

# Effect of integrated weed management practices on fibre yield of rainfed Mesta in North Coastal Andhra Pradesh

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Received: December 2022; Revised Accepted: March 2023

## ABSTRACT

A Field experiment was conducted at AINP on Jute and Allied Fibres, Agricultural Research Station, Amadalavalasa, Andhra Pradesh to evaluate chemical, mechanical, cultural practices and their integration for effective weed management in Mesta during *kharif* 2021. The results revealed that, maximum fibre yield of mesta was recorded in the weed free check (2093 kg/ha) followed by two hand weeding (HW) (1844 kg/ha) and Quizalofop ethyl 10% EC @ 38 g/ha at 15 days after emergence (DAE) + one hand weeding (HW) at 30 DAE (1828 kg/ha). However, mesta + greengram (1:1) intercropping recorded mesta equivalent yield of 1892 kg/ha which was statistically at par with weed free check (2093 kg/ha) and both the treatments recorded significantly higher fibre yield of mesta over other treatments. Two HW at 15 and 35 DAE (27.3 g/m<sup>2</sup>), Quizalofop ethyl 10% EC @ 38 g/ha at 15 DAE (POE) + one HW at 30 DAE (53.3 g/m<sup>2</sup>) and mulching with rice straw @ 7.5 t/ha + one HW at 15-21 DAE (53.7 g/m<sup>2</sup>) recorded lowest weed dry matter at harvest. Weed control efficiency (WCE) was highest with weed free check (99.3%) followed by two HW at 15 and 35 DAE (94.4%), Quizalofop ethyl 10% EC @ 38 g/ha at 15 DAE (POE) + one hand weeding (HW) at 30 DAE and mulching with rice straw @ 7.5 t/ha + one HW at 15-21 DAE treatment also recorded 89.1% WCE at harvest.

**Keywords:** Mesta, Economics, Fibre yield, Quizalofop ethyl, Weed management practices

## INTRODUCTION

Mesta is an important commercial and natural fibre crop after cotton and jute. It is mainly grown as a rainfed crop during *kharif* in Andhra Pradesh, Odisha, West Bengal, Bihar, Assam, Meghalaya, Tripura, Karnataka and Maharashtra. During 2020-21, raw jute occupied an area of 6.63 lakh ha in India with a production of 95.6 lakh bales and 2595 kg/ha yield and mesta occupies 6.1% and 4.3% of total raw jute area and production, respectively. In Andhra Pradesh, Jute and Mesta are concentrated mostly in Vizianagaram Srikakulam, Guntur and Prakasam districts occupying an area of 2000 ha with a production 22,000 bales of fibre (DES, 2022).

Weed infestation is the most important production constraint in Mesta cultivation under rainfed conditions. Weeds compete with mesta for soil moisture, nutrients and light as its growth is slow during initial crop growth period. Critical period of crop-weed competition in jute is during 21 to 45 days after sowing (Kumar *et al.*, 2015). Yield reduction upto 40 to 70% was reported under unweeded situation (Ghorai *et al.*, 2013). Grassy weeds are predominant in jute and mesta fields followed by sedges and broad-leaved weeds (Bhattacharya, 2012; Raju and Mitra, 2020). Manual weeding twice in the early stages of crop growth has been a common weed management practice in mesta. Conventional manual weeding is more expensive due to high manual labour re-

quirement and involves 30-40% of total cultivation cost (Raju and Mitra, 2020; Choudhary *et al.*, 2021; Kumar *et al.*, 2021). Therefore, application of herbicides enhances crop yields through enhancing profitability to the farmers. Herbicides are cost effective and useful in controlling the weeds timely (Goudar *et al.*, 2021). Keeping this in view this study was proposed to evaluate chemical, mechanical and cultural practices and their integration on weed management and fibre yield of Mesta.

### MATERIAL AND METHODS

The field experiment was conducted during *kharif* 2021 under rainfed conditions at All India Network Project on Jute and Allied Fibres, Agricultural Research Station (ANGRAU), Amadalavalasa in North Coastal zone of Andhra Pradesh. The experimental site was situated at 18.4°N latitude, 83.89°E longitude and altitude of 35 m MSL. Soil type of the experimental site is sandy loam with acidic pH (5.2), normal EC (0.01 dS/m), low in organic carbon (0.25%), available nitrogen (188 kg/ha), available phosphorus (20.6 kg/ha) and available potassium is medium (205 kg/ha). The study consisted of ten treatments with a plot size of 4.5×4.0 m, replicated thrice in randomized complete block design. The treatments are; T<sub>1</sub>: Quizalofop ethyl 10% EC @ 38 ga.i./ha at 15 DAE + one hand weeding (HW) at 30 DAE; T<sub>2</sub>: Pre-emergence spraying of Ipfen carbazone 25% SC @ 90 g a.i./ha + one HW at 15 DAE; T<sub>3</sub>: Pre-emergence spraying of Ipfen carbazone 25% SC @ 115 g a.i./ha + one HW at 15 DAE; T<sub>4</sub>: Mesta + Greengram intercropping (1:1); T<sub>5</sub>: Mesta + Blackgram intercropping (1:1); T<sub>6</sub>: Mulching with rice straw @ 7.5 t/ha + one HW at 15 DAE; T<sub>7</sub>: Nail weeder at 4 and 8 DAE (soil moisture must be at FC) + scrapper at 21 DAE; T<sub>8</sub>: Unweeded check; T<sub>9</sub>: Two hand weeding (HW) at 15 DAE and 35 DAE; and T<sub>10</sub>: Weed free check.

Mesta variety 'AMV 7' was sown at a spacing of 30 × 10 cm with a seed rate of 12.5 kg/ha on 25.06.2021 and harvested on 09.11.2021. Greengram variety 'IPM 2-14' and Blackgram variety 'GBG 1' were sown in the intercropping treatments at 1:1 ratio along with mesta and both were harvested on 07.09.2021. Rainfall received

during the crop growing period was 968 mm. Fertilizers at the rate of 60:30:30 kg NPK/ha were applied to all the treatments uniformly. Battery operated knapsack sprayer fitted with flat fan nozzle was used for herbicide application. Weed flora was recorded in unweeded plot and weed samples were collected in all treatments at 15, 35 and 45 days after emergence of crop placing two quadrates of 50 × 50 cm randomly. The weed samples were first dried in shade followed by oven drying at 70° C for 12 hours and recorded weed dry weight (g/m<sup>2</sup>). Plant height, basal diameter, fibre yield of mesta were recorded at the time of harvesting. Seed yield of intercrops (greengram and blackgram) was converted to mesta equivalent yield. Weed control efficiency and weed index were calculated as suggested by Devasenapathy *et al.* (2008). Data recorded on weed dry matter was subjected to square root transformation ( $\sqrt{x+0.5}$ ) before statistical analysis. The replicated data pertaining to transformed weed dry matter, plant height, basal diameter and fibre yield was statistically analysed as per the procedure suggested by Gomez and Gomez (1984) for randomized complete block design and treatment means were compared at LSD @ P=0.05.

### RESULTS AND DISCUSSION

#### Weed flora and weed dry matter production

The weed flora in the experimental field of mesta mainly comprised of *Cyperus rotundus* upto 30 days after emergence and *Celosia argentia*, *Cynodon doctylon*, *Digitaria sanguinalis*, *Dactyloctenium aegyptium* were the dominating weed flora after 90 days after emergence.

Among the weed management practices, Nail weeder at 4 and 8 days after emergence (DAE) + scrapper at 21 DAE recorded significantly lower weed dry matter (112.3 g/m<sup>2</sup>) at 15 DAE (Table 1). While, Quizalofop ethyl 10% EC @ 38 g/ha at 15 DAE + one HW at 30 DAE (34 g/m<sup>2</sup>) has recorded the significantly lower weed dry matter at 35 DAE followed by Two HW at 15 and 35 DAE (67 g/m<sup>2</sup>), Mesta + Greengram intercropping (70.3 g/m<sup>2</sup>), pre-emergence application of Ipfen carbazone 22.8% EC @ 90 g a.i./ha + HW at 15 DAE (75.7 g/m<sup>2</sup>), mulching with rice straw @ 7.5 t/ha + HW at 15

**Table 1. Weed dry matter production, weed control efficiency and weed index as influenced by weed management practices in Mesta**

Treatment	Weed dry matter (g/m <sup>2</sup> )*			Weed control efficiency (%)			Weed Index (%)
	15 DAE	35 DAE	45 DAE	15 DAE	35 DAE	45 DAE	
Quizalofop ethyl 110% EC @ 38 g a.i./ha at 15 DAE (POE) + HW at 30 DAE	16.8 (282.3)	5.9 (34)	9.4 (87.3)	19.1	91.3	79.3	12.64
Ipfen carbazone 22.8% EC @ 90 g a.i./ha (PRE) + HW at 15 DAE	16.9 (285)	8.6 (75.7)	13.2 (172.7)	18.6	81.0	66.3	18.61
Ipfen carbazone 22.8% EC @ 115 g a.i./ha (PRE) + HW at 15 DAE	15.7 (247)	9.1 (82.3)	13.4 (179)	29.5	79.0	57.3	24.83
Mesta + Greengram (1:1)	16.9 (286)	8.4 (70.3)	10.9 (118.7)	17.7	82.3	72.0	9.47
Mesta + Blackgram (1:1)	17.4 (302)	9.4 (87)	12.3 (151.3)	13.2	78.0	64.0	25.63
Mulching with rice straw @ 7.5 t/ha + HW at 15 DAE	12.6 (159)	9.1 (82.7)	10.8 (116.3)	54.6	79.0	72.7	20.93
Nail weeder at 4&8 DAE + Scrapper at 21 DAE	10.6 (112.3)	12.2 (147.7)	9.6 (91.7)	67.8	62.7	78.0	22.17
Unweeded check	18.8 (353)	19.9 (396)	20.5 (421)	0.0	0.0	0.0	45.95
Two HW/Nail weeder at 15 DAE and 35 DAE	17.3 (300.3)	8.2 (67)	9.0 (81)	13.7	83.0	81.0	11.79
Weed free check	12.8 (166)	7.6 (58.3)	8.9 (79.3)	52.0	85.3	81.3	0.00
SEm±	0.74	0.60	0.44	6.4	2.6	3.7	-
LSD (P=0.05)	2.2	1.8	1.3	19.1	7.8	11.2	-

\* Original data in parentheses is subjected to square root transformation before analysis

DAE (82.7 g/m<sup>2</sup>). At 45 DAE, lowest weed dry matter was recorded in weed free check and two HW at 15 and 35 DAE, which were on par with nail weeder at 4 & 8 DAE+ scrapper at 21 DAE (91.7 g/m<sup>2</sup>), Quizalofop ethyl 10% EC @ 38 g/ha at 15 DAE + one HW at 30 DAE and mulching with rice straw @ 7.5 t/ha + one HW at 15 DAE. Two HW at 15 and 35 DAE (27.3 g/m<sup>2</sup>), Quizalofop ethyl 10% EC @ 38 g/ha at 15 DAE + one HW at 30 DAE (53.3 g/m<sup>2</sup>) and mulching with rice straw @ 7.5 t/ha + one HW at 15-21 DAE (53.7 g/m<sup>2</sup>) recorded lowest weed dry matter at harvest also. Dutta and Kheroar (2020) also reported lowest weed biomass with application of quizalofop-ethyl + ethoxysulfuron followed by manual weeding in jute. Singh *et al.*(2015) recorded 23-53% lower weed biomass with quizalofop-ethyl followed by hand weeding than pretilachlor fb hand weeding during critical crop weed competition period.

**Weed control efficiency and Weed index**

The weed control efficiency (WCE) was highest with weed free check (81.3%, 99.3%) followed by two HW at 15 and 35 DAE (81%, 94.4%), Quizalofop ethyl 10% EC @ 38 g/ha at 15 DAE + one HW at 30 DAE (79.3%, 89.1%) and mulching with rice straw @ 7.5 t/ha + 1 HW at 15-21 DAE treatments also recorded (72.7%, 89.1%) WCE at 45 DAE and harvest, respectively (Table 1). Pre emergence application of Ipfen carbazone 22.8% EC @ 90 g a.i./ha + HW at 15 DAE recorded WCE of 86.9% at harvest. Growing of greengram as intercrop in

mesta achieved WCE of 73.8% at harvest. This has recorded lowest weed index (9.47%) among all other weed management practices followed by two HW at 15 and 35 DAE (11.79%) and Quizalofop ethyl 10% EC @ 38 g/ha at 15 DAE + one HW at 30 DAE (12.64%).

### Plant height and fibre yield of Mesta

Weed management practices has shown significant effect on plant height of mesta at 30 DAE and harvest (Table 2). Plant height of mesta recorded with weed free check, two HW at 15 & 35 DAE, nail weeder at 4 and 8 DAE+ scrapper at 21 DAE, Quizalofop ethyl 10% EC @ 38 g/ha at 15 DAE + one HW at 30 DAE and mulching with rice straw @ 7.5 t/ha + 1 HW at 15-21 DAE was on par with each other at 30 DAE and harvest except mesta + blackgram intercropping and unweeded check, which recorded significantly lower plant height.

All the weed control treatments significantly increased fibre yield of mesta over unweeded check (Table 2). Maximum fibre yield of mesta was recorded in the weed free check (2093 kg/ha) followed by two HW at 15&35 DAE (1844 kg/ha) and Quizalofop ethyl 10% EC @ 38 g/ha at 15 DAE + one HW at 30 DAE (1828 kg/ha) treatments. However, mesta + greengram (1:1) intercropping treatment recorded mesta equivalent yield (1892 kg/

ha) which was statistically at par with weed free check (2093 kg/ha) and both the treatments recorded significantly higher fibre yield of mesta over other treatments. This was possibly because of additional economic yield from the inter-crop component of greengram. Dutta and Kheroar (2020) also observed 136% increase in fibre yield of jute with application of quizalofop-ethyl 5 EC 60 g/ha + ethoxysulfuron 100 g./ha at 15 DAE + HW 35 DAS over unweeded plots.

### Economics of weed management in mesta

Weed free check has recorded highest gross returns (Rs.94,185/ha) followed by intercropping of mesta + greengram (1:1). While the highest net returns (Rs.46000/ha) and BC ratio (2.18) was recorded with intercropping of mesta + greengram followed by Quizalofop ethyl 10% EC @ 38 g/ha at 15 DAE + one HW at 30 DAE (Rs. 37957/ha and 1.86) (Table 3).

### CONCLUSION

Post emergence application of Quizalofop ethyl 10% EC @ 38 g/ha at 15 DAE + one HW at 30 DAE (18.28 q/ha) and mesta + greengram intercropping in 1:1 ratio (18.92 q/ha) has recorded higher fibre yield of mesta, lower weed index, higher weed control efficiency, net returns and

**Table 2. Effect of weed management practices on plant height, fibre yield and fibre equivalent yield of Mesta**

Treatment	Plant height (cm)			Fibre yield (kg/ha)	Inter crop yield (kg/ha)	Fibre Equi. Yield (kg/ha)
	30 DAE	60 DAE	At harvest			
Quizalofop ethyl 10% EC @ 38 g a.i./ha at 15 DAE (POE) + HW at 30 DAE	40.3	118.0	319.7	1828	-	1828
Ipfencarbazone 22.8% EC @ 90 g a.i./ha (PRE) + HW at 15 DAE	28.7	110.7	295.4	1706	-	1706
Ipfencarbazone 22.8% EC @ 115 g a.i./ ha (PRE) + HW at 15 DAE	27.7	108.0	299.7	1573	-	1573
Mesta + Greengram (1:1)	31.7	108.7	296.5	1372	322	1892
Mesta + Blackgram (1:1)	25.7	79.7	288.8	1155	287	1556
Mulching with rice straw @ 7.5 t/ha + HW at 15 DAE	38.3	112.7	307.2	1656	-	1656
Nail weeder at 4&8 DAE + Scrapper at 21 DAE	46.0	116.3	304.5	1628	-	1628
Unweeded check	35.0	100.3	270.5	1132	-	1132
Two HW/Nail weeder at 15 DAE and 35 DAE	46.3	106.7	310.2	1844	-	1844
Weed free check	55.3	115.0	314.0	2093	-	2093
SEm±	2.82	8.91	8.13	-	-	0.70
LSD (P=0.05)	8.5	NS	24.3	-	-	2.09

**Table 3. Economics of adopting various weed management practices in Mesta**

Treatment	Cost of Cultivation (Rs/ha)	Gross returns (Rs/ha)	Net Returns (Rs/ha)	BC Ratio
Quizalofop ethyl 10% EC @ 38 g a.i./ha at 15 DAE (POE) + HW at 30 DAE	44303	82260	37957	1.86
Ipfencarbazone 22.8% EC @ 90 g a.i./ha (PRE) + HW at 15 DAE	44505	76770	32265	1.72
Ipfencarbazone 22.8% EC @ 115 g a.i./ ha (PRE) + HW at 15 DAE	44505	70785	26280	1.59
Mesta + Greengram (1:1)	39005	85005	46000	2.18
Mesta + Blackgram (1:1)	39005	70056	31051	1.80
Mulching with rice straw @ 7.5 t/ha + HW at 15 DAE	62255	74520	12265	1.20
Nail weeder at 4&8 DAE + Scrapper at 21 DAE	44755	73260	28505	1.64
Unweeded check	39005	50940	11935	1.31
Two HW/Nail weeder at 15 DAE and 35 DAE	50005	82980	32975	1.66
Weed free check	54505	94185	39680	1.73

benefit cost ratio in north coastal Andhra Pradesh. Hence, farmers may adopt either of these depend-

ing on the weed intensity and prevailing climatic conditions.

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