***Original Research Article***

# Studies on the Effect of Weed Management Practices on Growth, Yield and Quality Parameters of Okra (*Abelmoschus esculentus* L. Moench.) c.v. Azad Bhindi-1

**Abstract:** The present investigation was conducted at Vegetable Research Farm, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur during kharif season 2023. The experiment was laid out in Randomized Block Design with seven different treatments viz**$T_1$**: Weed check control. **$T_2$**: Pre-emergence application of pendimethalin @6ml/L**.** **$T_3$**: Postemergence application of metribuzin @525g/ha. **$T_4$**: Pre-emergence application of pendimethalin @6ml/L. + 1 hand weeding at 40 DAS**$T_5$**: Postemergence application of metribuzin @525g/ha at 25 DAS+ 1 hand weeding at 60 DAS. **$T_6$**: Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha ,**$T_7$**Weed free check {three hand weeding} at 20,40,60 DAS respectively, **$T_8$**: Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha+ One hand weeding 40 DAS. The result of the study revealed that at 30 DAS maximum plant height (30.10cm) was reported in treatment **$T_6$**: Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha, and 60 and 90 DASmaximum plant height (76.50 and 110.00 cm) was reported in **$T_8$** : Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha+ One hand weeding 40 DAS . and at 30 days maximum number of nodes on main stem of plant(8.70) in **$T_6$**, whereas at 60 and 90 DAS maximum number of nodes on main stem of plant (17.80 and 20.50) was reported in **$T_8$**. At 30 days maximum diameter of stem(1.30 cm) reported in treatment **$T_6$** : Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha , and at 60 and 90 DAS maximum diameter of stem(1.90 and 2.50 cm) reported in **$T_8$**, at 30 days maximum number of leaves/plant (8.80) is reported in **$T_6$** ; Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/haand at 60 and 90 daysmaximum number of leaves/plant (2.27 and 4.76) is reported **$T_8$ :** Pre-emergence applicationof pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha+ One hand weeding 40 DAS.**,**At 60 and 90 DASMaximum number of branches per plant (4.90 and 5.96) was found in **$T_8$** : Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha+ One hand weeding 40 DAS, Maximum Pod diameter(1.80 cm), fruit weight (13.55 gm), pod length(14.30 cm), number of pods per plant( 25.74 ) , pod yield per plant ( 285.00gm) , pod yield per hectare (16.50 t), TSS( $3.18^0$Brix), crude fibre (8.65 %) and chlorophyll content (1.22 mg) .

## 1. Introduction

Okra or *Abelmoschus esculentus* (L.) is a plant native to Africa that is a member of the Malvaceae family and is also referred to as Lady's finger. It has a diploid chromosome number of 2n = 130. One of the most significant vegetables grown worldwide in tropical, subtropical, and warm temperate climates is okra.It is a warm-season crop because it is grown during the summer and rainy season. Okra is grown for its developing edible pods, or fruits. It is a fantastic vegetable that can be used in many stews and soups. For making gur, the root

and stem are used to clarify the cane liquid. Fruit with a highiodineconcentration aids in the treatment of goitre, while diarrhoea and inflammation are treated with leaves. Previous research have provided information on the makeup of the okra's edible section. The plant has the following biochemical components: Moisture 89.6g, Protein 1.9g, Fat 0.2 g, Fiber 1.2 g, Calories 35, Phosphorous 56 mg, Sodium 6.9 mg, Sulphur 30 mg, Riboflavin 0.1 mg, Oxalic acid 8 mg, Minerals 0.7mg, Carbohydrates 6.4g, Calcium 66 mg, Iron 0.3 5mg, Potassium 103 mg, Thiamine 0.07 mg, Nicotinic acid 0.6mg, Vitamin C 13 mg, Magnesium 53 mg and Copper 0.19 mg, **(Gopalan *et al,* (NIN), ICMR; 2007**).The fruit is also beneficial for leucorrhoea, overall weakness, and renal colic. The dry seed contains 13-22% good food oil and has numerous other uses. Protein, lipids, and ash are found in seeds in amounts of around 21, 14, and 5%, respectively (**Lyagba*et al.* 2012).**

Okra (*Abelmoschus esculentus* (L.) Moench.) also called as bhendi or lady's finger belongs to family Malvaceae. It is widely cultivated in warmer parts of the globe. it is grown during the summer and rainy season. Okra is a highly favoured vegetable across all demographic groups due to its abundant nutritional value, delicious flavour, and potential medical and industrial applications. Okra is grown for its spherical, round seeds found inside its fibrous fruits or pods. When still young, the fruits are harvested and consumed like vegetables. Okra typically takes 90 to 100 days to produce. Both *Kharif* and *Rabi* use okra production. An environment that is both warm and damp is ideal for the growth of okra. It is a good source of vitamins, minerals, calories, and amino acids present in seeds (**Thompson, 1949, Schipper 2000**). Okra, or lady finger, has several uses for all of its parts, including its fresh leaves, buds, flowers, pods, stems, and seeds. As such, it is a crop with many uses. (**Gemede, 2015**) ***Abelmoschus esculentus***" is the only species that may be widely or favourably grown for commercial vegetable production. Furthermore, although okra is a self-pollinated crop, it is frequently cross-pollinated because to the 20 per cent out crossing thatoccurs by insects**, (Chauhan 1972**).

Among the various factor responsible for the low yield of okra, weeds have been considered to be of prime importance. The losses caused by weeds exceed the losses from any other category of biotic factors like insects, nematodes, diseases, rodents, mites etc. A large number of weed species infest the crop during summer season declined production. Reduction in the yield due to weeds varies from 40 to 80 per cent depending upon the type of weeds, their intensity and tune of crop weed competition (**Patel *et al.* 2004**). Presence of weeds in the crop decreases the yield through competing with them for space, moisture, light and plant nutrients and also increase cost of cultivation, reduce input efficiency, interfere with agricultural operations, impair quality, act as alternate hosts for several insect-pests, diseases, affect aesthetic look of the ecosystem, native biodiversity, as well as affect human and cattle health. Therefore, the weed management is the most important agronomic aspect that plays an important role in exploiting the yield potential of okra, provided other inputs are not limiting.

Okra currently makes over 60% of fresh vegetable exports and has tremendous potential as a crop for foreign exchange. With an area of 513 000 ha and a productivity of

12.0 mt. ha-1, India is the world's greatest producer of okra, with a production of 6,170 thousand tonnes. India's top states for okra production are Uttar Pradesh, Bihar, and Orissa. Okra is grown on 12,167 hectares of land in Telangana, with a production of 1,67,255 tonnes(**National Horticulture Board 2018-19).**

## 2. Materials and Methods

The trial was conducted at Department of Vegetable Science Chandra Shekhar Azad University of Agriculture and Technology in Kalyanpur Kanpur, Uttar Pradesh, India during the Kharif season of 2023. The experiment was set up in randomized block design with three replication consisting of 8 treatments viz; shown in table;1 and The observation were recorded in randomly taken and tagged plants from each replication on morphological traits viz; plant height (cm), Numberof nodes onmainstemperplant, Stem diameter (cm), Number of leaves /plant, Number of branches per plant, PodDiameter(cm), Freshweightofpod(g), Podlength(cm), Numberofpods/plant, Podyield/plant(g), Totalpodyield(t/ha), Totalsolublesolids(TSS), Crudefiber (%) and Totalchlorophyllcontent(mg100-1g). Biometrical Analysis Experimental data was subjected to biometrical analysis as per the standard as procedure given by Gomez and Gomez (1984). Significant difference between treatment means was tested through 'F ' test and critical difference ( C.D. ) was worked out wherever 'F ' value was found to be significant for treatment effect.

**Table:1 List of treatments used for the study**

| Treatments | Particulars |
|---|---|
| $T_1$ | Weed check control |
| $T_2$ | Pre-emergence application of pendimethalin @6ml/L. |
| $T_3$ | Postemergence application of metribuzin @525g/ha. |
| $T_4$ | Pre-emergence application of pendimethalin @ 6ml/L. + 1 hand weeding at 40 DAS. |
| $T_5$ | Postemergence application of metribuzin @525g/ha at 25 DAS+ 1 hand weeding at 60 DAS. |
| $T_6$ | Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha. |
| $T_7$ | Weed free check (three hand weeding) at 20,40,60 days respectively. |
| $T_8$ | Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha.+ One hand weeding at 40 DAS. |

## 3.RESULT AND DISCUSSION

**Studies on the Effect of Weed Management Practices on Growth, Yield and Quality Parameters of Okra (*Abelmoschus esculentus* L. Moench.)**

### 3.1 Plant height (cm)

At 30 DAS, significantly highest plant height (30.1cm) was observed under treatment $T_6$ (Pre-emergence of pendimethalin @6ml+Postemergence application of metribuzin@525g/ha at 25 DAS) which was found at par with various treatments $T_8$ (, Pre-emergence of pendimethalin @6ml+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS), $T_4$ (Pre-emergence of pendimethalin @6ml+one hand weeding at 40 DAS), $T_5$ (Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS), and $T_7$ (three hand weeding at respectively 20,40,60 DAS), $T_2$ (Pre-emergence of pendimethalin @6ml) during experimentation. However, Weedy check ($T_1$) recorded significantly the lowest plant height (18.10 cm).

At 60 DAS, During treatment $T_8$ (Pre-emergence of pendimethalin @6ml+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS) the substantially highest plant height (76.50cm) was found at 60 DAS. Followed by $T_6$ (Pre-emergence of pendimethalin @6ml+Postemergence application of metribuzin@525g/ha at 25 DAS),$T_4$(Pre-emergence of pendimethalin @6ml+one hand weeding at 40 DAS),$T_5$(Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS), $T_7$ (three hand weeding at respectively 20,40,60 DAS), $T_2$(Pre-emergence of pendimethalin @6ml),$T_3$(Postemergence application of metribuzin@525g/ha at 25 DAS),with plant hight(74.2,72.1,70.3,68.2,67.5,65.9,)T1 the weedy check, had the lowest plant height (43.51 cm), by a substantial margin.

At 90 DAS,Treatment $T_8$ (pre-emergence + postemergence + one-hand weeding at 40 DAS) produced the highest plant height (110 cm), Followed by $T_6$ (Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS),$T_4$(Pre-emergence of pendimethalin @6ml/ha+one hand weeding at 40 DAS),$T_5$(Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS), $T_7$ (three hand weeding at respectively 20,40,60 DAS),$T_2$(Pre-emergence of pendimethalin @6ml/ha),$T_3$(Postemergence application of metribuzin@525g/ha at 25 DAS),with plant hight(105.003,101.9,99.00,97.99,95.00,87.00 cm)$T_1$, the weedy check, had the lowest plant height (84.82 cm), by a substantial margin. Similar results were reported by Jain and Tomar, Patel et al. and Pandey and Mishra.

### 3.2 Numberof nodes onmainstemperplant

The significantly higher numbers of nodes per main stem (8.70) at 30 DAS were recorded under treatment $T_6$ (Pre-emergence of pendimethalin @6ml+Postemergence application of metribuzin@525g/ha at 25 DAS) but remain at par with treatment $T_8$, $T_4$, $T_5$, $T_7$, $T_2$ and $T_3$ (7.90,6.70,6.4,6.20,6.1and 5.6, respectively). Whereas, significantly the lowest numbers of nodes per main stem (5.60) were recorded under weedy check treatment ($T_1$).

At 60 DAS, various weed control techniques had a substantial effect on the number of nodes per main stem and Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS ($T_8$) recorded maximum nodes per main stem (17.80) but remained statistically at par with other treatments $T_6$, $T_4$, and $T_5$( 16.900, 16.200 and 15.500, respectively) with respect to this

character. However, treatment T1 (weedy check) had the fewest nodes per main stem (10.68) during the trial.

At 90 DAS, the highest number of nodes per main stem (20.500) was reported with treatment ($T_8$) Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS and remained at par with treatments $T_6$ (Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS), Treatment $T_1$ (weedy check) produced the lowest number of nodes per main stem (8.693). and during the study, it was comparable to treatments $T_4$ and $T_5$, with scores of 17.400 and 16.497, respectively, Singh et al. , Patel et al. and Pandey and Mishra .

### 3.3 Stem diameter (cm)

Thedifferent treatments exhibited their significant effect on stemdiameter at 30 DAS. Application of (Pre-emergence of pendimethalin @6ml+Postemergence application of metribuzin@525g/ha at 25 DAS ($T_6$) significantly recorded the maximum stem diameter (1.30 cm) and remain at par with treatment $T_8$ and $T_4$ (1.29 cm and 1.25 cm, respectively). While, treatment $T_1$ were recorded the lowest stem diameter (0.890 cm) during the observation.

At 60 DAS, significantly maximum stem diameter (1.900 cm) was recorded under treatment $T_8$ Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS and remained at par with treatments $T_6$ (Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS(1.850cm), $T_4$(Pre-emergence of pendimethalin @6ml+one hand weeding at 40 DAS(1.790 cm), $T_5$(Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS(1.650 cm) Treatment $T_1$ (weedy check) resulted in a decreased stem diameter of 1.099 cm for okra plants.

The examination of data revealed that different weed control treatments had a substantial impact on stem diameter at 90 DAS. Treatment ($T_8$) Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS & $T_6$ (Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS were equally effective and recorded higher stem diameter (2.503& 2.200 cm, respectively) as compared to remaining treatments of weed management. Furthermore, during treatment $T_1$ (weedy check), the okra plant had a considerably reduced stem diameter (0.987 cm).

### 3.4 Number of leaves per plant

Initially, throughout the 30 DAS, various weed control treatments had no significant effect on the quantity of leaves per plant in the okra experiment. However, it was considerable at 60 and 90 DAS.

At 60 DAS, several weed control techniques had a substantial impact on the number of leaves per plant (table 2). The highest number of leaves (23.200) was reported during Treatment ($T_8$) Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS) But remained at par with treatments $T_6$ (Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS, However, treatment $T_1$ (weedy check) produced the fewest leaves per plant (7.600).

At 90 DAS, treatment $T_8$ Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS was recorded higher number of leaves per plant (49.50) followed by $T_6$ (Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS (47.00), $T_4$ Pre-emergence of pendimethalin @6ml+one hand weeding at 40 DAS (43.500), ($T_5$) Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS(39.00), However, treatment $T_1$ (Weedy check) had the lowest number of leaves during the research was recorded( 23.860).

### 3.5 Number of branches per plant

At 60 DAS, various weed control methods significantly altered the number of branches per plant and, During treatment $T_8$ (Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS) the substantially highest branches (4.90) was found. Followed by $T_6$ (Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS),$T_4$(Pre-emergence of pendimethalin @6ml+one hand weeding at 40 DAS),$T_5$(Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS), $T_7$ (three hand weeding at respectively 20,40,60 DAS),$T_2$(Pre-emergence of pendimethalin @6ml),$T_3$(Postemergence application of metribuzin@525g/ha at 25 DAS),with branches respectively (4.700,4.500,4.200,3.900,3.500,3.100) ,$T_1$ the weedy check, had the lowest number of branches (2.169) found, by a substantial margin.

At 90 DAS,Themaximum number of branches per plant (5.960) was recorded with treatment $T_8$(Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS). Followed by $T_6$ (Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS),$T_4$(Pre-emergence of pendimethalin @6ml+one hand weeding at 40 DAS),$T_5$(Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS), $T_7$ (three hand weeding at respectively 20,40,60 DAS), and it being at par with treatment $T_6$,$T_4$,$T_5$,and $T_7$(5.600,5.110,4.990 and 4.703) respectively during the investigation significantly the lowest number of branches (3.220)was recorded. The above findings arein close harmony with the results of Patel *et al,*andZinzala.*et al.*

**Yield Attributes**

To explain the trend of treatments in terms of fresh fruit production/ha, yield components such as pod diameter (cm), fresh pod weight (g), pod length (cm), number of pod/plant, and pod yield/plant (g),Total pod yield(t/ha) were measured throughout the experiment. The necessary information for each of these yield-attributing characters is listed below.

### 3.6 Diameter of pod (cm)

The diameter of the okra fruit was significantly impacted by weed control measures. Table 3 's mean data made it evident that Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS ($T_8$) resulted in a bigger fruit diameter (1.80 cm), although this difference was statistically insignificant when compared to treatment $T_6$, $T_4$, and $T_5$. Under treatment weedy check, a significantly smaller fruit diameter (1.094 cm) was noted ($T_1$). These findings are supported by Manju, *et al.*, Kumar et al.

### 3.7 Freshweightofpod(g)

Presented data indicating a strong relationship between weed management techniques and okra fruit weight. T8, the treatment that got Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS, had the highest fruit weight (13.55 g), although it was still comparable to T3, T4, and T5. With the weedy check, a significantly reduced fruit weight (7.63 g) was observed (T1).These findings are supported by Manju.*et al.* and Kumar *et al.*

### 3.8 Length of pod (cm)

Weed management techniques have a substantial effect on okra fruit length. The mean data clearly indicates that the weed was handled by the treatment that Pre-emergence application of pendimethalin at 6ml/ha, followed by post-emergence application of metribuzin at 525g/ha at 25 DAS and one-handed weeding at 40 DAS, significantly enhanced fruit length $T_8$ (14.30 cm), which remained comparable to treatments $T_6$, $T_4$, and $T_5$. The shortest fruit length (6.78 cm) was reported with treatment $T_1$ (weedy check).These findings are supported by Singh *et al.*, Kumar *et al.*,Sharma and Patel ,Dash.S*et al.*

### 3.9Numberofpods/ plant

The mean quantity of okra pods/plants was significantly impacted by various weed control techniques. The treatment $T_8$ produced the most pods per plant (25.74) Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS, followed by $T_6$ (Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS,( $T_4$) Pre-emergence of pendimethalin @6ml+one hand weeding at 40 DAS, ($T_5$) Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS, $T_7$ (three hand weeding at respectively 20,40,60 DAS),

$T_2$(Pre-emergence of pendimethalin @6ml),$T_3$ (Postemergence application of metribuzin@525g/ha at 25 DAS. However, the lowest quantity of fruit per plant (13.22) was seen following treatment $T_1$ (weedcheck control).

### 3.10Podproduction /plant (g)

Different weed control methods had a substantial effect on the mean pod output per plant for okra. Treatment $T_8$ (pre-emergence of pendimethalin at 6ml/ha, post-emergence application of metribuzin at 525g/ha at 25 DAS, and one-handed weeding at 40 DAS) resulted in the highest pod output per plant (285.0 g). followed by$T_6$ (Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS,(T4) Pre-emergence of pendimethalin @6ml+one hand weeding at 40 DAS, ($T_5$) Postemergence application of metribuzin@525g/ha at 25 DAS+ one hand weeding at 40 DAS, $T_7$ (three hand weeding at respectively 20,40,60 DAS), $T_2$ (Pre-emergence of pendimethalin @6ml),$T_3$(Postemergence application of metribuzin @ 525g/ha at 25 DAS, The lowest fruit output per plant (170.35 g) was seen with treatment $T_1$ (weedy check). The findings corroborate the observations made earlier more or less by by Patel *et al.*, Khalid *et al.* and Sharma and Patel

### 3.11Totalpodyield (t/ha)

Different weed control methods had a substantial impact on overall okra pod yields. $T_8$ (pre-emergence of pendimethalin @6ml+post-emergence application of metribuzin @525g/ha at 25 DAS+ one-handed weeding at 40 DAS) reported the highest okra fruit output (16.5 t/ha),and being on par with treatments $T_6$ and $T_4$. The lowest okra green fruit production (9.13 t/ha) was obtained under weedy check T1. The fruit production of okra under different weed control treatments was as follows: $T_8$< $T_6$ < $T_4$< $T_5$< $T_7$< $T_2$< $T_3$< $T_1$.These findingsareaccordancewiththoseobtainedbyKhadar and Reddy, Khalid *et al.* and Sharma and Patel .

### QualityParameters

### 3.12 Total solublesolids($^{o}$brix)

The mean total soluble solids of okra were significantly impacted by various weed management techniques. Treatment $T_8$ (pre-emergence of pendimethalin @6ml+post-emergence application of metribuzin @525g/ha at 25 DAS+ one-handed weeding at 40 DAS) produced the greatest total soluble solids (3.18 $^{o}$Brix), followed by $T_6$ (Pre-emergence of pendimethalin @6ml/ha+Postemergence application of metribuzin@525g/ha at 25 DAS,( $T_4$) Pre-emergence of pendimethalin @6ml+one hand weeding at 40 DAS, (T5) Postemergence application of metribuzin @ 525g/ha at 25 DAS+ one hand weeding at 40 DAS, $T_7$ (three hand weeding at respectively 20,40,60 DAS), $T_2$(Pre-emergence of pendimethalin @6ml),$T_3$(Postemergence application of metribuzin@525g/ha at 25 DAS.However, treatment $T_1$ (weedy check) produced the lowest total soluble solids (0.957oBrix).

### 3.13 Crudefiber(%)

The minimum and greatest crude fiber levels (5.4 and 8.65% respectively) were reported under treatments $T_1$ weedy check and $T_8$ (pre-emergence of pendimethalin @6ml+post-emergence application of metribuzin @525g/ha at 25 DAS+ one-handed weeding at 40 DAS).Theabovefindingsareincloseharmonywiththe results of Narayan, S *et al.*, and Adeyemi, O *et al.*

### 3.14 Totalchlorophyllcontent (mg$100^{-1}$g)

Weed management techniques significantly influenced chlorophyll content in okra pods. The mean results clearly showed that greater chlorophyll content in pod (1.22 mg 100-1 g) was noted when pre-emergence treatment of pendimethalin @6ml + post-emergence application of metribuzin @525g/ha at 25 DAS + one-handed weeding at 40 DAS ($T_8$).but it was statistically at par with treatment $T_4$, $T_1$, and $T_3$. However, treatment $T_1$ (weedy check) produced the lowest total chlorophyllcontent (0.623 mg 100-1 g).The results are in propinquity with the result of Minal, S *et al.*, Narayan, S *et al.*, and Adeyemi, O *et al.*

**Table no:2 Variation in plant parameters against different treatments**

| Treatment details | Plant height (cm) | | | Number of nodes on main stem of plant | | | Stem diameter (cm) | | | Number of leaves per plant | | | Number of branches per plant | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30 DAS | 60 DAS | 90 DAS | 30 DAS | 60 DAS | 90 DAS | 30 DAS | 60 DAS | 90 DAS | 30 DAS | 60 DAS | 90 DAS | 60 DAS | 90 DAS |
| $T_{1:}$ Weed check control. | 18.100 | 43.514 | 84.820 | 5.600 | 10.688 | 8.693 | 0.890 | 1.099 | 0.987 | 6.900 | 7.600 | 23.860 | 2.169 | 3.220 |
| $T_{2:}$ Pre-emergence application of pendimethalin @6ml/L. | 22.700 | 67.500 | 95.003 | 6.100 | 14.500 | 13.503 | 1.100 | 1.420 | 1.550 | 7.300 | 13.900 | 32.503 | 3.500 | 4.110 |
| $T_{3:}$ Postemergence application of metribuzin @525g/ha. | 20.450 | 65.900 | 87.000 | 5.900 | 13.900 | 13.003 | 1.050 | 1.360 | 1.473 | 7.100 | 12.560 | 27.580 | 3.100 | 3.553 |
| $T_{4:}$ Pre-emergence application of pendimethalin @6ml/L. + 1 hand weeding at 40 DAS | 27.670 | 72.100 | 101.997 | 6.700 | 16.200 | 17.400 | 1.250 | 1.790 | 1.900 | 8.300 | 18.500 | 43.500 | 4.500 | 5.110 |
| $T_{5:}$ Postemergence application of metribuzin @525g/ha at 25 DAS+ 1 hand weeding at 60 DAS. | 25.990 | 70.300 | 99.000 | 6.400 | 15.500 | 16.497 | 1.200 | 1.650 | 1.700 | 7.900 | 16.900 | 39.000 | 4.200 | 4.990 |
| $T_{6:}$ Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha. | 30.100 | 74.200 | 105.003 | 8.700 | 16.900 | 18.200 | 1.300 | 1.850 | 2.200 | 8.800 | 21.199 | 47.000 | 4.700 | 5.600 |
| $T_{7:}$ Weed free check {three hand weeding} at 20,40,60 DAS respectively. | 24.340 | 68.200 | 97.997 | 6.200 | 14.900 | 15.003 | 1.150 | 1.550 | 1.670 | 7.500 | 14.330 | 34.000 | 3.900 | 4.703 |
| $T_{8:}$ Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha+ One hand weeding 40 DAS. | 28.990 | 76.500 | 110.000 | 7.900 | 17.800 | 20.500 | 1.290 | 1.900 | 2.503 | , 8.500 | 23.200 | 49.503 | 4.900 | 5.960 |
| | | | | | | | | | | | | | | |
| CD at 5% | 3.4711 | 8.678 | 11.12 | 0.287 | 2.826 | 2.218 | 0.052 | 0.210 | 0.215 | 0.452 | 2.278 | 4.768 | 0.584 | 0.587 |
| C.V.% | 6.780 | 7.295 | 7.364 | 8.456 | 10.621 | 8.170 | 7.547 | 7.539 | 6.949 | 5.283 | 8.039 | 7.265 | 8.533 | 7.127 |

**Table No: 03Variation in pod parameters against different treatments**

| Treatment details | Pod diameter (cm) | Fresh weight of pod (gm) | Pod length (cm) | Number of pods per plant | Pod yield per plant (gm) | Total pod yield (ton/ha) | TSS ($^{o}$brix) | Crude fibre (%) | Total chlorophyll content in pods (mg /100 g) |
|---|---|---|---|---|---|---|---|---|---|
| $T_{1:}$ Weed check control. | 1.094 | 7.637 | 6.758 | 13.227 | 170.353 | 9.135 | 0.957 | 5.400 | 0.623 |
| $T_{2:}$ Pre-emergence application of pendimethalin @6ml/L. | 1.490 | 10.485 | 10.029 | 18.700 | 190.000 | 11.300 | 1.900 | 7.550 | 0.950 |
| $T_{3:}$ Postemergence application of metribuzin @525g/ha. | 1.450 | 10.100 | 9.200 | 17.200 | 175.000 | 10.000 | 1.880 | 7.330 | 0.920 |
| $T_{4:}$ Pre-emergence application of pendimethalin @6ml/L. + 1 hand weeding at 40 DAS | 1.730 | 12.771 | 13.500 | 23.500 | 230.000 | 13.990 | 2.700 | 8.330 | 1.000 |
| $T_{5:}$ Postemergence application of metribuzin @525g/ha at 25 DAS+ 1 hand weeding at 60 DAS. | 1.650 | 12.109 | 12.199 | 21.200 | 215.000 | 13.200 | 2.200 | 8.110 | 0.990 |
| $T_{6:}$ Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha. | 1.770 | 12.999 | 13.990 | 24.200 | 250.000 | 15.200 | 2.990 | 8.550 | 1.150 |
| $T_{7:}$ Weed free check {three hand weeding} at 20,40,60 DAS respectively. | 1.550 | 11.550 | 11.500 | 19.500 | 199.000 | 12.400 | 1.990 | 7.990 | 0.950 |
| $T_{8:}$ Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha+ One hand weeding 40 DAS | 1.800 | 13.552 | 14.300 | 25.740 | 285.000 | 16.500 | 3.180 | 8.650 | 1.220 |
| | | | | | | | | | |
| CD at 5% | 0.237 | 1.543 | 1.656 | 3.154 | 7.32 | 1.937 | 0.277 | 1.086 | 0.151 |
| C.V% | 8.541 | 7.655 | 8.193 | 8.741 | 6.945 | 8.614 | 7.042 | 7.938 | 8.760 |
| | | | | | | | | | |

## 4. Benefit Cost ratio (B:C)

A maximum B:C ratio of 1:27 was obtained with treatment T8 (Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha+ One hand weeding 40 DAS), followed by T6 (Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha) with 1:2.64, which are almost same data . However, the pod production of okra was highest in treatment T8 Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha+ One hand weeding 40 DAS). And Treatment T1 (weedy check control) had the lowest B:C ratio at 1:1.29. data is show in the table .

## 5. CONCLUSION

The current experimental results clearly demonstrate that weeds represent an injury to crop growth and considerably lower the production of green pods, and that okra is a large nutrient-dense crop. Weeds in agricultural fields show high levels of competition abilities as they challenge the crop plant (okra) for space, moisture, nutrients, sunshine, and other resources. The results of the current experiment indicate that, in terms of weed control, growth, yield, quality, and net profit, the okra variety (Azad bhindi-1) reacted favorably to the application of herbicide in conjunction with an agronomic plan and herbicidal sequences. pre-emergence treatment of pendimethalin @6ml + post-emergence application of metribuzin @525g/ha at 25 DAS + one-handed weeding at 40 DAS andsequential Pre-emergence application of pendimethalin @6ml/L.+ Postemergence application of metribuzin @525g/ha and Pre-emergence application of pendimethalin @6ml/L. + 1 hand weeding at 40 DAS can manage the weeds effectively in okra and offeredhighest economic returns. Hence, these three weed management practices mayserve as alternative of manual weeding and may be recommended for farmers of the centralplainzoneofUttarPradeshfor higher netreturnsfrom okracrop.

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