



## Weed management in lentil

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### ABSTRACT

A field experiment was conducted to explore the feasibility of growing lentil with integration of weed management practices using herbicide, increased plant population and manual weeding at Meerut during 2008-09 and 2009-10. The experiment was laid out in randomized block design with four replications and ten treatments. The major weeds in experimental field were *Chenopodium album*, *Phalaris minor*, *Anagalis arvensis* and *Convolvulus arvensis* were recorded with some other minor weed species. Lowest weed density (4 m<sup>2</sup>) and dry weight (2.64 g/m<sup>2</sup>) was recorded where pendimethalin was applied 0.75 kg/ha as PE plus one hand weeding, which was statistically on par with pendimethalin 1.0 kg/ha. Whereas, the highest grain yield of 1662 kg/ha was recorded by pendimethalin 0.75 kg/ha plus one hand weeding, which was statistically at par with weed free as well as pendimethalin 1.0 kg/ha. Increased seed rate of 25% significantly decreased the weed dry weight (32.0%) and increased seed yield (22.8%) in comparison to their respective treatments. On an average of 37.7% yield reduction was recorded due to weed infestation. The highest gross returns of ₹ 23,268, net returns of ₹ 15,918 and B:C was recorded by pendimethalin 0.75 kg/ha PE + one hand weeding.

**Key words:** Chemical weed control, Integrated weed management, Lentil, Weed Management

Lentil is an important crop among *Rabi* pulses and usually grown on marginal and sub-marginal lands of western Uttar Pradesh without weed management. Presently not only the productivity and production are diminishing but area is also shrinking under this crop. Among various barriers like hungry and discarded soil, lack of promising cultivars, improper fertilization, pest, disease, poor weed management is the most important yield limiting factors. Weed reduces yield of lentil to the extent of 73% (Phogat *et al.* 2003). Mechanical/manual weeding is normally tedious, labour consuming and costlier. Weed management, which includes use of herbicides and different planting methods, can prove more economical and beneficial in lentil crop.

### MATERIALS AND METHODS

A field experiment was conducted at Crop Research Station of Sardar Vallabhbhai Patel University of Agriculture & Technology, Meerut, during *Rabi* season of 2008-09 and 2009-10. Ten treatments consisted with pendimethalin 1.0 kg/ha PE, pendimethalin 0.75 kg/ha PE + 1 HW, isoproturon 1.0 kg/ha PE, isoproturon 0.75 kg/ha PoE, isoproturon 0.75 kg/ha PoE + 1 HW, 25% more seed, 25% more seed + 1 HW, one hand weeding, weed

free check and weedy check were laid out in randomized block design with four replications. The soil of experimental site was loam in texture, normal in reaction (pH 7.8), low in nitrogen and phosphorus and medium in potassium status. Lentil variety 'PL-406' was sown in last week of October during both the seasons of investigation. Recommended package of practices, except weed control treatments was adopted to grow the experimental crop. Herbicides were applied with knapsack foot sprayer fitted with flat fan nozzle. Species-wise weed population, their dry matter accumulations and finally seed yield and yield attributes were recorded.

### RESULTS AND DISCUSSION

#### Effect on weeds

The major weeds in experimental field were *Chenopodium album*, *Phalaris minor*, *Anagalis arvensis* and *Convolvulus arvensis* with some other minor weed species. The annual dicot weeds were dominant among the weed flora throughout the crop season during both the years. On an average of 37.7%, yield reduction was recorded due to weed infestation in comparison to weed free conditions. All the treatments of weed management practices proved significantly superior to weedy check in reducing weed density and dry matter at 90 DAS (Table

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**Table 1. Effect of weed control treatments on density, dry weight and weed control efficiency (pooled data of two years)**

| Treatment                           | Species-wise weed density (no./m <sup>2</sup> ) |                       |                          |                             |             | Total weed density/m <sup>2</sup> | Weed dry weight (g/m <sup>2</sup> ) | Weed control efficiency (%) |
|-------------------------------------|---|-----------------------|--------------------------|-----------------------------|-------------|-----------------------------------|-------------------------------------|-----------------------------|
|                                     | <i>Chenopodium album</i>                        | <i>Phalaris minor</i> | <i>Anagalis arvensis</i> | <i>Convolvulus arvensis</i> | Other weeds |                                   |                                     |                             |
| Pendimethalin 1.0 kg/ ha PE         | 2.2 (4)   | 2.6 (6)               | 2.8 (7)                  | 2.0 (3)                     | 2.4 (5)     | 5.1 (25)                          | 3.1(8.9)                            | 91.2                        |
| Pendimethalin 0.75 kg/ ha PE + 1 HW | 1.7(2)  | 2.2 (4)               | 2.0 (3)                  | 1.7 (2)                     | 2.2 (2)     | 4.0 (15)                          | 2.6 (6.0)                           | 94.1                        |
| Isoproturon 1.0 kg/ ha PE           | 4.4 (18)  | 2.6 (6)               | 4.6 (20)                 | 4.0 (15)                    | 3.0 (8)     | 8.2 (67)                          | 5.2 (25.8)                          | 74.6                        |
| Isoproturon 0.75 kg/ ha PoE         | 4.4 (18)  | 2.0 (3)               | 3.9 (14)                 | 3.9 (14)                    | 2.6 (6)     | 7.5 (55)                          | 20.0 (20.0)                         | 83.7                        |
| Isoproturon 0.75 kg/ ha PoE + 1 HW  | 4.8 (22)  | 3.0 (8)               | 4.9 (23)                 | 4.6 (20)                    | 2.8 (7)     | 9.0 (80)                          | 5.4 (27.7)                          | 72.7                        |
| 25% more seed                       | 6.1 (36)  | 5.2 (26)              | 5.7 (32)                 | 4.7 (21)                    | 3.0 (8)     | 11.1 (123)                        | 6.9 (46.3)                          | 45.4                        |
| 25% more seed + 1 HW                | 5.6 (30)  | 3.9 (14)              | 4.7 (21)                 | 3.2 (9)                     | 4.0 (15)    | 9.5 (89)                          | 4.8 (22.0)                          | 78.3                        |
| One hand weeding                    | 5.3 (27)  | 3.5 (11)              | 5.2 (26)                 | 4.9 (23)                    | 2.6 (6)     | 9.7 (93)                          | 5.7 (31.1)                          | 69.4                        |
| Weed free check                     | 1.0 (1)   | 1.0 (1)               | 1.4 (1)                  | 1.0 (0)                     | 1.4 (1)     | 1.7 (2)                           | 1.5 (1.2)                           | 98.8                        |
| Weedy check                         | 7.7 (59)  | 7.0 (48)              | 6.3 (39)                 | 4.1 (16)                    | 4.9 (23)    | 13.6 (185)                        | 10.1(101.5)                         | -                           |
| LSD (P=0.05)                        | 0.8   | 0.9                   | 0.7                      | 0.6                         | 0.6         | 1.3                               | 0.7                                 | -                           |

Values given in parentheses are mean of original values, which are transformed to  $\sqrt{x+1}$ , DAS: Days after sowing; HW: Hand weeding; PE: Pre-emergence (just after sowing); PoE: Post-emergence

**Table 2. Effect of weed control treatments on yield and economics of lentil (pooled data of two years)**

| Treatment                        | Pods/ plant | Grains/ pod | 1000-seed weight (g) | Seed yield (t/ha) | Straw yield (t/ha) | HI (%) | Gross return (x 10 <sup>3</sup> ₹/ha) | Net return (x 10 <sup>3</sup> ₹/ha) | B:C ratio |
|----------------------------------|-------------|-------------|----------------------|-------------------|--------------------|--------|---------------------------------------|-------------------------------------|-----------|
| Pendimethalin 1.0 kg/ha PE       | 95.2        | 1.3         | 31.3                 | 1.59              | 2.20               | 0.42   | 22.34                                 | 15.14                               | 2.1       |
| Pendimethalin 0.75 kg/ha PE+1 HW | 96.2        | 1.4         | 31.3                 | 1.66              | 2.29               | 0.42   | 23.26                                 | 15.91                               | 2.3       |
| Isoproturon 1.0 kg/ha PE         | 90.1        | 1.3         | 30.4                 | 1.50              | 2.16               | 0.41   | 21.07                                 | 14.57                               | 2.2       |
| Isoproturon 0.75 kg/ha PoE       | 95.4        | 1.3         | 31.5                 | 1.55              | 2.15               | 0.42   | 21.81                                 | 15.13                               | 2.2       |
| Isoproturon 0.75 kg/ha PoE+1 HW  | 88.9        | 1.3         | 31.2                 | 1.42              | 2.04               | 0.41   | 19.93                                 | 13.56                               | 2.1       |
| 25% more seed                    | 69.5        | 1.2         | 29.3                 | 1.29              | 2.28               | 0.36   | 18.17                                 | 12.08                               | 2.0       |
| 25% more seed + 1 HW             | 72.5        | 1.3         | 29.8                 | 1.54              | 2.37               | 0.39   | 21.67                                 | 15.04                               | 2.3       |
| One hand weeding                 | 93.8        | 1.3         | 33.0                 | 1.48              | 2.14               | 0.41   | 20.84                                 | 14.49                               | 2.2       |
| Weed-free                        | 94.2        | 1.5         | 33.8                 | 1.69              | 2.54               | 0.40   | 23.75                                 | 15.75                               | 2.0       |
| Weedy check                      | 72.5        | 1.2         | 29.3                 | 1.05              | 2.00               | 0.34   | 14.79                                 | 8.79                                | 1.5       |
| LSD (P=0.05)                     | 10.7        | 0.2         | 1.0                  | 0.21              | 0.27               | 0.02   | -                                     | -                                   | -         |

1). Lowest weed density (4 m<sup>2</sup>) and dry weight (2.64 g/m<sup>2</sup>) was recorded where pendimethalin was applied 0.75 kg/ha as PE plus one hand weeding, which was statistically at par with pendimethalin 1.0 kg/ha PE and significantly lower than that of other treatments, involving isoproturon irrespective of dose, time or with or without hand weeding. Increased seed rate of 25% significantly decreased the weed dry weight (32%) in comparison to their respective treatments. The maximum weed control efficiency of 94.1% was recorded with pendimethalin 0.75 kg/ha with one hand weeding followed by pendimethalin 1.0 kg/ha this may be attributed to inhibition of weed seed germination. Similar findings were also reported by Singh *et al.* (1994) and Jain (2007).

### Effect on crop

Application of herbicides had significant effect on yields and yield attributes of lentil (Table 2). The highest grain yield of 1.66 t/ha was produced by pendimethalin 0.75 kg/ha plus one hand weeding was statically at par with pendimethalin 1 kg/ha as well as weed free and proved superior over rest of the treatments with respect to grain yield. However, similar trends were observed for straw yield. Twenty five per cent increase in seed rate also significantly influenced the grain and straw yield as comparison to their respective treatments. On an average 22.8% increase in yield was recorded by 25% increase in seed rate, while 19.26 and 40.87% increment in yield was observed by one hand weeding in the treatment of 25% increased seed and normal seed rate conditions, respectively.

Weed-free conditions provided 60% increased in yield over weedy. Similar results were also reported by Jain (2007).

#### **Economics**

Data presented in Table 2 revealed that the highest gross returns (₹ 23,268), net returns (₹ 15,918) and B:C was recorded with application of pendimethalin 0.75 kg/ha PE + one hand weeding among different herbicidal treatments, while it was almost similar to the weed free conditions. Whereas lowest gross return and net return were recorded in weedy check. Similar findings were also reported by Turk and Tawaha (2001) and Jain (2007).

Therefore, it was concluded that pendimethalin 0.75 kg/ha PE followed by one hand weeding is better for broad-spectrum weed control, including grassy as well as broad-leaved weeds.

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