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## Weed management studies in Roselle (*Hibiscus sabdariffa* L.)

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### Abstract

An experiment was conducted at Agricultural Research Station, Amadalavalasa, Andhra Pradesh during *Kharif* 2016 and 2017 for studying the effect of different weed control treatments to manage the weeds of roselle. The results revealed that all weed control treatments significantly increased the plant height, basal diameter and fibre yield compared to unweeded check. Highest fibre yield was recorded with Pretilachlore 50% EC @ 900 ml /ha with sowing controlled all types of weeds and one more hand weeding is needed after the emergence of weeds and it was at par with two hand weedings and significantly superior over all the other treatments. First nail weeding at 5-6 DAE and second at 10DAE + one hand weeding was also as effective as two hand weedings in respect of fibre yield and controlling the weeds of Mesta. All the weed control treatments significantly reduced the weed biomass compared to Unweeded check at all crop growth stages. The higher weed control efficiency with lower weed index was noticed with Pretilachlore 50% EC @ 900 ml/ha + one hand weeding followed by two hand weedings treatment. Among the weed control treatments highest benefit cost ratio was recorded with Pretilachlore 50% EC @ 900 ml/ ha + one hand weeding followed by two hand weedings. From the study, it was revealed that Pretilachlore as pre emergence herbicide was more effective in controlling the weeds of roselle with highest economic returns.

**Keywords:** fibre yield, herbicide, roselle, weed drymatter, weed management

### Introduction

Mesta is an important commercial Fibre crop next to 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. Andhra Pradesh occupies the prime position in area and production of Mesta, which is concentrated mostly in Vizianagaram and Srikakulam districts.

Mesta, a herbaceous annual plant (lingo- cellulosic bast fibre crop like jute) believed to be originated from Afroasian countries, ranks next to jute in importance. (Sharing 15% of raw jute- cum-mesta fibre production) and comprises of two major distinct cultivated species- *Hibiscus cannabinus* (Kenaf, 2n=36) and *H. sabdariffa* (Roselle, 2n=72) belonging to cotton family Malvaceae. Mesta is more adaptive than jute under diverse conditions of climate and soil and also resistant to drought situation. Mesta has proved as a major substitute for jute and is successfully being grown in Tropical and Sub Tropical regions of both the hemispheres. All the existing types of *H. Sabdariffa* (Roselle) are characterised by slow growth rate and require a longer vegetative period. A uniform and optimum plant stand can exhibit its maximum yield potential only if it is properly nourished and managed thereafter. An effective weed management practice is necessary for higher crop production and better economic returns (Gaffer *et al.* 1988. Most effective and economic cultural practices for weed control in mesta crop are not clearly known to our farmers till date. In Andhra Pradesh, weeds are generally controlled by hoeing (hand weeding) and weeding and thinning operations involve about 50% or more of the labour cost. Hence, it is necessary to identify different weed management practices which can reduce the labour cost component and increase the net profit to the mesta farmers who belongs to small and marginal category. Therefore, it is proposed to study different weed control methods for managing weeds at different growth stages, so that it can be recommended to Mesta growing farmers.

## Materials and Methods

A field experiment was conducted at Agricultural Research Station, Amadalavalasa, Andhra Pradesh during *Kharif* season for two years, 2016 and 2017 under rainfed conditions. The experimental soil was sandy loam, medium in available nitrogen and phosphorus and high in potassium content. The experiment was laid out in Randomized Block Design with three replications. Treatments consisted of Pretilachlor 50% EC 900 ml/ha at 45-48 hours of sowing + one hand weeding (15 DAE), Nail weeder – 1<sup>st</sup> at 5-6 DAE (at field capacity) and 2<sup>nd</sup> at 10 DAE + one hand weeding (within the row) at 15 DAE, Mesta + groundnut (1:1)\*, Mesta + cluster bean (1:1)\*, Mesta + black gram (1:1)\*, Hand weeding twice (15 & 21 DAE) and Unweeded control (\*Component crops in between Mesta rows, Mesta spacing 40 cm row-row).

The seeds of mesta was treated with Mancozeb @ 3 g/kg seed against foot and stem rot disease and sown on 26<sup>th</sup> June 2016 and 16<sup>th</sup> June 2017, with a spacing of 40x10 cm. Farm yard manure @ 5 t ha<sup>-1</sup> was applied during last ploughing. A common fertilizer dose of 60 kg N/ha and 30 kg each of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O / ha were applied as basal. The crop was maintained by adopting the recommended package of practices. Need based plant protection measures were taken up during crop growth period. The data on plant height, basal diameter and fibre yield were recorded and the data was analysed as per the standard statistical procedures described by Panse and Sukhatme (1985) [5].

## Results and Discussion

### Growth parameters

The data revealed that all weed management treatments significantly influenced the plant height of mesta compared to un-weeded check (Table 1) in both the years of study. Highest plant height (340.67 cm in 2016 and 328.33 cm in 2017) was recorded with Pretilachlor 50% EC 900 ml ha<sup>-1</sup> at 45-48 hours of sowing + one hand weeding) which was at par with Hand weeding twice at 15 & 21 DAE and Nail weeder – 1<sup>st</sup> at 5-6 DAE (at field capacity) and 2<sup>nd</sup> at 10 DAE + one hand weeding (within the row) at 15 DAE. Stem girth (basal diameter) of roselle was significantly increased with all weed control measures when compared to un weeded check (Table 1) during both the years. Application of Pretilachlore 50% EC 900 ml/ha at 45-48 hours of sowing + one hand weeding (15 DAE) gave the highest basal diameter (21.0 and 21.4 mm respectively in 2016 and 2017), which was at par with Two hand weeding treatment and significantly superior over all the other treatments during both the years of study.

### Fibre yield

Perusal of experimental data revealed that significantly higher

fibre yield and of mesta fibre equivalent yield were recorded with Pretilachlor 50% EC 900 ml/ ha at 45-48 hours of sowing + one hand weeding treatment over other treatments except Two hand weedings treatment (Table 1). Pooled analysis of 2016 and 2017 also indicated highest fibre yield with Pretilachlor 50% EC 900 ml/ha at 45-48 hours of sowing + one hand weeding treatment. Un -weeded control treatment recorded lowest fibre yield of 8.15 q/ha (mean of two seasons). The increment in fibre yield with Pretilachlor 50% EC 900 ml/ ha at 45-48 hours of sowing + one hand weeding treatment might be due to effective control of weeds during early crop growth stages that in turn facilitates better crop growth in terms of higher plant height and basal diameter. Similar observations were reported by Ghorai *et al.* (2013) [13] and Amara Jyothi *et al.* (2016) [11] were they reported higher fibre yield in mesta with application of Butachlore 50% EC @ 1.5 kg / ha at 45-48 hours of sowing + one hand weeding.

### Weed dry weight

All weed control treatments significantly reduced the weed dry weight compared to un weeded check at all the crop growth stages (Table 2) during both the years of study. The treatment Pretilachlor 50% EC 900 ml/ ha at 45-48 hours of sowing + one hand weeding recorded lowest weed dry matter followed by Nail weeder – 1<sup>st</sup> at 5-6 DAE (at field capacity) and 2<sup>nd</sup> at 10 DAE + one hand weeding (within the row) at 15 DAE and Hand weeding twice (15 & 21 DAE) treatments. Highest weed dry matter recorded in un-weeded check. Component crops grown in between Mesta rows were failed in weed smothering as well as additional income. Sitangshu Sarkar (2007) [6] reported that application of herbicides recorded lowest weed dry weight when compared to un weeded check.

### Weed Control efficiency, Weed index and B: C ratio

The treatment Pretilachlore 50% EC 900 ml/ ha + one hand weeding recorded highest weed control efficiency and lowest weed index followed by Hand weeding twice (15 & 21 DAE) and Nail weeder – 1<sup>st</sup> at 5-6 DAE (at field capacity) and 2<sup>nd</sup> at 10 DAE + one hand weeding (within the row) at 15 DAE treatments during both the years of study. Among the weed control treatments, Pretilachlore 50% EC 900 ml/ha + one hand weeding recorded highest net return and higher B: C ratio when compared to other treatments majorly this might be due to the application of Pretilachlore which effectively controlled the weeds in roselle and putforth better crop growth. Highest cost of cultivation incurred in T<sub>3</sub> (Mesta + groundnut crop) treatment, which was due to the cost of groundnut seed. Similar finding were reported by Ghorai *et al.* (2009) [3] in jute crop.

**Table 1:** Yield attributes and fibre yield of mesta under different weed management treatments

Treatments	Plant Height (Cm)		Basal Diameter (mm)		Mesta Fibre Yield (Q/ha)		Component crop yield(q/ha)		Mesta fibre equivalent yield (q/ha)		
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017	#Pool
Pretilachlor 50% EC 900ml/ha at 45-48 hours of sowing with irrigation + one hand weeding (15 DAE)	340.67	328.33	21.05	21.35	25.43	21.59		-	25.43	21.59	23.50
Nail weeder- 1st at 5-6 DAE (at field capacity) and 2nd at 10 DAE + one hand weeding (within the row) at 15DAE	316.67	304.33	18.09	18.39	21.11	17.87		-	21.11	17.87	19.49
Mesta + Ground nut (1:1)*	309.33	297.00	14.99	15.29	15.63	12.63	2.85	2.49	19.68	16.31	17.99
Mesta + cluster bean(1:1)*	305.00	292.67	13.94	14.24	16.15	13.15	6.73	3.61	18.44	14.59	16.51
Mesta+ blackgram (1:1)*	305.00	292.67	13.06	14.28	15.30	12.30	1.10	2.13	16.86	14.45	15.65
Hand weeding twice (15 & 21 DAE)	321.67	309.33	19.17	19.47	24.51	20.89	-	-	24.51	20.89	22.70
Un weeded control	293.33	281.00	11.97	12.27	9.65	6.65	-	-	9.65	6.65	8.15
CD (5%)	30.7	30.7	2.78	2.49	5.05	3.6	-	2.49	5.17	3.66	2.99

CV (%)	5.64	6.0	9.99	8.7	14.6	13.7		4.61	15.06	13.66	14.46
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DAE- Days after emergence; # pool of 2016 &amp; 2017-18

**Table 2:** Weed biomass, WI and WCE under different weed management treatments

Treatments	Weed biomass (g/ha)						WI		WCE	
	15 DAS		35 DAS		55 DAS		2016	2017	2016	2017
	2016	2017	2016	2017	2016	2017				
Pretilachlor 50% EC 900ml/ha at 45-48 hours of sowing with irrigation + 1HW (15 DAE)	0.00	0.00	0.00	0.00	0.00	2.63	0	0	100	94.03
Nail weeder- 1st at 5-6 DAE (at field capacity) and 2nd at 10 DAE + 1HW (within the row) at 15DAE	0.60	2.43	1.30	2.50	3.06	3.70	16.98	17.23	43.38	87.68
Mesta + Ground nut (1:1)*	1.26	3.49	2.02	4.48	4.82	7.51	38.53	41.51	30.14	47.93
Mesta + cluster bean(1:1)*	1.37	3.77	2.15	4.82	5.37	8.13	36.49	39.08	26.57	38.97
Mesta+ blackgram (1:1)*	1.29	3.48	1.81	4.15	4.32	7.41	39.83	43.02	33.61	49.24
Hand weeding twice (15 & 21 DAE)	1.20	3.46	0.86	2.57	2.12	2.53	3.61	3.23	52.11	94.44
Un weeded control	1.32	3.68	6.14	7.78	10.32	10.37	62.05	69.19	0.00	0

DAS: Days after sowing; WI: Weed index and WCE: Weed control efficiency

**Table 3:** Economics of different weed control treatments

Treatments	Cost of cultivation (Rs/ha)	Return from Mesta (Rs/ha)	Returns from component crops (Rs/ha)	Total returns (Rs/ha)	B:C ratio
Pretilachlor 50% EC 900ml/ha at 45-48 hours of sowing with irrigation + one hand weeding(15 DAE)	18200	43180	-	43180	2.4
Nail weeder- 1st at 5-6 DAE (at field capacity) and 2nd at 10 DAE + one hand weeding (within the row) at 15DAE	20000	35740	-	35740	1.8
Mesta + Ground nut (1:1)*	23450	32360	12433	44793	1.9
Mesta + cluster bean(1:1)*	16200	28780	4328	33108	2.0
Mesta+ blackgram (1:1)*	16700	28000	5967	33967	2.0
Hand weeding twice (15 & 21 DAE)	19700	41780	-	41780	2.1
Un weeded control	12700	13300	-	13300	1.0

## Conclusion

From the two years study it can be concluded that all weed management treatments significantly increased the plant height, basal diameter and fibre yield of Mesta compared to un-weeded check. The highest growth parameters and fibre yield recorded with Pretilachlore 50% EC 900 ml/ ha + one hand weeding treatment, which was at par with Hand weeding twice treatment. Which was also confirmed by pooled data of 2016 and 2017. All weed management treatments significantly reduced the weed biomass compared to un-weeded check at all the crop growth stages. The treatment Pretilachlore 50% EC 900 ml/ ha + one hand weeding significantly reduced the weed biomass than remaining other treatments at all crop growth stages and also recorded highest weed control efficiency, lowest weed index, highest net returns and B:C ratio. Therefore application of Pretilachlore 50% EC 900 ml/ha + one hand weeding may be recommended for weed management in roselle to the Mesta growing farmers for fetching higher net profits.

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