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Ideal spacing in mesta (*Hibiscus sabdariffa*. L) grown for seed purpose

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ABSTRACT

A field experiment was conducted at Agricultural College Farm, Bapatla during *kharif*, 2013, to find out the ideal spacing in mesta crop grown for seed purpose, with four spacing *viz.*, 30 cm × 10 cm, 20 cm × 10 cm, 15 cm × 15 cm and 15 cm × 10 cm, growth parameters viz., the plant height, number of branches per plant yield parameters viz., number of seeds per capsule and 1000 seed weight were not altered significantly due to different spacing tried. Significantly superior values for dry matter accumulation, crop growth rate, stalk yield and number of days to reach 50 % flowering were noticed with closer spacing of 15 cm × 10 cm than the remaining tried. Significantly higher relative growth rate and more number of capsules per plant was found at a wider spacing of 30 cm × 10 cm, which was however, on a par with 15 cm ×15 cm and 20 cm × 10 cm, where as the number of capsules per plant were found statistically same with 15 cm × 15 cm. Roselle sown at a closer spacing 15 cm × 10 cm produced maximum seed yield, which was however, found parity with 20 cm × 10 cm.

Key words: Dry matter accumulation, Mesta, Plant height, Seed yield, Spacing, Test weight.

Mesta (*Hibiscus sabdariffa*. L), commonly called as roselle is the third most important fibre crop in India after cotton and jute. Which belongs to the family Malvaceae. Besides fibre, it also provides forage and paper pulp. In recent years, mesta is even attracting the attention of food and beverage manufacturers and pharmaceutical concerns who feel that it may have exploitable possibilities as a natural food product and as a colourant to replace some synthetic dyes. Mesta growers of upland pockets are facing acute shortage of seed of high yielding varieties since the practice of leaving the crop in a small patch till maturity for future seed requirement is diminishing gradually. Further, in contrast to the price instability of fibre, the cost of mesta seed is fairly stable and the demand for seed of high yielding varieties is also assured. Also, it does not require water for retting when it is grown exclusively for seed production. Though the productive efficiency of the crop depends on its genetic potentiality, its yield can be increased to a perceptible level by suitable agronomic practices and among them, spacing is of prime importance.

A field trial was carried out on sandy soil of Agricultural College Farm, Bapatla during *kharif* 2013, which is located at 15^0 55' N latitude, 80^0 28' E longitudes and altitude of 5.49 m above mean sea level and in the Krishna Agro-climatic zone of Andhra Pradesh, India. The soil was slightly alkaline in nature, low in organic carbon and nitrogen content and medium in phosphorous and potassium content. The experiment was laid out in split plot design and replicated thrice.

The treatments consisted of four dates of sowing (D_1- 19-07-2013, D_2- 02-08-2013, D_3- 17-08-2013 and D_4- 01-09-2018) allotted to main plots and four spacing *viz.*, S_1- 30 cm × 10 cm, S_2- 20 cm × 10 cm, S_3-15 cm × 15 cm and S_4- 15 cm × 10 cm allotted to sub plots. The observation on growth parameters *viz.*, plant height, dry matter accumulation, crop growth rate, relative growth rate, no. of branches per plant and days to 50 % flowering and yield parameters *viz.*, number of capsules per plant, number of seeds per capsule, 1000 seed weight, seed yield, stalk yield were analysed by using standard procedures.

Pre-Harvest Observations: Plant height of mesta measured at 30 DAS, flowering and maturity could not be altered to a statistically perceptible level among four treatments (30 cm×10 cm, 20 cm×10 cm, 15 cm×15 cm and 15 cm × 10 cm) tried. (Table 1).

Significantly superior values for dry matter accumulation at flowering and maturity were registered with 15 cm × 10 cm - 6,66,666 plants ha^{-1}. Roselle sown at 20 cm × 10 cm spacing i.e 5,00,000 plants ha^{-1} was found to be the next best treatment with regard to accumulation of dry matter at flowering. The lowest dry matter accumulation at both stages was obtained when mesta crop was sown at a wider spacing of 30 cm × 10 cm (3,33,333 plants ha^{-1}). (Guggari and Sheelavantar, 2004a and Pushpa *et al*, 2013a).

The highest crop growth rate between 30 DAS and flowering was obtained with a closer spacing of 15 cm × 10 cm. Sowing at 20 cm × 10 cm was found to be the next best treatment, which was however, on a par with 15 cm × 15 cm

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Table 1. Pre harvest observations in mesta as influenced by different spacing practices.

Treatment	Plant height (cm)			Dry matter accumulation (kg ha^{-1})		Crop Growth Rate (g m^{-2} d^{-1})		(Relative Growth Rate (g g^{-1} day^{-1})		No. of branches per plant		Days to 50 % flowering
	30 DAS	Flowering	Maturity	Flowering	Maturity	30 DAS -Flowering	Flowering to Maturity	30 DAS -Flowering	Flowering to Maturity	Flowering	Maturity	
S_1 (30 × 10 cm)	48.5	202.0	211.1	9781	9692	13.2	-0.2	43.0	0.2	2.1(3.5)	2.5(5.4)	95.3
S_2 (20 × 10 cm)	48.1	203.0	208.8	11947	10941	15.4	-1.8	41.0	-2.1	2.0(3.2)	2.4(4.8)	100.6
S_3 (15 × 15 cm)	50.8	205.5	216.9	11253	10429	14.7	-0.9	42.3	-2.5	2.2(4.2)	2.5(5.3)	97.9
S_4 (15 × 10 cm)	51.3	202.8	209.5	17368	17392	21.2	0.0	37.7	1.3	2.0(3.4)	2.4(4.9)	102.8
S.Em ±	1.29	4.15	4.81	183.96	170.62	0.26	-	0.82	-	0.1	0.1	0.44
CD (P=0.05)	NS	NS	NS	537	498	0.7	-	2.4	-	NS	NS	1.3
CV(%)	9.0	7.1	7.9	5.1	4.9	5.5	-	6.9	-	17.2	10.7	1.5

Note : Figures in parentheses are original, which have been transformed into $\sqrt{x+1}$ for the purpose of statistical analysis.

and which in turn found parity with 30 cm × 10 cm. Significantly higher relative growth rate between 30 DAS and flowering was found with wider spacing of 30 cm × 10 cm, which was however, found statistically similar with 15 cm × 15 cm and 20 cm × 10 cm. While the CGR and RGR values worked out between flowering and maturity registered negative values due to steep leaf fall and hence statistical analysis could not be carried out. These findings are in consonance with Sateesh (1984).

Various Spacing practices adopted in roselle could not exert any influence to a statistically noticeable level on number of branches per plant at 30 DAS, flowering and maturity.

Mesta sown at a closer spacing of 15 cm × 10 cm took maximum number of days to reach 50 % flowering, which was significantly higher than remaining spacing tried. While, roselle kept at wider spacing of 30 cm × 10 cm took significantly lower number of days to reach 50 % flowering. Significant delay to reach 50 % flowering at higher crop density of 15 cm×10 cm (6,66,666 plants ha^{-1}) in mesta might be attributed to the agronomic aspect that under higher plant densities, the competition for growth factors to put up adequate vegetative growth continues for a prolonged period before the crop transforms from vegetative to reproductive phase. These findings are in conformity with the results of Tiparaddi *et al*. (2006) in sunnhemp.

Post - Harvest Observations: Significantly higher number of capsules per plant in roselle was observed with wider spacing of 30cm × 10cm, which was however, on a par with 15cm × 15cm. Minimum number of capsules per plant was noticed when roselle was sown at a closer spacing of 15cm × 10cm, which was however, found parity (Table 2) with 20cm × 10cm. Similar views were also expressed by Guggari and Sheelavantar (2004b) and Pushpa *et al*. (2013b).

Spacing failed to exert any effect to a statistically measurable magnitude on number of seeds per capsule and 1000 seed weight of mesta.

Roselle sown at a closer spacing 15cm × 10cm was found to produce maximum seed yield (905.9 kg ha^{-1}) and found significantly higher over rest of the treatments adopted except 20cm × 10cm - 5,00,000 plants ha^{-1}, which was however, found parity with 15cm × 10cm. The lowest seed yield (694.3 kg ha $^{-1}$) was noticed in 15cm × 15cm, which was however, comparable with 30cm × 10cm. Despite comparable performance of mesta among varied spacing adopted with respect to yield attributes (1000 seed weight and number of seeds per capsule), higher plant density of 6,66,666 and 5,00,000 plants ha^{-1} associated with 15cm × 10cm and 20cm × 10cm, respectively might have exerted profound influence and escalated the seed yield to a statistically perceptible scale. Similar results were reported

Table 2: Post harvest observations in mesta as influenced by different spacing practices .

Treatment	Number of Capsules per plant	Number of seeds per capsule	1000 Seed weight (g)	Seed yield (kg ha^{-1})	Stalk yield (kg ha^{-1})
S_1 (30 × 10 cm)	12.1	24.1	24.0	701	7921
S_2 (20 × 10 cm)	9.8	23.9	24.4	830	9894
S_3 (15 × 15 cm)	11.9	24.8	24.7	694	9572
S_4 (15 × 10 cm)	10.0	23.7	23.7	904	16282
S.Em ±	0.36	0.60	0.44	25.75	433.95
CD (P=0.05)	1.1	NS	NS	75	1267
CV(%)	11.4	8.6	6.3	11	14

DAS – Days after sowing **NS** – Non-Significant (In case results are not significant)

in roselle (Okosun *et al*. 2006), in sunnhemp (Tiparaddi *et al*. 2006) and in jute (Madakadze *et al*. 2007).

Roselle crop sown at a closer spacing of 15cm × 10cm recorded significantly higher stalk yield over other spacing tried. Mesta sown at 20cm × 10cm was found to be the next best treatment, which was however, comparable with 15cm × 15cm. Similar findings were reported in kenaf (Bhangoo *et al*. 1986) and (Ulemale *et al*. 2001) in sunnhemp.

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