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# Effect of Pre and Post-emergence Herbicides on Yield and Economics of Potato (*Solanum tuberosum* L.) at Bastar Plateau Zone of Chhattisgarh

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**A B S T R A C T**

The study was conducted at Instructional cum Research Farm, S.G. College of Agriculture and Research Station, Jagdalpur, Dist-Bastar (C.G.) during *Rabi* season 2020-2021. The experiment was laid out in Randomized Complete Block Design (RBD) with three replication and consists of seventh treatments. The soil of experimental field was Inceptisols, with acidic in reaction (pH- 6.9), organic carbon was medium, available N P K was medium. Result revealed that two hand weeding highest significantly in growth parameter and total tuber yield, as comparable to other herbicide treatments.

## Introduction

Potato (*Solanum tuberosum* L.), known as the "king of vegetables" belongs to the family Solanaceae with chromosome number 2n=48 and is native to South America (Peru). Potato is a herbaceous annual dicot plant with underground stems, growth in tubers. Potato is propagated vegetatively, making it the fourth most important food crop in the world after rice, wheat and maize in terms of production (Razdan *et al.*, 2005). It is the only crop that can meet our food needs. About 90% of potatoes in India are grown under short day conditions during the winter months (Anonymous 2013). This crop fits well for rotation with cereals, vegetables, pulses, or oilseed crops. Currently, potato is grown in about 15 countries of the world. It is believed to have been first brought to India by the Portuguese in the 17th century over a wide range of soil and agro-climatic conditions (Khuranka and Naik, 2003).

India ranks third in area and second in production in the world after China, contributing 10% to the world's total potato production (Mohaniya, 2020). In India, potato had an area of 2.161 million ha with an area of 53.027 million tonnes and a productivity of 24.53 million tonnes (Anonymous, 2019). The world's major potato producing countries are China, Russia, India, USA, Germany, Poland, Ukraine, UK, Turkey, New Zealand and Belgium (Anonymous, 2018). Uttar Pradesh (31.26%) accounts for the highest potato production in India, followed by West Bengal, Bihar, Gujarat and Madhya Pradesh with 23.29%, 13.22, 7.43% and 6.20% share respectively.

The total production of potato in Chhattisgarh is about 0.44 lakh hectare with 5.98 lakh tonnes and productivity 13.74 tonnes hectare (Anonymous, 2013a).

Potato production has a number of constraints, among which weeds often pose a serious problem, making it a very poor competitor with weeds due to their extremely slow growth in the early growth stage. The reduction of yield by weeds is estimated to be around 10 to 80 percent in potatoes (Lal and Gupta, 1984). Therefore, control of weeds in the early stages appears to be very essential as it plays an important role in maximizing tuber production.

## Materials and Methods

A field experiment was conducted during *Rabi* season of 2020-2021 at Research Farm, S.G. College of Agriculture and Research Station, Jagdalpur, Bastar. The experiment was laid out in Randomized Complete Block Design (RBD) with three replication and consists of seventh treatments. The soil of experimental field was Inceptisols, with acidic in reaction (pH- 6.9), organic carbon was medium, available N P K was medium.

Seventh treatment comprised of Metribuzin 70% WP @ 500 g $ha^{-1}$ at 2-3 DAP, Oxyflorfen 23% EC @ 250 g $ha^{-1}$ 2-3 DAP, Fenoxaprop p ethayl 9.3% EC @ 54 g $ha^{-1}$ 10-12 DAP, Paraquat Dichloride 24% SL. @ 480 g $ha^{-1}$ 10-12 DAP, Pretilachlor 50% EC @ 400 ml $ha^{-1}$ 2-3 DAP, Two hand weeding at 20 and 40 DAP, Absolute control. The Potato variety Kufri lalit was planting on 5 December 2020 at a spacing of 60 x 20 cm and using 25 q $ha^{-1}$. A uniform does of fertilizer with 150 kg N, 100 kg $P_2O_5$ and 120 kg $K_2O$ $ha^{-1}$. Full does of phosphorus and potassium fertilizer along with half does of nitrogen was apply before planting. While, the rest half does of nitrogen was supplied at 20 DAP.

Plant emergence, Plant height, Number of shoots per plant, Number of leaves per plant, Fresh weight of shoots per plant, Marketable, Unmarketable and total tuber yield, Economics

## Results and Discussion

### Growth attributes

Effect of different herbicides treatments had significant effect on growth and yield during crop growth stages. (Table1).

Plant emergence was no significant due to different herbicides treatment. Significantly taller plant was recorded in treatment two hand weeding ($T_6$) in all the growth stages. This trend was possibly due to the minimized weed competition in weed free plot which allow the crop for proper growth with less weed competition as compared to other weed treatments. The results obtained by (Dua *et al.*, 2000, and Channappagoudar *et al.*, 2007b) Significantly higher numbers of shoots per plant were recorded in treatment two hand weeding ($T_6$). Similar finding also observed by (Sharma *et al.*, 2013 and Sharma *et al.*, 1998). Fresh weight of shoots per plant was observed in treatment two hand weeding ($T_6$).

### Yield attributes

Effect of different herbicides application on yield parameters of potato in (Table.2).

Two hand weeding ($T_6$) produced statistically higher marketable, unmarketable and total tuber yield (t $ha^{-1}$) which was found on par with the treatment Oxyflorfen 23% EC @ 250 g $ha^{-1}$ ($T_2$) and Metribuzin 70% WP @ 500 g $ha^{-1}$(T) and lowest yield was recorded in treatment Absolute control ($T_7$) among all the treatment. Reason for higher yield of potato tubers may be that the intensity of weeds and weed biomass were low in above treatments resulted in higher yield. Similar results were obtained by (Phogat, 1991 and Bhattacharya, 2005). Effect of different herbicides treatment by hand weeding resulted significantly highest plant height, number of shoots, number leaves per plant, fresh weight of shoots, Marketable, Unmarketable and total tuber yield as compared to herbicide treatments.

**Table.1** Effect of different herbicides application on growth of potato

| | | Plant height (cm) | Number of shoots per plant | Number of leaf per plant | Fresh weight of shoots per plant |
|---|---|---|---|---|---|
| **T1 Metribuzin 70% WP @ 500 g ha$^{-1}$** | 87.08 | 59.21 | 4.56 | 47.25 | 186.79 |
| **T2 Oxyflorfen 23% EC @ 250 g ha- 1** | 89.75 | 64.02 | 4.73 | 48.48 | 195.69 |
| **T3 Fenoxaprop p ethayl 9.3% EC @ 54 g ha-1** | 84.86 | 56.76 | 3.98 | 44.80 | 171.23 |
| **T4 Paraquat Dichloride 24% SL. @ 480 g ha$^{-1}$** | 85.12 | 57.17 | 4.18 | 45.79 | 174.35 |
| **T5 Pretilachlor 50% EC @ 400 ml ha-1** | 83.33 | 54.43 | 3.90 | 44.13 | 169.67 |
| **T6 Two hand weeding At 20 and 40 DAP.** | 91.13 | 66.24 | 5.18 | 52.48 | 204.15 |
| **T7 Absolute control.** | 82.71 | 53.51 | 3.66 | 41.20 | 168.55 |
| **SEm±** | 1.83 | 2.62 | 0.19 | 1.88 | 8.09 |
| **CD (P=0.05)** | N/S | 8.16 | 0.59 | 5.86 | 25.21 |
| **CV %** | 3.68 | 7.72 | 7.68 | 7.03 | 7.72 |

**Table.2** Effect of different herbicides application on yield parameters of potato.

| Treatment | Marketable yield (t/ha) | Unmarketable (yield t/ha) | Total yield (t/ha) |
|---|---|---|---|
| **T1 Metribuzin 70% WP @ 500 g ha$^{-1}$** | 20.48 | 3.07 | 23.55 |
| **T2 Oxyflorfen 23% EC @ 250 g ha$^{-1}$** | 20.81 | 3.12 | 23.93 |
| **T3 Fenoxaprop- p-ethayl 9.3% EC @ 54 g ha$^{-1}$** | 16.59 | 2.49 | 19.07 |
| **T4 Paraquat Dichloride 24% SL. @ 480 g ha$^{-1}$** | 19.59 | 2.94 | 22.53 |
| **T5 Pretilachlor 50% EC @ 400 ml ha$^{-1}$** | 16.45 | 2.47 | 18.91 |
| **T6 Two hand weeding At 20 and 40 DAP** | 21.22 | 3.18 | 24.40 |
| **T7 Absolute control** | 12.87 | 1.93 | 14.80 |
| **SEm±** | 1.28 | 0.19 | 1.47 |
| **CD (P=0.05)** | 3.99 | 0.60 | 4.59 |
| **CV %** | 12.16 | 12.19 | 12.15 |

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