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Effect of varying levels of fertility on seed production of various *olitorius* jute varieties in *Terai* zone of West Bengal

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ABSTRACT

A field experiment was conducted at Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar, West Bengal during 2012 and 2013 for assessing the seed yield performances of some olitorius jute varieties under different fertilizer doses. The experiment was laid out in a two-factor Randomized Block Design (RBD) with four varieties of olitorius jute viz., JRO-524,JRO-8432, JRO-204 and S-19 under three levels of fertilizer application, i.e., N-P_2O_5-K_2O @ 20:10:15,40:20:30 and 60:30:45 kg ha^{-1}. It was revealed that among the varieties JRO 8432 performed better in terms of highest no. of primary branches (5.96), no. of capsules per plant (48.92) and seed yield (8.07 q ha^{-1}) with highest net return (Rs. 34828.26 ha^{-1}) and benefit: cost ratio (1.98). Increase in fertilizer dose from 20:10:15 to 40:20:30 resulted in significant increase in seed yield for all the varieties but further incremental fertilizer dose did not result in significant yield increase.

Keywords: Nutrient management**,** olitorius jute, seed production

Jute is the second most important commercial fibre yielding cash crop next to cotton grown in humid tropical climate mainly under rainfed condition and it is predominantly cultivated by marginal and small farmers of Indo-Bangladesh subcontinent. There is an imbalance between total seed requirement for fibre production and total seed production in this zone as a result of which seed for this zone is imported from other dry states. Fibre and seed are two different crops of jute and climatic requirements for them are also different. Though jute as a fibre crop is grown in Eastern and North Eastern states, but seed crops are grown mainly in marginal and sub-marginal lands of Andhra Pradesh, Maharashtra and Gujarat where the weather, particularly rainfall and soil is ideal for jute seed production and cost of production is less due to less weed growth and comparatively less labour wages. Now the prices of seeds from non-fibre producing states are rising and very often jute seeds from non- fibre producing states are not available in time. If fibre producing states together produce some quantity of jute seed, it may arrest steep increase in prices of seed and at least some quantity of good quality jute seed may be available in time.

Though seed production activities of jute has already been initiated by some scientists in the dry western and southern part of the state through stem cutting or direct seeding (Mandal *et al*,2015), direct seeding is proved to be a better option in off-season jute seed production than clipping or transplanting of seedlings (Islam, 2010). Even in those areas, attempts were made to introduce certain intercrops like blackgram, cowpea or ricebean in wide spaced jute seed crop which increased the jute equivalent yield along with higher income (Sarkar and Majumdar, 2013). The *terai* region of West Bengal is also having the prospect to produce jute seeds in post monsoon season in underutilized lands but suitability of variety as well as nutrient management practices for quality seed production of jute is yet to be standardized for this zone as some scientists have reported that fertilizer management holds the key for increasing seed yield in jute (Alam *et al*., 2009). Basically the seed production aspect of jute in Northern part of West Bengal is still untouched. Keeping all the above perspectives, the present study was undertaken to assess the performances of various *oiltorius* varieties under varying fertility levels.

MATERIALS AND METHODS

The experiment was carried out at the Instructional farm of Uttar Banga Krishi Viswavidyalaya situated at $26^0$19’86" N latitude and $89^0$23’53" E longitude and at an elevation of 43 meters above mean sea level during two consecutive years, *i.e*., 2012 and 2013.The soil was sandy loam in texture, having pH 5.41, medium in organic C (0.65%), low in available Nitrogen (185.26 kg ha^{-1}), medium in available P(15.01 kg ha^{-1}) and available K(201.45 kg ha^{-1}) . The area experiences a pre-humid subtropical climate with a prolonged winter spell during December to February. The average annual rainfall of this zone was 2900-3100mm.

The experiment was laid out in 2 factor- RBD with four *olitorius* varieties (V1 – JRO 524 ,V2 – JRO 8432 , V3 – JRO 204 and V4 – S 19)under three varying fertility levels (F1 - 20:10:15 , F2 - 40:20:30 , F3 - 60:30:45 kg ha^{-1} of N-P_2O_5-K_2O).The twelve treatment combinations were replicated thrice.

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The seeds of all the varieties were sown on first week of August in both the years with half dose of N, full dose of P_2O_5 and K_2O as basal and rest half of N top dressed at 30 DAS when hand weeding was done. Treated seeds were sown @ 4 kg ha^{-1} with a spacing of 45 x 15 cm in tyne-opened furrow depth of 2-3 cm. In both the years the crop was harvested in third week of December.

All periodical growth parameters *viz*., number of branches plant, LAI and dry matter production was estimated by taking periodical plant sample while the observations on yield attributing characters and yield were taken from net plots. The economics of production was worked out by using the prevalent market price of inputs and outputs. Two years data were pooled and analyzed statistically.

RESULTS AND DISCUSSION

Perusal of data revealed that JRO 8432 produced significantly higher number of primary branches though the varieties did not differ significantly in number of secondary branches (Table 1). Though increase in fertilizer levels had a significant effect towards increasing the number of primary branches, but F2 (40:20:30) and F3 (60 : 30 : 45) were statistically *at par*. LAI increased upto 60 days after sowing (DAS) after which the value decreased due to leaf senescence in all four varieties taken up in this experiment. It was noted that the fertilizer levels had no impact in LAI of jute. Dry matter accumulation gradually increased with crop age and it attained maximum at maturity. Though leaf dry matter decreased at maturity but increased dry matter production was achieved due to steep increase in stem dry matter. It was interesting to note that during initial growth stages, dry matter production was maximum in variety JRO 204; with the advancement of crop age JRO 8432 superseded the other varieties indicating higher growth rate of this particular variety at later stages of growth. With respect to fertility levels, increase in dose from F1 (20:10:15) to F2 (40:20:30) brought about significant increase in dry matter production but further increment in fertilizer dose did not result in significant dry matter increase. M.M.Alam *et al*.(2002) reported higher response of *olitorius* varieties of jute to higher nitrogen level upto 100 kg ha^{-1} at Rangpur, Bangladesh which is adjacent to *terai* plains of Coochbehar, West Bengal.

All the *olitorius* varieties differed significantly in seed yield. Among the varieties, JRO 8432 recorded the highest seed yield (8.07 q ha^{-1}) which was 79 per cent higher than the check variety, JRO 524. JRO 204(7.00 q ha^{-1}) and S 19 (6.74 q ha^{-1}) also produced significantly higher yield than the check JRO 524(4.50 q ha^{-1}).This was in conformity with the findings of Roy (2013) in which the experimenter got around 5 t ha^{-1} of yield under *terai* zone of West Bengal through line sowing and clipped planting.

Increased seed yield in JRO 8432 was achieved due to increased no. of capsules plant^{-1}(48.92) which was much higher than the other varieties *viz*., S 19 (39.07), JRO 204(37.58) and JRO 524(33.29). However there was no significant difference in number of seeds capsule^{-1} in all four varieties though maximum seeds capsule^{-1} (217.48) was recorded in JRO 8432. The test weight, a genetic character of the variety, did not differ significantly in all four varieties. As far as fertility levels

Table 1: Growth parameters of some *olitorius* varieties under varying fertility levels

Treatments	Primary branches plant^{-1}			Secondary branches plant^{-1}		Leaf area index (LAI)			Dry matter production (g plant^{-1})			
	60 DAS	90 DAS	Harvest	90 DAS	Harvest	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	Harvest
Varieties												
V1 (JRO 524)	3.40	4.37	4.87	1.76	2.18	0.16	5.78	4.34	1.14	11.31	37.80	38.89
V2 (JRO 8432)	3.62	5.43	5.96	1.56	3.01	0.19	5.54	4.16	1.16	12.14	44.68	47.60
V3 (JRO 204)	3.09	4.76	5.41	1.67	3.04	0.18	5.62	4.22	1.46	14.60	37.36	39.11
V4 (S 19)	4.21	4.96	5.70	1.80	3.06	0.19	6.10	4.58	1.63	15.16	34.64	37.21
SEm (±)	**0.22**	**0.34**	**0.39**	**0.08**	**0.19**	**0.01**	**0.19**	**0.14**	**0.08**	**0.98**	**2.17**	**1.95**
LSD (0.05)	**0.61**	**0.98**	**1.13**	**NS**	**NS**	**0.03**	**0.14**	**0.35**	**0.24**	**2.81**	**6.25**	**5.59**
Fertility levels												
F1 (20:10:15)	4.16	5.85	6.37	1.69	2.99	0.17	5.17	3.84	1.38	14.72	38.20	32.91
F2 (40:20:30)	4.32	6.42	6.99	1.70	3.13	0.19	5.67	4.29	1.50	14.49	41.97	38.59
F3 (60:30:45)	4.33	6.73	7.46	1.76	3.26	0.21	5.80	4.55	1.51	15.36	43.31	41.53
SEm (±)	**0.22**	**0.24**	**0.28**	**0.05**	**0.13**	**0.02**	**0.23**	**0.18**	**0.06**	**0.08**	**1.54**	**1.38**
LSD (0.05)	**NS**	**0.69**	**0.80**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**4.42**	**3.95**

Table 2 : Yield attributes and yield of *olitorius* varieties as influenced by varying fertility levels

Treatments	No. of capsules plant^{-1}	No. of seeds capsule^{-1}	1000 seed weight (g)	Seed Yield (q ha^{-1})
Varieties				
V1 (JRO 524)	33.29	212.71	1.90	4.50
V2 (JRO 8432)	48.92	217.48	1.98	8.07
V3 (JRO 204)	37.58	213.82	1.98	7.00
V4 (S 19)	39.07	211.80	2.09	6.74
SEm (±)	**2.22**	**1.64**	**0.04**	**0.24**
LSD (0.05)	**6.39**	**4.71**	**0.11**	**0.68**
Fertility levels				
F1 (20:10:15)	50.56	145.06	2.49	6.49
F2 (40:20:30)	56.84	158.82	2.51	7.49
F3 (60:30:45)	53.71	158.23	2.48	7.30
SEm (±)	**1.57**	**1.16**	**0.03**	**0.17**
LSD (0.05)	**4.52**	**3.33**	**NS**	**0.48**

Table 3: Production economics of some *oiltorius* varieties under varying fertility levels

Treatments	Cost of cultivation (Rs. ha^{-1})	Gross return (Rs. ha^{-1})	Net return (Rs. ha^{-1})	B: C ratio
Varieties				
V1 (JRO 524)	35631.00	45355.37	9724.37	1.27
V2 (JRO 8432)	35631.00	70459.26	34828.26	1.98
V3 (JRO 204)	35631.00	67147.96	31516.96	1.88
V4 (S 19)	35631.00	61392.22	25761.22	1.72
Fertility levels				
F1 (20:10:15)	34664.50	59231.11	24566.61	1.71
F2 (40:20:30)	35631.00	67049.91	31418.91	1.88
F3 (60:30:45)	36597.50	67922.04	31324.54	1.86

were concerned, the maximum number of capsules plant^{-1} (56.84) and number of seeds capsule^{-1} (158.82) were recorded with F2 (40:20:30). Additional incremental dose did not increase number of capsules plant^{-1} and number of seeds capsule^{-1}.These increased values of major yield attributing characters led to significantly higher yield performances (7.49 q ha^{-1}) under F2 (40:20:30).

Among the varieties, maximum net return (Rs. 34826.26) with highest B-C ratio (1.98) was recorded with JRO 8432 due to higher seed yield performances. Similarly, among the fertility levels F2 (40:20:30) was found to be the most remunerative with respect to net return and B-C ratio.

It could be concluded that seed production programme of jute can be taken up in *terai* region of West Bengal following fertility levels (40:20:30) with high yielding varieties and among the varieties, JRO 8432 could the best option in terms of yield and profitability.

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