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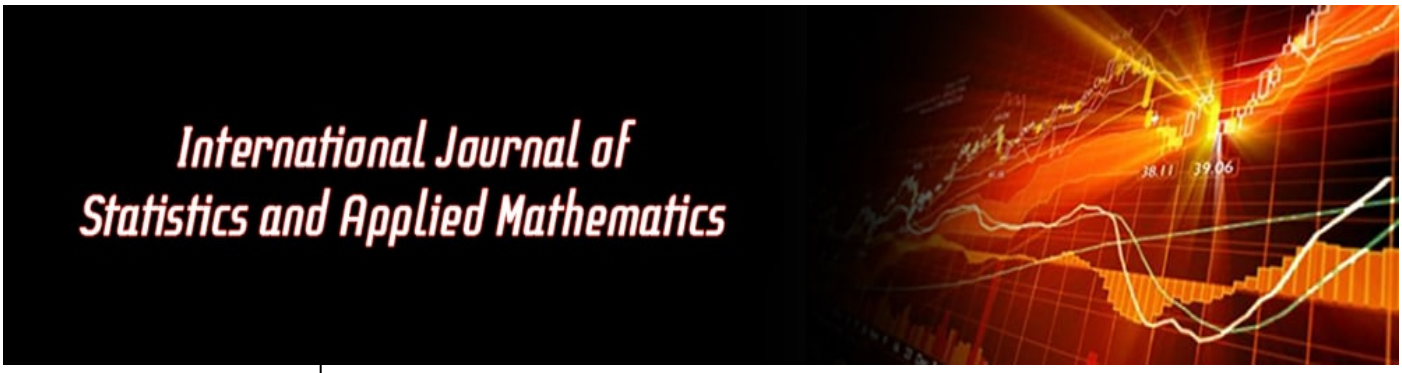

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Working out the economics of *rabi* maize under different weed management treatments

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Abstract
A field experiment was conducted at Indira Gandhi Krishi Vishwavidyalaya, Raipur to aggregate the effect of different weed management treatments on Economics of *rabi* maize. Performance of the treatments in maize was observed under Randomized block design. The cost of cultivation was minimum under weedy check for 60 cm and 45 cm and it was maximum with the treatments hand weeding for 20 DAS and 40 DAS. The highest B:C ratio recorded with the treatment 45 cm + atrazine 1.0 kg ha^{-1} PE fb topramezone 25.2 g ha^{-1} (2.81) followed by the treatment 45 cm + atrazine 1.0 kg ha^{-1} PE fb power weeder (25-30 DAS) (2.76), POST. The treatment 45cm + atrazine 1.0 kg ha^{-1} PE fb topramezone 25.2 g ha^{-1}, POST treatment generated highest gross (107504 Rs.) and net returns (69235 Rs.) when compared to other treatments. The lowest gross returns (Rs.), net returns (Rs.) and B:C ratio was recorded with the treatment weedy check for 45 cm and 60 cm. The treatments 45 cm + atrazine 1.0 kg ha^{-1} PE fb power weeder (25-30 DAS) (T_5) was comparable with the treatment 45cm + atrazine 1.0 kg ha^{-1} PE fb topramezone 25.2 g ha^{-1}, POST (T_7) with respect to the returns.

Keywords: Power weeder, topramezone, net returns (Rs.) atrazine, B.C. - benefit cost, *fb*- followed by

Introduction
The most important crop for producing cereal grains is maize (*Zea mays* L.). In India, maize is planted during the kharif, *rabi* (in peninsular India and Bihar), and spring (in northern India). It is still largely a kharif season crop, notwithstanding the recent rise of *rabi* maize in India's overall maize production. It is produced on approximately 201 M Ha worldwide, with 5754.7 kg/ha productivity, and has a wider range of soil, climate, biodiversity, and management techniques (FAOSTAT 2020) [4]. Around 10% of the nation's food grain production is maize. Production of maize in the country during 2022-23 is estimated at (record) 346.13 lakh tonnes which is higher by 8.83 lakh tonnes than the previous year production of 337.30 lakh tonnes (PIB).

Chemical weed management is preferable to hand weeding since it is less expensive, quicker, and provides greater control. Herbicides have been a great help, and their broad use has been immediately accepted by farmers as a significantly more effective method of weed management. A selective herbicide might be used that can control the weeds without damaging the crops. Using the same pesticides regularly, results in altering weed species, ineffective oversight and the emergence of certain weed biotypes that are resistant to herbicides. Integrated weed control can result in sustainable food production, less toil, and lower crop weed removal costs. IWM components that might be employed for successful weed management on smallholder farms include low pesticide dosages, cover crops, mulching, mechanical approaches, and high crop density.

To attain the potential production level, thorough weed management is essential. Weed management is practised for as long as agriculture has been, yet its methods and philosophy have developed over time. The existing weed management methods in India are characterised by a high dependence on manual work and animal power. They are both in short supply and becoming increasingly unviable. Not only is hand weeding tedious and labour-intensive, it is also unsuccessful. It is usually unfeasible due to poor soil conditions. As a result, combining chemical herbicides with cultural practises for business is rapidly increasing across the country, causing a slew of environmental difficulties in the process.

The combination of physical/cultural control and pesticide use improves soil conditions, allowing for more cost-effective weed management. In addition, optimal plant spacing streamlines field operations, decreases plant competition for nutrients, water, and light, and promotes an appropriate microclimate in the plant canopy to reduce the risk of infection and infestation (Lauer, 1994) [8].

As a result, an integrated approach is required to meet the economic status of the farmers through less expensive treatment combinations that provides higher yield. Keeping this in mind, present investigation was conducted.

Materials and Methods

The study entitled "Working out the Economics of rabi maize under different weed management treatments" was carried out during *rabi* 2022-23 at University Instructional-cum-Research Farm, IGKV, Raipur at 21°.25' N latitude and 81°.62' E longitude (Fig. 1). Table 1 lists the experiment's treatment specifics.

Fig 1: The experimental site

Table 1: The experiment's treatment specifics

Sr. No.	Treatments
T_1	45cm + power weeder at 25 DAS
T_2	60cm + power weeder at 25 DAS
T_3	45cm + power weeder at 25 DAS followed by intra-row weeding
T_4	60cm + power weeder at 25 DAS followed by intra-row weeding
T_5	45cm + atrazine 1.0 kg/ha PE followed by power weeder (25-30 DAS)
T_6	60cm + atrazine 1.0 kg/ha PE followed by power weeder (25-30 DAS)
T_7	45cm + atrazine 1.0 kg/ha PE followed by topramezone 25.2 g/ha, POST
T_8	60cm + atrazine 1.0 kg/ha PE followed by topramezone 25.2 g/ha, POST
T_9	45cm + directed spray of paraquat 500 g/ha at 25 DAS
T_{10}	60cm + directed spray of paraquat 500 g/ha at 25 DAS
T_{11}	45cm + live-mulch of cowpea upto fruiting
T_{12}	60cm + live-mulch of cowpea upto fruiting
T_{13}	45cm + hand weeding at 20 and 40 DAS
T_{14}	60cm + hand weeding at 20 and 40 DAS
T_{15}	Weedy check for 45 cm
T_{16}	Weedy check for 60 cm

DAS= Days after sowing

The soil of the experimental site was clay in texture, slightly acidic in nature having medium organic carbon, available phosphorus and potassium and low in available nitrogen. The field experiment was laid out in Randomized block design. Two set of treatments were performed with spacing 45cm and 60cm respectively. In the first two treatments power weeder was used at 25 DAS in plots of 45 and 60 cm spacings respectively. Among treatment T3 and T4 power weeder at 25 DAS was followed by intra-row weeding. The plots of T5 and T6 were sparyed with atrazine 1.0 kg/ha PE followed by power weeder (25-30 DAS). The treatment T7 and T8 were worked out with atrazine 1.0 kg/ha PE followed by topramezone 25.2 g/ha, POST. Directed spray of paraquat 500 g/ha at 25 DAS was done in T9 and T10. Live-mulch of cowpea upto fruiting was kept in treatment 11 and 12. Two hand weedings were performed at 20 and 40 DAS in T13 and

T14 and weedy check plots were kept for both the spacings of 45 and 60 cm respectively. Fertilizer, irrigation and other crop management practices were followed as per the need of the crop. The yield of the maize were recorded after harvest of the crop for all the treatment and data was analysed statistically using RBD tools. After getting the yield data, the economics of maize was analysed with the prevailing cost of inputs and for output cost, minimum support price (MSP) of maize of the year 2022 was considered.

Results and Discussions

The data on the economics *viz*., cost of cultivation, gross return, net return and benefits: cost is presented in the table 2. The cost of cultivation was minimum under weedy check for 60 cm and 45 cm and it was maximum with the treatments hand weeding for 20 DAS and 40 DAS. The highest B:C ratio recorded with the treatment 45cm + atrazine 1.0 kg ha^{-1} PE *fb* topramezone 25.2 g ha^{-1} (2.81) followed by the treatment 45cm + atrazine 1.0 kg ha^{-1} PE *fb* power weeder (25-30 DAS) (2.76), POST. The treatment 45cm + atrazine 1.0 kg ha^{-1} PE *fb* topramezone 25.2 g ha^{-1}, POST treatment generated highest gross (107504 Rs.) and net returns (69235 Rs.) when compared to other treatments. The lowest gross returns (Rs.), net returns (Rs.) and B:C Ratio was recorded with the treatment weedy check for 45 cm and 60 cm. The treatments 45cm + atrazine 1.0 kg ha^{-1} PE *fb* power weeder (25-30 DAS) (T_5) was comparable with the treatment 45cm + atrazine 1.0 kg ha^{-1} PE *fb* topramezone 25.2 g ha^{-1}, POST (T_7) with respect to the returns.

Table 2: Economics of *rabi* maize as influenced by different weed management treatments

Treatments		Total cost (Rs.)	Gross Returns (Rs.)	Net Returns (Rs.)	B:C Ratio
T1	45cm + power weeder at 25 DAS	37173	89113	52940	2.40
T2	60cm + power weeder at 25 DAS	37173	79064	42891	2.13
T3	45cm + power weeder at 25 DAS *fb* intra-row weeding	39060	97266	59206	2.49
T4	60cm + power weeder at 25 DAS *fb* intra-row weeding	39060	85890	47830	2.20
T5	45cm + atrazine 1.0 kg ha^{-1} PE *fb* power weeder (25-30 DAS)	38379	105798	68419	2.76
T6	60cm + atrazine 1.0 kg ha^{-1} PE *fb* power weeder (25-30 DAS)	38379	96318	58939	2.51
T7	45cm + atrazine 1.0 kg ha^{-1} PE *fb* topramezone 25.2 g ha^{-1}, POST	38269	107504	69235	2.81
T8	60cm + atrazine 1.0 kg ha^{-1} PE *fb* topramezone 25.2 g ha^{-1}, POST	38269	91388	53119	2.39
T9	45cm + directed spray of paraquat 500 g ha^{-1} at 25 DAS	35956	63896	27940	1.78
T10	60cm + directed spray of paraquat 500 g ha^{-1} at 25 DAS	35956	52140	16185	1.45
T11	45cm + live-mulch of cowpea upto fruiting	35094	69584	34490	1.98
T12	60cm + live-mulch of cowpea upto fruiting	35094	63137	28043	1.80
T13	45cm + hand weeding at 20 & 40 DAS	42815	105229	62414	2.46
T14	60cm + hand weeding at 20 & 40 DAS	42815	83046	40230	1.94
T15	Weedy check for 45 cm	34984	49676	14692	1.42
T16	Weedy check for 60 cm	34984	42660	7676	1.22

Conclusion

The highest net returns and B:C ratio recorded with the treatment 45cm + atrazine 1.0 kg ha^{-1} PE *fb* power weeder (25-30 DAS) followed by the treatment 45cm + atrazine 1.0 kg ha^{-1} PE *fb* topramezone 25.2 g ha^{-1}, POST.

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