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# Effect of different post emergence herbicides on growth and yield of pigeonpea (*Cajanus cajan* L. Mill)

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**Abstract**
A field experiment titled "Effect of post emergence herbicides on Pigeonpea (*Cajanus cajan* L. Mill)" was conducted during the *kharif* season of 2023-24 at the College of Agriculture, Badnapur. to assess the response of different post emergence herbicides on growth and yield of pigeonpea (*Cajanus cajan* L. Mill). The experiment was arranged in a Randomized Block Design with three replications and thirteen treatments comprised of ($T_1$) Weed Free, ($T_2$) Weedy Check, ($T_3$) Two hand weeding's at 20 and 40 DAS, ($T_4$) Pendimethalin 30 EC @ 0.75 Kg ai/ha (PE) followed by Imazethapyr 10 SL @100 g ai/ha at 20 to 25 DAS fb + One Inter cultivation at 50 DAS, ($T_5$) Chlorimuron ethyl 25 WP @ 9 g ai/ha at 20 to 25 DAS, ($T_6$) Propaquizalop 2.5% + Imazethapyr 3.7% W/W @ 50 g + 75 g ai/ha at 20 to 25 DAS, ($T_7$) Fenoxaprop ethyl 9.3 EC @ 70 g ai/ha at 20 – 25 DAS, ($T_8$) Sodium Acifluorfen 16.5 + Chlorimuron ethyl 8% @ 245 g ai/ha at 20 – 25 DAS, ($T_9$) Chlorimuron ethyl 9 g + Quizalofop ethyl 50 g ai/ha at 20 – 25 DAS, ($T_{10}$) Chlorimuron ethyl 6 g+ Quizalofop ethyl 37.5g ai/ha at 20 – 25 DAS, ($T_{11}$) Chlorimuron ethyl 9 g+ Fenoxaprop ethyl 70 g ai/ha at 20-25 DAS, ($T_{12}$) Chlorimuron ethyl 6 g + Fenoxaprop ethyl 50g ai/ha at 20- 25 DAS and ($T_{13}$) Imazethapyr+ Imazamox @ 100 g ai/ha at 20-25 DAS.
The gross plot size and net plot size was 5.4 x 5.0 $m^2$ and 3.6 x 4.6 $m^2$ respectively. The seed of pigeonpea variety BDN-711 was sown on June 30, 2023 through dibbling by planting one or two seeds per hill at a spacing of 90 cm x 20 cm, at an approximate depth of 4.0 cm. Treatment ($T_1$) Weed Free recorded highest value of growth attributes *viz.*, plant height, number of leaves and dry matter accumulation per plant at all growth stages of crop amongst the different weed management treatments. Among the different weed management treatment the highest highest seed yield (1655 kg $ha^{-1}$) and straw yield (5511 kg $ha^{-1}$) were recorded in ($T_1$) weed free treatment.

**Keywords:** Post emergence herbicides, Pigeonpea (*Cajanus cajan* L.), weed management

## Introduction
Pigeonpea is particularly rich in protein, making it a great complement to the everyday cereal, or tuber based diets of the majority of Africans, which are generally deficient in protein. It is often grown for their protein content, which has been reported to vary from 18% to 26% whereas up to 30% has been observed in other closely related *Cajanus spp*. It is a valuable source of amino acids. pigeonpea is susceptible to weed competition, which can significantly reduce its growth and yield. However, research has shown that the most critical period of weed competition in pigeonpea is between 30 and 60 days after planting. During this period, the crop is still establishing itself and is highly vulnerable to weed competition. Weeds can reduce the amount of light reaching the crop, leading to reduced photosynthesis and lower yields. This competition can also results in stunted growth, reduced yield, and even crop failure. Therefore, it is important to control weeds in pigeonpea fields to ensure optimal growth and yield of the crop. This can be achieved through various methods such as manual weeding, herbicide application, and crop rotation. By controlling weeds, farmers can improve the productivity of their crop. Keeping these in view the present investigation entitled "Effect of different post emergence herbicides on growth and yield of pigeonpea (*Cajanus cajan* L. Mill)." would be carried out.

## Materials and Methods
A field experiment titled "Effect of post emergence herbicides on growth and yield of Pigeonpea (*Cajanus cajan* L. Mill)" was conducted during the *kharif* season of 2023-24 at the College of

Agriculture, Badnapur. The experimental field was levelled, and the soil was medium black soil in colour with good drainage properties. The soil in the experimental plot is clayey in texture and the chemical composition reveals that the soil has a medium level of organic carbon, low available nitrogen, medium available phosphorus, very high available potassium and an alkaline $p^H$ of 8.59. The sowing was done on June 30, 2023 through dibbling by planting one or two seeds per hill at a spacing of 90 cm x 20 cm, at an approximate depth of 4.0 cm. The experiment was arranged in a Randomized Block Design with three replications and thirteen treatments.

## Results and Discussion

### Growth studies

Growth parameters *viz*., plant height, number of leaves, number of branches and dry matter production were significantly influenced by various weed management treatments at all the growth stages of pigeonpea. The highest plant height (158.5 cm), number of leaves (114.7), number of branches (16.8) and dry matter production (128.35 g) were recorded in weed free treatment ($T_1$) which was significantly superior over rest of the treatments, however, it was on par with treatment ($T_3$) receiving Two hand weeding's at 20 and 40 DAS, ($T_{13}$) Imazethapyr+ Imazamox @ 100 g ai/ha at 20 to 25 DAS, ($T_4$) Pendimethalin 30 EC @ 0.75 Kg ai /ha+Imazethapyr 10 SL 100 g ai /ha at 20 to 25 DAS fb + one inter cultivation at 50 DAS, respectively, while the lowest plant height (112.5 cm), number of leaves (85.1), number of branches (11.7) and dry matter production (90.33 g) were observed due to ($T_2$) weedy check. The weed free plot may be due to better suppression of weeds leading to lesser crop weed competition for growth of weeds leading to better crop weed competition for growth factors which ultimately created conductive environment for pigeonpea plant to grow and reproduce luxuriantly Vivek *et al.* (2003) [8]. Similar findings were also reported by Moasunep *et al.* (2014) [4].

### Yield and yield Parameters

Yield parameters *viz*., Pod yield plant$^{-1}$, seed yield plant$^{-1}$, and Number of seeds pod$^{-1}$ were significantly influenced by various weed management treatments at all the growth stages of pigeonpea.

The highest Pod yield plant$^{-1}$(147.68 g), seed yield plant$^{-1}$ (49.18 g), and Number of pods pod$^{-1}$ (304.7) were significantly improved with weed free treatment ($T_1$) which was significantly superior over rest of the treatments, however, it was on par with treatment ($T_3$) Two hand weeding's at 20 and 40, ($T_{13}$) Imazethapyr+ Imazamox @ 100 g ai/ ha at 20 to 25 DAS and ($T_4$) Pendimethalin 30 EC @ 0.75 Kg ai /ha+Imazethapyr 10 SL 100 g ai /ha at 20 to 25 DAS fb + one inter cultivation at 50 DAS respectively. While the lowest Pod yield plant$^{-1}$(153.97 g), seed yield plant$^{-1}$ (49.18 g), and Number of pods pod$^{-1}$ (22.47) was observed due to ($T_2$) weedy check. This might be due to the reduction in dry matter production by weeds due to herbicidal and cultural treatments plays a crucial role in enhancing the growth of pigeonpea. By effectively managing weed populations, these treatments reduce competition for nutrients, moisture, and sunlight, allowing the pigeonpea plants to utilize available resources more efficiently, which ultimately supports higher pod development and overall crop yield. Similar results were also reported by Rathod *et al.* (2016) [6]. Lower seed yield plant$^{-1}$ was observed in weedy check which is mainly due to emergence of weeds since beginning of crop that resulted in intense competition with crop plants for nutrient, moisture and sunlight. These findings are in accordance with those of Dhonde *et al.* (2009) [1] and Venkata *et al.* (2015) [7].

The different herbicidal treatments have non-significant effect on number seeds of per pod and seed index. However the highest seed index was recorded in ($T_1$) weed free treatment (11.23 g) receiving ($T_3$) Two hand weeding's at 20 and 40 DAS (10.87 g), ($T_{13}$) Imazethapyr + Imazamox @ 100g ai/ ha at 20 to 25 DAS (10.60 g) and ($T_4$) Pendimethalin 30 EC @ 0.75 Kg ai /ha+Imazethapyr 10 SL 100g ai /ha at 20 to 25 DAS fb + one inter cultivation at 50 DAS (10.63 g), while the lowest seed index were recorded in ($T_2$) weedy check (10.36 g). This clearly indicates that severe competition exerted by weeds on the crop in unweeded plot as reported by Mathews *et al.* (1995) [3].

### Seed yield and straw yield

The highest seed yield (1655 kg ha$^{-1}$) and straw yield (5511 kg ha$^{-1}$) were significantly improved with weed free treatment ($T_1$) which was significantly superior over rest of the treatments, however, it was on par with treatment ($T_3$) Two hand weeding's at 20 and 40, ($T_{13}$) Imazethapyr + Imazamox @ 100 g ai/ ha at 20 to 25 DAS and ($T_4$) Pendimethalin 30 EC @ 0.75 Kg ai /ha+Imazethapyr 10 SL 100 g ai /ha at 20 to 25 DAS fb + one inter cultivation at 50 DAS respectively. While the lowest seed yield (1051 kg ha$^{-1}$) and straw yield (3760 kg ha$^{-1}$) were observed due to ($T_2$) weedy check.

The increase in seed yield and straw yield of pigeonpea can be attributed to enhanced crop growth characteristics, such as greater plant height, a higher number of branches, and an increased number of pods per plant in the weed-free treatment. The effective control of weeds during critical growth stages in $T_1$, $T_3$, $T_4$ and $T_{13}$ also contributed to reduced competition for resources. This optimal growing environment allowed the pigeonpea plants to maximize their potential for growth and yield, resulting in improved straw and biological yield. Overall, the combination of reduced weed competition and favourable growth conditions significantly benefited the crop's productivity. Similar findings were also reported by Pagar *et al.* (2018) [5] and Lunagariya *et al.* (2022) [2].

**Table 1:** plant height, number of leaves, number of branches and dry matter production affected by different weed management treatments in pigeonpea

| Treatments | Growth parameters | | | |
|---|---|---|---|---|
| | At harvest | | | |
| | plant height | number of leaves | number of branches | Total dry matter production |
| $T_1$: Weed free | 34 | 95 | 129.5 | 136.5 |
| $T_2$: Weedy check | 20.6 | 73.5 | 98.1 | 104.5 |
| $T_3$: Two hand weeding's at 20 and 40 DAS | 32.6 | 93.7 | 126.8 | 133.5 |
| $T_4$: Pendimethalin 30 EC @ 0.75 Kg ai/ha (PE) followed by Imazethapyr 10 SL @ 100 g ai/ha at 20 to 25 DAS fb + One Inter cultivation at 50 DAS. | 30.8 | 88.8 | 121.5 | 126.4 |
| $T_5$: Chlorimuron ethyl 25 WP @ 9 g ai/ha at 20 to 25 DAS. | 22.9 | 80.4 | 97.8 | 114.3 |
| $T_6$: Propaquizalop 2.5% + Imazethapyr 3.7% W/W @ 50 g+75 g ai/ha at 20 to 25 DAS. | 26.6 | 86.6 | 102.0 | 118.5 |
| $T_7$: Fenoxaprop ethyl 9.3 EC @ 70 g ai/ha at 20 – 25 DAS. | 29 | 88.4 | 107.7 | 123.2 |

| | | | | |
|---|---|---|---|---|
| $T_8$: Sodium Acifluorfen 16.5 + Chlorimuron ethyl 8% @ 245 g ai/ha at 20 – 25 DAS. | 25.2 | 84.2 | 105.0 | 115.2 |
| $T_9$: Chlorimuron ethyl 9 g + Quizalofop ethyl 50 g ai/ha at 20 – 25 DAS. | 20.6 | 81.4 | 105.9 | 111.2 |
| $T_{10}$: Chlorimuron ethyl 6 g+ Quizalofop ethyl 37.5 g ai/ha at 20 – 25 DAS. | 22.4 | 79.8 | 100.7 | 123.2 |
| $T_{11}$: Chlorimuron ethyl 9 g+ Fenoxaprop ethyl 70 g ai/ha at 20- 25 DAS. | 21.2 | 81.4 | 105.7 | 106.9 |
| $T_{12}$: Chlorimuron ethyl 6 g + Fenoxaprop ethyl 50 g ai/ha at 20- 25 DAS. | 20.9 | 81.6 | 106.2 | 107.2 |
| $T_{13}$: Imazethapyr+ Imazamox @ 100 g ai/ ha at 20 to 25 DAS. | 31.9 | 91.4 | 124.7 | 128.0 |
| S.E(m) ± | 6.81 | 5.30 | 0.69 | 6.37 |
| CD at 5% | 19.9 | 15.4 | 2.02 | 19.90 |
| General Mean | 134.45 | 98.1 | 13.64 | 105.78 |

**Table 2:** Pod yield plant$^{-1}$, seed yield plant$^{-1}$, number of seeds pod$^{-1}$, number of pods plant$^{-1}$ and seed index production affected by different weed management treatments in pigeonpea.

| Treatments | No. of pods plant$^{-1}$ | Pod yield plant$^{-1}$ | Seed yield plant$^{-1}$ | No. of seeds pod$^{-1}$ | Seed index |
|---|---|---|---|---|---|
| $T_1$: Weed free | 304.7 | 153.97 | 49.18 | 3.8 | 11.23 |
| $T_2$: Weedy check | 139.0 | 114.73 | 22.47 | 3.3 | 10.36 |
| $T_3$: Two hand weeding's at 20 and 40 DAS | 297.4 | 147.68 | 45.07 | 3.7 | 10.87 |
| $T_4$: Pendimethalin 30 EC @ 0.75 Kg ai/ha (PE) followed by Imazethapyr 10 SL @ 100 g ai/ha at 20 to 25 DAS fb + One Inter cultivation at 50 DAS. | 275.0 | 138.11 | 43.43 | 3.6 | 10.63 |
| $T_5$: Chlorimuron ethyl 25 WP @ 9 g ai/ha at 20 to 25 DAS. | 183.9 | 124.57 | 26.40 | 3.5 | 10.50 |
| $T_6$: Propaquizalop 2.5% + Imazethapyr 3.7% W/W @ 50 g+75 g ai/ha at 20 to 25 DAS. | 196.9 | 121.54 | 25.56 | 3.6 | 10.47 |
| $T_7$: Fenoxaprop ethyl 9.3 EC @ 70 g ai/ha at 20 – 25 DAS. | 196.8 | 123.93 | 25.66 | 3.4 | 10.84 |
| $T_8$: Sodium Acifluorfen 16.5 + Chlorimuron ethyl 8% @ 245 g ai/ha at 20 – 25 DAS. | 274.3 | 121.73 | 31.83 | 3.4 | 10.66 |
| $T_9$: Chlorimuron ethyl 9 g + Quizalofop ethyl 50 g ai/ha at 20 – 25 DAS. | 262.0 | 129.33 | 27.90 | 3.6 | 10.82 |
| $T_{10}$: Chlorimuron ethyl 6 g+ Quizalofop ethyl 37.5 g ai/ha at 20 – 25 DAS. | 243.8 | 116.80 | 27.20 | 3.6 | 10.60 |
| $T_{11}$: Chlorimuron ethyl 9 g+ Fenoxaprop ethyl 70 g ai/ha at 20- 25 DAS. | 236.8 | 118.93 | 33.43 | 3.6 | 10.38 |
| $T_{12}$: Chlorimuron ethyl 6 g + Fenoxaprop ethyl 50 g ai/ha at 20- 25 DAS. | 258.8 | 125.58 | 31.06 | 3.5 | 10.60 |
| $T_{13}$: Imazethapyr+ Imazamox @ 100 g ai/ ha at 20 to 25 DAS. | 284.2 | 146.03 | 43.73 | 3.4 | 10.60 |
| S.E(m) ± | 13.23 | 5.56 | 2.42 | 0.15 | 0.43 |
| CD at 5% | 38.64 | 16.25 | 7.08 | NS | NS |
| General Mean | 242.6 | 121.07 | 33.30 | 3.50 | 10.61 |

**Table 3:** Seed yield (kg ha$^{-1}$) and straw yield (kg ha$^{-1}$) affected by different weed management treatments in pigeonpea.

| Treatments | Seed yield (kg ha$^{-1}$) | Straw yield (kg ha$^{-1}$) |
|---|---|---|
| $T_1$: Weed free | 1655 | 5511 |
| $T_2$: Weedy check | 1051 | 3760 |
| $T_3$: Two hand weeding's at 20 and 40 DAS | 1619 | 5055 |
| $T_4$: Pendimethalin 30 EC @ 0.75 Kg ai/ha (PE) followed by Imazethapyr 10 SL @ 100 g ai/ha at 20 to 25 DAS fb + One Inter cultivation at 50 DAS. | 1526 | 4810 |
| $T_5$: Chlorimuron ethyl 25 WP @ 9 g ai/ha at 20 to 25 DAS. | 1334 | 4110 |
| $T_6$: Propaquizalop 2.5% + Imazethapyr 3.7% W/W @ 50 g+75 g ai/ha at 20 to 25 DAS. | 1299 | 4247 |
| $T_7$: Fenoxaprop ethyl 9.3 EC @ 70 g ai/ha at 20 – 25 DAS. | 1366 | 4395 |
| $T_8$: Sodium Acifluorfen 16.5 + Chlorimuron ethyl 8% @ 245 g ai/ha at 20 – 25 DAS. | 1272 | 3666 |
| $T_9$: Chlorimuron ethyl 9 g + Quizalofop ethyl 50 g ai/ha at 20 – 25 DAS. | 1268 | 4260 |
| $T_{10}$: Chlorimuron ethyl 6 g+ Quizalofop ethyl 37.5 g ai/ha at 20 – 25 DAS. | 1315 | 4228 |
| $T_{11}$: Chlorimuron ethyl 9 g+ Fenoxaprop ethyl 70 g ai/ha at 20- 25 DAS. | 1271 | 4121 |
| $T_{12}$: Chlorimuron ethyl 6 g + Fenoxaprop ethyl 50 g ai/ha at 20- 25 DAS. | 1309 | 4183 |
| $T_{13}$: Imazethapyr+ Imazamox @ 100 g ai/ ha at 20 to 25 DAS. | 1542 | 5033 |
| S.E(m) ± | 94.06 | 281.00 |
| CD at 5% | 274.56 | 820.18 |
| General Mean | 1371 | 4413 |

## Conclusion

Among different weed management treatments, ($T_1$) weed free, provided most effective control of weeds therefore improvement of growth and yield contributing characters and consequently highest seed yield (1655 kg ha$^{-1}$) and straw yield (5511 kg ha$^{-1}$) were obtained, however, followed by the treatment ($T_3$) receiving Two hand weeding's at 20 and 40 DAS, ($T_{13}$) Imazethapyr+ Imazamox @ 100 g ai/ ha at 20 to 25 DAS and ($T_4$) Pendimethalin 30 EC @ 0.75 Kg ai /ha+Imazethapyr 10 SL 100 g ai /ha at 20 to 25 DAS fb + one inter cultivation at 50 DAS.

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