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IMPACT OF WEED MANAGEMENT ON MAIZE (ZEA MAYS L.) PLANTED AT NIGHT

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ABSTRACT

Field trial was conducted at Malkandher Research Farm, NWFP Agricultural University, Peshawar, Pakistan, during 2001 to study the effect of selective herbicides on grassy and broadleaf weeds in night planted maize hybrid P 3203. The treatments were: unweeded control, hand weeding, pre-emergence herbicides; Stomp (pendimethalin 0.75 kg a.i. ha^{-1}), Primextra (atrazine + metolachlor 2.25 kg a.i. ha^{-1}), Jinong (atrazine 0.90 kg a.i. ha^{-1}), Dual gold (S-metolachlor 1.92 kg a.i. ha^{-1}), and Treflan (trifluralin 1.50 kg a.i. ha^{-1}) and post-emergence herbicides; Banvel (dicamba 0.84 kg a.i. ha^{-1}) and 2,4-D (0.80 kg a.i. ha^{-1}). The predominant weed flora recorded was Echinochloa crus-galli, Leptochloa sp., Cyperus rotundus and Digiteria sanguinalis. The herbicides significantly affected leaf area, cob length, number of kernels cob^{-1}, 500 kernel weight (g), grain yield (t ha^{-1}), weeds density m^{-2} and weeds biomass m^{-2}. The most effective herbicides in controlling weeds were pendimethalin, atrazine + metolachlor and S-metolachlor with 65 and 55 % each control, respectively as compared to 265 weeds m^{-2} in unweeded control. Pendimethalin increased yield by 39 %, atrazine + metolachlor by 38 %, S-metolachlor by 31 % and hand weeding by 61 %. All the significant parameters of crop were comparable among the hand weeding, pendimethalin, atrazine + metolachlor and S-metolachlor treated plots. However pendimethalin and atrazine + metolachlor proved to be the most economical herbicides giving maximum returns of Rs. 35825 and 34582 ha^{-1}

Key Words: Weed Control, Night Planting

INTRODUCTION

Maize (*Zea mays* L.) belongs to family Gramineae and is one of the most important cereal crops. It is currently produced in most countries of the world and the third most planted field crop after wheat and rice. It not only provides food to the increasing population, but also supplies the raw material for domestic industries. Pakistan, despite an agricultural country, is deficient in food grains and other food items. The main cause of food shortage in our country has been the failure of production of food grain to keep pace with the increase in population. For bridging the gap between demand and supply of food grains, productivity needs to be enhanced. The feasibility to increase per acre yield is more because yield potential of maize crop has not been realized so for, as there is a large gap between potential and actual yield per acre.

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Besides other factors, yield is greatly affected by weeds in the field. In NWFP, the losses due to weeds are approximately 20-40 % (Anonymous, 2001). Weeds are a problem particularly for those farmers who have large holdings. Whereas, small farmers having ample farm labour, use these weeds as fodder for their animals. 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. Durkic and Knezevic (1993) reported that two inter-row cultivation and hoeing were not effective in controlling weeds while herbicides were effective in controlling weeds in maize crop. Similarly Gonzalez and Salas (1995) reported that Primextra gave 100 and 90 % control in two years and maximum grain yield of maize. Miller and Libby (1999) concluded that corn yield responded positively to increased weed control by herbicides.

In view of the importance of the problem, this experiment was designed to investigate the efficacy of different herbicides on weed pressure and consequent effects on various parameters of maize crop including yield and yield components.

Materials And Methods

Field studies were initiated to study the impact of weed management on maize crop at Malkandher Research Farm, NWFP Agricultural University, Peshawar during 2001. The experiment was laid out in Randomized Complete Block (RCB) design, having three replications with plot size of 5 x 3.75 m^2. The sowing of maize was done at night. The following treatments were studied during the course of the experiment.

S. No	Treatments	Common Name	Time of application	Dose Kg a.i.ha^{-1}
1.	Dual gold 960 EC	S-metolachlor	Pre-emergence	1.92.
2.	Primextra 500 FW	atrazine + metolachlor	Pre-emergence	2.25
3.	Treflan 48 EC	trifluralin	Pre-emergence	1.50.
4.	2,4-D 72 %	2,4-D	Post-emergence	0.80
5.	Stomp 330 E	pendimethalin	Pre-emergence	0.75
6.	Jinong 38 SL	atrazine	Pre-emergence	0.90
7.	Banvel 720 E	dicambe	Post-emergence	0.84
8.	Hand weeding	----------	----------	-----
9.	Weedy check	----------	----------	-----

The data were recorded on weeds density m^{-2}, weeds biomass m^{-2}, plant height, number of leaves plant^{-1}, leaf area (cm^2), number of cobs plant^{-1}, cob length, number of kernels cob^{-1}, 500 kernel weight (g), and Grain yield (kg ha^{-1}).

Standard procedures were adopted for recording data on various parameters. Weeds density m^{-2} was recorded after 3rd irrigation by placing quadrate of 0.5 x 0.5 m^2 size, five times

randomly, counting the number of weeds occurring in each quadrate. The mean of five quadrates was subsequently converted to count m^{-2}. For recording weed biomass, weeds were removed by hand weeding from subplot once in a week and from the treated subplot after harvesting, and then fresh weight of weeds were noted through electronic balance. However leaf area was calculated by measuring in cm the width and length of ten randomly selected leaves in the axil of which the first cob is born and subsequently the leaf area was computed with the formula: Leaf area (cm^2) = length (cm) x width (cm) x 0.75 (factor). Grain yield data were recorded by harvesting net plots, husked, sun dried and shelled.

The data collected were subjected to statistical analysis and the treatment means were separated by least significance difference (LSD) test (Steel and Torrie, 1980).

Results and Discussion

Data concerning number of weeds m^{-2} of maize crop affected by different weeds control treatments is shown in Table-1. Analysis of the data revealed that weeds m^{-2} were significantly ($P \leq 0.05$) affected by various treatments. The maximum of 265 weeds m^{-2} were recorded in weedy check plots while minimum (92.7) weeds m^{-2} were in plots treated with stomp 330 E which gave good control of *Echinochloa crus-galli* and *Leptochloa* sp. Similar results were reported by Dimitrijevic and Konstantinovic, (1983) and Abid *et al.*, (1991) who reported an excellent control of weeds by stomp.

Data pertaining to weed biomass in different herbicides applied on maize crop showed that fresh weed weight was significantly ($P \leq 0.05$) affected by various weed control treatments. The data exhibit that maximum weed weight of 384.00 g m^{-2} was recorded in plots treated with Jinong 38 SL followed by Banvel 720 E treated plots which produced 383.66 g while minimum of 215.33 g weed weight m^{-2} was produced by Primextra 500 FW treated plots (Table-1). Similar results were reported by Khan *et al*, (1998) in their studies on maize.

Data concerning plant height of maize subjected to different herbicides showed that plant height was non significantly affected by various herbicide treatments (Table-1). Although not approaching the level of statistical significance, the taller plants (192.66 cm) were attained by hand weeded plots followed by Stomp (190 cm), while minimum plant height of 157.33 cm was recorded in weedy check. These results are in agreement with Sakhunkhu and Faungfupong (1985), who reported that weed control methods had no effect on plant height of maize.

Number of leaves $plant^{-1}$ were also non significantly affected by different treatments. However the maximum number of leaves $plant^{-1}$ (12.2) were recorded in hand weeding and Dual gold treated plots and minimum number (11) of leaves $plant^{-1}$ were recorded in weedy check plots (Table-1).

Leaf area was significantly affected by different weed control treatments (Table-1). Mean values showed that maximum leaf area (6247 cm^2) was recorded in hand weeding plots and minimum leaf area (4387) was recorded in weedy check plots. However leaf area in all other

plots was non-significantly affected from each other. Similar results were reported by El-Bially (1995a), who measured variable leaf area in different herbicidal treatments of maize.

Data regarding number of cobs plant^{-1} was non significantly affected by different treatments (Table-1). One cob plant^{-1} was recorded in all treatments except weedy check and plots treated with post emergence herbicides. Chemical treatments had no any significant effect on number of cobs palnt^{-1} are the analogous results reported by Akhtar *et al*, (1984).

Data pertaining to cob length of maize crop treated with different weeds control methods revealed that cob length was significantly ($P \leq 0.05$) affected by various weed control treatments. The maximum (17.00 cm) cob length was recorded in hand weeding followed by Stomp 330 E treated plots which attained 15.80 cm cob length while minimum cob length (12.33 cm) was recorded in weedy check. Similar results were reported by El-Bially (1995a). He reported that cob length was greater for the chemical and mechanical treatments than for the untreated control.

Further statistical analysis of the data indicated that number of grains cob^{-1} were significantly ($P < 0.05$) affected by various herbicides. The maximum (540.33) kernels cob^{-1} were produced by hand weeding followed by Stomp 330 E which produced 535.66 kernels cob^{-1} while minimum number of kernels cob^{-1} (450.33) were recorded in weedy check (Table-1). These results agree with Akhtar *et al.* (1998).

Data pertaining to 500 kernel weight of maize crop indicated that 500 kernel weight was significantly ($P \leq 0.05$) affected by various herbicides. Maximum (120.33 g) 500 kernel weight was produced by hand weeding followed by Stomp 330 E which produced 117.00 g 500 kernel weight, while minimum weight was produced by weedy check and Banvel 720 E (Table-1). These results are in analogy with the work of El-Bially (1995b). He reported that 100 grain weight was greater for the chemical and mechanical treatments than for the untreated control.

Data pertaining to grain yield of maize crop as affected by different weed control treatments showed that grain yield was significantly ($P \leq 0.05$) affected by various weed control treatments. It is inferred from the data shown in Table-1 that maximum grain yield of 5.33 tons ha^{-1} was obtained by hand weeding, while minimum grains yield (3.5 and 3.6 tons ha^{-1}) were recorded in Banvel 720 E and weedy check plots, respectively. These results are in analogy with those reported by Abid *et al.*, (1991).

Table-1. Efficacy of different herbicides on weed density and biomass (m^{-2}) and then impact on yield and yield components of maize

Treatment	Plant height (cm)	Number of leaves plant^{-1}	Leaf area (cm^2)	Number of cobs plant^{-1}	Cob length (cm)	Number of kernels cob^{-1}	500 kernel weight (g)	Grain yield (t/ha)	Weeds density m^{-2}	Weeds biomass m^{-2}
Stomp 330E	190.3	12.1	5610 ab	1.00	15.7 ab	535.7 a	117.0 a	5.01 ab	92.7 cd	234.7 bcd
Banvel 720 E	158.7	11.0	4602 ab	0.97	12.7 b	452.0 bc	114.0 b	3.55 b	236.0 ab	383.7 a
Primextra 500 FW	182.3	11.9	5545 ab	1.00	14.7 ab	528.3 abc	116.3 ab	4.97 ab	117.0 bcd	215.33 b
Jinong 38 SL	164.7	11.6	4721 ab	1.00	14.0 ab	480.0 abc	114.7 ab	4.30 ab	185.7 abc	384.00 a
Dual gold 960 EC	184.3	12.2	5059 ab	1.00	15.0 ab	531.3 ab	116.7 ab	4.73 ab	118.7 bcd	287.7 ab
2,4-D 72 %	168.7	11.9	5298 ab	0.97	14.0 ab	475.0 abc	115.3 ab	4.02 ab	215.7 abc	306.7 ab
Treflan 48 EC	174.3	11.7	5288 ab	1.00	14.3 ab	511.0 abc	115.7 ab	4.50 ab	168.0 abc	253.7 ab
Hand weeding	192.7	12.2	6247 a	1.00	17.0 a	540.0 a	120.3 a	5.80 a	0 d	304.3 ab
Weedy check	157.3	11.0	4387 b	0.97	12.3 b	450.3 c	114.3 b	3.60 b	265.0 a	381.3 a
LSD $_{(0.05)}$	NS	NS	1855	NS	3.46	79.62	5.877	2.007	136.1	159.40

Means in the columns followed by different letters are significantly different at $P \leq 0.05$, using LSD test.

NS = Non significant

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