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**Pranali S Sarwade**
Post Graduate Student, Department of Agronomy, College of Agriculture, Badnapur, VNMKV, Jalna, Maharashtra, India

**Chandrakant B Patil**
Senior Scientist, Agricultural Research Station, Badnapur, VNMKV, Jalna, Maharashtra, India

**Digambar S Mundphane**
Post Graduate Student, Department of Agronomy, College of Agriculture, Badnapur, VNMKV, Jalna, Maharashtra, India

**Corresponding Author:**
**Pranali S Sarwade**
Post Graduate Student, Department of Agronomy, College of Agriculture, Badnapur, VNMKV, Jalna, Maharashtra, India

# Effect of post emergence herbicides on weeds in chickpea, *Cicer arietinum* L.

**Pranali S Sarwade, Chandrakant B Patil and Digambar S Mundphane**

## Abstract
At the Agricultural Research Station in Badnapur, a field experiment was conducted to assess the impact of various post-emergence herbicides on weeds in chickpea, (*Cicer arietinum* L). The experimental unit's gross and net plot sizes were 4.5 x 5.0 m and 3.6 x 4.8 m, respectively. On October 19, 2020, seeds were sown using the dibbling method, with 45 cm x 10 cm spacing. The recommendations for each treatment were followed when it came to seed treatment, pest control, irrigation, and fertilizer management. Post-emergence herbicides are one of the nine treatments in the randomized block design (RBD) field experiment. Treatment comprised of ($T_1$) Topramezone 20.6 g a.i./ha at 14 DAS, ($T_2$) Topramezone 20.6 g a.i./ha at 21 DAS, ($T_3$) Topramezone 25.7 g a.i./ha at 14 DAS, ($T_4$) Topramezone 25.7g a.i./ha at 21 DAS, ($T_5$) Quizalofop-p-ethyl 100 g a.i./ha 25 DAS, ($T_6$) Unweeded control, ($T_7$) Weed free check (Manual weed control/ Recommended practice), ($T_8$) Pendimethalin @ 0.75 kg a.i./ha (PE), ($T_9$) Fluazifop-p-butyl @ 1.0 kg a.i./ha 30 DAS. The results specified that, at 35 DAS highest weed control efficiency was recorded (74.04%) in ($T_5$) weed free plot followed by ($T_4$) Topramezone 25.7 g a.i./ha at 21 DAS (65.31%) and lowest weed control efficiency recorded in ($T_9$) Fluazifop-p-butyl @ 1.0 kg a.i./ha 30 DAS (33.74%).

**Keywords:** Chickpea, topramezone, post emergence, herbicide, weed

## Introduction
In our nation's agriculture and food economies, pulses are vital. For the great majority of Indians, pulses form the mainstay of their diets because, when combined with grains, they offer the ideal balance of high biological value vegetarian components. One member of the Fabaceae family of legumes is the chickpea (*Cicer arietinum* L.). Important vitamins like thiamine, riboflavin, niacin, folate, and the precursor vitamin A, beta-carotene, are all found in good amounts in chickpeas. After pigeon pea, it is the second most widely used pulse crop worldwide for human food and other purposes. Grown over 13.45 million hectares, this yields an average output of 967.6 kg ha and a total production of 13.10 tons (Anonymous, 2017) [1]. With 9.93 million hectares of cultivation, 9.53 million tons of output, and an average yield of 960 kg $ha^{-1}$, it is the most widely farmed crop in India. The states that produce the most chickpeas, sharing over 95% of their total area, are Madhya Pradesh, Uttar Pradesh, Maharashtra, Gujarat, Andhra Pradesh, and Karnataka. On 10.59 lakh hectares in Marathwada, chickpea was grown, yielding 7.96 lakh tons and 707.56 kg/ha of productivity (Sontakke *et al.*, 2020) [10]. Weed infestation is one of the main obstacles to chickpea production. Due to their competition for space, water, and nutrients with crop plants, weeds significantly reduce agricultural yields. Due to their slow growth rate and restricted leaf development in the early stages of crop growth and establishment, chickpeas are poor competitors with weeds; if weed management is ignored in these circumstances, production loss can range from 40 to 87% (Ratnam *et al.*, 2011) [8]. Therefore, one of the key components needed to increase chickpea yield is weed control. There aren't many options for applying post-emergence herbicides to suppress weeds because chickpeas are known to be sensitive to a lot of herbicides. Therefore, the goal of the current study was to identify suitable herbicides for weed control and assess their effects on weed flora.

## Materials and Methods
The experiment was carried out at the Research Farm, Agricultural Research Station, Badnapur, District Jalna, during the 2020–21 Rabi season. With a kharif cropping cycle and an average yearly precipitation of 650 mm spread over 46 rainy days, primarily in June through September, Badnapur is classified as a guaranteed rainfall zone.

There are few and erratic winter showers. The south-west monsoon is responsible for the majority of the rainfall. The experimental plot's topography was even, and its medium-black, clayey soil had good drainage and a pretty deep color. Before the experiment was set up, a random sample of soil from 0 to 30 cm strata was taken from 10 sites. A composite sample was then created and examined to estimate different physio-chemical parameters. The experimental plot's soil was found to have a clayey texture, low levels of organic carbon (0.68%), poor levels of nitrogen (155 kg $ha^{-1}$), medium levels of available phosphorus (14 kg $ha^{-1}$), high levels of potash (641 kg $ha^{-1}$), and slightly alkaline (pH 7.4) in reaction, according to mechanical analysis of the soil conducted using the international pipette method (Piper, 1906) [6]; available potassium by flame emission method (Jackson, 1967) [4]; available phosphorus by Olsen method (Jackson, 1967) [4]; available potassium by flame emission method (Piper, 1906) [6]; and pH by electrode pH meter. The seeds were sown by dibbling, with one or two per hill, at a distance of 45 cm by 10 cm and a depth of roughly 4.0 cm. Gap filling was done ten days after sowing. First, at 30-35 and 60-35 DAS, two-hand weeding; for weed-free treatment, hoeing at 20-25 DAS. Just prior to sowing, all treatments received an equal application of the full dose of 25 kg N $ha^{-1}$ in the form of urea and 50 kg P2O5 $ha^{-1}$ in the form of single super phosphate and K2O in MOP. The field experiment was laid out in randomized block design with three replications and nine treatments *viz*., ($T_1$) Topramezone 20.6 g a.i/ha at 14 DAS, ($T_2$) Topramezone 20.6 g a.i/ha at 21 DAS, ($T_3$) Topramezone 25.7 g a.i/ha at 14 DAS, ($T_4$) Topramezone 25.7 g a.i/ha at 21 DAS, ($T_5$) Quizalofop-p-ethyl 100 g a.i/ha 25 DAS, ($T_6$) Unweeded control, ($T_7$) Weed free check (Manual weed control/Recommended practice), ($T_8$) Pendimethalin @ 0.75 kg a.i/ha (PE), ($T_9$) Fluazifop-p-butyl @ 1.0 kg a.i/ ha 30 DAS. The number of weeds per $m^2$ was recorded from 35 and 75 DAS. Weed per $m^2$ from each net plot was selected randomly and uprooted at each observation date for dry matter studies. Roots were discarded for dry matter studies. Weeds were sun dried for three days followed by oven drying at a constant temperature of 62 ºC ± 2 ºC until constant dry weight was obtained. After air cooling the dry weights of leaves and stem per plant was recorded.

Weed index was calculated by using following formula.

$$\text{Weed index (WI)} = \frac{X-Y}{X} \times 100$$

Where,
X= Weight of seed yield in weed free plot
Y= Seed yield from the treated plot for which WI is to be work out.
Weed control efficiency was calculated by using following formula

$$\text{WCE (\%)} = \frac{WC-Wt}{WC} \times 100$$

Where,
WC= Average weed control or average weed weight per unit area in the unweeded control plot.
Wt= Average weed count or average dry weed weight per unit area in plot under treatment.

## Results and Discussion

### Studies on weed

The predominant weed species recorded in the experimental field were *Medicago denticulate*, *Chenopodium album*, *Cynodon dactylon*, *Parthenium hysterophorus* and *Echinochloa colonum*. Singh *et al.* (2014) [9] have published similar findings.

### Mean number of weeds m²

At 35 days, significantly lowest weed count was observed in treatment of weed free check ($T_7$) (0) followed by treatment Quizalofop-p-ethyl 100 g a.i/ha at 25 DAS ($T_5$) (2.33), Topramezone 25.7 g a.i/ha at 21 DAS ($T_4$) (3.33), Topramezone 25.7 g a.i/ha at 14 DAS ($T_3$) (4.66). Maximum mean number of weeds per $m^2$ were observed with unweeded control treatment ($T_6$) (14). Similar trend was also observed at 75 DAS.

### Total dry matter of weeds m²

At 35 days, maximum mean total dry matter of weeds per $m^2$ was observed with unweeded control treatment ($T_6$) (26.6 g) Higher weed dry matter per $m^2$ was recorded in weed unweeded control at all the stages. All treatments effectively decreased the weed infestation compared to unweeded control. Lower mean total dry matter of weed $m^2$ was observed in weed free check treatment ($T_7$) (0). Similar trend was observed at 75 DAS. These results are in accordance with the finding of Bhutada and Bhale (2013) [2] and chandrakar *et al*. (2015) [3].

### Weed index (%)

Weed index was computed as the yield reduction to highest yielding treatment among the weed management practices Quizalofop-p-ethyl 100 g a.i/ha at 25 DAS ($T_5$) (13.64%), followed by treatments receiving post emergence application of Topramezone 25.7 g a.i/ha at 21 DAS ($T_4$) (13.69%), Topramezone 25.7 g a.i/ha at 14 DAS ($T_3$) (14.70) and highest weed index recorded in unweeded control ($T_6$) (49.04%).

### Weed control efficiency (%)

At 35 DAS, maximum weed control efficiency was observed in the treatment of Quizalofop-p-ethyl 100 g a.i/ha at 25 DAS ($T_5$) (74.04%), followed by treatments Topramezone 25.7 g a.i/ha at 21 DAS ($T_4$) (65.31%), Topramezone 25.7 g a.i/ha at 14 DAS ($T_3$) (64.53%) among the treatments Fluazuron-p-butyl @ 1.0 kg a.i/ha at 30 DAS($T_9$) (33.74%) recorded lower weed control efficiency.

**Table 1:** Effect of weed management practices on weed index, weed control efficiency

| Treatment details | Weed Control Efficiency (%) | | Weed index (%) |
|---|---|---|---|
| | 35 DAS | 75 DAS | |
| $T_1$: Topramezone 20.6 g a.i/ha at 14 DAS | 58.45 | 51.33 | 22.20 |
| $T_2$: Topramezone 20.6 g a.i/ha at 21 DAS | 62.35 | 64.88 | 15.82 |
| $T_3$: Topramezone 25.7 g a.i/ha at 14 DAS | 64.53 | 66.22 | 14.70 |
| $T_4$: Topramezone 25.7 g a.i/ha at 21 DAS | 65.31 | 74.33 | 13.69 |

| | | | |
|---|---|---|---|
| $T_5$: Quizalofop-p-ethyl 100 g a.i/ha at 25 DAS | 74.04 | 79.72 | 13.64 |
| $T_6$: Unweeded control | 0 | 0 | 49.04 |
| $T_7$: Weed free check | - | - | - |
| $T_8$: Pendimethalin @0.75 kg a.i/ha (PE) | 62.97 | 63.50 | 17.72 |
| $T_9$: Fluazifop-p-butyl @1.0 kg a.i/ha at 30 DAS | 33.74 | 35.28 | 29.97 |
| GM | 57.64 | 65.49 | 19.40 |

**Table 2:** Effect of weed management on density and dry matter of weeds

| Treatments | Weed count | | Weed dry matter | |
|---|---|---|---|---|
| | 35DAS | 75 DAS | 35 DAS | 75 DAS |
| $T_1$: Topramezone 20.6 g a.i/ha at 14 DAS | 5.00 | 7.00 | 10.66 | 9.00 |
| $T_2$: Topramezone 20.6 g a.i/ha at 21 DAS | 5.66 | 6.00 | 9.66 | 8.60 |
| $T_3$: Topramezone 25.7 g a.i/ha at 14 DAS | 4.66 | 8.00 | 9.10 | 8.30 |
| $T_4$: Topramezone 25.7 g a.i/ha at 21 DAS | 3.33 | 6.33 | 8.90 | 6.30 |
| $T_5$: Quizalofop-p-ethyl 100 g a.i/ha at 25 DAS | 2.33 | 5.66 | 6.66 | 5.00 |
| $T_6$: Unweeded control | 14.00 | 25.66 | 26.60 | 24.66 |
| $T_7$: Weed free check | 0 | 0 | 0.00 | 0.00 |
| $T_8$: Pendimethalin @0.75 kg a.i/ha (PE) | 5.33 | 8.00 | 9.50 | 9.00 |
| $T_9$: Fluazifop-p-butyl @1.0 kg a.i/ha at 30 DAS | 8.00 | 10.33 | 17.00 | 9.33 |
| S.Em ± | 0.83 | 1.27 | 1.28 | 1.23 |
| C.D at 5% | 2.50 | 1.80 | 3.87 | 3.71 |
| GM | 5.36 | 8.55 | 11.03 | 8.91 |

At 75 DAS, maximum weed control efficiency was observed in treatment Quizalofop-p-ethyl 100 g a.i/ha at 25 DAS ($T_5$) (79.72%), followed by treatments Topramezone 25.7 g a.i/ha at 21 DAS ($T_4$) (74.33%), Topramezone 25.7 g a.i/ha at 14 DAS ($T_3$) (66.22%) among the treatments Fluazifop-p-butyl @ 1.0 kg a.i/ha at 30 DAS ($T_9$) (35.28%) recorded lower weed control efficiency. These results are in accordance with the findings of Kour *et al*. (2014) [5] and Rathod *et al*. (2017) [7].

## Conclusion

An agronomic investigation was carried out to study the effect of post emergence herbicides on weeds in chickpea which included weed index, weed count and counting weed control efficiency. Based on the results of experimentation, some of the important findings emerging from this investigation are summarized below.

1. Highest weed index recorded in unweeded control($T_6$) (49.04%) while lowest recorded in Quizalofop-p-ethyl 100 g a.i/ha at 25 DAS ($T_5$) (13.64%), followed by treatments receiving post emergence application of Topramezone 25.7 g a.i/ha at 21 DAS ($T_4$) (13.69%), Topramezone 25.7 g a.i/ha at 14 DAS ($T_3$) (14.70).
2. Weed free check ($T_7$) recorded lowest number of weeds per $m^2$ (0.00) and dry matter of weed per $m^2$ (0.00) whereas highest number of weeds per $m^2$ (25.66) and dry matter of weed per $m^2$ (24.66) was observed by unweeded control treatment ($T_6$) respectively.
3. Highest weed control efficiency (79.72%) was recorded in weed Quizalofop-p-ethyl 100 g a.i/ha at 25 DAS ($T_5$) at 35 DAS and lowest (35.28%) was observed in treatment Fluazifop-p-butyl @1.0 kg a.i/ ha 30DAS ($T_9$). Then, treatment ($T_4$) and ($T_6$) also recorded lowest and highest weed index respectively.

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