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HERBICIDAL WEED CONTROL IN MUNGBEAN IN SUMMER SEASON

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ABSTRACT

A herbicidal field trial was conducted at Pulses Research Centre (PRC), Ishwardi, Pabna to find out suitable herbicide for controlling weeds in mungbean grown in summer season. There were ten herbicidal treatments including one control (no herbicide). Treatments namely Paraxon (27.6% WV paraquat dichloride salt) @ 3.73 mL L^{-1} water, Basta15 SL (Gluphosinate-ammonia) @ 4 mL L^{-1} water, Topstar 40 WP (40% Oxadiargyl) @ 200 g ha^{-1} with 400 L water,U-46 D Fluid (2,4-D) @ 6 mL L^{-1} water, Whipsupper (9% Phenoxaprop-T- Ethyl) @ 2 mL L^{-1}, Weedkill (2,4-D Dimethyl amine salt) @ 1000 mL ha^{-1} with 500 L water, M-clore 5G (Butaclore) @ 2.5 g m^{-2} L^{-1} water, Hammer 24 EC (Carfentrazone ethyl) @ 1 mL L^{-1} water, Panida 33 EC (Gluphosinate-ammonia) @ 4 ml L^{-1} water and control were laid out in a RCB design with three replications. All herbicides were applied as pre emergence. Among the herbicides, Paraxon, Topstar and panida showed the highest weed control efficiency (58.33-63.17 %). Seed yield was also found the highest (1170-1240 kg ha^{-1}) in Paraxon and Topstar. Paraxon, Topstar and Panida showed better economic performance representing higher gross margin (Tk. 54610-59635 ha^{-1}) and BCR (3.54-3.84). Seed yield was negatively correlated with weed population (r=0.88 at p=0.01) and positively correlated with weed control efficiency of herbicides (r=0.96 at p=0.01). These three herbicides can be used to control weeds in mungbean field in summer season as a low cost weed control method.

Key word: Herbicides, weed, mungbean, yield

INTRODUCTION

Mungbean area is increasing day by day due to cultivation of this crop in summer season (AIS 2015; BBS 2016). Area coverage of mungbean is about 0.18 million hectares with an annual production of 0.20 metric tons (AIS 2016). Weed is a serious problem in mungbean grown in summer season (Mian*et al.* 2015). Seed yield might be reduced about 56-79% in mungbean due to weed competition (Mian*et al*. 2015; Akter*et al*. 2015). Warm and humid weather condition in summer is liable to vigorous weed growth in Bangladesh (Mian and Samad 2001). Manual weeding becomes merely impossible when it rains continuously. Consequently, farmers harvest lower yield in mungbean due to severe weed competition (Mian*et al.* 2015). Moreover, peak period of labour in summer season makes the weed control situation more critical in munbean cultivation. Simultaneousworks of *boro* harvesting and weeding of jute and other summer crops creates labour crises. So, farmers are not interested to cultivate mungbean in summer due to weed problem. Now, it is imperative to find out suitable low cost weed control methods for muungbean cultivation in summer. Therefore, an experiment was undertaken to find out suitable herbicide for controlling weeds in mungbean in summer season as a sustainable low cost weed control method.

MATERIALS AND METHODS

The experiment was conducted at Pulses Research Centre (PRC), Ishwardi, Pabna during summer season month of March to May 2012 to evaluate the efficacy of herbicide and economic viability of herbicide application for controlling weed in mungbean. Ten weedicide treatments were Paraxon (27.6% WV paraquat dichloride salt) @ 3.73 mL L^{-1} water, Basta15 SL (Gluphosinate-ammonia) @ 4 mL L^{-1} water, Topstar 40 WP (40% Oxadiargyl) @ 200 g ha^{-1} with 400 L water,U-46 D Fluid (2,4-D) @ 6 mL L^{-1} water, Whipsupper (9% Phenoxaprop-T- Ethyl) @ 2 mL L^{-1}, Weedkill (2,4-D Dimethyl amine salt) @ 1000 mL ha^{-1} with 500 L water, M-clore 5G (Butaclore) @ 2.5 g m^{-2} L^{-1} water, Hammer 24 EC (Carfentrazone ethyl) @ 1 mL L^{-1} water, Panida 33 EC (Gluphosinate-ammonia) @ 4 ml L^{-1} water and control. All herbicides were applied as pre emergence except whipsupper. The experiment was laid out in a RCB design with three replications. The soil of the experimental plot was silty loam having pH 7.5. Unit plot size was 4.5 m× 6 m. Seeding was done on 20 March 2012. The experimental plots were fertilized with nutrients @ 20-20-30-8-2-1kg ha^{-1} of N-P-K-S-Zn-B at final land preparation as basal. The variety BARI mung-6 was used as test crop @ 30 kg ha^{-1} of seed. Weed sample was collected from 1 m^{-2} in each plot using quadrate at 40 days after sowing (DAS). Then weed population was collected and dry matter weight was recorded treatment wise. Weeding

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was done in each plot at 40 DAS after collection of weed samples. Two irrigations were done at 20 DAS and 45 DAS. Imitaf was sprayed (@ 0.5 mL L^{-1} water) to control thrips at 25 DAS and 40 DAS, respectively. First and second pod harvesting of mungbean was done on 15 May to 28 May 2012. Data on yield contributing characteristics were recorded from randomly selected 5 plants from each plot. Grain yield (kg ha^{-1}) was recorded from whole plot after harvesting. The recorded data were statistically analyzed and mean values were separated by $LSD_{(0.05)}$ (Gomez and Gomez 1984). All types of variable production cost and market price of the crop were computed to find out gross return and benefit cost ratio (BCR). Some weed parameters were computed as follows (Mian 1996).

$$\text{Absolute Density (AD)} = \frac{\text{Total number of weeds of all species in a given treatment}}{\text{Unit area (per meter square)}}$$

$$\text{Relative Dry Weight (RDW)} = \frac{\text{Dry weight of all weed species in a given treatment per meter square}}{\text{Dry weight of all weed species in control treatment per meter square}} \times 100$$

$$\text{Efficiency of herbicide (EH)} = \frac{DWC - DWT}{DWC} \times 100$$

Where, DWC=Dry weight of weed in control treatment and DWT=Dry weight of weed in given treatment.

Results and Discussion

Weed parameters

The lowest weed population (244 m^{-2}) was observed in Topstar followed by Paraxon(261 m^{-2}) and Panida (293 m^{-2}) while the highest (567 m^{-2}) in control (Table 1). Relative dry wieght of weed (30.50%) and intensity of weed infestation (3.93) was the lowest using Topstar followed by Paraxon andPanida while the highest in control. The efficacy of weed control was observed the highest by Topstar (63.17%) and Paraxon (61.27%) followed by Panida (58.33%) but the lowest in Hammer (Table 1). Variation of weed control efficiency of herbicides in mustard was also reported by Mian*et al.* (2001) and Akter*et al.* (2015).

Crop characteristics

The highest plant (42.91 to 44.32 cm) was produced in Topstar, Paraxon and Panida while the lowest in control (Table 2). The results indicated that lower weed infestation persued to increase plant heightrepresenting better plant growth. The results are in agreement with the observation of Mian*et al.* (2001). Branches $plant^{-1}$ was the highest (1.42-1.43) using Topstar and Paraxon followed by Panida (1.35) but the lowest in control. The number of pods $plant^{-1}$ was recorded and the highest (9.31 to 10.33) was in Topstar and Paraxon which were identical to Panida (9.28) while producing the lowest in control. The highest number of branches $plant^{-1}$ supported to produce higher no. of pods $plant^{-i}$. Weight of 1000-seed was the highest (50.20-52.33) in Paraxon, Basta, Topstar, Whipsuper and Panida but the lowest in control. Similar results also have been described by Akter*et al.* (2015). The highest seed yield was found in Topstar (1240 kg ha^{-1}), Paraxon (1220 kg ha^{-1}) and Panida (1170 kg ha^{-1}) while the lowest in control (Table 2). Similarly yield variation was noticed in herbicidal treatment in mungbean (Akter*et al*. 2015). The highest seed yield was mainly contributed by higher number of pod $plant^{-1}$ and thousands seed weight. The results have been supported by the finding of Mian (2008). Stover yield was recorded the highest (4410-4800 kg ha^{-1}) in Topstar, Paraxon and Panida followed by Basta and whipsupper while giving the lowest in control. The results revealed that higher seed yield and stover yield were produced in herbicides where the weed infestation was lower (Table 1 and Table 2). Seed yield was negatively correlated with weed population (r=0.88 at p=0.01) and positively correlated with weed control efficiency of herbicides (r=0.96 at p=0.01) (values not shown in the Table). Similar results have been described by Mian*et al.* (2001).

Gross return, gross margin and BCR

Differences of total variable cost were occurred in the herbicidal treatments due to variation of prices of herbicides (Table 3). The highest gross return was recorded in Topstar (Tk. 80600 ha^{-1}) followed by Paraxon (Tk.79300 ha^{-1}) and Panida (Tk.76050 ha^{-1}) while the lowest in control (Table 3). Similarly, gross margin was the highest in Topstar (Tk. 59635 ha^{-1}) followed by Paraxon (Tk. 56952 ha^{-1}) and Panida (54610 ha^{-1}). Higher BCR (3.54- 3.84) was calculated in the herbicides of Paraxon, Topstar and Panida. Higher BCR was also observed in these three herbicides due to higher seed yield. The findings were in agreement with the report of BARI (2015).

Weedicides	Weed population density ($no.m^{-2}$)	Relative dry weight (%)	Intensity of weed infestation	Efficacy of weed control (%)
Paraxon	261	32.63	4.05	61.27
Basta	399	37.38	5.97	51.22
Topstar	244	30.50	3.93	63.17
U-46	453	56.63	6.82	48.05
Whipsuper	401	50.13	5.90	52.70
Weed kill	466	58.25	7.14	49.02
M-clore	473	59.13	7.37	50.16
Hammer	487	60.87	10.53	37.25
Panida	293	39.13	4.54	58.33
Conrtol	567	113.40	21.76	00.00
SD	106.91	23.92	5.28	18.14
$LSD_{(0.05)}$	129.88	4.81	0.14	3.64
CV (%)	18.27	5.12	1.02	3.73

Table 2. Yield contributing characters and yield of mungbean as affected by herbicide

Weedicide	Plant height (cm)	Branches plant^{-1} (no.)	Pods plant^{-1} (no.)	1000-seed weight (g)	Seed yield (kg ha^{-1})	Straw yield (kg ha^{-1})
Paraxon	44.31	1.42	9.31	51.93	1220	4650
Basta	41.66	1.08	9.08	50.49	1100	3430
Topstar	44.32	1.43	10.33	52.33	1240	4800
U-46	41.66	1.08	6.80	49.00	1000	3010
Whipsupper	41.00	1.09	9.06	50.20	1120	3380
Weed kill	38.33	1.06	8.62	49.38	1040	3300
M-clore	38.03	1.09	8.02	49.40	1050	3270
Hammer	37.09	1.10	8.60	48.28	880	2960
Panida	42.91	1.35	9.28	50.22	1170	4410
Conrtol	31.33	1.08	7.05	47.03	640	2080
SD	3.98	0.15	1.07	1.59	178	849
$LSD_{(0.05)}$	2.5	0.13	1.63	1.48	0.09	410
CV (%)	3.66	6.31	11.09	1.73	4.86	6.90

SD=Standard Deviation, Mean values were compared at 0.05 level of probability

Table 3. Gross return, Gross margin and BCR of mungbean as affected by herbicide

Weedicide	Total production cost (Tk.)	Gross return(Tk.)	Gross margin (Tk.)	BCR
Paraxon	22348	79300	56952	3.55
Basta	21665	71500	49835	3.30
Topstar	20965	80600	59635	3.84
U-46	22128	65000	42872	2.94
Whipsupper	22173	72800	50627	3.28
Weed kill	21600	67600	46000	3.13
M-clore	21440	68250	46810	3.18
Hammer	21440	57200	35760	2.67
Panida	21440	76050	54610	3.54
Conrtol	21098	41600	20502	1.97

Market price:Urea=Tk.16 kg^{-1}, TSP=Tk. 22 kg^{-1}, MOP=Tk.15 kg^{-1}, Gypsum=Tk.10 kg^{-1}, Zinc Sulphate=Tk.150 kg^{-1}, Boric acid=Tk. 110 kg^{-1}, Mungbean seed=Tk. 65 kg^{-1}, Human Labour=Tk. 300 day^{-1}(March to May 2012)

CONCLUSIONS

Three herbicides named Paraxon, Topstar and Panida would be used as pre-emergence for controlling weeds in mungbean field in summer season as a low cost weed control method.

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