The Pharma Innovation Journal 2023; 12(7): 1262-1264

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(7): 1262-1264

www.thepharmajournal.com
Received: 22-04-2023
Accepted: 26-05-2023

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Effect of herbicidal weed management on yield attributes and yield of ragi (*Eleusine coracana* L.)

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Abstract
The performance of the experiment under conducted was of ragi at the Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh during *kharif* seasons 2021 and 2022. Indira Ragi 1 was used as the test crop in the field experiment, and it was set up using a randomised block design (RBD) with 10 treatments and 3 replications. The results of the trial showed that all yield attribute and yield *viz*., Significantly greater numbers of finger^{-1}, length of finger (cm), number of seeds finger^{-1}, number of finger plant^{-1} (g), test weight (g), and harvest index (%) were observed. under Pyrazosulfuron ethyl 10% 20 g/ha (PE) *fb* Chlorimuron ethyl 10% + Metsulfuron methyl 10% 4 g/ha (PoE) which was followed by Hand weeding twice at 20 and 40 DAS. The yield and all of its characteristics maximum in both kharif seasons. *i.e*. seed and straw yield of finger millet (Mean *viz*., 2719 and 8167 kg ha^{-1}) were also found maximum under Pyrazosulfuron ethyl 10% 20 g/ha (PE) *fb* Chlorimuron ethyl 10% + Metsulfuron methyl 10% 4 g/ha (PoE) which was highest in comparison to the different weed management treatments.

Keywords: Finger millet, chemicals, yield

Introduction
A very nutrient-dense diet that doesn't produce acid is millet. There are basically two types of millets: major millets and minor millets. Maize, bajra, and sorghum are major millets; kodo, kutki, and ragi are minor millets. Among small millets, known as ragi or mandua, finger millet is the first important crop. It is treasured as a staple food. Finger millet is thought to have originated in the African highlands. Of Uganda and Ethiopia (Seetharam, 1997) [9], around 3,000 years BC and spread to India around 3,000 years ago. Millets are a common food source in the developing world, particularly in the dry parts of Africa and Asia. The majorities of millets are native to Africa and were domesticated there before spreading to other regions of the world. Only 7 of the 93 countries that farm millets on a global scale have more than 1 million acres of millets. Over 97% of the world's millets are produced and consumed in developing nations. With a share of 37.5% of global production, India produces the most millet, followed by Sudan and Nigeria. (Meena *et al*. 2021) [7]. India is considered as a secondary centre of genetic diversity.

The importance of finger millet among the millets in the nation is third in both area (1.27 million ha) and production (1.91 million tonne) subsequent to sorghum and pearl millet. Millet is grown primarily in dry, desert areas of India where rainfall is scant and irregular. The millet that accounts for the majority of output in India 56%, (9 Mt) is pearl millet, which is mostly grown in the states of Rajasthan, Uttar Pradesh, Gujarat, Madhya Pradesh, and Haryana. Finger millet is the most widely planted minor millet in India, producing 1.79 Mt from a total farmed area of 1.17 M ha. (Meena *et al*. 2021) [7].

We need to come up with weed control programmes that are efficient at the right time and employ the proper techniques in order to increase finger millet output. Due to their effectiveness, mechanical and cultural weed management methods are widely utilised in India; these methods, still take a lot of time and money to complete. It is frequently challenging to carry out these cultural tasks due to the inconsistent distribution of monsoon rains in the field. These methods are also unprofitable due to the significant workforce shortage that exists during this busy time, particularly during the *kharif* season, and the rising cost of workers. Application of herbicides for weed control will reduce cultivation expenses and increase weed control efficiency. The current study's objective was to ascertain the effects of herbicidal weed management methods on the yield characteristics and yield of finger millet.

Materials and Methods

A field experiment was conducted at the Instructional Cum Research Farm, College of Agriculture, I.G.K.V., Raipur (C.G.), during the *kharif* season of 2021 and 2022. To research finger millet yield attributes and yield are affected by herbicidal weed management practises. Three replications were used in the randomised block design experiment, 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% + metsulfuronmethyl 10% 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.

Results and Discussion

The result of the experiment revealed that different weed management practices all the yield attributes *viz*., number of fingers plant^{-1}, length of finger (cm), number of seeds plant^{-1} (g), test weight (g), seed yield, straw yield and harvest index (%) were significantly higher under (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 because there was less competition during the critical phases of crop growth and weeds were better controlled, allowing the crop to grow to its greatest ability by absorbing enough nutrients, light, moisture, and space. Which encourage increased photosynthate move to the reproductive portions and the availability of suitable agro-climatic conditions as a result of weed eradication, resulted to an increase in the quantity of finger plant^{-1} (g) seeds. The same outcomes were reported by Guruprasanna *et al.*, 2004 [3] and Gopinath and Kundu, 2008 [2]. The lower weed populations throughout the early stages of crop growth may have increased yield characteristics and pod production, which in turn increased straw yield, in the treatments mentioned above. While the lowest straw yield was recorded with this treatment since the contrary trend was seen in the weedy check. The same results were reported by Walia *et al.*, 2008 [10]. Fingers plant^{-1}, which are yield-related features, and their length were also greater under these treatments. Although the thousand seed weight was unaltered by various weed control practises, all yield attributes were higher under weed management practises than under weedy checks. (Kumara *et al.*, 2007) [6]. The lower weed density and increased finger millet yield features under weed management practises led to higher yields over weedy check were mostly attributed to greater tillers plant^{-1}, number of fingers plant^{-1}, number of seeds finger^{-1}, and finger weight plant^{-1}, as well as decreased weed density and increased finger millet yield parameters. (Pradhan *et al.*, 2010) [8].

Table 1: Number of fingers plant$^{-1,}$ finger length plant^{-1} (cm), finger weight plant^{-1} (g) and number of seeds finger^{-1} of finger millet as influenced by different weed management practices

Treatments		Finger (No.) plant^{-1}			Finger length (cm)			Plant finger weight, 1 (g)			Finger^{-1} (No.) of seeds		
		2021	2022	Mean	2021	2022	Mean	2021	2022	Mean	2021	2022	Mean
T_1	Pyrazosulfuron ethyl 10% 20 g/ha (PE)	4	5	4	5.48	5.82	5.65	5.80	6.01	5.90	1729	1745	1737
T_2	Chlorimuron ethyl 10% + Metsulfuron methyl 10% 4 g/ha (PoE)	5	6	5	6.28	6.67	6.47	7.07	7.26	7.16	1904	1920	1912
T_3	Metsulfuron methyl 20% 4 g/ha (PoE)	5	4	4	6.22	6.49	6.36	6.77	6.95	6.86	1897	1912	1905
T_4	Carfentrazone ethyl 40% 12.5 g / ha. PoE	4	4	4	5.89	6.16	6.02	6.72	6.89	6.81	1838	1853	1845
T_5	Pyrazosulfuron ethyl 10% 20 g/ha (PE) *fb* Chlorimuron ethyl 10% + Metsulfuron methyl 10% 4 g/ha (PoE)	6	6	6	6.99	7.25	7.12	8.49	8.81	8.65	2209	2230	2220
T_6	Pyrazosulfuron ethyl 10% 20 g/ha (PE) *fb* Metsulfuron methyl 20% 4 g/ha (PoE)	6	5	5	6.44	6.71	6.58	7.33	7.52	7.43	2058	2073	2065
T_7	Pyrazosulfuron ethyl 10% 20 g/ha (PE) *fb* Carfentrazone 40% 12.5 g / ha. (PoE)	5	6	5	6.41	6.66	6.53	7.15	7.33	7.24	2038	2052	2045
T_8	Hand weeding twice 20 and 40 DAS	5	6	5	6.66	6.91	6.79	8.29	8.59	8.44	2105	2119	2112
T_9	Green manuring up to 40 DAS	4	4	4	5.78	6.01	5.89	6.58	6.76	6.67	1785	1799	1792
T_{10}	Control	4	4	4	4.86	5.18	5.02	4.46	4.78	4.62	1037	1051	1044
	S.Em ±	0.36	0.39	0.38	0.32	0.30	0.31	0.54	0.45	0.50	36.39	30.34	33.37
	CD (P=0.05)	1.06	1.17	1.12	0.96	0.90	0.93	1.59	1.33	1.46	108.11	107.98	108.05

Table 2: Seed yield, straw yield (kg ha^{-1}), harvest index (%) and test weight of finger millet as influenced by different weed management practices

Treatments		Seed yield (kg ha^{-1})			Straw yield (kg ha^{-1})			Harvest index (%)			Test weight (g)		
		2021	2022	Mean	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	2.44	2.57	2.51
T_2	Chlorimuron ethyl 10% + Metsulfuron methyl 10% 4 g/ha (PoE)	2207	2239	2223	6861	6937	6899	24.34	24.40	24.37	2.67	2.80	2.73
T_3	Metsulfuron methyl 20% 4 g/ha (PoE)	2103	2132	2118	6527	6591	6559	24.37	24.44	24.41	2.60	2.74	2.67
T_4	Carfentrazone ethyl 40% 12.5 g / ha. PoE	1918	1943	1930	6464	6545	6504	22.88	22.89	22.89	2.58	2.70	2.64
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	2.83	3.05	2.94
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	2.75	2.89	2.82
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	2.68	2.84	2.76
T_8	Hand weeding twice 20 and 40 DAS	2591	2644	2618	7886	7967	7927	24.73	24.92	24.83	2.77	2.93	2.85
T_9	Green manuring up to 40 DAS	1890	1916	1903	6271	6354	6312	23.16	23.17	23.16	2.53	2.66	2.60
T_{10}	Control	526	538	532	1870	1920	1895	21.97	21.91	21.94	1.43	1.62	1.53
	S.Em ±	4.74	3.68	4.21	16.74	13.93	15.34	2.79	1.33	2.06	0.08	0.07	0.08
	CD (P=0.05)	14.07	10.95	12.51	43.50	41.40	42.45	8.29	5.45	6.87	0.24	0.21	0.23

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