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Economics of chemical weed management in drum seeded rice (*Oryza sativa* L.)

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ABSTRACT

Field experiment was conducted at Periyanarkunam during *Kuruvai* 2021 to evaluate the economics of chemical weed management in drum seeded rice. The experiment was conducted in randomized block design with four replications. Among the treatments, application of bensulfuron methyl 0.6% + pretilachlor 6% @ 10 kg ha^{-1} PE on 8 DAS fb metsulfuron methyl 10% + chlorimuron ethyl 10% WP @ 20 g ha^{-1} PoE on 25 DAS fb hand weeding on 45 DAS recorded the highest gross, net returns and benefit cost ratio with the lowest total cost of cultivation. Hence this method of weed management can be recommended to achieve the highest profit in drum seeded rice.

Key words: *Chemical weed management, Drum seeded rice and Agricultural economics*

Introduction

Direct seeded rice refers to the process of growing rice crop by directly sowing seeds in the field rather than by transplanting seedlings from the nursery and offers the advantages of quicker and easier planting, less labour intensive, saves labour cost by avoiding raising of the seedling, uprooting and transplanting, 10 to 12 days earlier crop maturity, high tolerance to water deficit and often higher profit in areas with assured water supply further reduced methane emission offers an excellent opportunity for environmental sustainability. The three prime systems of direct seeded rice establishment are dry seeding, wet seeding (manual seeding and drum seeding) and water seeding. Drum seeding of rice offer benefits *viz*., light in weight, easy to transport, gender-neutral, solves labour scarcity problem, sowing more area in short period, reduced production cost and increased the returns rupee^{-1} invested. However, the control of weeds in drum seeded rice is a challenging task for effective crop production as their presence leads to significant reductions in crop yield and quality, which in turn reduces the benefit cost ratio (BCR). Thus, among different agronomic management options, effective control of weeds is an essential condition for achieving maximum net returns and BCR in drum seeded rice. Currently, herbicide has become the most important weed management tool as it offers the timely, effective, economical and practical way of weed control (Sen *et al*., 2020). Judicious selection of herbicide at right time, right dose and right method helps to effectively manage weeds, increase the crop yield there by increased the BCR. With the above needs in view, the present study was carried out to evaluate the economics of chemical weed management in drum seeded rice.

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Materials and Methods

Field experiment was conducted at Periyanarkunam during *Kuruvai* 2021 in randomized block design with four replications. The treatments comprised of unweeded control (T_1), twice hand weeding on 25 and 45 DAS (T_2), application of bispyribac sodium 10% SC @ 250 ml ha^{-1} PoE on 20 DAS fb hand weeding on 45 DAS (T_3), application of bensulfuron methyl 0.6% + pretilachlor 6% GR @ 10 kg ha^{-1} PE on 8 DAS fb metsulfuron methyl 10% + chlorimuron ethyl 10% WP @ 20 g ha^{-1} PoE on 25 DAS (T_4), application of bensulfuron methyl 0.6% + pretilachlor 6% @ 10 kg ha^{-1} PE on 8 DAS fb metsulfuron methyl 10% + chlorimuron ethyl 10% WP @ 20 g ha^{-1} PoE on 25 DAS fb hand weeding on 45 DAS (T_5) and application of triafamone 20% + ethoxysulfuron 10% WG @ 200 g ha^{-1} EPoE on 12 DAS fb metsulfuron methyl 10% + chlorimuron ethyl 10% WP @ 20 g ha^{-1} PoE on 25 DAS fb hand weeding on 45 DAS (T_6). The field was ploughed to fine tilth and made to puddled condition. Paddy seeds (ASD 16) at the rate of 40 kg ha^{-1} were soaked in water for 24 hours and stored in gunny bags for 24 hours. The seeding drums were filled with the pre-germinated seeds up to three-fourths of its capacity and sown in the field with a spacing of 20 cm between the rows and 10 cm between the plants of rows. Calculated quantity of herbicides was mixed with water @ 500 liters ha^{-1} and sprayed through knapsack sprayer fitted with flood jet nozzle. The granular herbicide was applied with dry sand @ 50 kg ha^{-1}. A thin film of water was maintained at the time of both liquid and granular herbicide application. Two hand weedings were done on 25 and 45 DAS. The unweeded control plots were maintained unweeded throughout the cropping period. The grains from net plot were cleaned, sun dried and weighed at 14 per cent moisture content and the grain yield was calculated. After separating the grains, the left-over straw from the net plot were sun dried, weighed, computed and expressed in kg ha^{-1}. The gross and net income ha^{-1} for each treatment was worked out based on the prevailing market rates. The net income was calculated by deducting the cost of cultivation from the gross return. Return rupee^{-1} invested was worked out by dividing the gross return by the cost of cultivation.

Results and Discussion

Among the weed management practices tested, application of bensulfuron methyl 0.6% + pretilachlor 6% GR @ 10 kg ha^{-1} PE on 8 DAS fb metsulfuron methyl 10% + chlorimuron ethyl 10% WP @ 20 g ha^{-1} PoE on 25 DAS fb hand weeding on 45 DAS (T_5) recorded the highest gross (1,17,363 Rs. ha^{-1}), net in-

Table 1. Economics of chemical weed management in drum seeded rice

Treatments	Total cost of cultivation (Rs. ha^{-1})	Gross income (Rs. ha^{-1})	Net income (Rs. ha^{-1})	Benefit cost ratio
T_1 – Unweeded control	37,158	71,861	34,703	1.93
T_2 – Twice hand weeding on 25 and 45 DAS	43,908	1,00,745	56,837	2.29
T_3 – Bispyribac Sodium 10% SC @ 250 ml ha^{-1} PoE on 20 DAS fb hand weeding on 45 DAS	40,833	1,11,177	70,344	2.72
T_4 – Bensulfuron Methyl 0.6% + Pretilachlor 6% GR @ 10 kg ha^{-1} PE on 8 DAS fb Metsulfuron Methyl 10% + Chlorimuron Ethyl 10% WP @ 20 g ha^{-1} PoE on 25 DAS	40,008	94,523	54,515	2.36
T_5 – Bensulfuron Methyl 0.6% + Pretilachlor 6% GR @ 10 kg ha^{-1} PE on 8 DAS fb Metsulfuron Methyl 10% + Chlorimuron Ethyl 10% WP @ 20 g ha^{-1} PoE on 25 DAS fb hand weeding on 45 DAS	42,258	1,17,363	75,105	2.78
T_6 – Triafamone 20% + Ethoxysulfuron 10% WG @ 200 g ha^{-1} EPoE on 12 DAS fb Metsulfuron Methyl 10% + Chlorimuron Ethyl 10% WP @ 20 g ha^{-1} PoE on 25 DAS fb hand weeding on 45 DAS	42,605	1,06,030	63,425	2.49

PE: Pre-emergence, EPoE: Early post emergence, PoE: Post emergence, fb: followed by, DAS: Days after sowing

come (75,105 Rs. ha^{-1}) and BCR (2.78). Timely controls of weeds with timely application of herbicides has increased the yield, save the money in terms of labour cost reduces the cost of cultivation and get the higher gross income and monitory benefit returns (Rao *et al*., 2019). The lowest gross (71,861 Rs. ha^{-1}), net income (34703 Rs. ha^{-1}) and BCR (1.93), were recorded under unweeded control (T_1). This might be due to reduction in grain and straw yield in unweeded control. Rawat *et al.* (2021) reported the similar findings.

Conclusion

Application of bensulfuron methyl 0.6% + pretilachlor 6% @ 10 kg ha^{-1} PE on 8 DAS fb metsulfuron methyl 10% + chlorimuron ethyl 10% WP @ 20 g ha^{-1} PoE on 25 DAS fb hand weeding on 45 DAS can be recommended to achieve the highest gross, net returns and benefit cost ratio with the lowest total cost of cultivation in drum seeded rice.

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