

Effect of different weed management practices in summer mungbean [*Vigna radiata* L.] under new alluvial zone of West Bengal

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ABSTRACT

A field experiment was undertaken during summer season of 2006 and 2007 under medium land situation of inceptisol at Instructional Farm, Bidhan Chandra Krishi Viswavidyalaya, Jaguli, Nadia, West Bengal to find out the effect of different weed management practices in mungbean. The maximum reduction of weed population, weed dry weight and the highest weed control efficiency vis-a-vis crop yield, and maximum benefit: cost ratio were obtained in the treatment receiving quizalofop-p-ethyl 50 g a.i. ha⁻¹ at 21 day after emergence (DAE) + hand weeding (HW) at 28 DAE. This was closely followed by the treatment with quizalofop-p-ethyl 50 g a.i. ha⁻¹ at 14 DAE + HW at 21 DAE. Weedy check treatment produced lowest yield of mungbean.

Key word: Herbicide, quizalofop-p-ethyl, hand weeding, hoeing, weed management

Ecological degradation from synthetic chemicals, population pressure and poverty coupled with malnutrition are the alarming concerns for the present day agricultural researchers. Hence, nutrition oriented sustainable agricultural production system is of utmost priority in the present context. Pulses are inseparable ingredients of vegetarian diet, and one of the cheapest weapons for combating the malnutritional problem by supplying dietary protein to the people of our motherland. India, contributes 27.65% to the global pulse production and holds 35.2% of the world's pulse acreage. In spite of being the largest producer in the world, our country has to import pulses to the tune of two million tonnes every year to meet its domestic requirement, the increment in the production being not able to maintain the pace with population growth (Chaturvedi and Ali, 2002).

Among the grain legumes, mungbean [*Vigna radiata* (L.) Wilczek] can be grown throughout the year; again summer mungbean cultivation has been a success story in our agriculture. In our country, mungbean ranks third after chickpea and pigeon pea among the pulses in respect of production. In West Bengal, about 4.4 thousand tonnes of mungbean production was recorded from 11.7 thousand hectares of area in 2004 – 05 (Anonymous, 2006). In our state, a vast area remains idle for about 60 – 90 days during post-rabi period. As this crop is deep rooted, it can be grown with limited irrigation.

One of the major constraints in mungbean production is weed competition. The loss of mungbean yield due to weeds ranges from 65.4% to 79.0% (Shuaib 2001; Dungarwal *et al.* 2003). Besides causing crop losses, weeds are also responsible for reducing crop quality, nutrient status of soil etc. The weeds can be checked by adopting various methods like eco-physical, biological, chemical and recently

through combining direct and indirect approach i.e. integrated weed management.

Keeping the above idea in view, the present research work was carried out with the objective to evaluate the relative efficacy of integrated method of weed management with sole chemical method on growth, yield and economics of summer mungbean.

MATERIALS AND METHODS

The field experiment was conducted for two consecutive years during pre-kharif season of 2006 and 2007 at the Instructional farm of Bidhan Chandra Krishi Viswavidyalaya, Jaguli, Nadia, West Bengal to study the effect of different weed management practices on the production of summer mungbean. The experimental soil was well drained, alluvial in nature and sandy loam in texture, having pH 6.8, organic carbon 0.76%, available nitrogen 154 kg ha⁻¹, available phosphorus 17.97 kg ha⁻¹ and available potassium 160.56 kg ha⁻¹. These were estimated by Combined glass electrode pH meter method, Walkley and Black's rapid titration method, Modified macro Kjeldahl method, Olsen's method and Flame photometer method, respectively (Jackson, 1967). The experimental site belongs to the sub-tropical humid climate. The temperature is moderate, ranges from 25 to 38°C and the annual rainfall ranges from 1250 mm to 1500 mm and about 70% of the rainfall is generally received during the month of July to October. The experiment was laid out in Randomized Block Design (RBD) with 10 different weed management practices with each replicated four times. The different weed management treatments were T₁, Quizalofop-p-ethyl @ 37.5 g a.i. ha⁻¹ at 7 days after emergence (DAE); T₂, Quizalofop-p-ethyl @ 37.5 g a.i. ha⁻¹ at 7 DAE + hand weeding (HW) at 14 DAE; T₃, Quizalofop-p-ethyl @ 37.5 g a.i. ha⁻¹ at 7 DAE + hoeing at 14 DAE;

T₄, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE; T₅, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE + HW at 21 DAE; T₆, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE + hoeing at 21 DAE; T₇, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE; T₈, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + HW at 28 DAE; T₉, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + hoeing at 28 DAE and T₁₀, Weedy check.

Mungbean cv. Samrat (PDM 84-139) was grown with the fertilizer dose @ 20:40:20 kg ha⁻¹ of N, P₂O₅ and K₂O in the form of urea, single super phosphate, muriate of potash, respectively as basal application. The seeds were sown @ 20 kg ha⁻¹ in furrows at 30 cm x 10 cm spacing at a depth of 2 to 3 cm below the soil surface.

The crop growth rate, weed population, weed dry weight and weed control efficiency were recorded at different stages of the crop. Weed control efficiency were obtained by using the following

$$\text{formula. WCE} = \frac{X - Y}{X} \times 100$$

Where, X = Number or dry weight of weeds in unweeded plot. Y = Number or dry weight of weeds in treated plot.

RESULTS AND DISCUSSION

Effect on weeds

Different types of weed flora were observed in experimental field during summer season of 2006 and 2007. The most commonly noticed grass weeds were *Echinochloa colona*, *Echinochloa crusgalli*, *Digitaria sanguinalis*, *Eleusine indica* etc; sedge weed was *Cyperus rotundus* and broad leaved weeds were *Physalis minima*, *Alternanthera sessilis*, *Euphorbia hirta*, *Cleome viscosa*, *Chenopodium album* etc.

Weed population in mungbean field differed significantly with the different weed management practices both at 30 and 45 days after sowing (DAS). Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + HW at 28 DAE (T₈) showed the lowest population of grass, sedge and broad leaved weeds at both the stages. This was statistically at par with the treatment T₅ (quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE + HW at 21 DAE). The weedy check treatment (T₁₀) showed significantly highest population of grass weeds among all the treatments. However, sole herbicidal treatments (*viz.* T₁, T₄ and T₇) were comparable with each other and at par with weedy check with respect to population of sedge and broad leaved weeds. The total weed population was significantly highest in weedy check treatment where as, maximum reduction of total weed population was found in T₈ and T₅ treatments both at 30 and 45 DAS

in summer mungbean. Similar result was also reported by Singh, (2005).

Dry weight of different categories of weeds (*viz.* grass, sedge and broad leaf) and total weeds differed significantly among the treatments both at 30 and 45 DAS (Table 1). Significantly higher dry weight of grass weeds was recorded in weedy check treatment where as dry weight of sedge and broad leaved weeds in weedy check were at par with sole herbicidal treatments *viz.* T₁, T₄ and T₇. The lowest dry weight of grass, sedge and broad leaved weeds as well as of total weeds were observed in T₈ treatment (Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + HW at 28 DAE). This was comparable with T₅ treatment receiving quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE + HW at 21 DAE both at 30 and 45 DAS. Dry weight of total weeds followed the same trend as found in grass, sedge and broad leaved weeds separately. Similar result was also reported by Bedmar (1997).

The highest weed control efficiency was found in T₈ (quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + HW at 28 DAE) followed by T₅ (quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE + HW at 21 DAE). On the other hand the sole chemical treatments like T₁, T₄ and T₇ had lower weed control efficiency in summer mungbean. Similar result was also reported by Tiwari *et al.* (2006).

Effect on crop

Growth attributes

Plant height at harvest varied significantly among various weed management practices in mungbean (Table 2). The highest plant height was recorded in the treatment having quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + HW at 28 DAE. This was similar with treatments receiving quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE + HW at 21 DAE and quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 7 DAE + HW at 14 DAE. Among the treatments, significantly lowest height of plant was observed in weedy check plot. Crop growth rate of mungbean showed similar trend as in plant height.

Yield attributes and seed yield

Yield attributes (*viz.* number of pods plant⁻¹, number of seeds pod⁻¹) and seed yield of mungbean varied significantly with different weed management practices (Table 2). The number of pods plant⁻¹, seeds pod⁻¹ as well as seed yield (1327 kg ha⁻¹) were highest in the treatment having quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + HW at 28 DAE. This was closely followed by the treatment with quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE + HW at 21 DAE. Similar

result was also reported by Singh *et al.* (2001). The lowest number of pods plant⁻¹, seeds pod⁻¹ as well as seed yield were recorded in weedy check treatment (T₁₀). However, thousand seed weight of mungbean was not significant among the treatments.

The sole application of herbicide *viz.* T₁, T₄ and T₇ were at par with each other and produced significantly lower seed yield compared with integrated approach of weed management practices. Haulm yield followed the same trend as seed yield. Reduction in seed yield in sole herbicidal treatment was attributed to higher weed infestation in the crop field. Similar result was also reported by Singh *et al.* (2002).

Economics

Application of quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + HW at 28 DAE in mungbean showed the highest harvest index, increase in yield over control and benefit: cost ratio. This was followed by quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE + HW at 21 DAE and quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 7 DAE + HW at 14 DAE. The lowest harvest index, yield increment over control and benefit: cost ratio was found with weedy check treatment (T₁₀).

Integrated weed management practices with quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + hand weeding at 28 DAE produced the highest yield attributes, seed yield and benefit: cost ratio in mungbean cultivation compared with application of herbicide alone.

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Table 1: Effect of different weed management practices on population and dry weight of weeds at different stages of crop growth (Pooled data of two years)

Treatment	Weed population (no. m ²)								Dry weight of weeds (g m ⁻²)							
	Grass		Sedge		Broad leaved weeds		Total weeds		Grass		Sedge		Broad leaved weeds		Total weeds	
	Days after showing															
	30	45	30	45	30	45	30	45	30	45	30	45	30	45	30	45
T ₁	16.50	24.30	47.43	59.17	65.87	70.50	129.80	153.97	7.87	15.23	14.57	25.20	36.07	45.23	58.51	85.66
T ₂	6.27	10.61	17.97	25.85	16.93	23.33	41.17	59.79	2.75	7.09	5.10	9.28	9.13	15.07	16.98	31.44
T ₃	13.27	19.27	30.83	37.46	29.17	36.97	73.27	93.70	5.91	12.25	9.26	13.17	17.33	25.86	32.50	51.28
T ₄	14.13	21.27	48.17	58.23	64.13	69.80	126.43	149.30	6.27	13.67	15.33	25.00	36.24	44.90	57.84	83.57
T ₅	4.73	8.77	14.23	20.17	11.57	16.90	30.53	45.84	1.97	5.70	4.27	9.07	6.67	11.33	12.91	26.10
T ₆	11.30	16.77	25.83	31.37	28.87	35.53	66.00	83.67	5.70	10.40	7.87	12.20	17.30	22.17	30.87	44.77
T ₇	10.30	17.84	46.97	57.50	66.03	71.87	123.30	147.21	5.41	11.05	14.05	22.87	36.77	45.05	56.23	78.97
T ₈	2.17	6.83	8.07	13.87	6.96	11.07	17.20	31.77	1.03	4.77	1.96	7.13	3.83	7.85	6.82	19.75
T ₉	9.47	14.13	21.77	27.30	26.30	33.00	57.54	74.43	5.16	9.13	6.87	11.56	15.50	21.97	27.53	42.66
T ₁₀	65.90	79.77	48.83	59.24	66.90	72.29	181.63	211.30	31.27	42.97	15.45	26.33	37.23	45.89	83.95	115.19
S.Em (±)	1.25	1.40	1.33	1.46	2.20	2.43	4.06	5.20	0.59	0.69	0.50	0.72	1.26	1.50	2.41	3.23
LSD (0.05)	3.62	4.06	3.85	4.23	6.37	7.04	11.76	15.06	1.71	2.00	1.45	2.09	3.65	4.34	6.98	9.36

T₁, Quizalofop-p-ethyl @ 37.5 g a.i. ha⁻¹ at 7 days after emergence (DAE);

T₃, Quizalofop-p-ethyl @ 37.5 g a.i. ha⁻¹ at 7 DAE + hoeing at 14 DAE;

T₅, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE + HW at 21 DAE;

T₇, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE;

T₉, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + hoeing at 28 DAE and

T₂, Quizalofop-p-ethyl @ 37.5 g a.i. ha⁻¹ at 7 DAE + hand weeding (HW) at 14 DAE;

T₄, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE;

T₆, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE + hoeing at 21 DAE;

T₈, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + HW at 28 DAE;

T₁₀, Weedy check.

Table: 2 Effect of different weed management practices on weed control efficiency, growth, yield attributes and seed yield of mungbean (Pooled data of two years)

Treatment	WCE		Plant height at harvest (cm)	CGR		Yield components			Yield (kg ha ⁻¹)		Harvest index (%)	Increase in yield over control (%)	Benefit: cost ratio
	30 DAS	45 DAS		30-45 DAS	45-60 DAS	No. of pods plant ⁻¹	No. of seeds pod ⁻¹	1000 seed weight (g)	Seed	Haulm			
T ₁	30.30	25.64	43.08	5.43	22.06	16.57	9.70	34.1	782	4795	14.02	26.33	1.49
T ₂	79.77	72.71	45.65	8.47	26.75	21.00	10.40	36.0	1145	5647	16.86	84.98	1.88
T ₃	61.29	55.48	44.12	7.07	24.08	19.63	10.10	36.2	962	5282	15.41	55.41	1.67
T ₄	31.10	27.45	43.62	5.63	22.50	17.45	9.90	35.0	804	4887	14.13	29.89	1.51
T ₅	84.62	77.34	46.92	8.97	27.20	22.37	10.60	37.1	1260	5934	17.52	103.55	2.03
T ₆	63.23	61.13	44.85	7.69	24.10	20.13	10.20	36.6	996	5395	15.58	60.91	1.68
T ₇	33.02	31.44	43.91	5.95	22.73	18.60	9.90	35.4	837	5046	14.23	35.22	1.61
T ₈	91.88	82.85	47.58	10.90	28.35	23.63	10.70	37.0	1327	6109	17.85	114.38	2.26
T ₉	67.21	62.97	45.11	8.25	26.32	20.27	10.20	36.5	1033	5550	15.69	66.88	1.78
T ₁₀	----	-----	39.25	4.50	20.02	14.70	9.50	34.3	619	4107	13.10	----	1.17
SEm (±)	-		1.14	0.11	0.98	0.44	0.16	0.91	27.83	92.17	-	-	-
LSD (0.05)	-	-	3.30	0.32	2.84	1.27	0.46	NS	80.62	267.02	-	-	-

Days after sowing, WCE = Weed control efficiency, CGR = Crop growth rate

T₁, Quizalofop-p-ethyl @ 37.5 g a.i. ha⁻¹ at 7 days after emergence (DAE);

T₃, Quizalofop-p-ethyl @ 37.5 g a.i. ha⁻¹ at 7 DAE + hoeing at 14 DAE;

T₅, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE + HW at 21 DAE;

T₇, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE;

T₉, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + hoeing at 28 DAE and

T₂, Quizalofop-p-ethyl @ 37.5 g a.i. ha⁻¹ at 7 DAE + hand weeding (HW) at 14 DAE;

T₄, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE;

T₆, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 14 DAE + hoeing at 21 DAE;

T₈, Quizalofop-p-ethyl @ 50 g a.i. ha⁻¹ at 21 DAE + HW at 28 DAE;

T₁₀, Weedy check.