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Effect of Different Herbicidal Weed Management on Yield and Economic of Ragi

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Short Research Article

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ABSTRACT

The present experiment was carried on the performance of ragi at the Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh during *Kharif* seasons 2021 and 2022 The field experiment was laid out of ragi (Indira ragi 1) was growing variety for test crop in Randomized block design (RBD) with 10 treatment and 3 replications. The crop was sown manually on seedcum fertilizers 1 July 2021 and 2 July 2022 after the onset of monsoon. The result of the experiment revealed that, different weed management practices on seed yield, straw yield, harvest index % and economics of different herbicide application of ragi reveals that T_9: Green manuring up to 40 DAS required highest cost of cultivation (Mean *viz.,* 39676Rs. ha^{-1}) than hand weeding twice 20 and 40 DAS (Mean *viz.,* 34876Rs. ha^{-1}) and lowest cost of cultivation in control (Mean *viz.,* 22876Rs. ha^{-1}). Gross return, net return and B: C ratio was significantly higher under (T_5) Pyrazosulfuron ethyl 10 % 20 g/ha (PE) *fb* Chlorimuronethyl 10 % + Metsulfuron methyl 10 % 4

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g/ha (PoE). Seed and straw yield of finger millet (Mean *viz.,* 2719 and 8167 kg ha^{-1} and 24.98%), Gross return, net return and B: C ratio (Mean *viz.,* 94573, 68950Rs. ha^{-1} and 3.69) while minimum was recorded under T_{10}: control during both years and on mean value.

Keywords: Ragi (Eleusine coracana L.) chemicals; yield; net returns; gross returns; B:C.

1. INTRODUCTION

Millets are highly nutritious, non-glutinous and non-acid forming foods. Millets are two types: major millets and minor millets. Major millets are maize, bajra, sorghum, and minor millets are Kodo, Kutki, Ragi. Finger millet also known as ragi or mandua, valued as staple food and first important crop among small millets. Protein content of finger millet is more than that of rice with well-balanced amino acid profile. It contains 9.2% protein, 1.29% fat, 76.32% carbohydrate, 2.24% minerals and 3.9% ash besides vitamin A and B. The grains are rich in phosphorus, potassium and amino acid. It is also rich source of calcium (410mg/100g grain) for growing children and aged people [1]. Ragi (*Eleusine coracana* L.) is ideal food as it lowers the incidence of cardio-vascular diseases, duodenal ulcers and diabetes among population consuming millets [2]. Around 3,000 years BC and spread to India around 3,000 year ago. Millets are staple food in the developing world, especially in the dry lands of Africa and Asia. The finger millet flour is consumed by mixing with milk, boiled water or yoghurt. It is non-acid forming food and easy to digest. It is considered to be one of the least allergic and most digestible foods [3]. In general, more than 97% of millets production and consumption is by developing nations. India is the largest producer of millets with 37.5% of the total global output followed by Sudan and Nigeria [4]. In Chhattisgarh, finger millet is grown in an area of 8.2 thousand ha with production of 2.3 thousand tonne and having a productivity of 280 kg ha^{-1} [5].

2. MATERIALS AND METHODS

Geographical situation: The field experiment was carried out at Research cum Instructional Farm, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh). Geographically, Raipur is situated in central parts of Chhattisgarh and lies at latitude, longitude and altitude of 21^{o}4'N, 81^{o}35' E and 290.20 meters above mean sea level, respectively.

Experimental site: The experimental site was located at the Instructional cum Research Farm, College of Agriculture, I.G.K.V. Raipur (C.G.) during *Kharif* seasons 2021 and 2022 The field experiment was laid out of ragi (*Eleusine coracana* L.) (Indira ragi 1) was growing variety for test crop in Randomized block design (RBD) with 10 treatment and 3 replications. The crop was sown manually on seedcum fertilizers 1 July 2021and 2 July 2022 after the onset of monsoon. The treatments were *viz* T_1**:** Pyrazosulfuron ethyl 10% 20 g/ha (PE), T_2: Chlorimuron ethyl 10% + Metsulfuron methyl 10 % 4 g/ha (PoE), T_3: Metsulfuron methyl 20% 4 g/ha (PoE), T_4: Carfentrazone ethyl 40% 12.5 g / ha. (PoE), T_5: Pyrazosulfuron ethyl 10%20 g/ha (PE) *fb* Chlorimuron ethyl 10% +Metsulfuronmethyl10% 4 g/ha (PoE), T_6: Pyrazosulfuron ethyl 10% 20 g/ha (PE) *fb* Metsulfuron methyl 20% 4 g/ha (PoE), T_7: Pyrazosulfuron ethyl 10% 20 g/ha (PE) *fb* Carfentrazone 40% 12.5 g / ha. (PoE), T_8**:** Hand weeding twice 20 and 40 DAS, T_9**:** Green manuring up to 40 DAS and T_{10}**:** Control.

3. RESULTS AND DISCUSSION

The result of the experiment revealed that, different weed management practices all Seed yield, Straw yield and Harvest index (%) were significantly higher under (Mean *viz.,* 2719 and 8167 kg ha^{-1} and 24.98%), (T_5) Pyrazosulfuron ethyl 10 % 20 g/ha (PE) *fb* Chlorimuron ethyl 10 % + Metsulfuron methyl 10 % 4 g/ha (PoE) which was followed by (T_8) hand weeding twice at 20 and 40 DAS. Control (T_{10}) was recorded lowest during both the years and in mean data. This may be due to the less competition at critical periods of crop growth and better suppression of weeds, which allowed the crop to grow to their potential by absorbing sufficient nutrients, light, moisture and space which facilitate more translocation of photosynthates towards the reproductive parts as well as presence of favourable agro-climatic conditions due to removal of weeds, led to more number of seeds finger plant^{-1} (g), number of finger plant^{-1}. Similar results were reported by Guruprasanna et al*.,* [6] and Gopinath and Kundu, [7]. The higher straw yield in above treatments might be due to lesser weeds during early crop growth period and give higher yield attributes and pod

Table 1. Seed yield, straw yield (kg ha^{-1}) and Harvest index (%) ragi as influenced by different weed management practices

Treatments		Seed yield (kg ha^{-1})			Straw yield (kg ha^{-1})			Harvest index (%)		
		2021	2022	Mean	2021	2022	Mean	2021	2022	Mean
T_1	Pyrazosulfuron ethyl 10% 20 g/ha (PE)	1708	1736	1722	6067	6144	6106	21.97	22.03	22.00
T_2	Chlorimuron ethyl 10% + Metsulfuron methyl 10 % 4 g/ha (PoE)	2207	2239	2223	6861	6937	6899	24.34	24.40	24.37
T_3	Metsulfuron methyl 20 % 4 g/ha (PoE)	2103	2132	2118	6527	6591	6559	24.37	24.44	24.41
T_4	Carfentrazone ethyl 40 % 12.5 g / ha. PoE	1918	1943	1930	6464	6545	6504	22.88	22.89	22.89
T_5	Pyrazosulfuron ethyl 10 % 20 g/ha (PE) *fb* Chlorimuron ethyl 10 % + Metsulfuron methyl 10 % 4 g/ha (PoE)	2698	2740	2719	8133	8201	8167	24.91	25.04	24.98
T_6	Pyrazosulfuron ethyl 10 % 20 g/ha (PE) *fb* Metsulfuron methyl 20% 4 g/ha (PoE)	2391	2427	2409	7436	7507	7471	24.33	24.43	24.38
T_7	Pyrazosulfuron ethyl 10 % 20 g/ha (PE) *fb* Carfentrazone 40% 12.5 g / ha (PoE)	2330	2362	2346	7081	7150	7115	24.76	24.84	24.80
T_8	Hand weeding twice 20 and 40 DAS	2591	2644	2618	7886	7967	7927	24.73	24.92	24.83
T_9	Green manuring up to 40 DAS	1890	1916	1903	6271	6354	6312	23.16	23.17	23.16
T_{10}	Control	526	538	532	1870	1920	1895	21.97	21.91	21.94
	SEm ±	4.74	3.68	4.21	16.74	13.93	15.34	2.79	1.33	2.06
	CD (P=0.05)	14.07	10.95	12.51	43.50	41.40	42.45	8.29	5.45	6.87

Table 2. Economics of Ragi as influenced by different weed management practices

Treatments	Cost of cultivation			Gross Income (Rs.)			Net Income (Rs.)			B:C Ratio		
	2021	2022	Mean	2021	2022	Mean	2021	2022	Mean	2021	2022	Mean
T_1: Pyrazosulfuron ethyl 10 % 20 g/ha (PE)	24446	24446	24446	57670	62105	59888	33224	37659	35442	2.36	2.54	2.45
T_2 :Chlorimuron ethyl 10 % + Metsulfuron methyl 10 % 4 g/ha (PoE)	24053	24053	24053	74542	80123	77332	50489	56070	53279	3.10	3.33	3.22
T_3: Metsulfuron methyl 20 % 4 g/ha (PoE)	23836	23836	23836	71026	76291	73658	47190	52455	49822	2.98	3.20	3.09
T_4: Carfentrazone ethyl 40 % 12.5 g / ha. PoE	23978	23978	23978	64777	69503	67140	40799	45525	43162	2.70	2.90	2.80
T_5: Pyrazosulfuron ethyl 10 % 20 g/ha (PE) *fb* Chlorimuron ethyl 10 % + Metsulfuron methyl 10 % 4 g/ha (PoE)	25623	25623	25623	91126	98020	94573	65503	72397	68950	3.56	3.83	3.69
T_6: Pyrazosulfuron ethyl 10 % 20 g/ha (PE) *fb* Metsulfuron methyl 20% 4 g/ha (PoE)	25406	25406	25406	80727	86820	83774	55321	61414	58368	3.18	3.42	3.30
T_7: Pyrazosulfuron ethyl 20 g/ha (PE) *fb* Carfentrazone 40% 12.5 g / ha. (PoE)	25548	25548	25548	78695	84524	81609	53147	58976	56061	3.08	3.31	3.19
T_8: Hand weeding twice 20 and 40 DAS	34876	34876	34876	87513	94616	91065	52637	59740	56189	2.51	2.71	2.61
T_9: Green manuring up to 40 DAS	39676	39676	39676	63826	68555	66190	24150	28879	26514	1.61	1.73	1.67
T_{10}: Control	22876	22876	22876	17779	19267	18523	-5097	-3609	-4353	0.78	0.84	0.81

yield which leads to higher straw yield. While, in weedy check reverse trend was observed and therefore, the lowest straw yield was noted under this treatment. Similar findings were reported by Walia et al*.,* [8]. Yield attributing characters *viz*. fingers plant^{-1} and their length were also higher under these treatments. All the yield attributes were higher under weed management practices over weedy check though the thousand seed weight was unaffected by different weed management practices [9]. The higher yields under weed management practices over weedy check were due to decreasing density of weeds and increasing yield attributes of finger millet and mainly due to higher tillers plant^{-1}, number of fingers plant^{-1}, number of seeds finger^{-1} and finger weight plant^{-1} [10].

The result of the experiment revealed that, different weed management practices on economics of different herbicide application of ragi reveals that $T_{9:}$ Green manuring up to 40 DAS maximum cost of cultivation (Mean *viz.,* 39676Rs. ha^{-1}), the gross return emphasized that among the different herbicide weed management the maximum gross return, net return, B:C ratio was recorded under T_5: Pyrazosulfuron ethyl 10 % 20 g/ha (PE) *fb* Chlorimuron ethyl 10 % + Metsulfuron methyl 10 % 4 g/ha (PoE) (Mean *viz.,* 94573, 68950Rs. ha^{-1} and 3.69 Similar results were also reported by Tutie et al., [11], who determined that hand weeding at 20 DAS had the highest benefit:cost ratio (1.39). Manual weeding was more economical than greater cultivation expenditures in weed-free areas because it required the use of more employees. Herbicides are economical and cost effective in managing weeds during initial stages as compared to hand weeding. This indicated that use of herbicides prevented weed emergence from initial stages and consequently increased the yield over hand weeding. This increased yield provided higher monetary returns, similarly when compared to unweeded control, considering the gross returns and cost of weed management practices, the benefit accrued due to weed management was considerably higher similar observations were made by Kumara et al [9]

4. CONCLUSION

Pyrazosulfuron ethyl 10% 20 g/ha (PE) *fb* Chlorimuron ethyl 10% + Metsulfuron methyl 10% 4 g/ha (PoE) recorded were significantly highest seed yield, straw yield and harvest index (%) (Mean *viz.,* 2719 and 8167 kg ha^{-1} and 24.98%) gross return (94573Rsha^{-1}), net return (68950Rs ha^{-1}) and B: C ratio (3:69) in ragi mean basis.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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