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RESEARCH ARTICLE

Varietal performance of jute based on yield and yield contributing characters under the Terai region of Province -1 Nepal

Sujan Karki[1]*, Tirtha Raj Rijal[1], Govinda Prasad Timsina[1], and Sabita Sharma[2]
[1]Jute Research Programme, Itahari, Sunsari, NARC, Nepal.
[2]Directorate of Agricultural Research, Tarahara, Sunsari, NARC, Nepal.

Edited by:

Dr. M. Prakash, Ph.D.,
Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University, Chidambaram- India.

Reviewed by:

Dr. M.S. Jeberson, Ph.D.,
Department of Genetics and Plant Breeding, Agricultural University Jodhpur, Mandor, Jodhpur, Rajasthan, India.

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*Corresponding author e-mail address:
ksujan165@gmail.com (S. Karki)

ABSTRACT

A research experiment was conducted to know the varietal performance of some jute varieties at the farm of Jute Research Programme, Itahari, Sunsari, Nepal, during the jute growing period in 2019 and 2020. A total of fifteen tossa jute varieties viz. CO-58, JRCM-2, JRO-524, JRO-2407, SM-100, JRO-204, NJ-7010, Mahabij, JBO-2003H, JRO-7835, YA-41, Itahari-2, OM-1, JRO-632 and KEN-DS-058 were used as experimental crops. The experiment was laid out in Randomize Complete Block Design (RCBD) with three replications, and each replicate had 12 lines with an inter and Intra row spacing of 25 cm and 5 to 7cm, respectively. Varietal performances of jute showed statistically significant variation for all the traits. Among the tested varieties, the jute variety NJ-7010 showed the tallest plant height (366 cm), highest basal diameter (20.6 mm), bark thickness (1.7 mm), leaf width (4.8 cm), petiole length (4.7cm), lowest disease incidence (2.5 %) respectively. However, the variety JRCM-2 and JRO-524 showed the highest leaf length (15.1 cm), while the variety JRO-524 showed the lowest pest incidence (4.2 %). Furthermore, the jute variety NJ-7010 also showed greater results on various yield characters *viz.* green leaf weight (17.3 ton/ha), green plant weight (100.3 ton/ha), green fibre weight (44.7 ton/ha), green stick weight (57 ton/ha), dry fibre weight (7.2 ton/ha), dry stick weight (17.3 ton/ha). Thus, the jute variety NJ-7010 understood superiority in growth, yield, and yield-attributing traits. Therefore, the jute variety NJ-7010 could be a more successful, productive variety than other tested varieties in the terai region of Province-1 Nepal.

Keywords: Jute, varietal performance, yield traits, yield,

INTRODUCTION

Jute (*Corchorus olitorious* L.) is a commercial crop mainly confined to the Terai regions of Province-1 Nepal. Jute crop is a versatile, most significant natural, biodegradable, recyclable, and eco-friendly lignocellulose fiber crop belonging to Malvaceae and genus Corchorus. *Corchorus olitorius* is the most cultivated species extensively grown in major jute-growing areas of the country, which is grown in the summer season (Karki et al., 2021). In Nepal, the area of Jute cultivation is 7507 hectares of land, with a total production of 11159 tons per annum, with an average yield of 1.48 tons per hectare (AICC, 2020). Jute fibre is used for making hessian blankets, sacks, gunny bags, carpets, mats, ropes, and different packaging materials. Besides fiber, farmers also get a substantial quantity of jute sticks which is very important as construction material for rural houses and has a variety of applications such as fuel, fencing, particle board, etc., while the leaves of the young plants continue to be used as a quite popular vegetable. In addition, jute plants improve soil fertility through their massive leaf-dropping and root proliferation in the field. Thus, most farmers take up jute production for crop rotation because it helps in enriching soil fertility. Although, there are so many attributes responsible for yields, such as plant population, plant height, basal diameter, fibre yield, and stick yield. Varietal effect and agronomic practices on crop cultivation play vital roles for higher yield and quality fibre. However, the yields of jute crops declined day by day due to various reasons (Karki et al., 2021). Presently it is encountering several problems from climate change issues, unavailability of sustainable promising improved jute varieties, and higher cost of abiotic stress factors, which affects not only the yield but also the quality of the fibre. Only the suitable jute variety combats this situation by producing quality fibres. Therefore, this study was incited to test the varietal performance of jute crops for their adaptability on growth, yield and yield-related traits, and pest and disease incidence in the study areas.

MATERIAL AND METHODS

Experimental location and weather

An experiment was conducted at Jute Research Programme, Itahari, Sunsari, Nepal (at 26º15' north latitude and 87º 20' east longitude) during the jute growing period in 2019 and 2020 to know the varietal performance of tossa jute varieties. The details of the climatic condition of the study area are presented in (Table 1).

Table 1. Combined mean of meteorological data recorded at the experimental site during the study period 2019 and 2020 at JRP, Itahari, Sunsari, Nepal.

Months	Air Temperature		Rainfall (mm)
	Maximum (^{0}C)	Minimum (^{0}C)	
April	31.3	18.1	91.5
May	31.5	21.9	131.9
June	32.0	24.8	390.7
July	31.2	25.4	1122.7
August	33.4	25.7	182.3

Experimental materials, design and crop husbandry

A total of fifteen tossa jute varieties viz. CO-58, JRCM-2, JRO-524, JRO-2407, SM-100, JRO-204, NJ-7010 (Rani), Mahabij, JBO-2003H, JRO-7835, YA-41, Itahari-2, OM-1, JRO-632, and KEN-DS-58 were used as experimental variety, which was collected from Jute Research Programme, Itahari, Sunsari, Nepal. The experiment was laid out in Randomized Block Design (RBD) with three replications, and each replicate had 12 lines with inter and Intra row spacing of 25 cm and 5 to 7cm, respectively. Dense plants were thinned at 20-25 days after sowing. Intercultural operations such as weeding, thinning, and water management were done as and when necessary.

Morpho-physiological characters, yield and yields attributes measured

Observations were recorded from 1m^2 plot size of each experimental plot which were selected randomly from each replication for the fibre yield related traits, namely, plant population (m^2) plant height (cm), basal diameter (cm), green plant weight (ton/ha), green stick weight (ton/ha), dry fibre yield (ton/ha) and dry sticks yields (ton/ha), insect incidence (%) and disease incidence (%) was measured with the help of proper instrument accurately.

Statistical analysis

The collected data were compiled and analyzed statistically using analysis of variance (ANOVA) techniques with the help of GenStat Discovery edition 4th and mean differences were adjudged by Least Significant Differences (LSD) (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Morpho-physiological characters

The combined mean performance over the years 2019 and 2020 of fifteen tested jute varieties had significantly varied on morpho-physiological characters accept plant population among the tested varieties. Analysis of variance data on plant height significantly (P≤0.01) influenced by the various jute varieties. Among the varieties, the variety NJ-7010 (Rani) showed the tallest plant height (366 cm), followed by variety Mahabij (362.5 cm) and JRO-7835 (359.4 cm), respectively. In contrast, the variety JRO-632 (319.8 cm) showed the shortest plant height among the tested jute varieties (Table 2). Karim et al. (2020) and AI Rafiq et al. (2020) also obtained similar findings, who stated that maximum plant height returned the highest fibre yield. Similarly, the results showed significantly (P≤0.01) the highest basal diameter from variety NJ-7010 (Rani) (20.6 mm), while the lowest basal diameter was observed from variety JRO-2407 (14.1 mm). The variation because on jutes varieties with respect to basal diameter was presented in (Table2). Significant varietals performances on base diameter were also obtained by Islam (2007 and 2004), and Al Rafiq et al. (2020). Likewise, the variety NJ-7010 (Rani) showed significantly (P≤0.01) the highest bark thickness (1.7 mm). In contrast the lowest bark thickness (1.4 mm) was found in variety SM-100 and Itahari-2. Similar types of results were found by Prodhan et al. (2001); Hossain et al. (2012) and Karim et al. (2020). With respect to leaf length varieties showed significantly (P≤0.01) the highest leaf length (15.1 cm) from variety JRCM-2 and JRO-524 while, the lowest leaf length (13 cm) was observed in SM-100 and Itahari-2 variety.

The result of the analysis of variance data was present in indicated significant (P≤0.05) variation in leaf width among the tested varieties. The highest leaf width (4.8 cm) was observed from variety NJ-7010 (Rani), while the lowest leaf width (3.8 cm) was found in variety SM-100 and KEN-DS-058, respectively. Similar findings were also obtained by Karim et al. (2020) and Al Rafiq et al. (2020). Further, the analysis results reveal a significant (P≤0.05) variation in petiole length. The highest petiole length (4.7cm) was observed in variety NJ-7010 (Rani), and the lowest petiole length (3.6 cm) was found in SM-100. Pest incidence data was significantly (P≤0.01) influenced by the effect of varieties. Of different varieties, the variety Itahari-2 showed the highest pest incidence (23.5 %) followed by variety JRO-632 (20.5 %) and JRCM-2 (18 %), whereas the lowest pest incidence was recorded from variety JRO-524 (4.2 %) followed by NJ-7010 (Rani) (5.2%). The findings are supported by Karim et al. (2020), Timsina and Karki (2019), Hassan et al. (2018), and Hossain et al. (2012). Disease incidence data was also significantly (P≤0.01) influenced by the effect of varieties. Of different varieties, the variety JRO-632 showed the highest disease incidence (18 %), followed by SM-100 (16.2 %) and Itahari-2 (14.3 %), while the lowest disease incidence was observed from variety NJ-7010 (Rani) (2.5 %) followed by Mahabij (2.7 %), JRO-524 (3.7 %) respectively (Table 2). Similar results were also found by Hassan et al. (2018) and Karim et al. (2020).

Yield and yield attributing characters

The influence of fifteen different tossa jute varieties on yield and yield attributing characters showed a significantly (P ≤ 0.01) difference which is depicted in (Table 3). The results reveal that the maximum green leaf weight (17.3 ton/ha) was observed in variety NJ-7010 (Rani), and the minimum green leaf weight (10.3 ton/ha) was found in variety JRO-2407. Similarly, the highest green plant weight (100.3 ton/ha) was observed in variety NJ-7010 (Rani) followed by variety JRO-524 (94.8 ton/ha), JRO-204 (93.1 ton/ha) whereas the lowest green plant weight (67.1 ton/ha) was found in variety JRO-632. This result agrees with the finding of Khan and Tareq (2018). Likewise, the highest green fibre weight (44.7 ton/ha) was observed in variety NJ-7010 (Rani) followed by variety CO-58 (41.9 ton/ha), JRO-524 (41.8 ton/ha) while the lowest green fibre weight (30.5 ton/ha) was found in variety JRO-632. Hassan et al. (2018) and Prodhan et al. (2001) was observed similar results. With respect to green stick weight, the highest was observed from variety NJ-7010 (Rani) (57 ton/ha), followed by variety JRO-524(49.1 ton/ha), CO-58 (48.1 ton/ha), JRO-204 (47.7 ton/ha) respectively, however, the lowest green stick weight was found in variety JRO-632 (32.9 ton/ha). Similar findings were also obtained by Miah et al. (2020); Khan and Tareq (2018), Islam (2007), and Karim et al. (2020).

The highest dry fibre weight was observed from variety NJ-7010 (Rani) (7.2 ton/ha) followed by variety JRO-7835(6.7 ton/ha), CO-58, JRCM-2, OM-1 (6.3 ton/ha) respectively. In contrast, the lowest dry fibre weight was found in variety SM-100 (4.9 ton/ha). Similar findings were also obtained by Islam (2007) and Karim et al. (2020). Furthermore, the highest dry stick weight (17.3 ton/ha) was observed in variety YA-41, followed by variety NJ-7010 (Rani) (16.5 ton/ha), Itahari-2 (16.3 ton/ha), CO-58 (15.6

ton/ha) respectively, whereas the lowest dry stick weight (10.1ton/ha) was found in variety JRO-632 (Table 3). Khan and Tareq (2018) and Tareq et al. (2015) also found similar results.

Table 2. Combined mean performance of tested jute varieties on morpho-physiological characters at JRP, Itahari, Sunsari, Nepal during 2019 and 2020.

Varieties	PP (no/ha)	PH (cm)	BD (mm)	FT (mm)	LL (cm)	LW (cm)	PL (cm)	PI (%)	DI (%)
CO-58	384306	338.8	16.5	1.5	14.7	4.7	4.3	13.0	4.7
JRCM-2	394583	345.2	14.3	1.5	15.1	4.5	4.1	18.0	9.5
JRO-524	343056	347.0	15.3	1.5	15.1	4.6	4.6	4.2	3.7
JRO-2407	299167	341.1	14.1	1.5	13.5	4.2	3.9	12.8	11.2
SM-100	373194	329.4	14.2	1.4	13.0	3.8	3.6	10.5	16.2
JRO-204	396111	324.8	15.4	1.6	14.9	4.4	4.2	9.3	9.5
NJ-7010(Rani)	324028	366.0	20.6	1.7	14.8	4.8	4.7	5.2	2.5
Mahabij	245694	362.5	16.3	1.6	14.1	4.5	4.3	6.7	2.7
JBO-2003H	367222	350.3	19.2	1.6	14.1	4.6	4.5	9.3	12.5
JRO-7835	367500	359.4	14.5	1.6	15.0	4.3	4.5	12.2	12.8
YA-41	363333	349.2	16.1	1.6	14.1	4.6	4.4	10.2	9.0
OM-1	351111	345.0	16.7	1.5	13.8	4.3	4.1	10.0	4.8
JRO-632	370278	319.8	14.9	1.5	14.7	4.5	4.2	20.5	18.0
KEN-DS-058	365833	354.8	14.7	1.5	13.5	3.8	3.7	13.0	12.0
Itahari-2	382639	348.8	15.1	1.4	13.0	3.9	3.7	23.5	14.3
Mean	355203.7	345.5	15.9	1.5	14.2	4.4	4.2	11.9	9.6
F-Value	NS	**	**	**	**	*	*	**	**
LSD (0.05)	-	14.8	0.8	0.1	0.7	0.6	0.6	3.4	2.7
CV (%)	11.5	3.0	3.7	4.9	3.7	9.1	9.7	17.2	17.1

*, Significant at P ≤ 0.05. **, P≤0.01. LSD, least significant difference. CV, coefficient of variance, respectively.PP= plant population, PH=plant height, BD=basal diameter, FT= fibre thickness, LL=leaf length, LW= leaf width, PL= petiole length, PI= pest incidence, DI= disease incidence

Table 3. Combined mean performance of tested jute varieties on yield and yield attributing characters at JRP, Itahari, Sunsari, Nepal during 2019 and 2020.

Varieties	GLY (ton/ha)	GPY (ton/ha)	GFY (ton/ha)	GSY (ton/ha)	DFY (ton/ha)	DSY (ton/ha)
CO-58	15.2	91.3	41.9	48.1	6.3	15.6
JRCM-2	12.6	83.7	37.9	39.9	6.3	14.6
JRO-524	12.6	94.8	41.8	49.1	6.2	12.8
JRO-2407	10.3	82.3	35.8	42.5	5.7	14.6
SM-100	11.4	83.8	32.2	39.9	4.9	13.1
JRO-204	13.4	93.1	39.1	47.7	5.5	15.1
NJ-7010(Rani)	17.3	100.3	44.7	57.0	7.2	16.5
Mahabij	12.6	75.1	33.4	39.3	5.3	12.9
JBO-2003H	15.0	82.4	32.5	40.2	6.2	16.1
JRO-7835	13.8	80.6	34.3	44.2	6.7	15.0
YA-41	16.0	90.6	37.4	39.6	6.1	17.3

OM-1	12.5	85.1	38.1	43.4	6.3	15.3
JRO-632	15.1	67.1	30.5	32.9	5.4	10.1
KEN-DS-058	15.1	91.0	37.5	44.8	5.4	15.2
Itahari-2	14.0	86.6	35.1	45.5	5.4	16.3
Mean	13.8	85.9	36.8	43.6	5.9	14.7
F-Value	**	**	**	**	**	**
LSD (0.05)	1.0	6.9	2.8	2.6	0.6	3.3
CV (%)	5.3	5.6	5.2	4.1	7.0	15.5

**, P≤0.01. LSD, least significant difference. CV, coefficient of variance, respectively. GLY= green leaf yield, GPY= green plant yield, GFY= green fibre yield, GSY= green stick yield, DFY= dry fibre yield, DSY= dry stick yield, %= percentage

CONCLUSION

In the present research, NJ-7010 (Rani) variety had more efficiency overall morphological, yield, and yield attributing traits. Thus, NJ-7010 (Rani) variety would be the most suitable one that will return maximum quality yield. Therefore, we strongly recommended that jute variety NJ-7010 (Rani) could be a more prosperous, productive variety in the terai region of Province-1 Nepal.

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DISCLOSURE STATEMENT

No potential conflict of interest was reported by Authors.

AUTHORS CONTRIBUTION

Sujan Karki designed and performed experiments, analysis data and wrote the paper, Govinda Parsad Timsina helped to guideline during the experiment and paper write-up and Sabita Sharma helped during the experiment and recording the observation, data analysis and write-up of the paper.

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