Himachal Journal of Agricultural Research Vol. 33 (1): 7-10, 2007

# Studies on planting and weed control methods on nutrient uptake by blackgram (*Vigna mungo* L.) and associated weeds under mid hill conditions of Himachal Pradesh

**Suresh Kumar, N.N. Angiras and Rupinder Singh**
Department of Agronomy
CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur- 176 062.

**Abstract**

**A field experiment was carried out during the *kharif* seasons of 2004 and 2005 at the Research Farm of Department of Agronomy, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur to find out the effect of planting and weed management methods on nutrient uptake by black gram and associated weeds. Raised seed bed significantly decreased dry matter accumulation and N and P depletion by weeds and increased N and P uptake and grain yield of black gram over the other seed bed planting techniques (ridge and conventional). All weed control methods were superior to weedy check in influencing weed dry matter, nutrient removal and black gram yield and nutrient uptake. Pendimethalin 0.75 kg ha$^{-1}$ integrated with one hand weeding and hand weeding twice decreased dry mater accumulation and N and P depletion by weeds and thereby increased the N and P uptake and grain yield by crop over the other methods of weed management. Pendimethalin 0.75 kg ha$^{-1}$ + HW was superior to hand weeding twice in influencing grain yield of black gram in 2005.**

**Key words:** Planting methods, black gram, seed yield, herbicide.

## Introduction

Besides competing with crop plants for light, space and water, weeds remove considerable amount of native and applied nutrients from soil. Blackgram suffers from heavy weed competition, especially in the early growth stages in the monsoon season. Uncontrolled weed growth in rainy season black gram can deplete the soil reserve upto 28.0 kg N, 3.3 kg P and 14.2 kg K ha$^{-1}$ (Choubey *et al.* 1999) depending upon the type of soil, season and intensity of weed infestation. Weed free environment especially until critical crop- growth period is essential to reduce crop weed competition for nutients. Pre – emergence application of herbicide such as pendimethalin (Kumar and Angiras 2005) and alachlor controls weeds adequately. However, at the later stages of crop growth, blackgram has been found infestated with *Ageratum conyzoides* especially under Palampur conditions. Therefore, integrated weed management practice involving herbicides and hand weeding at later stage may be more vital in providing acceptable weed control. Seed bed manipulation, such as raised seed bed and ridge planting helps in boosting crop growth and thereby improving nutrient use efficiency. Keeping these factors in mind, the present study was undertaken to evaluate the effect of various planting and weed control methods on nutrient uptake by black gram and associated weeds.

## Material and Methods

A field experiment was conducted during the *Kharif* seasons of 2004 and 2005, at the Research Farm of Department of Agronomy, CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur. The soil of the experimental field was silty clay loam in texture, acidic in reaction (pH 5.6) and medium in available nitrogen (284.8 kg ha$^{-1}$), phosphorus (14.6 kg ha$^{-1}$) and potassium (268.0 kg ha$^{-1}$). Eighteen treatment combinations consisted of three planting methods (ridge planting, raised seed bed planting and conventional planting) as main plot and six weed control methods (unweeded, pendimethalin 1.5 kg ha$^{-1}$, pendimethalin 0.75 kg ha$^{-1}$ + 1 HW (45 DAS), alachlor 1.5 kg ha$^{-1}$, alachlor 0.75 kg ha$^{-1}$+ 1HW (45 DAS) and hand weeding twice (25 and 45 DAS) as sub plot factors were evaluated in split plot design with three replications. Black gram variety 'PDU-1' was planted during second week of July, 30 cm apart using a seed rate of 20 kg ha$^{-1}$ during both the years. Ridges and raised seed beds were prepared manually. Ridge planting comprised of planting of single row of black gram at ridge top. In case of raised seed bed, two rows of mash were planted on 15 cm raised bed. In conventional seed bed

method, the crop was sown on well prepared flat surface During the entire crop life cycle, a total of 1458.5 and 2224.7 mm rainfall was received in 2004 and 2005, respectively. No irrigation was given to raise the crop.

The rest of the management practices were followed in accordance with the recommended package of practices of the university. Pre emergence application of herbicides (pendimethalin and alachlor) was made immediately after sowing of the crop with power sprayer using flat fan nozzle with a spray volume of 600 l of water $ha^{-1}$. Weed density and dry weight were recorded at the harvest. Yields were harvested from net plot.

## Results and Discussion

The predominant weeds were *Ageratum conyzoides, Cyperus iria, Echinochloa colona, Commelina benghalensis, Polygonum alatum* and *Panicum dichotomiflorum* during both the years of study. In general, *Cyperus iria, Echinochloa colona, Commelina benghalensis* and *Polygonum alatum* were the dominant weed species in the early stages of crop growth. The effective control of these weeds by adopting different weed control measures provided enough space for *Ageratum conyzoides* to emerge and become predominant at the harvest stage of crop. The weed infestation was relatively higher during the second year of study.

*Dry matter of weeds*

Raised stale seed bed has an advantages of easy planting because the soil on a raised bed warms up and dries out faster, better drainage eliminating the problems of water stagnation too close to the plant roots and fewer diseases and ultimately enhancing the nutrient use efficiency. As a matter of the fact, the resultant better plant growth eliminates or reduces competition from weeds considerably. As in the present investigation, the dry weight of weeds was significantly lower as compared to ridge and conventional method of planting (Table 1).

Pendimethalin and alachlor at higher doses alone provided less than adequate control of weeds as weed control efficiency owing to these treatments was just 37.8 and 24.4%, respectively. However, in integration with hand weeding (45 DAS), both the herbicides were quite effective against weeds. Pendimethalin 0.75 kg $ha^{-1}$ + HW resulted in significantly lowest total weed biomass in 2004 and was at par with hand weeding twice (25 & 45 DAS) during 2005. Alachlor 0.75 kg $ha^{-1}$ in integration with one hand weeding at 45 DAS was as effective as hand weeding twice in reducing weed biomass during both the years of study. This indicated that hand weeding could economize the dose of the herbicide by 50 per cent.

**Table 1. Effect of planting and weed control methods on weed biomass, WCE and nutrients depletion by weeds in blackgram**

| Treatments | Dose of herbicide (kg/ha) | Weed biomass ($gm^{-2}$) | | WCE (%) | Uptake by weeds (kg/ ha) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | N | | P | |
| | | 2004 | 2005 | | 2004 | 2005 | 2004 | 2005 |
| Planting methods | | | | | | | | |
| Ridge Planting | - | 6.4 (50.7) | 6.6 (53.7) | 52.2 | 15.86 | 16.78 | 3.10 | 3.26 |
| Raised seed bed | - | 5.7 (38.9) | 5.9 (41.8) | 63.3 | 12.40 | 12.87 | 2.39 | 2.54 |
| Conventional methods | - | 6.7 (54.0) | 6.9 (56.9) | 49.1 | 17.39 | 18.32 | 3.33 | 3.44 |
| LSD (P=0.05) | - | 0.4 | 0.5 | | 2.74 | 2.73 | 0.50 | 0.54 |
| Weed control methods | | | | | | | | |
| Unweeded | - | 10.3 (106.5) | 10.6 (112.3) | - | 34.79 | 36.60 | 6.54 | 6.88 |
| Pendimethalin | 1.50 | 8.1 (66.0) | 8.4 (70.8) | 37.8 | 20.10 | 21.72 | 3.95 | 4.24 |
| Pendimethalin + HW | 0.75 | 2.9 (8.21) | 3.07 (8.7) | 92.3 | 3.45 | 2.73 | 0.68 | 0.51 |
| Alachlor | 1.50 | 8.9 (80.2) | 9.2 (85.4) | 24.4 | 27.57 | 26.35 | 4.86 | 5.19 |
| Alachlor + HW | 0.75 | 3.8 (13.8) | 3.9 (14.6) | 87.0 | 7.74 | 4.49 | 0.82 | 0.87 |
| Hand weeding twice | - | 3.6 (12.3) | 3.7 (13.0) | 88.4 | 3.65 | 4.03 | 0.73 | 0.78 |
| LSD (P=0.05) | - | 0.6 | 0.7 | - | 1.51 | 1.55 | 0.40 | 0.68 |

Values in the parentheses are the means of original values

*Nutrient removal by weeds*

Owing to lower dry matter accumulation by weeds, raised seed bed resulted in significantly lowest depletion of N and P by weeds during both the years of study (Table-1). Like weed dry weight, ridge planting did not show any significant benefit

in saving of nutrient losses by weeds as this was statistically similar with conventional method of planting in influencing N and P depletion by weeds during both years of study.

All the weed control methods recorded significantly lower depletion of N and P by weeds over unweeded check. Pendimethalin 0.75 kg $ha^{-1}$ + 1 HW being statistically at par with hand weeding twice resulted in significantly lower N removal by weeds. Alachlor 0.75 kg $ha^{-1}$ + 1 HW was the next best treatments in this regard. Phosphorus depletion by weeds owing to lower dose of both pendimethalin and alachlor in integration with one hand weeding, behaving statistically similar with each other was also significantly lower. Similar findings on nutrient removal by weeds have also been reported by Chin and Pandey (1991).

*Seed yield of black gram*

Among various planting methods, raised seed bed recorded significantly highest seed yield as compare to other methods of planting during both the years of study (Table 2). This may be owed to significant reduction in crop-weed competition for nutrients in this method of stand establishment over the others. Because of significant reduction in crop-weed competition for nutrients, all the weed control treatments increased the seed yield of black gram over unweeded check. Integration of one hand weeding with pendimethalin 0.75 kg $ha^{-1}$ resulted in significantly highest seed yield of black gram in 2005. However, hand weeding twice was statistically at par with pendimethalin 0.75 kg $ha^{-1}$ + HW during 2004.

**Table 2. Effect of planting and weed control methods on grain yield and nutrients uptake by blackgram**

| Treatments | Dose (kg/ha) of herbicide | Grain yield (kg/ha) | | Uptake by crop (kg/ ha) | | | |
|---|---|---|---|---|---|---|---|
| | | | | N | | P | |
| | | 2004 | 2005 | 2004 | 2005 | 2004 | 2005 |
| Planting methods | | | | | | | |
| Ridge Planting | - | 1309.4 | 1154.8 | 59.93 | 51.38 | 9.16 | 7.85 |
| Raised seed bed | - | 1515.7 | 1361.1 | 68.31 | 59.44 | 10.38 | 9.03 |
| Conventional methods | - | 1204.8 | 1050.2 | 57.87 | 47.90 | 8.09 | 6.93 |
| LSD (P=0.05) | - | 172.5 | 146.9 | 2.24 | 2.90 | 0.77 | 0.63 |
| Weed control methods | | | | | | | |
| Unweeded | - | 981.4 | 735.8 | 36.41 | 27.48 | 6.19 | 5.19 |
| Pendimethalin | 1.50 | 1291.6 | 1140.9 | 54.92 | 47.59 | 9.01 | 7.82 |
| Pendimethalin + HW | 0.75 | 1701.6 | 1599.2 | 77.67 | 70.24 | 11.36 | 10.15 |
| Alachlor | 1.50 | 1206.5 | 1039.2 | 49.99 | 41.35 | 8.44 | 7.00 |
| Alachlor + HW | 0.75 | 1347.0 | 1224.4 | 73.77 | 63.32 | 9.78 | 8.09 |
| Hand weeding twice | - | 1531.5 | 1392.6 | 79.46 | 67.78 | 10.47 | 9.19 |
| LSD (P=0.05) | - | 172.5 | 171.6 | 2.04 | 2.74 | 0.49 | 0.43 |

*Nutrient uptake by blackgram*

The uptake of N and P by black gram was significantly influenced by different treatments. Among different planting methods significantly highest N and P uptake by black gram was recorded in raised seed bed planting as compare to ridge and conventional method of planting during both the years of study (Table 2). All the weed control treatments resulted in significantly higher N and P uptake by black gram over unweeded check. Pendimethalin 0.75 kg $ha^{-1}$ + 1 HW (45 DAS) recorded significantly highest N uptake in 2005 & P uptake by black gram during both the years of study. Hand weeding twice was the next best treatment in increasing the N & P uptake by black gram. As already mentioned, the uptake of nutrients by weeds and crop could mainly be attributed to extent of their dry matter production. Wherever, the removal of nutrients by weeds was more, the corresponding uptake by the crop was less and vice versa. These findings are in conformity with the finding of Modak *et al.* (1995).

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