



Integrated weed management practices on flowering and yield attributes in kharif season brinjal cv. Bhagyamathi

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ABSTRACT

An experiment was conducted on integrated weed management practices on flowering and yield attributes in brinjal cv. Bhagyamathi was conducted at Vegetable Research Station, Agriculture Research Institute, Rajendranagar, Hyderabad. Different types of herbicides with different combinations were tried. The experiment was laid out in randomized block design with thirteen treatment combinations and replicated thrice. Among the treatments, minimum days taken for first flowering and minimum days taken for 50% flowering was found with hand weeding three times at 20, 40 and 60 days after transplanting (T_{12}) (45.33) (52.33) respectively. Minimum days taken for first fruit harvest and more days taken for final harvest was noticed with treatment T_{12} (66.00) and (146.33) respectively. The highest number of fruits per plant (28.46), highest fruit yield per plant (1290.02 g), highest average fruit weight (45.33 g) and the highest fruit yield ($31.10 t ha^{-1}$) was noticed with hand weeding three times at 20, 40 and 60 days after transplanting. Different integrated weed management practices exhibited significant effect on total weed population and weed dry matter at all the stages of crop growth.

Key words: Brinjal, Integrated weed management, flowering and yield attributes, Total weed population.

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INTRODUCTION

Brinjal (*Solanum melongena* L.) also known as eggplant or aubergine is an important commercial vegetable crop grown throughout India mainly by small and marginal farmers. It is the second highest consumable vegetable in India after potato and is considered as poor man's vegetable. It is quite high in nutritive value and can be well compared with tomato. Brinjal is cultivated in different seasons in different parts of the country. The maximum area under this crop is during kharif season. Where success of the crop depends on many factors, among them, effective weed management is one of the most important factor for a successful brinjal crop. Favourable environmental conditions, wider spacing and liberal use of farmyard manure, chemical fertilizers and frequent irrigations encourage the weeds to grow vigorously and leads to severe weed competition particularly during early stages of its growth. It has been estimated that losses in yield due to weeds alone vary from 10 to 70% depending upon the extent of weed infestation [4]. It is difficult to control manually because of poor efficiency of the available labour in summer and rainy season besides heavy cost of manual weeding. There seems to be good scope to make use of selective chemical and cultural methods to attain season long control of weeds [8]. Herbicides have become important tool for weed control, but are not effective in controlling all the weeds present in the crop. Indeed very little work was done on the weed management in brinjal. Hence the present study was undertaken on the effect of integrated weed management practices on flowering and yield attributes during kharif season with brinjal cv. Bhagyamathi.

MATERIAL AND METHODS

The field experiment was conducted at Vegetable Research Station, Agriculture Research Institute, Rajendranagar, Hyderabad, during kharif 2011. The experimental site comes under sub-tropical zone and is situated at a latitude of $17^{\circ} 19' N$ and longitude of $79^{\circ} 23' E$, the altitude of the place is 546.2 m above mean sea level. The mean annual precipitation on the basis of last ten years is 852 mm mostly received from South-West Monsoon during June to October. The mean annual minimum and maximum

temperatures are 20.2°C and 32.6°C respectively. The humidity ranged from 44.5 per cent in summer to 79.4 per cent in rainy season. Hyderabad thus has hot dry summer and moderate cold winter.

Thirty days old seedlings were transplanted in the main field at a spacing of 60 cm × 50 cm. Different herbicides with thirteen treatment combinations *viz.*, T₁- Pendimethalin C.S as pre-emergence @ 0.70 kg a.i ha⁻¹ + one hand weeding at 45 DAT, T₂- Oxadiargyl as pre-emergence @ 90 g a.i ha⁻¹ + one hand weeding at 45 DAT, T₃- Oxyfluorfen as pre-emergence @ 0.15 kg a.i ha⁻¹ + one hand weeding at 45 DAT, T₄-Pendimethalin C.S as pre-emergence @ 0.70 kg a.i ha⁻¹ followed by quizalofop ethyl @ 50 g a.i ha⁻¹ at 15 to 20 DAT, T₅- Oxadiargyl as pre-emergence @ 90 g a.i ha⁻¹ followed by quizalofop ethyl @ 50 g a.i ha⁻¹ at 15 to 20 DAT, T₆-Oxyfluorfen as pre-emergence @ 0.15 kg a.i ha⁻¹ followed by quizalofop ethyl @ 50 g a.i ha⁻¹ at 15 to 20 DAT, T₇- Pendimethalin C.S as pre-emergence @ 0.70 kg a.i ha⁻¹ followed by propaquiza fop @ 62.5 g a.i ha⁻¹ at 15 to 20 DAT, T₈-Oxadiargyl as pre-emergence @ 90 g a.i ha⁻¹ followed by propaquiza fop @ 62.5 g a.i ha⁻¹ at 15 to 20 DAT, T₉- Oxyfluorfen as pre emergence @ 0.15 kg a.i ha⁻¹ followed by propaquiza fop @ 62.5 g a.i ha⁻¹ at 15 to 20 DAT, T₁₀- Glyphosate @ 1.5 kg a.i ha⁻¹ directed spray at 25 and 50 DAT, T₁₁- Inter cultivation at 25 and 50 DAT, T₁₂-Hand weeding three times at 20, 40 and 60 DAT and T₁₃- Control were tried and replicated thrice.

The required amount of herbicides for the experimentation was calculated by using the following formula.

$$\text{Commercial herbicide} = \frac{\text{RA}}{\text{C}} \times 100$$

Here, R = Recommended dose of herbicide per hectare

A = Area (hectares)

C = Concentration of herbicide

Thus calculated amount of herbicide was sprayed to each treatmental plot using knapsack sprayer with a spray volume of 600 litre of water per hectare. The quantity of herbicide per plot (4.2 m x 4 m) was calculated by using the above formula and dissolved in water and spread over an area of 16.8 m² according to different treatments by using knapsack sprayer with flat pan nozzle.

Total weed population, dry weight of the weed, the number of days taken to first flowering, 50 per cent flowering from transplanting date from each plot, The days taken to attaining marketable size of brinjal fruits in each plot was noted from transplanting to last fruit harvest. Average fruit number per plant was taken as the total number of fruits in each treatment divided by the total plants in each treatment. Average fruit weight was taken as total weight of the fruits in each treatment divided by total number of plants in each treatment. Weight of fresh fruits of all observational plants were measured by using the weighing balance immediately after harvesting of the fruits and an average was recorded in grams (g). The marketable yield of brinjal fruits per net plot from each treatment was recorded and expressed in kilograms (kg). The marketable yield per hectare of brinjal fruits was computed and recorded accordingly in tonnes per hectare. Fisher's method of analysis of variance was applied for the analysis and interpretation of data as given by Panse and Sukhatme [7]. The level of significance used in 'F' and 't' test was 0.05. Critical difference values were calculated wherever 'F' test was significant.

RESULTS AND DISCUSSION

Different integrated weed management practices exhibited significant effect on total weed population and weed dry matter at all the stages of crop growth (Table 1). Among all the treatments, pendimethalin C.S as pre-emergence @ 0.70 kg a.i ha⁻¹ + one hand weeding at 45 DAT (T₁) recorded the lowest weed population at all the stages of crop growth except 30 DAT. At 30 DAT, glyphosate @ 1.5 kg a.i ha⁻¹ directed spray 25 and 50 DAT (T₁₀) recorded the lowest weed density. Similar results were reported by Sukhadia *et al.*, [10] and Pandey *et al.* [6]. With respect to weed dry matter, among all the treatments, hand weeding three times at 20, 40 and 60 DAT recorded lowest dry weight of weeds at all the stages of crop growth except at 30 and 60 days after trans planting (Table 2). The lower weed dry weight in integrated weed management practices may be due to the less number of weeds, rapid depletion of carbohydrate reserves of weeds through rapid respiration and may be reduced photosynthetic activity. Similar results were recorded by Karle *et al.*, [3] and Sha and Karuppaiah [9], Dakshinadas, [1] and Hilli and Santkemann, [2].

Among the treatments, less number of days taken for first flowering was found with hand weeding three times at 20, 40 and 60 DAT (T₁₂) (45.33) followed by inter cultivation at 25 and 50 DAT (T₁₁) (46.33). whereas maximum days were taken for first flowering in glyphosate @ 1.5 kg a.i ha⁻¹ directed spray at 25 and 50 DAT (T₁₀) and control (T₁₃) (56.33), whereas, days taken for fifty per cent flowering recorded significant results (Table 3). Minimum days taken for 50 per cent flowering was noticed in hand weeding three times at 20, 40 and 60 DAT (T₁₂) (52.33) and inter cultivation at 25 and 50 DAT (T₁₁) (52.33), whereas maximum days taken for 50 per cent flowering was in control (T₁₃) (62.33).

Among all the treatments, significantly minimum days taken for first fruit harvest was with hand weeding three times at 20, 40 and 60 DAT (T₁₂) (66.00), whereas significantly maximum days taken for first fruit harvest was control (T₁₃) (76.33).

significantly more number of days taken for last fruit harvesting was recorded in hand weeding three times at 20, 40 and 60 DAT (T₁₂) (146.33). with respect to yield attributes, significantly the highest number of fruits per plant were recorded in hand weeding three times at 20, 40 and 60 DAT (T₁₂) (28.46), The lowest number of fruits were recorded in control (T₁₃) (21.69). Among all the treatments, significantly highest fruit yield per plant was recorded in hand weeding three times at 20, 40 and 60 DAT (T₁₂) (1290.02 g plant⁻¹), whereas the lowest fruit yield per plant was recorded in glyphosate @ 1.5 kg a.i ha⁻¹ directed spray at 25 and 50 DAT (T₁₀), (591.0 g plant⁻¹) which was on par with control (T₁₃) (614.43 g plant⁻¹).

The highest average fruit weight was recorded in hand weeding three times at 20, 40 and 60 DAT (T₁₂), (45.33 g fruit⁻¹) and the lowest average fruit weight was recorded in glyphosate @ 1.5 kg a.i ha⁻¹ directed spray at 25 and 50 DAT (T₁₀) (26.33) followed by control (T₁₃) (28.33 g fruit⁻¹) (Table 4).

Days taken for first flowering, days taken for 50 per cent flowering, yield attributes (number of fruits per plant, average fruit weight, average fruit yield per plant) was recorded with hand weeding three times at 20, 40 and 60 DAT (T₁₂), which might be due to the reason that faster vegetative growth due to reduction in weed population, availability of moisture and nutrients. It enhances the early reproductive phase thereby recording minimum period for flower initiation and 50 per cent flowering and early fruit set. Different integrated management practices has significant effect on yield characters of brinjal which might be due to the better weed control efficiency and lowest crop weed competition resulting in better availability of soil moisture, light, space and nutrients for optimum plant growth and fruit development, which in turn resulted in higher dry matter production per plant, more nutrient uptake and overall improvement in other yield contributing characters *viz.*, average weight of fruit, primary branches per plant, plant spread, etc. These results are in conformity with the findings of Sha and Karuppaiah [9], Reddy *et al.*, [8] Mekki *et al.*, [5].

Table 1: Total weed density (number m⁻²) at different days after transplanting as influenced by different weed management practices in brinjal.

Treatments	30	60	90	Final harvest
T ₁ . Pendimethalin C.S as pre- emergence @ 0.70 kg a.i ha ⁻¹ + one hand weeding at 45 DAT	24.99 (5.08)	6.65 (2.75)	14.65 (3.95)	20.99 (4.68)
T ₂ . Oxadiargyl as pre-emergence @ 90 g a.i ha ⁻¹ + one hand weeding at 45 DAT	24.99 (5.09)	7.99 (2.99)	15.99 (3.99)	22.32 (4.82)
T ₃ . Oxyflourfen pre-emergence @ 0.15 kg a.i ha ⁻¹ + one hand weeding at 45 DAT	24.65 (5.04)	7.98 (2.97)	13.98 (3.86)	21.99 (4.79)
T ₄ . Pendimethalin C.S as pre-emergence @ 0.70 kg a.i ha ⁻¹ followed by quizalofop- ethyl @ 50 g a.i ha ⁻¹ at 15 to 20 DAT	19.32 (4.35)	23.99 (4.90)	30.32 (5.52)	35.32 (5.98)
T ₅ . Oxadiargyl pre-emergence @ 90 g a.i ha ⁻¹ followed by quizalofop-ethyl @ 50 g a.i ha ⁻¹ at 15 to 20 DAT	19.99 (4.39)	25.65 (5.05)	32.65 (5.72)	36.99 (6.11)
T ₆ . Oxyfluorfen pre-emergence @ 0.15 kg a.i ha ⁻¹ followed by quizalofop-ethyl @ 50 g a.i ha ⁻¹ at 15 to 20 DAT	17.32 (4.08)	22.32 (4.71)	28.32 (5.33)	34.99 (5.97)
T ₇ . Pendimethalin C.S as pre-emergence @ 0.70 kg a.i ha ⁻¹ followed by propaquiza fop @ 62.5 g a.i ha ⁻¹ at 15 to 20 DAT	20.32 (4.51)	25.32 (5.05)	31.32 (5.63)	37.32 (6.15)
T ₈ . Oxadiargyl pre-emergence @ 90 g a.i ha ⁻¹ followed by propaquiza fop @ 62.5 g a.i ha ⁻¹ at 15 to 20 DAT	18.99 (4.35)	23.99 (4.93)	30.32 (5.54)	36.98 (6.14)
T ₉ . Oxyfluorfen pre emergence @ 0.15 kg a.i ha ⁻¹ followed by propaquiza fop @ 62.5 g a.i ha ⁻¹ at 15 to 20 DAT	19.99 (4.44)	24.33 (4.96)	30.66 (5.56)	38.99 (6.30)
T ₁₀ . Glyphosate @ 1.5 kg a.i ha ⁻¹ directed spray 25 and 50 DAT	4.66 (2.35)	9.65 (3.23)	15.98 (4.11)	19.32 (4.54)
T ₁₁ . Intercultivation at 25 and 50 DAT	8.32 (3.03)	10.66 (3.37)	16.99 (4.22)	17.66 (4.31)
T ₁₂ . Hand weeding three times at 20,40 and 60 DAT	5.32 (2.50)	9.99 (3.30)	12.00 (3.46)	16.32 (4.16)
T ₁₃ . Control	50.66 (7.08)	58.66 (7.60)	75.65 (8.66)	83.66 (9.10)
S.Em ±	0.49	0.46	0.39	0.34
CD (5%)	1.45	1.36	1.14	1.01

Data transformed to square root transformation. Figures in parentheses are indicating original values. DAT-days after transplanting

Table 2: Dry weight of the weed (g m⁻²) at different harvesting stages as influenced by different weed management practices in brinjal.

Treatments	30	60	90	Final harvest
T ₁ . Pendimethalin C.S as pre- emergence @ 0.70 kg a.i ha ⁻¹ + one hand weeding at 45 DAT	8.57 (3.09)	1.66 (1.61)	6.66 (2.75)	10.78 (3.42)
T ₂ . Oxadiargyl as pre-emergence @ 90 g a.i ha ⁻¹ + one hand weeding at 45 DAT	8.76 (3.12)	2.73 (1.91)	7.08 (2.83)	11.06 (3.46)
T ₃ . Oxyflourfen pre-emergence @ 0.15 kg a.i ha ⁻¹ + one hand weeding at 45 DAT	8.64 (3.10)	2.67 (1.90)	7.10 (2.82)	11.20 (3.48)
T ₄ . Pendimethalin C.S as pre-emergence @ 0.70 kg a.i ha ⁻¹ followed by quizalofop- ethyl @ 50 g a.i ha ⁻¹ at 15 to 20 DAT	6.34 (2.70)	8.31 (3.01)	12.69 (3.67)	15.34 (4.03)
T ₅ . Oxadiargyl pre-emergence @ 90 g a.i ha ⁻¹ followed by quizalofop-ethyl @ 50 g a.i ha ⁻¹ at 15 to 20 DAT	6.75 (2.78)	9.22 (3.15)	13.66 (3.80)	16.19 (4.13)
T ₆ . Oxyfluorfen pre-emergence @ 0.15 kg a.i ha ⁻¹ followed by quizalofop-ethyl @ 50 g a.i ha ⁻¹ at 15 to 20 DAT	5.34 (2.44)	7.36 (2.84)	12.27 (3.61)	16.4 (4.16)
T ₇ . Pendimethalin C.S as pre-emergence @ 0.70 kg a.i ha ⁻¹ followed by propaquiza fop @ 62.5 g a.i ha ⁻¹ at 15 to 20 DAT	6.77 (2.74)	8.78 (3.11)	13.64 (3.80)	16.59 (4.18)
T ₈ . Oxadiargyl pre-emergence @ 90 g a.i ha ⁻¹ followed by propaquiza fop @ 62.5 g a.i ha ⁻¹ at 15 to 20 DAT	6.46 (2.68)	8.50 (3.06)	12.12 (3.59)	16.37 (4.14)
T ₉ . Oxyfluorfen pre emergence @ 0.15 kg a.i ha ⁻¹ followed by propaquiza fop @ 62.5 g a.i ha ⁻¹ at 15 to 20 DAT	6.43 (2.70)	8.74 (3.12)	13.05 (3.74)	17.69 (4.30)
T ₁₀ . Glyphosate @ 1.5 kg a.i ha ⁻¹ directed spray 25 and 50 DAT	1.74 (1.62)	4.46 (2.32)	6.64 (2.76)	8.94 (3.14)
T ₁₁ . Intercultivation at 25 and 50 DAT	3.13 (2.00)	5.03 (2.44)	6.48 (2.73)	8.35 (3.03)
T ₁₂ . Hand weeding three times at 20,40 and 60 DAT	1.97 (1.70)	3.92 (2.21)	5.30 (2.50)	7.1 (2.82)
T ₁₃ . Control	13.63 (3.80)	23.65 (4.80)	27.99 (5.28)	35.32 (5.96)
S.Em ±	0.20	0.26	0.19	0.14
CD (5%)	0.59	0.78	0.58	0.43

Data transformed to square root transformation. Figures in parentheses are indicating original values.

DAT-days after transplanting

Table 3: Days taken for flowering and fruit harvest as influenced by different weed management practices in brinjal.

Treatments	Days taken for first flowering	Days taken for 50 % flowering	Days taken for first fruit harvest	Days taken for last fruit harvest
T ₁ . Pendimethalin C.S as pre- emergence @ 0.70 kg a.i ha ⁻¹ + one hand weeding at 45 DAT	46.66	52.66	66.66	142.66
T ₂ . Oxadiargyl as pre-emergence @ 90 g a.i ha ⁻¹ + one hand weeding at 45 DAT	47.33	53.33	66.66	142.33
T ₃ . Oxyflourfen pre-emergence @ 0.15 kg a.i ha ⁻¹ + one hand weeding at 45 DAT	47.33	53.66	67.33	142.33
T ₄ . Pendimethalin C.S as pre-emergence @ 0.70 kg a.i ha ⁻¹ followed by quizalofop- ethyl @ 50 g a.i ha ⁻¹ at 15 to 20 DAT	49.66	55.66	67.66	140.33
T ₅ . Oxadiargyl pre-emergence @ 90 g a.i ha ⁻¹ followed by quizalofop-ethyl @ 50 g a.i ha ⁻¹ at 15 to 20 DAT	50.66	56.66	68.00	139.33
T ₆ . Oxyfluorfen pre-emergence @ 0.15 kg a.i ha ⁻¹ followed by quizalofop-ethyl @ 50 g a.i ha ⁻¹ at 15 to 20 DAT	51.33	56.33	68.66	140.66
T ₇ . Pendimethalin C.S as pre-emergence @ 0.70 kg a.i ha ⁻¹ followed by propaquiza fop @ 62.5 g a.i ha ⁻¹ at 15 to 20 DAT	51.66	57.33	68.00	141.66
T ₈ . Oxadiargyl pre-emergence @ 90 g a.i ha ⁻¹ followed by propaquiza fop @ 62.5 g a.i ha ⁻¹ at 15 to 20 DAT	51.33	57.66	67.33	140.33
T ₉ . Oxyfluorfen pre emergence @ 0.15 kg a.i ha ⁻¹ followed by propaquiza fop @ 62.5 g a.i ha ⁻¹ at 15 to 20 DAT	52.33	58.66	67.66	139.66
T ₁₀ . Glyphosate @ 1.5 kg a.i ha ⁻¹ directed spray 25 and 50 DAT	56.66	62.00	75.66	136.66
T ₁₁ . Intercultivation at 25 and 50 DAT	46.33	52.33	66.33	143.33
T ₁₂ . Hand weeding three times at 20,40 and 60 DAT	45.33	52.33	66.00	146.33
T ₁₃ . Control	55.66	62.33	76.33	137.33
S.Em ±	0.33	0.33	0.30	0.44
CD (5%)	0.99	0.98	0.89	1.29

DAT-days after transplanting

Table 4: Yield parameters as influenced by different weed management practices in brinjal.

Treatments	No. of fruits per plant	Fruit yield (g plant ⁻¹)	Average fruit weight (g)	Marketable Fruit yield (t ha ⁻¹)
T ₁ . Pendimethalin C.S as pre- emergence @ 0.70 kg a.i ha ⁻¹ + one hand weeding at 45 DAT	27.07	1154.18	42.33	27.95
T ₂ . Oxadiargyl as pre-emergence @ 90 g a.i ha ⁻¹ + one hand weeding at 45 DAT	27.05	1118.80	41.66	27.58
T ₃ . Oxyflourfen pre-emergence @ 0.15 kg a.i ha ⁻¹ + one hand weeding at 45 DAT	26.70	1112.37	41.33	27.51
T ₄ . Pendimethalin C.S as pre-emergence @ 0.70 kg a.i ha ⁻¹ followed by quizalofop- ethyl @ 50 g a.i ha ⁻¹ at 15 to 20 DAT	22.20	854.16	38.60	24.42
T ₅ . Oxadiargyl pre-emergence @ 90 g a.i ha ⁻¹ followed by quizalofop-ethyl @ 50 g a.i ha ⁻¹ at 15 to 20 DAT	23.54	850.00	36.54	24.28
T ₆ . Oxyfluorfen pre-emergence @ 0.15 kg a.i ha ⁻¹ followed by quizalofop-ethyl @ 50 g a.i ha ⁻¹ at 15 to 20 DAT	22.34	843.75	35.78	24.12
T ₇ . Pendimethalin C.S as pre-emergence @ 0.70 kg a.i ha ⁻¹ followed by propaquiza fop @ 62.5 g a.i ha ⁻¹ at 15 to 20 DAT	23.75	822.91	35.46	23.50
T ₈ . Oxadiargyl pre-emergence @ 90 g a.i ha ⁻¹ followed by propaquiza fop @ 62.5 g a.i ha ⁻¹ at 15 to 20 DAT	20.30	816.66	35.70	23.16
T ₉ . Oxyfluorfen pre emergence @ 0.15 kg a.i ha ⁻¹ followed by propaquiza fop @ 62.5 g a.i ha ⁻¹ at 15 to 20 DAT	22.28	809.37	34.92	23.36
T ₁₀ . Glyphosate @ 1.5 kg a.i ha ⁻¹ directed spray 25 and 50 DAT	23.59	591.00	26.33	9.72
T ₁₁ . Intercultivation at 25 and 50 DAT	27.12	1148.52	42.66	28.92
T ₁₂ . Hand weeding three times at 20,40 and 60 DAT	28.46	1290.02	45.33	31.10
T ₁₃ . Control	21.69	614.43	28.33	10.35
S.Em ±	0.53	7.11	0.54	0.17
CD (5%)	1.55	20.86	1.60	0.52

CONCLUSION

The present study revealed that the treatment, hand weeding three times at 20, 40 and 60 days after transplanting recorded significant results with respect to flowering (days taken for first and 50 per cent flowering), yield attributes (days taken for first and last fruit harvest, number of fruits per plant, fruit yield per plant, average fruit weight and marketable fruit yield) while comparing with rest of the treatments during kharif season in brinjal.

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