-do-	Post-emergence	-do-
Stomp 330E	pendimatalin	Pre-emergence	0.75
Hand weeding	-	-	-
Weedy check	-	-	-

The data were recorded on weed density m⁻², weed biomass (g m⁻²), plant height (cm), ear height (cm), days to 50 % silking, days to 50% physiological maturity, 1000 kernel weight (g) and grain yield (kg ha⁻¹). The data were subjected to the analysis of various technique and the significant means were separated by the LSD test (Steel and Torrie, 1980)

RESULTS AND DISCUSSION

Weeds density (m⁻²)

The weeds infesting the crop were *Cynodon dactylon*, *Cyperus rotundus*, *Digera arvensis*, *Digitaria ascendens*, *D. sanguinalis*, *Dactyloctenium aegyptium*, *Echinochloa colonum*, *Sorghum halepense* and *Trianthema portulacastrum*. Data revealed that there was significant (P<0.05) effect of herbicides on the weed density (Table-2). It can be inferred from the data that pre-emergence herbicides were more effective than post emergence herbicides. Dual Gold and Primextra Gold applied pre-emergence controlled maximum weeds. The plots treated with Dual gold have shown 25 weeds m⁻² as compared to 253 weeds m⁻² in weedy check plots. It was followed by Primextra gold and Atrazine applied as pre- emergence (29 & 54 m⁻²) and were found at par with Dual gold. Khan and Haq (2004) and Veseloski (1993) also reported that Dual gold and Primextra gold were most effective in controlling weeds.

Weeds Biomass

Data on dry weed biomass indicated that dry the biomass was markedly affected by different herbicide treatments (Table-2). The data exhibited that there was a significant difference between pre- and post-emergence herbicides application and hand weeding. Minimum weeds biomass (22 g m⁻²) was observed in the plots treated with Dual gold applied as pre-emergence followed by Primextra gold treated plots (30g m⁻²).

Maximum weed biomass of 238 g m² was recorded in weedy check plots. Similarly Gonzalez and Sales (1995) and Olunuga and Objimi (1983) also reported the same effective weed control with Primextra in maize crop.

Plant Height

Data concerning plant height of maize subjected to different methods of weed control showed that Plant height was non-significantly affected by various herbicide treatments (Table-2). Although not approaching the level of statistical significance, the taller plants (163, 160, 160 cm) were attained in the plots treated with Dual gold, Primextra gold and Atrazine when applied as pre-emergence, while minimum plant height of 132 cm was recorded in weedy check plots. These results are in agreement with Sakhunkhu and Faungfupong (1985), who also reported that weed control methods had no effect on plant height of maize.

Ear Height

Data concerning the ear height of maize subjected to different herbicides showed that ear height was also non-significantly affected by various weed control treatments. However, the means showed that maximum ear height (80 cm) was noticed in Dual gold treated plots and minimum plant height (52 cm) in no weeding plots.

Days to 50% Silking

Days to 50% Silking data were also non significant statistically. However, overall it was observed that plots treated with weed control methods took more days to silking than no weeding (Table-2). The findings are in agreement with Nawab et al. (1997), who reported that number of days to tasseling was increased in weed free plots as compared to check plots.

Days to 50% maturity

Weed control treatments also showed non significant effects. However, on average the maximum days to maturity were recorded in plots treated with weedicides as compared to hand weeding and no weeding. This was confirmed by Nawab et al. (1997), who reported that days to maturity were increased in weed free plots as compared to check plots. Comparing the results, Primextra gold (pre-em) plots took more days to maturity as compared to other treated plots.

1000 kernel weight (g)

The analysis of the data showed that different herbicides at different application times had significant ($P < 0.05$) effect on the 1000 kernel weight.

Data indicated that maximum 1000 grain weight (133 g) was produced by Primextra gold (pre-em). It was also found statistically at par with Dual gold. Minimum 1000 kernel weight (109 g) was obtained in the weedy check. The best performance of Primextra gold and Dual gold can be attributed to the best weed control. Similar results have been reported by Veseloski (1993).

Grain yield kg ha⁻¹

Significant differences were observed in grain yield due to weed control treatments. Weed control treated plots produced maximum grain yield and results are in agreement with Saini (2000), who reported that weed control treated plots have shown increased yield. In the recent study pre-emergence herbicides vs. post emergence herbicides, the pre-emergence herbicides produced higher grain yield (Table-2). Regarding pre-emergence herbicides, highest grain yield (4248 kg ha⁻¹) was produced by Dual gold treated plots which was found significantly different from the weedy check (2579 kg ha⁻¹). It was followed by Premixtra gold treated which produced 3610 kg ha⁻¹. In the post-emergence herbicides, Atrazine treated plots were far better (3400 kg ha⁻¹) than other herbicides, hand weeding and weedy check. The possible explanation for the increase in grain yield could be that weed control by different methods in this study diverted the nutrients to the crop, which in turn resulted in increased grain yield. These results are also confirmed by Ali *et al.* (2003) and Khan (2004).

It is concluded from this study that lesser weed infestation with low weed biomass and maximum maize grain yield was recorded when crop was treated with Dual gold (pre-em) followed by Primextra gold (pre-em).

Table-2. Efficacy of different herbicides on weed density, weed biomass, yield and yield components and some morphological and physiological traits of maize.

Treatment	Weed density m ⁻²	Weed biomass m ⁻² (g)	Plant height (cm)	Ear height (cm)	Days to 50% silking	Days to 50% maturity	1000Grain weight (g)	Grain yield (kg ha)
Primextra gold 720 SC pre-em	29e	30ef	160	73	70	100	133a	3610b
Primextra gold 720 SC post- em	98d	60se	147	70	66	96	123ab	3030f
Atrazine 38 SC pre- em	54e	40ef	160	70	68	98	120bcd	3283d
Atrazine 38 SC post- em	196b	102c	147	73	65	94	107d	3400c
Dual gold 960 EC pre-em	25e	22f	163	80	72	99	133a	4248a
Dual gold 960 EC post -em	102d	87cd	143	57	67	97	131ab	3259d
Stomp 330 E pre-em	99d	38ef	153	77	69	98	121abc	3171e
Hand weeding	161c	143b	150	63	66	96	126ab	2804g
Weedy check	253a	238a	132	52	64	94	109cd	2579hs
LSD _{0.05}	30.14	30.44	ns.	ns.	ns	ns	12.93	30.44

Means in the respective columns followed by different letters are significantly different by LSD test at P≤0.05. NS= Non Significant

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