Himachal Journal of Agricultural Research Vol. 32(2) : 40-43, 2006

# Economic studies of different weed management treatments in brinjal (*Solanum melongena* L.) under humid sub-temperate conditions

**Razia Sultana, N.K. Pathania, N.N. Angiras and Meenakshi Sood**
Department of Vegetable Science and Floriculture
CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur-176 062.

## Abstract

**Effective weed management is one of the critical factors influencing crop yield as well as economic returns. The black plastic mulch proved quite effective w.r.t. weed control efficiency and gross returns. On the basis of benefit cost ratio, the integrated weed management involving pendimethalin (1.0 kg/ha) followed by 2 hand weedings was found to be the most remunerative followed by black and transparent plastic mulches, respectively. However, w.r.t. convenience of application and benefit cost ratio, pendimethalin (1.0 kg/ha) followed by 2 hand weedings at 30 and 60 DAT proved quite effective for obtaining higher yield of brinjal in humid sub-temperate mid hills.**

**Key words**: Brinjal, *Solanum melongena*, economic studies, weed management.

## Introduction

Severe competition between crop and weeds varies with climate, growth habit, nutritional requirement, time of emergence and length of life cycle of the weeds and the crop. The weed competition in brinjal accounts to a reduction in yield by 20-25% (Abak *et al.*, 1992). Manual weed control although most effective, is laborious, time consuming, inconvenient and uneconomical. The relative cost involved, non-availability of labour at peak season, tediousness of operation, non workable soil conditions and re-emergence of weeds render manual weed control impracticable especially in humid sub-temperate western Himalaya. The weeds are detrimental to the crop at early stages of its growth, whereas at later stages their association with the crop may not adversely affect crop yield. Hence, there is a need to develop effective and economically viable technology to manage weeds in brinjal, which is cultivated on more than 600 hectares in Himachal Pradesh. In the present study, an attempt has been made to evaluate the comparative economics of various weed control treatments to manage weeds in brinjal.

## Material and Methods

The present investigation was carried out at the Vegetable Research Farm of CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur (H.P.) during *Kharif*, 2001. The location has a sub-temperate climate with heavy rainfall during monsoons. The soil of this zone is silty clay loam in texture with acidic reaction. The total rainfall of 1756.7 mm was recorded from transplanting to completion of harvesting. The sixteen different treatments of weed control (Table 1) were included in the present study and the experiment was laid in randomized block design with three replications. The seedlings of bacterial wilt resistant variety of brinjal- Arka Nidhi were transplanted on 12.05.2001 at a spacing of 60 cm from row to row and 45 cm from plant to plant in a gross plot measuring 3.0 m x 2.70m. A net plot measuring 1.80m x 1.80m was considered for recording the data on weeds and crop yield. Comparative economics of various weed control treatments was worked out by calculating cost of cultivation and gross and net returns per hectare and benefit cost ratio.

## Results and Discussion

The results of the study have been presented in Table 2. A critical perusal of the data revealed that both black and transparent plastic mulches completely checked the weed emergence. This may be attributed to the mechanical barrier caused by the mulches to weed emergence and the higher soil temperatures than

**Table1. Details of different treatments**

| S. No. | Treatment | Dose (kg/ha) | Time of application |
|---|---|---|---|
| 1. | Trifluralin fb. 1 HW | 1.2 | PPI fb. 60 DAT |
| 2. | Fluchloralin fb. 1 HW | 1.0 | PPI fb. 60 DAT |
| 3. | Metolachlor fb. 1 HW | 1.5 | Pre-plant fb. 60 DAT |
| 4. | Alachlor fb. 1 HW | 2.0 | Pre-plant fb. 60 DAT |
| 5. | Pendimethalin fb. 1 HW | 2.0 | Pre-plant fb. 60 DAT |
| 6. | Trifluralin fb. 2 HW | 0.6 | PPI fb. 30 & 60 DAT |
| 7. | Fluchloralin fb. 2 HW | 0.5 | PPI fb. 30 & 60 DAT |
| 8. | Metolachlor fb. 2 HW | 0.75 | Pre-plant fb. 30 & 30 DAT |
| 9. | Alachlor fb. 2 HW | 1.0 | Pre-plant fb. 30 & 60 DAT |
| 10. | Pendimethalin fb. 2 HW | 1.0 | Pre-plant fb. 30 & 60 DAT |
| 11. | Black plastic mulch | - | Applied at the time of transplanting |
| 12. | Transparent plastic mulch | - | Applied at the time of transplanting |
| 13. | Hand weeding (twice) | - | 30, 60 DAT |
| 14. | Hand weeding (thrice) | - | 30, 60, 90 DAT |
| 15. | Weed free | - | Weeding as and when weeds appeared |
| 16. | Unweeded check | - | Left without any weeding during the entire crop period |

DAT = Days after transplanting PPI = Pre-plant incorporation fb. followed by

bare soil. These results are in conformity with the results obtained by Aseigbu (1991) and Singh (1992). All the weed management treatments were effective to reduce the dry weight of weeds significantly over unweeded check. Among these, hand weeding thrice resulted in significantly lowest dry weight of weeds. Pendimethalin (1 kg $ha^{-1}$) fb 2 HW was the next best in reducing the dry matter of weeds. Raghav (1995), Singh *et al.* (1997) and Prakash *et al.* (1999) also observed that pendimethalin (1.0 kg $ha^{-1}$) reduced the dry weight of weeds. The reduced crop weed competition due to the plastic mulches resulted in significantly highest fruit yield of brinjal and the pendimethalin (1 kg $ha^{-1}$) fb 2 HW was the next best.

Black plastic mulch resulted in significantly highest gross returns (Rs 185873.3) followed by transparent plastic mulch (Rs 156678.3) and weed free treatment. Among herbicide fb HW and hand weeding treatments, pendimethalin (1.0 kg $ha^{-1}$) fb2 HW resulted in highest gross returns (Rs 81690) followed by alachlor (1.0 kg $ha^{-1}$) fb2 HW (Rs 68423.3) and trifluralin (1.0 kg $ha^{-1}$) fb2 HW (Rs 64103). Unweeded check gave lowest gross returns (Table 2).

The cost of cultivation was recorded to be highest in case of the plastic mulch treatments (Rs 70797.1/ha), while it was lowest in trifluralin (1.2 kg $ha^{-1}$) fb1 HW, (Rs 27236.6/ha), followed by fluchloralin (1.2 kg $ha^{-1}$) fb1 HW (Rs 27508.3/ ha), metolachlor fb1 HW (Rs 27801.6/ha). Among the treatments having herbicide at half of the recommended dose fb2 HW, almost similar trend was observed with respect to cost of cultivation and triflùralin (0.6 kg $ha^{-1}$) fb2 HW was observed to be the cheapest treatment.

The net returns were found to be highest (Rs 115075.9) in case of black plastic mulch. Transparent plastic mulch was the next best followed by weed free treatment with net returns of Rs. 85881.1 and Rs. 55213.4 respectively. However, the net return was obtained by considering the life of plastic mulch as three years. Pendimethalin 1 kg $ha^{-1}$ fb2 HW was the best chemical treatment with a net profit of Rs. 50908.4, followed by alachlor 1 kg $ha^{-1}$ fb2 HW with a net profit of Rs. 38031.7. Higher gross and net

**Table 2. Economics of different weed control treatments in brinjal**

| Treatment | Dose (kg/ha) | Weed count* (No. $m^{-2}$) | *Dry weight of total weeds ($g/m^2$) | Gross yield (q/ha) | Cost of cultivation (Rs/ha) | Gross returns (Rs/ha) | Net returns (Rs/ha) | Benefit: cost ratio |
|---|---|---|---|---|---|---|---|---|
| Trifluralin fb 1HW | 1.2 | 14.21 | 12.07 | 68.84 | 27236.6 | 34421.7 | 7185.5 | 0.26 |
| Fluchloralin fb 1HW | 1 | 14.05 | 12.24 | 56.39 | 27508.3 | 28198.3 | 690.2 | 0.02 |
| Metolachlor fb 1HW | 1.5 | 15.50 | 11.69 | 82.52 | 27801.6 | 41236.3 | 13461.7 | 0.48 |
| Alachlor fb 1HW | 2 | 15.05 | 11.43 | 93.24 | 28921.6 | 46621.7 | 17700.0 | 0.61 |
| Pendimethalin fb 1HW | 2 | 14.05 | 10.45 | 96.73 | 29701.6 | 48365.0 | 18663.4 | 0.62 |
| Trifluralin fb 2HW | 0.6 | 14.62 | 10.55 | 128.20 | 29549.1 | 64103.3 | 34554.2 | 1.16 |
| Fluchloralin fb 2HW | 0.5 | 16.3 | 11.17 | 93.12 | 29684.7 | 46560.0 | 16875.3 | 0.56 |
| Metolachlor fb 2HW | 0.75 | 17.54 | 10.33 | 126.86 | 29831.6 | 63433.3 | 33601.7 | 1.12 |
| Alachlor fb2HW | 1 | 17.20 | 10.06 | 136.86 | 30391.6 | 68423.3 | 38031.7 | 1.25 |
| Pendimethalin fb2HW | 1 | 12.97 | 8.76 | 163.38 | 31781.6 | 81690.0 | 50908.4 | 1.72 |
| Black plastic mulch | - | 1 | 1 | 371.74 | 70797.1 | 185873.3 | 115075.9 | 1.62 |
| Transparent plastic | - | 1 | 1 | 313.35 | 70797.1 | 156678.3 | 85881.1 | 1.20 |
| Handweeding (twice) 30,60DAT | - | 20.10 | 10.47 | 103.88 | 28891.6 | 51941.6 | 23050.4 | 0.79 |
| Handweeding (thrice) 30,60,90DAT | - | 14.0 | 7.45 | 127.89 | 31641.6 | 63948.3 | 32302.7 | 0.91 |
| Weed free | - | 1 | 1 | 223.89 | 56391.6 | 111606.7 | 55213.4 | 0.97 |
| Unweeded check | - | 22.7 | 25.05 | 34.37 | 23391.6 | 17188.3 | -6203.2 | -0.54 |
| CD (P=0.05) | | 0.96 | 1.01 | 24.84 | - | 12421.2 | 10120.0 | - |

Sale price @ Rs. 5/kg

* Logarithmic values

DAT =Days after transplanting, HW =Hand weeding, fb. followed by

returns in the mulch and herbicide treatments were obtained due to higher yields as a result of reduced competition due to lesser count and dry weight of weeds, which is responsible for enhanced growth and higher yield. Similar results have been reported by Singh *et al.* (1991), Singh (1992) and Raghav (1995).

The highest benefit: cost ratio (1.72) was obtained with pendimethalin 1.0 kg $ha^{-1}$ fb2 HW treatment, which can be attributed to its comparatively higher net returns (Rs 81690.0) and relatively lower cost of the treatment (Rs 31781.6). The next best treatment in terms of benefit : cost ratio were black plastic mulch and alachlor (1 kg $ha^{-1}$) fb2 HW with a benefit : cost ratio of 1.62 and 1.25 respectively. These were followed by transparent plastic mulch and metolachlor (0.75 kg $ha^{-1}$) fb2 HW with a benefit cost ratio 1.20 and 1.12, respectively. Further the lowest benefit cost ratio was recorded in unweeded check (-0.54) followed by fluchloralin 1.0 kg $ha^{-1}$ fb1 HW (0.02). Almost similar findings have been reported by Raghav (1995) and Singh *et al.* (1997).

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