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Effect of different sowing dates and mulching practices on growth, yield and fiber quality of Jute

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ABSTRACT

The field experiment was conducted during pre-kharif (summer) season of 2008-09 and 2009-10 at the Agriculture Farm of Palli Siksha Bhavana (Institute of Agriculture), Visva-Bharati, Sriniketan, Birbhum, West Bengal to observe the effect of mulching on growth and productivity of jute grown under rainfed condition at different dates of sowing. The experiment was laid out in split plot design (SPD) having three different dates of sowing viz., 1st April (D1), 7th April (D2) and 14th April (D3) as a main plot treatments and five different mulching practices (one control) viz., Control (no mulching and no irrigation) (M0), Rice straw mulching @2.5 t ha^{-1} applied on the sown crop rows (M1), Rice straw mulching @ 7.5 t ha-1 applied in between crop rows (M2),Rice chaffs mulching @ 5.0 t ha-1 applied in between crop rows (M3) and one irrigation (life saving) @ 300000 l ha-1 (M4) as sub-plot treatments with three replications and the jute seeds are sown in row spacing of 25 cm in a plot size of 4×3 m2 . From the experiment it was found that the highest plant height, leaf area index (LAI), crop growth rate (CGR), green biomass yield, fiber yield and stick yield was recorded at 1st April (D1) sown crops and among the mulching practices rice straw mulching @7.5 t ha-1 applied in between crop rows (M2) showed the highest values of growth and yield parameters, yields and quality jute. The crop sown on 1st April produced 7.87% higher fiber yield than that of 14th April sowing whereas rice straw mulching @7.5 t ha-1 applied in between crop rows (M2) harvested 56.40% more jute fiber than control (no mulch and no irrigation) (M0).

1. Introduction

Jute (*Corchorus capsularis L.* and *Corchorus olitorius L.*) is one of the most important commercial bast fiber crops of India next to cotton. It plays a key role in the economy of the eastern states of India such as West Bengal, Assam, Bihar, Orissa, Meghalaya, Tripura & eastern Utter Pradesh. It is mainly industry oriented crop, its 95% of fibers are utilized in industry and the remaining 5% are retained by farmers for domestic use. About 4 million farmers, 0.25 million industrial workers and 0.5 million traders find gainful employment in the jute sector. Thus, raw jute farming, industry and trade support livelihood to over 14 million people though it shares only 0.15% of the cropped area of the country. These apart, the jute industry also contributes to export earning to the tune of nearly 1,200 crore of rupees yearly (Sen *et al.,* 2006). Jute is the cheapest and most extensively used material of all textile fibers. The

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fiber is used extensively in the manufacturing of gunny cloth, gunny bags and other packaging materials for storing and transporting grains, pulses, spices, cement, sugar, cotton, fertilizer, wood etc. all over the world. Jute is also used in making ropes, carpets, rugs and twines. Different types of cloth in different qualities are made out of fibre for the purpose of upholstery, for linoleum for tapestries etc. The jute stalks stripped of fibre are used as fuel and also for making gun powder charcoal. Since recently the paper industry has been using it as a row material for coarser paper.

Jute is mainly a rainfed crop. It is usually sown rainfed after onset of monsoon. Rainfed farming denotes growing crops solely based on rainfall, which may vary from a low 500 mm to as high as 1500 mm rainfall in a year. Rainfed farming has a distinct place in Indian agriculture, occupying more than 60% of the cultivated area, contributing 44% of the food grains and supporting 40% of the population (Singh and Venkateswarlu, 1999).

The improvements in the productivity of rainfed areas are largely indiscernible. With limited scope for increasing the area under the plough, the only option left is to further upgrade productivity with the application of modern technology and inputs. There are number of simple strategies which together can have a significant impact on the productivity of dry land crops. They include i) off-season tillage, ii) ploughing across the slope, iii) planting with the earliest opportunity, iv) adoption of appropriate in-situ moisture conservation practices, v) selection of suitable crop variety that matches the growing season, vi) maintaining optimum plant population by using improved sowing implements, vii) timely weed control, viii) use of chemical fertilizer at recommended level and ix) need based plant protection measures.

Rainfed areas suffer from a number of constraints. The aberrant behavior of the monsoon causes frequent drought. When rainfall is less than 25% of its normal rainfall, it is called as drought. Drought is a condition of insufficient moisture supply under which plants fail to develop and mature properly. Thus drought is applicable to moisture deficiencies caused by soil, atmosphere and/or by both which force the plants to stop physiological functions resulting into a complete failure of plants to grow, develop and mature. More than 80% of the total jute cultivated area (0.8 mha) depends on the mercy of rainfall (Basu 1997). In the present climatic changing situation, the rainfall deficit have been found to the order of 40-50% starting from jute sowing to onset of monsoon i.e., mid-March to 1st week of June over last 25 years long term average, in the jute growing areas of West Bengal (Ghorai 2003-2006). The un-assured and poorly distributed rainfall during jute growth often leads to moisture deficit and water stress to the crop, particularly during its early growth phase. The detrimental effects of water stress on crop growth are poor germination, crop establishment, reduction in plant size, leaf area and crop yield. This ultimately reduces the yield and quality of fibre. To tackle the water deficit situation and as well improve or sustain the crop growth, one needs to know the possible reasons and effects of water stress on plant. Only after the understanding of such interactions, it is possible to design the management techniques.

Out of various processes recommended by specialists for conservation and proper utilization of soil moisture, mulching is a very effective agronomic management in areas where soil moisture is the most limiting factor. Mulch is any material applied on the soil surface to reduce evaporation, run off and weeds and increase in infiltration by insulating the soil surface from direct radiation or by obstructing vapour diffusion (Umarani *et al.,* 1973).

Sowing time is also importance for jute crop, therefore the sowing time must be so adjusted that the crop is able to attain a height to about 1 meter before heavy rain starts. Generally, sowing of jute takes place from February to April according to the position and condition of the land, nature of soil and the amount of rainfall. However, jute crops of both types sown in April performance the best results. Early sowing of olitorius types in March results in premature flowering, which reduces the yield and quality of fiber on account of branching. Delayed sowing of jute not only delayed the transplanting of next crop rice but may also be affected by water logging situation. Experiments conducted at Central Research Institute for Jute and Allied Fibres (CRIJAF) and also under All India Co-ordinated Research Project have confirmed

that mid-March and mid-April are the optimum sowing time for capsularis and olitorius respectively (CRIJAF Annual Report 1987-89).

In last 50 years no attempt has been made to uphold the jute productivity from rain fed farming mitigating the stress due to periodic drought spells. The deficit moisture stress under rain fed farming is a major reason behind the yield gap. Thus in-situ soil moisture conservation and manipulation of sowing time will plays a crucial role in increasing crop productivity under deficit rainfall condition and will reduce this yield gap.

In the present climatic changing situation, the rainfall deficit have been found in the order of 40-50% starting from jute sowing to onset of monsoon i.e., mid-March to 1st week of June over last 25 years long term average, in the jute growing areas of West Bengal (Ghorai, 2003, 2006). The un-assured and poorly distributed rainfall during jute growth often leads to moisture deficit and water stress to the crop, particularly during its early growth phase which ultimately reduces the yield and quality of fiber. Conservation of adequate soil moisture and its continuous supply to jute plants is of prime importance for achieving higher yields of the crop particularly under deficit rainfall situation. Sowing time is also important for jute crop, therefore, the sowing time must be so adjusted that the crop is able to attain a height to about one meter before heavy rain starts. Hence, attempts were made to increase fiber yield under deficit rainfall situation following different agronomic and drought management techniques.

Keeping these ideas in mind and realizing the importance of the problem, the present investigations were carried out to find effect of different dates of showing and mulching practices on growth and yields of jute.

2. Materials and Methods

The field experiment were conducted during pre-kharif (summer) season of 2008-09 and 2009-10 at the Agricultural Farm of Palli Siksha Bhavana (Institute of Agriculture), Visva-Bharati, Sriniketan, Birbhum, West Bengal, by looking at the objective. The experimental details, materials used and the methods employed during the course of this investigation are described below. The farm is situated at 23039′ N latitude and 87042′E longitude with an average elevation of 58.9 m (MSL). The experiment was laid out in split-plot design during the experiment and it was replicated thrice with three date of sowing in the main plots and five drought management techniques in the sub-plots. The plot size was 4×4m. There were altogether 45 plots each of which were specified by bounds and ridges on all sides. Adequate number of irrigation channel was also constructed. To provide irrigation as per treatment. The layout of this experiment has been shown in Fig.1 and necessary information regarding layout are given below:

Design of experiment	**:**	**Split-plot design**
Number of replication	:	3
Number of main-plot treatment (date of sowing):	:	3
Number of sub-plot treatment (drought management techniques)	:	5
Number of treatment combinations	:	3×5=15
Total number of plots	:	15×3=45
Size of each plot	:	4m×3 m=12 m2
Width of irrigation/drainage channel	:	1m
Width of main plot bund	:	50cm
Width of sub-plot bund	:	25cm
Row to row spacing	:	25cm

Notation	**Date of sowing**
D_1 →	1st April
D_2 →	7th April
D_3 →	14th April

Notation Drought management techniques

M0 → Control (no mulching and no irrigation)

M1 → Rice straw mulching @2.5t/ha applied on the sown crop rows

M2 → Rice straw mulching @7.5t/ha applied in between crop rows

M3 → Rice chaffs mulching @ 5.0 t/ha applied in between crop rows

M4 → One irrigation (lifesaving) @ 300000 litre/ha

Biometric observations of jute taken were plant height (cm), dry matter accumulation (g/m2), LAI, CGR (g/m2/day), green biomass yield (t/ha), fiber yield (t/ha), stick yield (t/ha) and fiber: stick ratio.

Reed length (fiber length in cm)

The analysis of variance method (Panse and Sukhatme 1985; Gomez and Gomez 1984) was followed to statistically analyse the various data. The significance of different sources of variation was tested by "Error Mean Square method" of Fisher Snedecor's 'F' test at probability level 0.05. In the summary tables of result, the standard error of means (S. Em.±), the value of critical difference (C.D.) to compare the differences between treatments means and the co-efficient of variation (C.V.) have been provided.

3. Results and Discussion

Plant height

It was found from the two years results as well as pooled result that sowing dates showed significant differences for plant height at four different stages of observation (i.e., 30, 60, 90 and 120 DAE). The higher significant plant height was recorded from 1st April (D1) shown crops at all the four stages followed by 7th April (D2) shown crops and 14th April (D3) shown crops. This may be because of the 1st April shown crop got sufficient effective rainfall during the germination of the jute seeds, which is similar with the finding of Subhan and Das (1970). In case mulching practices significantly highest plant height was recorded from M2 (Rice straw mulching @ 7.5 t/ha applied in between crop rows) at all the stages of plant growth from both the years and from the pooled data which was followed by M1 (Rice straw mulching @ 2.5 t/ha applied on the sown crop rows), M3 (Rice chaffs mulching @ 5.0 t/ha applied in between crop rows), M4 (One irrigation (life saving) @ 300000 litre/ha) and M0 (Control). Mulching helps to conserve soil moisture through reduced evaporation; besides it regulates soil temperature and control weeds and thus helps in efficient use of conserved soil moisture for satisfactory growth and development of the crop, which ultimately helps in better plant height (Mandal *et al.,* 2015).

Leaf area index (LAI)

No significant result was observed from the two years result as well as from the pooled data on LAI at all the stages of crop growth, all though increasing trends of LAI was observed from 30 DAE to 90 DAE and at 120 DAE a decreasing LAI trends was observed due to the leaf senescence (Patra *et al.*, 2016).But in mulching practices M2 results significant highest LAI at all the stages (i.e., 30 DAE, 60 DAE 90 DAE and 120 DAE) may be due to the availability of highest amount of water for optimum leaf development as compared all other practices Gupta and Dorgan (1972) and Ghorai *et al.*, 2005.

Dry matter accumulation (g/m2)

In case of sowing dates 1st April (D1) showed crops recorded highest dry matter production m-2 area may be due to the received of the early shower during germination which triggered the dry matter production in 1st April (D1) shown crops (Thomson and Siddique 1997) as compared to D2 (7th April) shown crops and D3 (14thApril) shown crops. Mulched plots maintained better hydrothermal regime of soil, cooled down soil temperature and maintained more soil moisture than bare soil cultivation resulted into higher dry matter production by supplying adequate soil moisture (Mandal *et al.*, 2015). Among the mulching practices the suitable mulching practices for better dry matter production was found from M2 which was followed M1, M3, M4 and M0, M2 recorded significantly highest dry matter production because of the better ground coverage and thickness of the mulching material.

Crop growth rate (CGR)

At the early stages the CGR was increased up to 90 DAE in both the years as well as in pooled data, after that CGR was went down in case both sowing dates and mulching practices. In sowing dates non-significant results was observed at all the stages of crops growth among various dates of sowing , although highest CGR was recorded in 1st April (D1) sown crops as compared to 7th April (D2) sown crops and 14th April (D3) sown crops. In mulching significant highest CGR was recorded in M2 than four other treatments. At 90 DAE, the CGR was slowed down, because of reduction of pure absorption and leaves falling (Fonseka *et al.,* 1996; Borego *et al.,* 2000).

Green biomass yield, fiber yield, stick yield and fiber: stick ratio

In perusal of data revealed that green biomass, fiber yield, stick yield and fiber: stick ratio of jute were significantly influenced by sowing time during both the years of experiment and from pooled data (Table 6). 1st April sowing crop recorded the significant maximum green biomass, fiber yield, stick yield and fiber: stick ratio. Jute crops sowed on 1st April out yielded for green biomass yield, fiber yield stick yield and sowed highest significant fiber: stick ratio too as compared to the 14th April and 7th April showed crops. The increase in green biomass yield, fiber yield, stick yield

and fiber: stick ratio in early sowing dates may be ascribed to its significant improvement in plant height and green biomass due to sufficient effective rainfall received during germination of jute seeds sown early, which were similar with the result Subhan and Das, 1970.

Mulching practices also influenced green biomass, fiber yield, stick yield and fiber: stick during both the years as well as in pooled data. The green biomass, fiber yield, stick yield and fiber: stick were recorded significantly higher in rice straw mulching @ 7.5 t ha-1(M2) applied in between crop rows those of rice straw mulching @ 2.5 t ha-1(M1) applied on the sown crop rows, rice chaffs mulching @ 5 t ha-1(M3) applied in between crop rows, one life saving irrigation (@ 300000 litre ha-1) (M4) and control (M0). Mulching helps to conserve soil moisture through reduced evaporation; besides it regulates soil temperature and control weeds and thus helps in efficient use of conserved soil moisture for satisfactory growth and development of the crop. Adequate turgidity and eventually higher meristematic activity, leading to better plant growth, more foliage development, greater photosynthetic rate and consequently favourable effect on sink components. Conserved soil moisture was sufficient to produce satisfactory green biomass, fibre yield, stick yield and fiber: stick of jute by covering the soil surface either in between crop rows or on seeded rows and therefore both the rice straw mulching and rice chaffs mulching recorded the higher fibre yield. Similar crop yield improvement by rice straw mulching @ 7-10 t ha-1 in rainfed situation was observed by Ghorai *et al.,* 2007 and Saren *et al.,* 2009. From the above result it is concluded that 1st April sowed crops (D1) is the best date of sowing among the two other dates and in case of mulching practices rice straw mulching @ 7.5 t ha-1 (M2) for higher green biomass yield, fiber yield, stick yield and fiber: stick.

4. Conclusion

From the two year study it is concluded that early sowing (1st April) of jute crop facilitated the better performance of the crop and drought management techniques especially mulching did not hamper the oxygen diffusion rate but maintained the better hydrothermal regime of soil and thus reduced the early drought stress which was adequately reflected on jute fibre yield. availability of moisture to plants resulted in better cell

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Table 1: Effect of date of sowing and Soil moisture conservation techniques on plant height (cm) of Jute

Treatment	Plant Height (cm)											
	30 DAE			60 DAE			90 DAE			120 DAE		
Main Plot	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled
D_1	39.20	39.06	39.13	119.43	109.64	114.53	189.39	188.04	188.71	293.47	275.32	284.39
D_2	37.46	36.53	37.00	114.79	100.14	107.46	185.34	177.53	181.44	283.80	261.00	272.40
D_3	35.83	37.76	36.80	112.21	104.75	108.48	181.31	183.16	182.23	279.24	268.76	274.00
SEm±	0.34	0.32	0.26	0.92	0.95	0.64	1.52	1.70	0.98	2.29	2.48	0.75
CD (*p*=0.05)	1.02	0.96	0.79	2.76	2.86	1.92	4.59	5.12	2.94	6.91	7.47	2.25
Sub plot												
M_0	26.60	25.94	26.27	80.82	78.12	79.47	160.21	146.86	153.54	226.43	211.72	219.08
M_1	45.16	45.75	45.45	127.97	114.20	121.08	192.38	198.74	195.56	306.59	288.39	297.49
M_2	48.53	47.84	48.18	134.08	117.14	125.61	210.85	203.19	207.02	319.51	293.88	306.69
M_3	40.08	43.58	41.83	120.26	112.57	116.42	184.54	190.10	187.32	290.53	280.37	285.45
M_4	27.12	25.82	26.47	114.26	102.17	108.21	178.75	175.64	177.20	284.48	267.42	275.95
SEm±	0.49	0.49	0.32	1.68	1.52	1.08	2.18	3.01	1.79	3.98	3.37	2.40
CD (*P*=0.05)	1.18	1.17	0.78	4.06	3.67	2.61	5.28	7.27	4.34	9.63	8.16	5.80
Interaction												
At the same level of date of sowing												
SEm±	0.85	0.84	0.56	2.91	2.63	1.87	3.78	5.21	3.11	6.89	5.85	4.15
CD (*P*=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
At the same level of soil moisture conservation technique												
SEm±	0.76	0.71	0.59	2.05	2.12	1.43	3.41	3.80	2.19	5.13	5.54	1.67
CD (*P*=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

DAE - Days after emergence; NS: Non Significant

Table 2: Effect of date of sowing and Soil moisture conservation techniques on Leaf area index (LAI) of Jute

Treatment	Leaf Area Index (LAI)											
	30 DAE			60 DAE			90 DAE			120 DAE		
Main Plot	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled
D_1	3.00	2.93	2.97	5.78	5.79	5.79	7.17	7.00	7.08	3.86	3.86	3.86
D_2	2.96	2.91	2.93	5.77	5.73	5.75	7.10	6.90	7.00	3.84	3.78	3.81
D_3	2.94	2.92	2.93	5.76	5.76	5.76	7.07	6.94	7.01	3.81	3.82	3.82
SEm±	0.02	0.02	0.02	0.05	0.05	0.03	0.06	0.07	0.04	0.03	0.04	0.03
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Sub plot												
M_0	2.39	2.30	2.35	4.93	4.90	4.92	6.29	5.94	6.12	3.03	2.96	2.99
M_1	3.22	3.19	3.21	5.93	5.96	5.94	7.28	7.16	7.22	4.06	4.02	4.04
M_2	3.61	3.56	3.59	6.39	6.35	6.37	7.77	7.62	7.69	4.49	4.45	4.47
M_3	3.19	3.15	3.17	5.87	5.90	5.88	7.21	7.10	7.16	3.92	4.01	3.96
M_4	2.41	2.39	2.40	5.72	5.70	5.71	7.02	6.91	6.96	3.70	3.66	3.68
SEm±	0.03	0.03	0.02	0.06	0.06	0.05	0.09	0.08	0.06	0.05	0.06	0.05
CD (p=0.05)	0.08	0.08	0.06	0.15	0.15	0.12	0.22	0.18	0.15	0.13	0.13	0.12
Interaction												
At the same level of date of sowing												
SEm±	0.06	0.05	0.04	0.11	0.11	0.08	0.16	0.13	0.11	0.09	0.10	0.08
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
At the same level of soil moisture conservation technique												
SEm±	0.05	0.06	0.03	0.11	0.10	0.07	0.14	0.15	0.09	0.08	0.09	0.08
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

DAE Days after emergence; NS: Non Significant

Table 3: Effect of date of sowing and Soil moisture conservation techniques on Dry matter accumulation (g/m^2) of Jute

Treatment	Dry Matter Accumulation (g/m^2)											
	30 DAE			60 DAE			90 DAE			120 DAE		
Main Plot	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled
D_1	37.95	37.43	37.69	468.57	465.06	466.82	924.44	881.11	902.77	1338.61	1269.13	1303.87
D_2	36.71	35.73	36.22	458.70	445.28	451.99	901.85	843.01	872.43	1303.56	1214.93	1259.24
D_3	35.29	37.07	36.18	448.00	459.24	453.62	883.34	863.07	873.20	1272.04	1239.20	1255.62
SEm±	0.33	0.30	0.30	3.70	3.82	2.64	7.46	7.16	3.97	11.55	10.22	7.66
CD (p=0.05)	0.99	0.89	0.92	11.14	11.49	7.94	22.48	21.56	11.97	34.80	30.80	23.07
Sub plot												
M_0	26.47	25.57	26.02	234.22	230.99	232.60	487.86	472.06	479.96	826.14	782.35	804.25
M_1	42.75	43.09	42.92	517.21	518.03	517.62	1018.22	969.24	993.73	1431.26	1372.18	1401.72
M_2	45.86	45.57	45.71	523.68	524.34	524.01	1032.74	986.99	1009.87	1455.20	1394.32	1424.76
M_3	40.29	42.72	41.50	514.88	512.86	513.87	1002.53	958.73	980.63	1416.76	1352.13	1384.45
M_4	27.89	26.77	27.33	502.14	496.42	499.28	974.69	924.96	949.82	1394.33	1304.45	1349.39
SEm±	0.45	0.44	0.38	7.19	5.34	5.13	10.24	11.79	9.06	21.09	14.36	12.58
CD (p=0.05)	1.08	1.07	0.92	17.39	12.92	12.40	24.75	28.50	21.90	50.99	34.72	30.42
Interaction												
At the same level of date of sowing												
SEm±	0.78	0.77	0.66	12.45	9.25	8.88	17.73	20.41	15.69	36.52	24.87	21.79
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
At the same level of soil moisture conservation technique												
SEm±	0.74	0.66	0.68	8.27	8.53	5.89	16.68	16.00	8.89	25.83	22.86	17.12
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

DAE Days after emergence; NS: Non Significant

Table 4: Effect of date of sowing and Soil moisture conservation techniques on Crop growth rate (g/m^2/day) of Jute

Treatment	Crop Growth Rate (g/m^2/day)								
	30-60 DAE			60-90 DAE			90-120 DAE		
Main Plot	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled
D_1	14.35	14.25	14.30	15.20	13.87	14.53	13.81	12.93	13.37
D_2	14.07	13.65	13.86	14.77	13.26	14.01	13.39	12.40	12.89
D_3	13.76	14.07	13.91	14.51	13.46	13.99	12.96	12.54	12.75
SEm±	0.12	0.13	0.09	0.32	0.15	0.15	0.44	0.54	0.33
CD (p=0.05)	NS	NS	0.28	NS	NS	NS	NS	NS	NS
Sub plot									
M_0	6.92	6.85	6.89	8.45	8.04	8.25	11.28	10.34	10.81
M_1	15.82	15.83	15.82	16.70	15.04	15.87	13.77	13.43	13.60
M_2	15.93	15.96	15.94	16.97	15.42	16.20	14.08	13.58	13.83
M_3	15.82	15.67	15.75	16.25	14.86	15.56	13.81	13.11	13.46
M_4	15.81	15.66	15.73	15.75	14.28	15.02	13.99	12.65	13.32
SEm±	0.24	0.18	0.17	0.42	0.38	0.32	0.69	0.45	0.41
CD (p=0.05)	0.58	0.43	0.41	1.02	0.92	0.77	1.66	1.09	0.99
Interaction									
At the same level of date of sowing									
SEm±	0.41	0.31	0.29	0.73	0.66	0.55	1.19	0.78	0.71
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS
At the same level of soil moisture conservation technique									
SEm±	0.27	0.30	0.20	0.71	0.33	0.33	0.97	1.20	0.75
CD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS

DAE Days after emergence; NS: Non Significant

Table 5: Effect of date of sowing and Soil moisture conservation techniques on Green biomass yield (t/ha), Fiber yield (t/ha), Stick yield (t/ha), Fiber: Stick ratio of Jute

Treatment	Green Biomass Yield (t/ha)			Fiber Yield (t/ha)			Stick Yield (t/ha)			Fiber : Stick Ratio		
Main Plot	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled	2008-09	2009-10	Pooled
D_1	38.33	36.45	37.39	2.73	2.61	2.67	8.90	8.84	8.87	0.30	0.29	0.30
D_2	36.24	32.46	34.35	2.63	2.25	2.44	8.48	7.83	8.16	0.31	0.28	0.30
D_3	34.69	34.30	34.49	2.49	2.43	2.46	8.10	8.25	8.18	0.30	0.29	0.30
SEm±	0.69	0.65	0.62	0.05	0.05	0.03	0.15	0.16	0.15	0.01	0.01	0.01
CD (P=0.05)	2.08	1.96	1.85	0.14	0.16	0.09	0.46	0.49	0.45	NS	NS	NS
Sub plot												
M_0	22.43	20.16	21.30	1.62	1.23	1.43	6.53	6.27	6.40	0.25	0.20	0.22
M_1	40.69	39.26	39.98	2.81	2.73	2.77	9.13	9.12	9.13	0.31	0.30	0.30
M_2	43.28	41.15	42.22	3.44	3.11	3.28	10.07	9.50	9.79	0.34	0.33	0.34
M_3	38.83	37.13	37.98	2.63	2.61	2.62	8.63	8.60	8.62	0.31	0.30	0.31
M_4	36.85	34.32	35.59	2.59	2.46	2.53	8.11	8.07	8.09	0.32	0.31	0.31
SEm±	1.22	1.18	1.05	0.06	0.06	0.05	0.20	0.21	0.17	0.01	0.01	0.01
CD (P=0.05)	2.94	2.84	2.54	0.15	0.16	0.12	0.49	0.51	0.41	0.03	0.03	0.02
Interaction												
At the same level of date of sowing												
SEm±	2.11	2.04	1.82	0.11	0.11	0.09	0.35	0.37	0.29	0.02	0.02	0.02
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
At the same level of soil moisture conservation technique												
SEm±	1.54	1.45	1.38	0.11	0.12	0.07	0.34	0.36	0.33	0.02	0.02	0.02
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

DAE Days after emergence; NS: Non Significant