Effect of Sowing Time,Planting Geometry and Topping on Seed Yield of Roselle (*Hibiscus sabdariffa L.*) in East and South Eastern Coastal Plain Zone of Odisha

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Abstract**—***To optimize sowing time, spacing and topping schedule for quality mesta seed production, an experiment with three dates of sowing [21st May (D_1), 5th June (D_2) and 21st June (D_3)], three spacing treatments [30 x 10 cm (S_1), 45 x 10 cm (S_2) and 60 x 10 cm (S_3)] and two topping schedules [30 DAS (T_1) and 45 DAS (T_2)] were laid out in split-split-plot arrangements with three replications. Different yield attributing characters and seed yield of roselle was significantly influenced by date of sowing and spacing arrangements.*

It was observed that sowing dates influenced different growth parameters as well as yield significantly. D_2 sown crop recorded maximum seed yield (6.4q ha^{-1}) and statistically at par with D3 (6.17q ha^{-1}).Similarly spacing arrangements also had a significant impact seed yield of roselle, with highest seed yield of 6.4q ha^{-1} obtained under 45×10 cm spacing followed by 60×10 cm spacing (6.28q ha^{-1}).Topping done at 45 DAS resulted in 5.3% higher yield than that of 30 DAS. Yield attributing characters were not significantly influenced by topping schedules. Maximum net return of above Rs 27,000/ha was obtained, when the crop was sown on 5th June, with 45cmX10cm spacing and topping scheduled on 45 DAS with a B:C ratio of 1.76.Hence, it can be suggested that, sowing of mesta (roselle) during 1st week of June to third week of June with 45 x 10 cm and topping at 45 DAS should be recommended to harvest maximum quantity seeds in east and south eastern coastal plain zone of Odisha.

Keywords— Roselle, topping, seed yield, sowing time, spacing.

I. INTRODUCTION

Roselle *(Hibiscus sabdariffa L.),* a herbaceous, annual lignocellulosic bast fibre crop is successfully grown as a commercial crop in coastal regions of Odisha. Roselle (Hibiscus sabdariffa L.) is a plant that has medicinal properties backed by scientific studies; however, it is also used to dye food, soft drinks, syrups, among other products (Gardezi *et al*, 2020). It finds its place next to jute in importance. Although it's tougher and coarser than jute fibre, however, equals in quality to the medium grades of jute (Berger, 1969). It is the nearest ally of jute and plays an effective role in supplementing the short supply of jute industry. Mesta fibre is blended with jute fibre and used for making of cordage, rope, twines, hessian, sacking and geotextile etc [Da-CostaRocha et al., 2014]. The fibre content and other chemical properties make it a commercial crop next to jute and cotton [Kumar et al,2020]. Apart from fibre production, diversification of roselle for paper pulp production finds its importance with the growing domestic and global demand for paper pulp. Apart from fibre and pulp, its seeds also contain 18-20% oil which can be directly used in soap and other industries. Hence, seed production in this crop, during recent

years is also gaining popularity. Besides, there is also an imbalance between total seed requirement for fibre production and total available seed, reflecting a steep increase in price of seeds imported from other states. Literatures are available regarding optimization of agro-techniques for maximizing the fibre production in roselle. However, reports related to improved method including suitable time of sowing with specific planting geometry, for increasing the seed production in roselle is very meager. Reports are also available on importance of topping practice in increasing the yield levels in different crops (Singh *et al*., 2013). Besides, significance of weeding frequency and fertilizer levels on dry seed weight, fresh and dry weight of calyx yield of roselle plants were also studied (Bake,2015). Keeping all these factors in consideration, a two year field experiment was conducted during the *Kharif* season of 2018 and 2019 with the objective to study and assess the optimum date of sowing, planting geometry and topping schedule for higher seed production in *roselle (H.sabdariffa L).*

II. MATERIALS AND METHOD

The experiment was conducted during *kharif* seasons in 2018 and 2019 at Jute Research Station, Kendrapara (19^0 34' N latitude and 86^0 30' E longitudes). The soil of the experimental field was sandy loam with pH 6.5,organic carbon 6.2g/kg and available N,P and K 297,28.2 and 255kg/ha, respectively. The experiment was a randomized complete block design with split-split-plot arrangements and three replications. Date of sowing (D_1- 21st May, D_2- 5th June and D_3- 21st June) was assigned to the main plots, spacing (S_1- 30 x 10 cm, S_2- 45 x 10cm and S_3- 60 x 10 cm) assigned to the sub-plots and topping (T_1- 30 DAS and T_2- 45 DAS) was assigned to the sub-sub-plots having total 18 treatment combinations. *H.sabdariffa* variety (*Roselle*), AMV *5* was sown on the above dates under three different spacing arrangements. The uniform fertilizer dose given to each and every plot was N, P_2O_5 and K_2O @ 60:30:30 kg ha^{-1}. For data collection on growth and other yield attributing characters five plants were picked at random from each plot. At maturity, all plants from each net plot were harvested. Plants were threshed and seeds were separated, sundried, cleaned and weighed. Seed yield per hectare was worked out and expressed in quintal ha^{-1}. While calculating gross return prevalent market price for sale of *Roselle* seed was taken as Rs. 100**.**00 kg^{-1}.

III. RESULTS AND DISCUSSION

Perusal of data revealed that, seed yield of mesta was significantly influenced by dates of sowing, spacing and topping schedule. Crop sown on 5th June recorded significantly higher seed yield of 6.4q/ha as compared to the remaining two dates of sowing (Table 1). This may be attributed to better growth of the plant in terms of number of productive branches per plant (6.8), pods per plant (33.86) and number of seeds/pod (26.47) when sown on this date. The results obtained confirm the findings of Venkatakrishnan et al. (2004).Seed yield of mesta was enhanced under wider spacing and maximum seed yield of 6.44q ha^{-1} was obtained under 45cmX10cm spacing and it remained statistically at par with 60cmX10 cm spacing(6.28q ha^{-1}).

Though widest spacing (60cm×10cm) performed better, when the growth parameters viz. productive branch per plant,pods per plant and seeds per pod were taken into consideration. However, yield could not increase up to the highest extent due to less plant population per unit area.

Topping of apical buds induced the growth of auxiliary branches and had a positive impact on other yield attributing parameters on both 30 and 45 DAS. Topping done on 45DAS resulted 5.3% more seed yield (6.3q ha^{-1}) than that on 30 DAS (6 q ha^{-1}). However, the number of seeds per pod and test weight did not vary significantly due to topping treatments. Similar findings were reported for white jute seed production (Patra *et al*,2017).He found sowing on 5th June along with topping done

on 45 DAS, resulted in maximum net return of Rs.27689.00 and B:C ratio of 1.76. The interaction effect for of all the yield attributing characters remained non-significant.

Maximum net return of above Rs 27,000/ha was obtained, when the crop was sown on 5th June, with 45cmX10cm spacing and topping scheduled on 45 DAS with a B:C ratio of 1.76.

TABLE 1
EFFECT OF DATE OF SOWING, SPACING AND TOPPING ON GROWTH AND YIELD ATTRIBUTES OF ROSELLE (MEAN OF TWO YEARS)

Treatment	Productive br./plant	Pods /Plant	No. of Seeds/Pod	1000 seed weight(g)	Seed yield(q/ha)	Net return(Rs/ha)	B:C ratio
Date of sowing							
21st May(D_1)	5.2	29.7	25.2	22.4	6	23584	1.64
5th June(D_2)	6.8	31.3	26.4	22.5	6.42	27689	1.76
21st June(D_3)	5.8	31.9	26	22.26	6.17	25228	1.69
CD(0.05)	0.58	1.46	0.91	NS	0.067	661	0.021
Spacing							
30cm×10cm(S_1)	5.5	26.6	25.2	22.26	5.87	22228	1.61
45cm×10cm(S_2)	6.4	33.8	26.4	22.5	6.44	27920	1.76
60cm×10cm(S_3)	6	32.6	26	22.4	6.28	26364	1.73
CD(0.05)	0.35	0.72	0.85	NS	0.037	366	0.011
Topping							
30DAS(T_1)	6	30.8	25.7	22.4	6.039	23890	1.65
45DAS(T_2)	5.98	31.2	26	22.37	6.362	27116	1.74
CD(0.05)	NS	NS	NS	NS	0.08	812	0.023
Interactions							
DXS							
SE m(±)	0.195	0.406	0.482	0.121	0.021	205.9	0.006
CD(0.05)	NS	1.2	NS	NS	0.063	634	0.018
DXT							
SE m(±)	0.192	0.34	0.273	0.065	0.047	473.3	0.014
CD(0.05)	NS	NS	NS	NS	0.141	1406	0.04
SXT							
SE m(±)	0.192	0.34	0.273	0.065	0.047	473.3	0.014
CD(0.05)	NS	NS	NS	NS	NS	NS	NS
DXSXT							
SE m(±)	0.333	0.58	0.473	0.113	0.082	812.7	0.023
CD(0.05)	NS	NS	NS	NS	NS	NS	NS

IV. CONCLUSION

Based on the present study, it can be concluded that sowing of mesta (roselle) crop during first week of June with 45 x 10 cm spacing and scheduling one topping at 45DAS can be recommended to increase the seed production of mesta in eastern and south eastern coastal plain zone of Odisha.

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