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## Phenology of Jute, Kenaf and Roselle Seed Crops at Different Date of Sowing

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**Abstract:** Phenological events namely field duration, average flowering and pod maturation took longer period in Roselle, HS-24 at all the ten dates of sowing. Jute and Kenaf had shorter field duration, average flowering days and pod maturation days compared to Roselle. Field duration of the crop was longer in May 15 sowing in all the experimental materials. Plant height decreased consistently from May sowing to September sowing. Plant height in all the sowings was higher in Tossa than White Jute, Kenaf and Roselle. Seed crop could be sown from May 15 to September 30.

**Key words:** Phenology, seed crops, sowing

### Introduction

Generally very little of Jute, Kenaf and Roselle are grown purely for seed. Mostly a portion of fibre crop (about 5.0%) is usually kept to harvest seed. Fibre yield has always been of primary interest and practically no experiments have been designed to study the progress of growth phases or phenology of seed crop. Few experiments have been conducted on seed yield but not on phenology of seed crop.

Seed is the planting material to raise a jute and allied fibre crops (JAF). At present Bangladesh requires about 4000 M. tons of seeds annually. Out of this requirement about 15% of the improved quality seeds are replaced by the Public agency like Bangladesh Agricultural Development Corporation (BADC) through contact growers.

Some initial experimental evidences indicate that sowing of jute seeds in Autumn (August-September) as a separate seed crop provide higher yield of better quality seeds (Hossain *et al.*, 1994; Khan *et al.*, 1995). Still, this late or off season seed crop lacks information regarding appropriate planting time and its interaction with required maturity stage of crop to ameliorate both the yield and quality of seed. Harvesting of *C. capsularis* seeds after 178 days and *C. olitorius* seed after 187 days of sowing attained optimum physiological maturity as indicated by maximum accumulation of dry matter in seeds and was further stated that maximum number of pods appeared when 60% *C. capsularis* pods and 70% *C. olitorius* pods attained brown colour and seed yield was optimum as well (Khandakar *et al.*, 1985).

Farmers are normally not interested to grow jute seed crop due to its cost and occupation of the land for longer periods. Since jute, kenaf and Roselle are short days plants, it is likely that the phenology would differ with different planting dates. Hence experiments were conducted to have an understanding of the phenology and relationship of growth phases of late planted seed crops of jute, kenaf and Roselle to develop appropriate cropping plan for sole seed crop at late plantings. Which could encourage the farmers to grow the seed crops.

### Materials and Methods

Experiments were conducted for three consecutive cropping seasons from 1993-94 to 1995-96 at Jute Agricultural Research Station, Manikganj, Bangladesh. The experiments were laid out in randomized complete block design and replicated thrice having a plot size of 3 × 3 m<sup>2</sup>. There were three experiments, one each for White Jute (*Chorchorus capsularis*); Tossa Jute (*C. olitorius*); and Kenaf (*Hibiscus cannabinus*) and Roselle (*H. sabdariffa*). The seeds were sown at ten dates of sowing on 15<sup>th</sup> and 30<sup>th</sup> of each month starting from May 15 up to September 30. White Jute var. D-154 and

CVL-1, Tossa jute var. O-4 and O-9897, Kenaf var. HC-2 and Roselle var. HS-24 were sown when the day length was 12.20 hours. The site had medium high land having sandy loam texture with pH 6.5 belonging to Gangetic alluvial tract. The organic matter content of the soil was 1.3% and CEC of 17 meq/100g of soil. The total N was 0.15%, P 12.1 µg/g and K 0.18 meg/100g of soil (Anonymous, 1997).

Crops of different dates of sowing were observed for (i) duration of the average flowering (period from seeding to 50% plants with flowering), (ii) duration of pod maturity (period from average flowering to seed maturity) and (iii) total field duration (period from seeding to crop harvest). The phenological events were determined and recorded by visual observation on every other day as has been done in other crops. Three years data were combined and analysis of variance was carried out (Zaman *et al.*, 1982).

From each sowing and for each variety, 15 randomly selected plants were used to record the linear growth (plant height) attained at harvest. Three seasons data on plant height were combined and analysis of variance were worked out.

### Results and Discussion

The attainment of average flowering ranges from first week of September in sowing from May 15 to July 15 in White jute, D-154 and CVL-1. In September 30 sowing in White jute, D-154 and CVL-1, the average flowering ranges from first week of November. In Tossa jute, O-9897, it ranges from first week of September in sowing from May 15 to June 30 and in mid November in sowing of September 30. It extends in O-4 up to last week of November in September 30 sowing. The average flowering in Kenaf, HC-2 was attained within October in May 15 to September 15 sowing. In September 30 sowing HC-2 had average flowering at mid November. In Roselle, HS-24 the average flowering was attained from last week of October to mid November. In other words, HS-24 attained average flowering in last week of October in May 15 to July 15 and within mid November in July 30 to September 30 sowing.

Pod maturation in all experimental materials i.e. Jute, Kenaf and Roselle was attained within 50 to 69 days. Pod maturation days was shorter in July to August sowing. It was longer in earlier and latter planting as compared to July and August sowing.

Field duration ranged from first week of November to first week of January in D-154, CVL-1, O-9897 and HC-2. It ranged from mid December to last week of January in HS-24 and first week of November to last week of December in O-4. May 15 to July 15 sowing required more than 6 to 8 months field duration in D-154, CVL-1 and O-4. July 30 to September 30 sowing required less than 4 months of field duration in D-

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**Table 1: Effect of dates of sowing on phenological events in seed crop of White Jute (var. D-154 and CVL-1)**

Dates of sowing	Average flowering (days)			Pod maturation after anthesis (days)			Field duration (days)		
	D-154	CVL-1	Mean	D-154	CVL-1	Mean	D-154	CVL-1	Mean
May 15	111	115	113.0	67	64	65.5	178	178	178.0
May 30	106	111	108.5	59	54	56.5	165	165	165.0
June 15	91	94	92.5	58	55	56.5	149	149	149.0
June 30	80	84	82.0	58	54	56.0	138	138	138.0
July 15	71	75	73.0	52	47	49.5	123	123	123.0
July 30	62	65	63.5	54	50	52.0	115	115	115.0
August 15	54	55	54.5	48	48	48.0	102	103	102.5
August 30	47	48	47.5	57	54	55.5	103	102	102.5
September 15	46	43	44.5	59	65	62.0	105	108	106.5
September 30	46	45	44.5	62	58	60.0	109	104	106.5
LSD of D at 1%			7.40			6.39			7.39

**Table 2: Effect of dates of sowing on phenological events in seed crop of Tossa Jute (var. O-4 and O-9897)**

Dates of sowing	Average flowering (days)			Pod maturation after anthesis (days)			Field duration days		
	O-4	O-9897	Mean	O-4	O-9897	Mean	O-4	O-9897	Mean
May 15	113	134	123.5	64	67	65.5	182	201	191.5
May 30	101	121	111.0	60	65	62.5	169	186	177.5
June 15	91	106	98.5	60	63	61.5	156	169	162.5
June 30	82	97	89.5	54	57	55.5	141	154	147.5
July 15	74	91	82.5	50	51	50.5	126	141	133.5
July 30	56	82	69.0	51	61	56.0	114	144	129.0
August 15	47	71	59.0	51	52	51.5	104	124	114.0
August 30	39	63	51.0	53	62	57.5	91	126	108.5
September 15	35	60	47.5	62	55	58.5	94	115	104.5
September 30	32	50	41.0	62	54	58.0	93	103	98.0
LSD of D at 1% = 8.23				D at 5% = 9.38			LSD of D x V at 5% = 9.80		

**Table 3: Effect of dates of sowing x variety on phenological events in seed crop of Kenaf and Roselle.**

Dates of sowing	Average flowering (days)		Pod maturation after anthesis (days)		Field duration (days)	
	HC-2	HS-24	HC-2	HS-24	HC-2	HS-24
May 15	150	171	55	60	205	231
May 30	134	163	58	56	192	219
June 15	120	144	55	63	176	207
June 30	108	132	53	61	161	192
July 15	94	118	53	62	147	180
July 30	82	106	49	59	147	166
August 15	67	92	66	54	132	146
August 30	63	83	69	53	132	136
September 15	54	67	61	64	115	131
September 30	49	57	54	69	103	127
LSD of D x V at 1%	8.28		13.46		19.6	

**Table 4: Effect of dates of sowing x variety on plant height (m) in seed crop of Jute, Kenaf and Roselle.**

Dates of sowing	White		Tossa		Kenaf and Roselle	
	D-154	CVL-1	O-4	O-9897	HC-2	HS-24
May 15	2.5	2.5	3.0	3.3	3.0	2.5
May 30	2.3	2.4	2.9	3.1	2.9	2.1
June 15	2.2	2.3	2.9	3.0	2.7	2.0
June 30	2.0	2.0	2.7	2.8	2.6	2.4
July 15	1.9	2.0	2.6	2.5	2.3	1.7
July 30	1.6	1.6	1.7	1.8	1.6	1.7
August 15	1.3	1.3	1.6	1.7	1.7	1.5
August 30	1.0	1.0	1.1	1.4	1.2	1.0
September 15	1.0	1.0	1.1	1.1	1.0	0.9
September 30	0.8	0.9	0.8	1.1	0.6	0.7
LSD of D x V at 1%	NS		1.81		NS	

154, CVL-1 and O-4. Tossa jute var. O-9897 and Kenaf var. HC-2 required 6½ months to 4 months field duration in May 15 sowing through August 30 sowing. It was less than 4 months in two September sowings. Roselle var. HS-24 took more than 7½ months in May 15 to June 15 sowing and about 4 months in August 15 to September 30 sowing. Above expressions of average flowering, pod maturation and

field duration events were based from Table 1, 2 and 3. The days from sowing to flowering, sowing to pod maturation and sowing to harvest were counted and expressed in calendar days from sowing to the attainment of dates of events. Effect of date of sowing in White jute was significant at 1% level for average flowering days, pod maturation days and total field duration. May 15 and May 30 sowing took longer

duration of 113 and 108.5 days, respectively for attainment of average flowering. It decreased gradually in latter dates of sowing. It was 44.5 days in September 15 sowing (Table 1). Pod maturation days gradually decreased from May 15 to September 30. The duration was 65.5 days in May 15 sowing and 60 days in September 30 sowing. Field duration decreased gradually from May 15 to August 30 sowing and increased in September 15 to September 30 sowing. It was 178 days in May 15 sowing, 102.5 days in August 30 sowing and 106.5 days in September 30 sowing (Table 1).

Average flowering days and pod duration days differed significantly for dates of sowing in Tossa jute at 1% level (Table 2). It indicated that the duration of average flowering varied among different dates of sowing. Duration of pod maturation was also varied across the dates of sowing. Effects of dates  $\times$  variety was significant for total field days. It indicated that the varieties of field duration varied among the dates of sowing.

The average flowering days consistently decreased from May 15 sowing (123.5 days) to September 30 sowing (41 days) in Tossa. Pod maturation days were also decreased consistently from May 15 to July 15 and it increased from July 30 to September 30. The field duration decreased consistently from May 15 to September 30. The field duration ranged from 103-201 days in O-9897 and from 93-182 days in O-4 from May 15 to September 30 sowing (Table 2). The marked difference in total field duration between O-9897 and O-4 supports the earlier report that O-9897 was less photo-sensitive. Being less photo-sensitive O-9897 took longer field duration to mature the D-154, CVL-1 and O-4. It is postulated that the later varieties started flowering at day length of 12.30 hours. This might have happened due to the decrease in sunshine hours from June to September (5.0 to 5.9 hours). The var. O-9897 responded to a low temperature, shorter sunshine hours and day length below 12 hours.

Kar (1962) indicated that a critical day length for White and Tossa jute was 12 hours and suggested that low temperatures hastened the photoperiodic effect in Tossa jute and delayed the reproductive phase in White jute. He also reported that days to flowering of both White and Tossa jute progressively shortened with the delay in planting from April to October. Mian and Gani (1971) suggested that the gradual reduction in duration of reproductive phase of White and Tossa jute with the delay in planting was caused by the gradual reduction in the prevailing day length. Roy Choudhuri *et al.* (1992) and Mian and Gani (1971) also hold the same contention and that sowing from April through September, the plant flowered progressively in less number of days.

Date  $\times$  variety effect for average flowering days, pod maturation days and total field duration was significant at 1% level in Kenaf and Roselle. It indicated that all the phenological events of both HC-2 and HS-24 varied with dates of sowing (Table 3).

The attainment of average flowering was longer in HS-24 as compared to HC-2 in all the dates of sowing. In HS-24 it ranged from 57 to 171 days and in HC-2 it was 49-150 days under May 15 to September 30 sowing. The varieties of Kenaf (HC-2) and Roselle (HS-24) showed photoperiodic effect in flowering as the length went down to 11.6 hours in October and 11.0 hours in November. Pod maturation ranged from 69 to 49 days in HC-2 and 69 to 53 days in HS-24. August 15 to September 15 sowing had longer pod maturation days in HC-2. September 15 to September 30 sowing had longer pod maturation days in HS-24. The field duration gradually

decreased from May 15 to September 30 sowing. Longer field duration of 231 days was required in HS-24. Field duration was 205 days in HC-2 (Table 3).

Dempsey (1975) reported that May through July planting of Roselle flowered on October 28. Chaudhuri and Islam (1951) reported that there was a variation in varietal response of Roselle to flowering time. Ghosh (1983) suggested that Kenaf tend to flower when day length becomes shorter than 12½ hours and generally flowers from mid September to mid October, depending on early or late planting and on latitude.

Dates of sowing  $\times$  variety interaction in Tossa jute for plant height was significant and plant height had no real difference in White jute, Kenaf and Roselle. Plant height in all the experimental materials consistently decreased from May 15 to September 30 sowing. It was taller in May 15 sowing and shorter in September 30 sowing. Tossa jute and Kenaf attained higher plant height in May 15 to September 15 sowing as compared to White jute and Roselle (Table 4). Plant height decreased with the delay in planting from May to September. The finding is in agreement with Mian and Gani (1971).

All the varieties of the experimental materials, however, flowered during November in September 30 sowing. The vegetative period was also shortened in all the experimental materials with the delay in planting. Field duration of seed crop and average flowering days would consistently decrease from May 15 to September 30 sowing. Pod maturation days would be shorter in July to August sowing. The plant height would decrease consistently from May 15 to September 30 sowing. Depending on the availability of land and scope of accommodation long or short field days of a seed crop; Jute, Kenaf and Roselle could be sown from mid May to end September.

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