



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2020; 8(5): 891-893

© 2020 IJCS

Received: 02-06-2020

Accepted: 10-07-2020

Meghana GK

Department of Agronomy,
College of Agriculture, UAS,
GKVK, Bengaluru, Karnataka,
India

Sukanya TS

Department of Agronomy,
College of Agriculture, UAS,
GKVK, Bengaluru, Karnataka,
India

Salmankhan RM

Department of Agronomy,
College of Agriculture, UAS,
GKVK, Bengaluru, Karnataka,
India

Kiran HP

Department of Agronomy,
College of Agriculture, UAS,
GKVK, Bengaluru, Karnataka,
India

Corresponding Author:**Salmankhan RM**

Department of Agronomy,
College of Agriculture, UAS,
GKVK, Bengaluru, Karnataka,
India

Performance of different weedicides on yield and economics of Kodo millet (*Paspalum scrobiculatum* L.)

Meghana GK, Sukanya TS, Salmankhan RM and Kiran HP

DOI: <https://doi.org/10.22271/chemi.2020.v8.i5m.10408>

Abstract

An experiment in Kodo millet was conducted during *Kharif* 2018 in red sandy loamy soil of Zonal Agricultural Research Station, University of Agricultural Sciences, GKVK, Bengaluru with different weed management practices. Twelve treatments replicated thrice in a randomized complete block design (RCBD). Among the different weedicides treatments on yield and economics of kodo millet. Application of Bensulfuron methyl 0.6 G + Pretilachlor 6.0 G @ 165 g a. i. ha⁻¹ *fb* Bispyribac sodium 10 SC @ 10 g a. i. ha⁻¹ (T₅) recorded highest grain (1958 kg ha⁻¹), straw yield (4063 kg ha⁻¹), gross monetary returns (Rs.69,509ha⁻¹), net monetary returns (Rs.46,812 ha⁻¹) and B:C ratio(3.06) with lower weed index (6.67%).

Keywords: Kodo millet, weedicides, yield, economics

Introduction

Kodo millet (*Paspalum scrobiculatum* L.) is an important small millet crop grown in India and is having longest duration crop among other minor millets. It is known as haraka, cow grass, rice grass, ditch millet, native paspalum and Indian crown grass grown as a minor crop in many Asian countries, with the exception of the Deccan plateau in India where it is grown as a food source. In view of nutrient composition, the crop is now considered as nutri cereals. The grains are rich source of protein (10-11%) and have long storability under ambient conditions and hence, suitable as famine reserve (Ramesh *et al.*, 1998) [4]. It is also an excellent source of fibre at 10 g per 100 g, as opposed to rice, which provides 0.2 g per 100 g, and wheat, which provides 1.2 g per 100 g. An adequate fibre source helps to combat the feeling of hunger. Kodo millet contains 66.6 g of carbohydrates and 3.6 g of fat per 100 g of grain, comparable to other millets. It provides minimal amounts of iron (0.5 mg per 100 mg) and calcium (27 mg per 100 mg). Kodo millets also contain high amounts of polyphenols and lower phosphorus content than any other millet and its anti oxidant potential is much higher than any other millet and major cereals. When consumed as food it provides a sustaining diet, especially wholesome food for diabetic patients. Straw is a good fodder and grain may also be malted and flour of the malted grain is used in cakes or porridge and a nourishing food for infants.

Kodo millet is mainly cultivated for human consumption in Philippines, Indonesia, Vietnam, Thailand, West Africa and India. It grows wild as a perennial in the west of Africa, where it is eaten as a famine food. Small millets are grown worldwide and it is cultivated over an area of 0.62 m. ha with the production of 0.44 m. t. and with a productivity of 714 kg ha⁻¹ in India. Madhya Pradesh, Chhattisgarh, Maharashtra, Tamil Nadu and Karnataka are the main states of its cultivation in India.

Material and Methods

The experiment to study the performance of different weedicides on yield and economics in kodo millet consisted of twelve treatments replicated thrice in a randomized complete block design (RCBD). This experiment was conducted during *Kharif* 2018 at Gandhi Krishi Vignan Kendra (GKVK). The soil is red sandy loam and the treatments tested were, T₁: Oxadiargyl 80% WP @ 150 g a. i. ha⁻¹, T₂: Bensulfuron methyl 0.6% G + Pretilachlor 6.0% G @ 165 g a. i. ha⁻¹, T₃: Pendimethalin 38.7% CS @ 450 g a. i. ha⁻¹, T₄: Oxadiargyl 80% WP @ 150 g a. i.

ha⁻¹fb Bispyribacsodium 10% SC @ 10 g a. i ha⁻¹, T₅: Bensulfuron methyl 0.6% G + Pretilachlor 6.0% G @ 165 g a. i ha⁻¹ fb Bispyribacsodium 10% SC @ 10 g a. i ha⁻¹, T₆: Pendimethalin 38.7% CS @ 450 g a. i ha⁻¹ fb Bispyribac sodium 10% SC @ 10 g a. i ha⁻¹, T₇: Oxadiargyl 80% WP @ 150 g a. i ha⁻¹ fb Ethoxysulfuron 15% WG @ 12 g a. i ha⁻¹, T₈: Bensulfuron methyl 0.6% G + Pretilachlor 6.0% G @ 165 g a. i ha⁻¹ fb Ethoxysulfuron 15% WG @ 12 g a. i ha⁻¹, T₉: Pendimethalin 38.7% CS @ 450 g a. i ha⁻¹ fb Ethoxysulfuron 15% WG @ 12 g a. i ha⁻¹, T₁₀: Two intercultivation + hand weeding @ 20 and 40 DAS, T₁₁: un weeded check and T₁₂: weed free check.

Variety 'RBK-155' was sown at a spacing of 30 × 10 cm and fertilizer level of 40 kg N and 20 kg P₂O₅ was used. The gross and net plot sizes were 4.5 m × 4.0 m and 3.3m × 3.6 m, respectively. Data averaged over three replications and the data on Kodo millet grain and straw yield was collected after the crop harvest. The economics of weed management practices was worked out. The data collected on different traits was statistically analyzed using the standard procedure and the results were tested at five per cent level of significance as given by Gomez and Gomez (1984) [2].

Weed index

Weed index is defined as the reduction in yield due to presence of weeds in comparison to weed free check. Weed index was calculated by using the formula,

$$WI (\%) = \frac{(X-Y)}{X} \times 100$$

Where

WI = Weed index expressed in percentage

X = Yield of weed free plot

Y = Yield from treatment for which weed index is to be worked out

Weed control efficiency (%)

The weed control efficiency was calculated as the percentage reduction in density and growth of weeds in case of the treatments under study compared to the control treatment.

$$\text{Weed control efficiency (\%)} = \frac{W_0 - W_t}{W_0} \times 100$$

Where

W₀ = Total dry weight of weeds from unweeded plot.

W_t = Total dry weight of weeds from treated plot.

Gross returns (ha⁻¹)

The gross return per hectare was calculated by multiplying prevailing market price into total yield obtained per hectare. (Market price / unit quantity × grain yield + Market price of straw × straw yield).

Net returns

The net returns per hectare was calculated by deducting the cost of cultivation per hectare from the gross return per hectare

Net returns = Gross returns – Total cost of cultivation

Benefit cost ratio

The Benefit: Cost (B:C) ratio was worked out using the following formula

$$B:C = \frac{\text{Gross return (ha}^{-1}\text{)}}{\text{Cost of cultivation (ha}^{-1}\text{)}}$$

Results and Discussion

Yield attributes

The grain yield of herbicide treatments, T₅ *i.e.*, bensulfuron methyl 0.6 G + pretilachlor 6.0 G (165 g a. i/ha) fb bispyribac sodium 10 SC (10 g a. i/ha) @ 15-20 DAS was significantly superior to other herbicide treatments (1958 kg ha⁻¹) followed by T₈ *i.e.*, bensulfuron methyl 0.6 G + pretilachlor 6.0 G (165 g a. i/ha) fb ethoxysulfuron 15 WG (12 g a. i/ha) @ 15-20 DAS (1940 kg ha⁻¹), were on par with T₁₂ *i.e.*, weed free check which recorded highest grain yield of kodo millet (2107 kg ha⁻¹). Whereas, unweeded control (T₁₁) recorded significantly the lowest grain yield (717 kg ha⁻¹) compared to all other treatments.

The higher grain yield of kodo millet among herbicide treatments was recorded with bensulfuron methyl 0.6 G + pretilachlor 6.0 G (165 g a. i/ha) fb bispyribac sodium 10 SC (10 g a. i/ha) @ 15-20 DAS. This is due to control of the broad spectrum of weeds effectively during the critical period of crop weed competition, which otherwise were quite notorious for imposing competition for light, space and nutrients with crop. It has provided congenial environment for better expression of growth stature and yield attributes *viz.*, number of ear heads per plant, ear head length, number of grains per ear head, weight of grains per ear head and test weight. The cumulative effect of all these yield components resulted in increased grain yield. These results were confirmatory with the work of Dubey *et al.* (2005) [1] and Prajapati *et al.* (2007) [3].

The straw yield of herbicide treatments, T₅ *i.e.*, bensulfuron methyl 0.6 G + pretilachlor 6.0 G (165 g a. i/ha) fb bispyribac sodium 10 SC (10 g a. i/ha) @ 15-20 DAS (4063 kg ha⁻¹), T₈ *i.e.*, bensulfuron methyl 0.6 G + pretilachlor 6.0 G (165 g a. i/ha) fb ethoxysulfuron 15 WG (12 g a. i/ha) @ 15-20 DAS (4037 kg ha⁻¹) and T₆ *i.e.*, pendimethalin 38.7 CS (450 g a. i/ha) fb bispyribac sodium 10 SC (10 g a.i/ha) @ 15-20 DAS were significantly superior to other treatments and were on par weed free check (T₁₂) which recorded highest straw yield (4200 kg ha⁻¹). Whereas, unweeded control (T₁₁) recorded significantly lowest straw yield (2038 kg ha⁻¹) compared to all other treatments.

The higher straw yield in T₅ and T₈ among herbicide treatments might be due to cumulative effect of vegetative growth as evident from higher plant height, leaf area index and dry matter production (Shahid and Mudasar, 2016) [6]. Unweeded control (T₁₁) recorded the lowest straw yield. This might be due to heavy weed infestation, which exploited the growth resources and resulted in poor growth of kodo millet.

The lowest weed index was noticed in two inter cultivation + hand weeding at 20 and 40 DAS (T₁₀) (3.33%) followed by bensulfuron methyl 0.6 G + pretilachlor 6.0 G (165 g a. i/ha) fb bispyribac sodium 10 SC (10 g a. i/ha) @ 15-20 DAS (T₅) (6.67%) and bensulfuron methyl 0.6 G + pretilachlor 6.0 G (165 g a. i/ha) fb ethoxysulfuron 15 WG (12 g a. i/ha) @ 15-20 DAS (T₈) (10%). Highest weed index was noticed in T₁₁ *i.e.*, unweeded control (66.67%). Followed by oxadiargyl 80 WP (150 g a. i/ha) within 3 DAS (T₁) (53.33%).

The lower weed index attributed to reduction in the weed dry weight as a result of effective weed control in these treatments. Lower weed index is a result of satisfactory control of weeds owing to increase in yield. This enabled the crop to utilize available resources like light, nutrients, moisture and space resulting in higher yield. These results are

in accordance with the findings of Saha (2009) [5] and Singh *et al.* (2005) [7]. Among herbicide treatments, highest weed control efficiency (94.63%) at harvest was recorded in T₅ i.e.,

pre + post emergence application of bensulfuron methyl 0.6% G + pretilachlor 6.0% G @ 165 g a. i. ha⁻¹ at 3 DAS fb bispyribac sodium 10% SC 10 g a. i. ha⁻¹.

Table 1: Grain yield, straw yield and weed index in kodo millet as influenced by weed management practices

Treatment	Grain yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)	Weed index (%)	Weed control efficiency (%)
T ₁ : Oxadiargyl 80% WP @ 150 g a. i. ha ⁻¹	956	3055	53.33	70.42
T ₂ : Bensulfuron methyl 0.6% G + Pretilachlor 6.0%G @ 165 g a. i. ha ⁻¹	1173	3525	43.33	71.36
T ₃ : Pendimethalin 38.7% CS @ 450 g a. i. ha ⁻¹	1046	3246	50.00	73.65
T ₄ : Oxadiargyl 80% WP @ 150 g a. i. ha ⁻¹ fb Bispyribac sodium 10 SC @ 10 g a. i. ha ⁻¹	1859	3896	13.33	75.98
T ₅ : Bensulfuron methyl 0.6 G + Pretilachlor 6.0 G @ 165 g a. i. ha ⁻¹ fb Bispyribac sodium 10 SC @ 10 g a. i. ha ⁻¹	1958	4063	6.67	94.63
T ₆ : Pendimethalin 38.7 CS @ 450 g a. i. ha ⁻¹ fb Bispyribac sodium 10 SC @ 10 g a. i. ha ⁻¹	1909	4012	10.00	83.44
T ₇ : Oxadiargyl 80 WP @ 150 g a. i. ha ⁻¹ fb Ethoxysulfuron 15 WG @ 12 g a. i. ha ⁻¹	1504	3633	30.00	81.96
T ₈ : Bensulfuron methyl 0.6 G + Pretilachlor 6.0 G @ 165 g a. i. ha ⁻¹ fb Ethoxysulfuron 15 WG @ 12 g a. i. ha ⁻¹	1940	4037	10.00	86.87
T ₉ : Pendimethalin 38.7 CS @ 450 g a. i. ha ⁻¹ fb Ethoxysulfuron 15 WG @ 12 g a. i. ha ⁻¹	1607	3737	26.67	79.93
T ₁₀ : Two intercultivation + hand weeding	2034	4101	3.33	96.31
T ₁₁ : Un weeded check	717	2038	66.67	100
T ₁₂ : Weed free check	2107	4200	0.00	0.00
S.Em±	64.95	77.31	-	-
C. D. at 5%	190.53	226.78	-	-

Table 2: Economics of weed management practices in Kodo millet

Treatment	Gross returns (Rs. ha ⁻¹)	Cost of cultivation (Rs. ha ⁻¹)	Net returns (Rs. ha ⁻¹)	B:C ratio
T ₁ : Oxadiargyl 80% WP @ 150 g a. i. ha ⁻¹	33950	20485	13465	1.66
T ₂ : Bensulfuron methyl 0.6% G + Pretilachlor 6.0%G @ 165 g a. i. ha ⁻¹	41653	22093	19561	1.89
T ₃ : Pendimethalin 38.7% CS @ 450 g a. i. ha ⁻¹	37145	22155	14990	1.68
T ₄ : Oxadiargyl 80% WP @ 150 g a. i. ha ⁻¹ fb Bispyribac sodium 10 SC @ 10 g a. i. ha ⁻¹	66006	22778	43229	2.90
T ₅ : Bensulfuron methyl 0.6 G + Pretilachlor 6.0 G @ 165 g a. i. ha ⁻¹ fb Bispyribac sodium 10 SC @ 10 g a. i. ha ⁻¹	69509	22698	46812	3.06
T ₆ : Pendimethalin 38.7 CS @ 450 g a. i. ha ⁻¹ fb Bispyribac sodium 10 SC @ 10 g a. i. ha ⁻¹	67770	22758	45012	2.98
T ₇ : Oxadiargyl 80 WP @ 150 g a. i. ha ⁻¹ fb Ethoxysulfuron 15 WG @ 12 g a. i. ha ⁻¹	53404	22780	30624	2.34
T ₈ : Bensulfuron methyl 0.6 G + Pretilachlor 6.0 G @ 165 g a. i. ha ⁻¹ fb Ethoxysulfuron 15 WG @ 12 g a. i. ha ⁻¹	68870	22700	46170	3.03
T ₉ : Pendimethalin 38.7 CS @ 450 g a. i. ha ⁻¹ fb Ethoxysulfuron 15 WG 12 g a. i. ha ⁻¹	57049	22763	34286	2.51
T ₁₀ : Two intercultivation + hand weeding	72195	26715	45480	2.70
T ₁₁ : Un weeded check	25442	17575	7867	1.45
T ₁₂ : Weed free check	74799	27840	46959	2.69

Economics

Economics is the ultimate criteria for acceptance or rejection and wider adoption of any technology (Table 2). Among the various treatments, herbicide combination of Bensulfuron methyl 0.6% G + Pretilachlor 6.0% G @ 165 g a. i. ha⁻¹ as pre emergent herbicide fb Bispyribac sodium 10% SC @ 10 g a. i. ha⁻¹ as a post emergence herbicide recorded higher net returns of Rs. 46,812 ha⁻¹ with higher benefit: cost ratio (3.06) compared to other treatments. This was attributed to effective weed management at critical stages by integration of effective pre- and post-emergence herbicides which resulted in higher grain with reduced cost of cultivation. The lowest B:C ratio (1.45) was obtained in the un weeded check plot.

Conclusion

The herbicide combination of Bensulfuron methyl 0.6% G + Pretilachlor 6.0% G @ 165 g a. i. ha⁻¹ as pre-emergence fb Bispyribac sodium 10% SC @ 10 g a. i. ha⁻¹ as post-emergence is very effective in controlling weeds in Kodo millet and resulted in higher grain and straw yield with better economic returns due to reduced cost of cultivation.

References

1. Dubey RP, Moorthy BT, Gogoi AK. Bio-efficacy of

acetachlo + bensulfuron methyl against weeds in transplanted rice. Indian J Weed Sci. 2005; 37(3&4):265-266.

2. Gomez KA, Gomez AA. Statistical Procedures for Agric. Res. 2nd Ed. John Wiley & Sons, New York, 1984.
3. Prajapati BL, Upadhyay VB, Singh RP. Integrated weed management in rainfed Kodo millet (*Paspalum scrobiculatum* L.). Indian J of Agron. 2007; 52(1):67-69.
4. Ramesh S, Shankara BT, Gangappa E. Inheritance of qualitative characters in proso millet (*Panicum miliaceum* L.). Crop Res. 1998; 15(2&3):218-220.
5. Saha S. Efficacy of bensulfuron-methyl for controlling sedges and non grassy weeds in transplanted rice (*Oryza sativa* L.). Indian J Agric. Sci. 2009; 75(1):140-143.
6. Shahid R, Mudasir HK. Growth and yield of maize (*Zea mays* L.) as influenced by integrated weed management under temperate conditions of north western himalayas. American J. Exptl. Agri. 2016; 14(1):1-9.
7. Singh VP, Govindra S, Mahendra S. Effect of bensulfuron-methyl on sedges and weeds in transplanted rice. Indian J Weed Sci. 2005; 48(3&4):87-91.