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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 4 (6): 660-664, 2001

Effect of Water Stresses on Growth Attributes in Jute II. Plant Base Diameter

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Abstract: The plant base diameter was studied in *Corchorus capsularis* L. (cv. CVL-1 and D-154) and *Corchorus olitorius* L. (cv. O-4 and R-26) grown under constant drought, constant saturation, alternate saturation and drought, and different levels of standing water (5 cm, 10 cm, 20 cm and 30 cm) conditions. The cultivar O-4 had been found to be tolerant to drought but susceptible to waterlogging condition, particularly at the young stage of growth. On the descending order of base diameter and tolerance of submersion, the test cultivars could be placed as CVL-1 > D-154 > R-26 > O-4. The base diameter of CVL-1 plants decreased in constant drought condition as compared to that of O-4 plants. At the age of 90 days, the decrease in base diameter in CVL-1 plants was doubled compared to that of O-4 plants. On the contrary, the base diameter of O-4 and R-26 plants decreased in standing water condition compared to that of CVL-1 and D-154 plants. The CVL-1 plants died earlier in constant drought. The O-4 and R-26 plants died earlier in standing water condition compared to CVL-1 and D-154 plants. It appeared that the base diameter highly affected by standing water in case of *Corchorus olitorius* and by constant drought in case of *Corchorus capsularis*. The base diameter of all the stressed plants decreased in comparison with those of control plants.

Key words: Jute, *Corchorus* species, water stresses, plant base diameter

Introduction

The effect of water stresses on plant height of *Corchorus capsularis* L. cv. CVL-1, D-154 and *Corchorus olitorius* L. cv. O-4, R-26 at different stages of growth has been reported in the first article of the series (Prodhan *et al.*, 2001). In this article, the effect of water stress on plant base diameter of *Corchorus capsularis* L. cv. CVL-1, D-154 and *Corchorus olitorius* L. cv. O-4, R-26 at different stages of growth will be described, so that a clear picture about the effect of water in excess and deficit on base diameter of jute plant may be obtained.

Materials and Methods

The two species of jute plant, *Corchorus capsularis* L. cv. CVL-1, D-154 and *Corchorus olitorius* L. cv. O-4, R-26, were used. Seeds of these cultivars were obtained through the courtesy of Bangladesh Jute Research Institute (BJRI), Dhaka.

Field Experiment: The field experiment was conducted in the farm of Kishoregonj Regional Station, BJRI. The experimental plot (0.021 ha) was divided into 4 equal blocks. Each block was again divided into 5 equal plots of 3m × 2m size. The cultivars were sown in the block randomly. The preparation of land, application of fertilizers and sowing of seeds were done as per recommendation of BJRI (Anon., 1985, 1992). Each block contained all 4 cultivars of jute. The standard methods of cultural practices and plant protection measures were taken as and when required. The crops were allowed to grow under natural climatic condition till the imposition of standing water treatment.

Treatments: The treatments of the field experiment were the control, and 10 cm, 20 cm and 30 cm standing water. The control plants of cultivar CVL-1, D-154, O-4 and R-26 were grown in the field under natural conditions of weather till they were 120 days old. The treatments have been described in the previous paper of the series (Prodhan *et al.*, 2001).

Pot Experiment: The pot experiment was conducted in the open net houses of Bangladesh Agricultural University (BAU), Mymensingh, Bangladesh. Plastic pots (height 35 cm, top diameter 33 cm and base diameter 27 cm) were used in this experiment. The pots were sufficiently perforated at the bottom and side (each hole was approximately 5 mm in diameter) for quick drainage of excess water and for proper aeration. Each pot was filled up to top with light loam soil thoroughly mixed with cowdung in ratio of 5:1. The soil was collected from the cultivated land of BAU Farm. Fertilizers at the rate of 2 gm urea, 1 gm TSP and 2 gm MP were added with top soil of each pot. The total quantity of TSP and MP, and 1 gm of urea were applied as basal dose and the rest 1 gm of urea as top dressing. In each pot 30 seeds were sown. On an average 25 of them were germinated. The seedlings were thinned out every week. Ultimately there were 7 or 8 healthy plants in each pot while they were 4 weeks old. Before commencement of the treatments, all the pots were kept under uniform condition of soil moisture of 20-25%. Cultural operations were done following standard procedure of jute cultivation. Plant protection measures were taken as and when necessary (Anon., 1985, 1992).

Treatments: The treatments of the pot experiment were the control, constant drought, constant saturation, alternate saturation, drought and standing water (5 cm, 10 cm, 20 cm and 30 cm). All these treatments have been described in the previous paper of the series (Prodhan *et al.*, 2001).

Collection of Data: The plant base diameters of cultivars CVL-1, D-154, O-4 and R-26, grown in the field and pots at different levels of standing water and that of CVL-1 and O-4, grown in the pots at different soil moisture regimes, were recorded at 15 days intervals.

Results

The effects of different levels of soil moisture, such as, constant drought, constant saturation, and alternate saturation and drought conditions of soil moisture were studied on the plant base diameter of *Corchorus capsularis* L. cv. CVL-1 and *Corchorus olitorius* L. cv. O-4 (Table 1). The 30 days old seedlings of these two cultivars were grown in different soil moisture regimes till they became 120 days old or died earlier due to water stress. Effects of different levels of standing water on plant base diameter of *Corchorus capsularis* L. cv. CVL-1, D-154 and *Corchorus olitorius* L. cv. O-4 and R-26 were investigated (Table 1 and 2). The 30, 45, 60 and 90 days old plants were exposed to 5 cm, 10 cm, 20 cm and 30 cm standing water respectively. The plants were allowed to grow in different levels of standing water till they were 120 days old or died earlier. The plant base diameter had been found to increase as the plant became older but the rate of increase declined due to water stress. The effects of different soil moisture regimes on plant base diameter of

Table 1: Effect of soil moisture and standing water on the plant base diameter (mm) of *Corchorus capsularis* cv. CVL-1 and *Corchorus olitorius* cv. O-4

Treatment	Cultivar	Age of plant (days)						
		30	45	60	75	90	105	120
Control	CVL-1	4.0	7.7	10.9	12.2	14.4	15.6	16.6
	O-4	3.4	5.5	7.7	9.8	11.4	12.8	14.0
Constant drought	CVL-1		6.2	7.7	8.2	8.4	d	d
	O-4		5.3	7.0	8.2	9.0	9.6	10.1
Constant saturation	CVL-1		6.4	8.4	9.9	11.0	12.2	13.0
	O-4		5.1	6.6	7.7	8.6	9.4	9.9
Alternate saturation & drought	CVL-1		6.8	9.0	10.8	12.3	13.5	14.5
	O-4		5.5	7.3	8.8	10.1	11.3	12.3
5 cm standing water	CVL-1		5.5	7.1	8.5	9.7	10.6	10.9
	O-4		4.7	5.5	5.8	d	d	d
10 cm standing water	CVL-1			9.9	11.9	13.0	14.0	14.8
	O-4			4.7	7.2	7.7	d	d
20 cm standing water	CVL-1				12.6	13.0	14.4	15.1
	O-4				8.8	9.7	10.2	d
30 cm standing water	CVL-1						15.4	16.1
	O-4						12.1	12.8
S. E.		±0.35	±0.31	± 0.43	± 0.46	±0.54	±0.55	±0.63

d = dead

Table 2: Effect of standing water on the plant base diameter (mm) of *Corchorus capsularis* cv. D-154 and *Corchorus olitorius* cv. R-26

Treatment	Cultivar	Age of plant (days)						
		30	45	60	75	90	105	120
Control	D-154	3.7	7.2	10.1	12.2	13.9	15.2	16.3
	R-26	3.3	5.2	7.2	9.1	10.8	12.3	13.7
5 cm standing water	D-154		5.1	6.6	7.7	8.7	9.4	9.6
	R-26		4.5	5.4	5.8	d	d	d
10 cm standing water	D-154			9.2	12.8	12.2	13.4	14.0
	R-26			6.3	7.4	8.3	8.9	d
20 cm standing water	D-154				11.5	12.7	13.5	14.1
	R-26				8.5	9.5	10.2	10.8
30 cm standing water	D-154						15.1	16.2
	R-26						11.7	12.7
S. E.		±0.30	±0.30	±0.55	±0.53	±0.64	±0.79	±0.78

d = dead

cultivars CVL-1, D-154, O-4 and R-26 are described below.

Cultivar CVL-1

Control: The plant base diameters of *Corchorus capsularis* L. cv. CVL-1 grown under normal soil moisture were 7.7, 10.9, 12.2, 14.4, 15.6 and 16.6 mm when the plants were 45, 60, 75, 90, 105 and 120 days old respectively (Table 1). The fortnightly increase in base diameter of these plants was calculated as 3.2, 1.3, 2.2, 1.2 and 1.0 mm for the period of 45-60, 60-75, 75-90, 90-105 and 105-120 days after sowing (DAS) respectively (Fig. 1A).

Constant drought: The lateral growth of the plant was also affected by constant drought like axial growth. The test plants, grown in constant drought condition, exhibited 6.2, 7.7, 8.2 and 8.4 mm base diameters while they were 45, 60, 75 and 90 days old respectively (Table 1). The fortnightly increase in base diameter of these plants was calculated as 1.5, 0.5 and 0.2 mm for the period of 45-60, 60-75 and 75-90 DAS respectively (Fig. 1A). In constant drought, the stressed plants did not survived beyond 90 days of age. At the age of 60, 75 and 90 days, the plant base diameter was 29.3%, 32.7% and 41.6% less than that of their corresponding control plants.

Constant saturation: The plant base diameter of CVL-1 plants, grown under constant saturation, was 6.4, 8.4, 9.9, 11.0, 12.2 and 13.0 mm while they were of 45, 60, 75, 90, 105 and 120 days old respectively (Table 1). The fortnightly increase in base diameter was 2.0, 1.5, 1.1, 1.2 and 0.8 mm during the period of 45-60, 60-75, 75-90, 90-105 and 105-120 DAS respectively (Fig. 1A). The 75, 105 and 120 days old plants, grown in constant saturation, exhibited 18.8%, 21.7% and 21.6% less base diameter than that of their corresponding control plants.

Alternate saturation and drought: The plant base diameter had not been seriously affected while the plants were subjected to and grown in alternate saturation and drought conditions of soil moisture. In this situation the base diameter was 6.8, 9.0, 10.8, 12.3, 13.5 and 14.5 mm when the plants were of 45, 60, 75, 90, 105 and 120 days old respectively (Table 1). The fortnightly increase in base diameter was calculated as 2.2, 1.8, 1.5, 1.2 and 1.0 mm for the period of 45-60, 60-75, 75-90, 90-105 and 105-120 DAS respectively (Fig. 1A). The rate of growth of stressed plants was slightly less than that of the control. The stressed plants exhibited 11.4%, 13.4% and 12.6% less base diameter than that of the control plants while they were of 75, 105 and 120 days old respectively.

5 cm standing water: The plant base diameter of the test plants, grown in 5 cm standing water, was 5.5, 7.1, 8.5, 9.7, 10.6 and 10.9 mm while they were of 45, 60, 75, 90, 105 and 120 days old respectively (Table 1). During the period of 30-45, 45-60, 60-75, 75-90, 90-105 and 105-120 DAS, the fortnightly increase in base diameter was 1.5, 1.6, 1.4, 1.2, 0.9 and 0.3 mm respectively (Fig. 1A). The fortnightly increase in base diameter was very low in these plants. At the age of 75, 105 and 120 days, the base diameter of the stressed plants was 30.3%, 32.0% and 34.3% less than that of the corresponding control plants.

10 cm standing water: At 10 cm standing water, the base diameter of the plants was 9.9, 11.9, 13.0, 14.0 and 14.8 mm while they were of 60, 75, 90, 105 and 120 days old respectively (Table 1). The fortnightly increase in plant hase

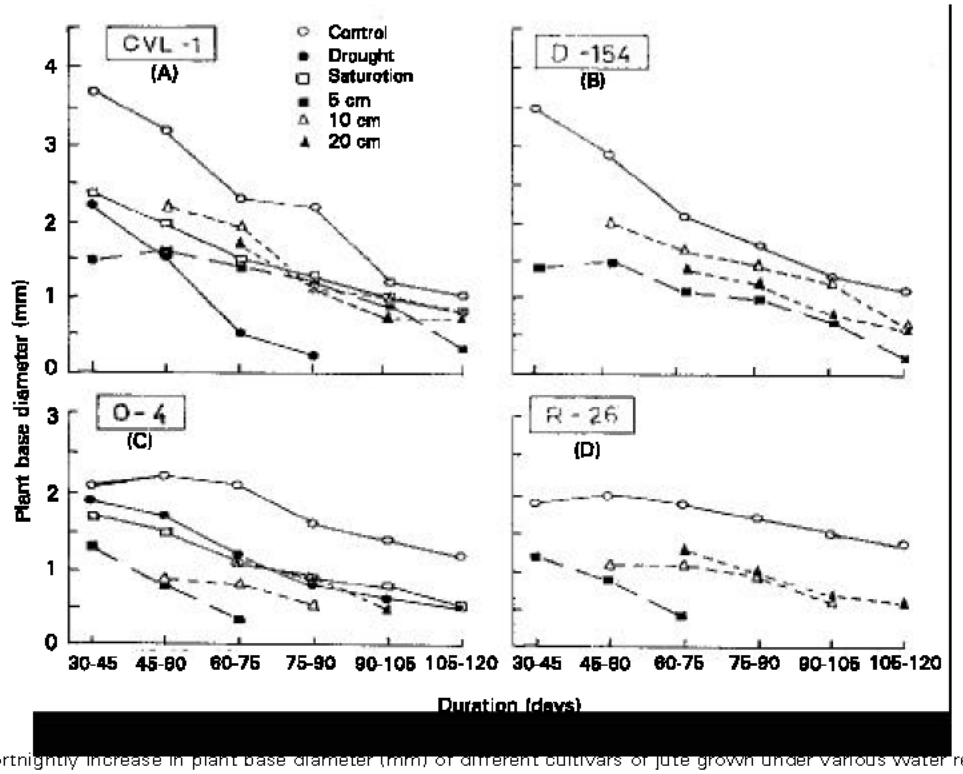

Fig. 1: Fortnightly increase in plant base diameter (mm) of different cultivars of jute grown under various water regimes

diameter was 2.2, 2.0, 1.1, 1.0 and 0.8 mm during the period of 45-60, 60-75, 75-90, 90-105 and 105-120 DAS respectively (Fig. 1A). The base diameter of these plants was 9.7%, 10.2% and 10.8% less than that of their corresponding control plants while the plants were of 90, 105 and 120 days old respectively.

20 cm standing water: The base diameter of CVL-1 plants grown in 20 cm standing water was 12.6, 13.7, 14.4 and 15.1 mm when the plants were of 75, 90, 105 and 120 days old respectively (Table 1). The fortnightly increase in base diameter was calculated as 1.7, 1.1, 0.7 and 0.7 mm for the period of 60-75, 75-90, 90-105 and 105-120 DAS respectively (Fig. 1A). In these plants, the rate of growth in base diameter was higher than that of 5 cm or 10 cm standing water (Fig. 1A). The stressed plants of 105 and 120 days old exhibited 7.7% and 9.0% less base diameter than that of corresponding control plants respectively.

30 cm standing water: At the age of 105 and 120 days, the base diameter of CVL-1 plants, grown in 30 cm standing water, was 15.4 and 16.1 mm respectively (Table 1). The fortnightly increase in base diameter of the stressed plants during the period of 90-105 and 105-120 DAS was 1.0 and 0.7 mm respectively (Fig. 1A). It was more or less similar to that of the control. The base diameter of 105 and 120 days old stressed plants was 1.3% and 3.0% less than that of their corresponding control plants.

Cultivar D-154

Control: The base diameter of control plants of D-154 of *Corchorus capsularis* L. was 7.2, 10.1, 12.2, 13.9, 15.2 and 16.3 mm while the plants were 45, 60, 75, 90, 105 and 120 days old respectively (Table 2). The fortnightly increase in base diameter of these plants was 2.9, 2.1, 1.7, 1.3 and 1.1 mm during the period of 45-60, 60-75, 75-90, 90-105 and 105-120 DAS respectively (Fig. 1B).

5 cm standing water: The 30 days old plants of D-154, grown in 5 cm standing water, had been found to withstand waterlogged condition but they remained stunted throughout the remaining period of their lives. The base diameter of these plants was 5.1, 6.6, 7.7, 8.7, 9.4 and 9.6 mm while the plants were of 45, 60, 75, 90, 105 and 120 days old respectively (Table 2). The fortnightly increase in base diameter of these plants was 1.4, 1.5, 1.1, 1.0, 0.7 and 0.2 mm during the period of 30-45, 45-60, 60-75, 75-90, 90-105 and 105-120 DAS respectively (Fig. 1B). At the age of 75, 105 and 120 days, the stressed plants exhibited 36.8%, 38.1% and 41.1% less base diameter than that of their corresponding control plants respectively.

10 cm standing water: The base diameter of D-154 plants, grown in 10 cm standing water was 9.2, 10.8, 12.2, 13.4 and 14.0 mm while the plants were 60, 75, 90, 105 and 120 days old respectively (Table 2). The fortnightly increase in base diameter during the period of 45-60, 60-75, 75-90, 90-105 and 105-120 DAS, had been found to be 2.0, 1.6, 1.4, 1.2 and 0.6 mm respectively (Fig. 1B). At the age of 75, 105 and 120 days, the plant base diameter was 11.4%, 11.8% and 14.1% less than that of their corresponding control plants respectively.

20 cm standing water: The plant base diameter of 75, 90, 105 and 120 days old D-154 plants, grown in 20 cm standing water was 11.5, 12.7, 13.5 and 14.1 mm respectively (Table 2). During the period of 60-75, 75-90, 90-105 and 105-120 DAS, the fortnightly increase in base diameter was calculated as 1.4, 1.2, 0.8 and 0.6 mm respectively (Fig. 1B). At the age of 90, 105 and 120 days, the base diameter was 8.6%, 11.1% and 13.4% less than that of corresponding control plants respectively.

30 cm standing water: The D-154 plants, grown in 30 cm standing water, showed base diameter as 15.1 ad 16.2 mm

while they were of 105 and 120 days age respectively (Table 2). During the growth period of 90-105 and 105-120 DAS, the fortnightly increase in base diameter was 1.2 and 1.1 mm respectively (Fig. 1B). At the age of 105 and 120 days, the base diameter of the stressed plants was 0.7% and 0.6% less than that of their corresponding control plants.

Cultivar O-4

Control: At the normal soil moisture condition, the base diameter of O-4 plants was 5.5, 7.7, 9.8, 11.4, 12.8 and 14.0 mm while the plants were of 45, 60, 75, 90, 105 and 120 days old respectively (Table 1). During the period of 45-60, 60-75, 75-90, 90-105 and 105-120 DAS, the fortnightly increase in base diameter of these plants was 2.2, 2.1, 1.6, 1.4 and 1.2 mm respectively (Fig. 1C).

Constant drought: The 30 days old plants of O-4 had been found to thrive in constant drought better than other cultivars studied. The base diameter of the stressed plants at the age of 45, 60, 75, 90, 105 and 120 days, was 5.3, 7.0, 8.2, 9.0, 9.6 and 10.1 mm respectively (Table 1). The fortnightly increase in base diameter during the growth period of 45-60, 60-75, 75-90, 90-105 and 105-120 DAS was 1.7, 1.2, 0.8, 0.6 and 0.5 mm respectively (Fig. 1C). The base diameter of the stressed plants was 16.3%, 25.0% and 27.8% less than that of corresponding control plants while the plants were of 75, 105 and 120 days old respectively.

Constant saturation: The base diameter of the O-4 plants, grown in constant saturated soil moisture condition was 5.1, 6.6, 7.7, 8.6, 9.4 and 9.9 mm while they were of 45, 60, 75, 90, 105 and 120 days old respectively (Table 1). During the growth period of 45-60, 60-75, 75-90, 90-105 and 105-120 DAS, the fortnightly increase in base diameter was 1.5, 1.1, 0.9, 0.8 and 0.5 mm respectively (Fig. 1C). These plants showed 21.4, 26.5 and 29.2% less base diameter than that of their corresponding control plants while they were of 75, 105 and 120 days old respectively.

Alternate saturation and drought: The base diameter of the test plants, grown in alternate saturation and drought, was 5.5, 7.3, 8.8, 10.1, 11.3 and 12.3 mm while they were of 45, 60, 75, 90, 105 and 120 days old respectively (Table 1). The fortnightly increase in base diameter during the growth period of 45-60, 60-75, 75-90, 90-105 and 105-120 DAS was 1.8, 1.5, 1.3, 1.2 and 1.0 mm respectively (Fig. 1C). At the age of 75, 105 and 120 days, the base diameter of the stressed plants was 10.2%, 11.7% and 12.1% less than that of their corresponding control plants.

5 cm standing water: The 30 days old plants could not withstand 5 cm standing water condition beyond 75 days of age. The base diameter of these plants, at the age of 45, 60 and 75 days, was 4.7, 5.5 and 5.8 mm respectively (Table 1). The fortnightly increase in base diameter of these plants was 0.8 and 0.3 mm during the period of 45-60 and 60-75 DAS respectively (Fig. 1C). At the age of 60 and 75 days, the stressed plants exhibited 28.5% and 40.0% less base diameter than that of their corresponding control plants.

10 cm standing water: The O-4 plants could survive in 10 cm standing water till they became 90 days old. The base diameter of these plants was 6.4, 7.2 and 7.7 mm while the plants were of 60, 75 and 90 days old respectively (Table 1). During the growth period of 45-60, 60-75 and 75-90 DAS, the fortnightly increase in base diameter was 0.9, 0.8 and 0.5 mm respectively (Fig. 1C). At the age of 75 and 90 days, the base diameter of the stressed plants of O-4 had been found to be 26.5% and 32.4% less than that of their corresponding control plants.

20 cm standing water: In 20 cm standing water, the O-4 plants survived up to an age of 105 days. The base diameter of these plants had been found to be 8.8, 9.7 and 10.2 mm while they were of 75, 90 and 105 days old respectively (Table 1). The fortnightly increase in base diameter was 0.9 and 0.5 mm during the growth period of 75-90 and 90-105 DAS respectively (Fig. 1C). At the age of 75 and 105 days, the stressed plants exhibited 10.2% and 20.3% less base diameter than that of control plants.

30 cm standing water: The base diameter of the 105 and 120 days old plants was 12.1 and 12.8 mm while they were grown in 30 cm standing water (Table 1). The fortnightly increase in base diameter of these plants was 0.7 mm during the growth period of 105-120 DAS (Fig. 1C). At the age of 105 and 120 days the base diameter was 5.5% and 8.5% less in the stressed plants than that of their corresponding control plants respectively.

Cultivar R-26

Control: The R-26 plants of *Corchorus olitorius*, grown in normal soil moisture condition, had the base diameter of 5.2, 7.2, 9.1, 10.8, 12.3 and 13.7 mm while they were of 45, 60, 75, 90, 105 and 120 days old respectively (Table 2). During the growth period of 45-60, 60-75, 75-90, 90-105 and 105-120 DAS, the fortnightly increase in base diameter of control plants was 2.0, 1.9, 1.7, 1.5 and 1.4 mm respectively (Fig. 1D).

5 cm standing water: The base diameter of the test plants, grown in 5 cm standing water was 4.5, 5.4 and 5.8 mm while they were of 45, 60 and 75 days old respectively (Table 2). The fortnightly increase in base diameter of these test plants was 0.9 and 0.4 mm during the growth period of 45-60 and 60-75 DAS respectively (Fig. 1D). At the age of 60 and 75 days, the stressed plants exhibited 25.0% and 36.3% less base diameter than that of their corresponding control plants respectively.

10 cm standing water: The base diameter of the test plants grown in 10 cm standing water was 6.3, 7.4, 8.3 and 8.9 mm while the stressed plants were of 60, 75, 90 and 105 days old respectively (Table 2). The fortnightly increase in base diameter was 1.1, 0.9 and 0.6 mm during the growth period of 60-75, 75-90 and 90-105 DAS respectively (Fig. 1D). A the age of 75, 90 and 105 days, the base diameter was 18.6% 23.1% and 27.6% less in the stressed plants than that of their corresponding control plants respectively.

20 cm standing water: The 60 days old plants had been found to thrive in 20 cm standing water till they were 120 days old. The base diameter of these stressed plants was 8.5, 9.5, 10.2 and 10.8 mm while they were of 75, 90, 105 and 120 days old respectively (Table 2). During the growth period of 75-90, 90-105 and 105-120 DAS, the fortnightly increase in base diameter was 1.0, 0.7 and 0.6 mm respectively (Fig. 1D). At the age of 75, 105 and 120 days, the base diameter was 6.6%, 12.0% and 21.1% less in the stressed plants than that of their corresponding control plants respectively.

30 cm standing water: The base diameter of the test plants, grown in 30 cm standing water, was 11.7 and 12.7 mm while they were of 105 and 120 days old respectively (Table 2). The fortnightly increase in base diameter of these plants was 1.0 mm during the growth period of 105-120 DAS (Fig. 1D). At the age of 105 and 120 days, the base diameter of the stressed plants was 4.8% and 7.7% less than that of their corresponding control plants respectively.

Discussion

The plant base diameter of *Corchorus capsularis* L. (cv. CVL-1 and D-154) and *Corchorus olitorius* L. (cv. O-4 and R-26) was studied under different water regimes. The results of the present investigation have been discussed below in context to water stress.

The lateral growth of jute plant was affected by water in excess or deficit compared to the axial growth (Prodhan *et al.*, 2001). The trend of decrease in plant base diameter was similar to that of plant height in all the treatments in jute plant (Prodhan *et al.*, 2001). In constant drought condition of soil moisture, the growth performance of O-4 was much better than that of CVL-1. The cultivar O-4 had been found to be more drought tolerant than cultivar CVL-1. At the age of 120 days, the base diameter of O-4 was 28% less than that of the control. The CVL-1 plants did not survive beyond 90 days after sowing (DAS). At the age of 90 days, the base diameters of CVL-1 and O-4 were 42% and 21% less than those of the control. At this age, the decrease in base diameter in CVL-1 was doubled compared to that of O-4. According to Ghosal and Chattapadhyay (1977), the *Corchorus olitorius* showed more increase in base diameter than *Corchorus capsularis* grown under chronic moisture stress. The *Corchorus capsularis* is water loving and *Corchorus olitorius* is drought loving and the former is grown in low land and later in high land (Basak and Chaudhuri, 1967; Choudhury, 1946, 1951; Ghosal and Chattapadhyay, 1977). Bisaria and Saraswat (1983), however, reported that at early stage of growth, *Corchorus capsularis* could tolerate drought better than *Corchorus olitorius*. According to these reports, *Corchorus olitorius* is more tolerant to drought than *Corchorus capsularis*. The findings of the present investigation are in conformity with above reports.

The decrease in base diameter in saturated soil moisture condition was 22% in CVL-1 and 29% in O-4 at the age of 120 days. In alternate saturation and drought condition of soil moisture, the CVL-1 and O-4 had 13% and 12% less base diameter than those of their control plants at 120 DAS. The CVL-1 plants showed more or less similar growth habit in both saturated, and alternate saturation and drought conditions of soil moisture while the O-4 plants exhibited more desirable growth habit in alternate saturation and drought compared to saturated soil indicating the drought loving character of *Corchorus olitorius* (Prodhan *et al.*, 2001). For a hydro-sensitive plant like jute, the soil moisture below or above the optimum, affects the plant growth and reduces the plant base diameter (Prodhan *et al.*, 2001).

In all the test cultivars, the base diameter of the plants was affected in waterlogging condition. Different cultivars were affected to different degrees. In the standing water treatments, four factors, such as, the variety, age of the plant, duration of submersion and the level of standing water responsible to affect the plant growth (Prodhan *et al.*, 2001). The age of the plant had been found to be the more critical than all the factors (Prodhan *et al.*, 2001). When the 30 days old plants were grown at 5 cm standing water, all the test cultivars were affected to different degrees. In 5 cm standing water, the 30 days old plants of O-4 and R-26 survived up to 75 days and those of CVL-1 survived up to the age of 90 days while the D-154 plants had been found to thrive till they were 120 days old.

Irrespective of variety, the fortnightly increase in base diameter had been found to decline sharply in the younger plants subjected to standing water treatments (Fig. 1). The decline in plant base diameter had been found to proceed sharply as the duration of submersion was prolonged. When the older plants were submerged in standing water, the fortnightly increase in base diameter had been found to be slightly less than that of the control plants. In comparison to control, the test plants of CVL-1, D-154, O-4 and R-26 had 30%, 37%, 40% ad 36% less base diameter at the age of 75 days. When the plants were submerged for 2 weeks, the decrease in base diameter was more in D-154 than that of CVL-1 but subsequently, the D-154 plants showed better performance. At the age of 120 days, the stressed plants of CVL-1 and D-154 (the 90 days old plants grown in 30 cm standing water for 30 days) showed 3% and 0.6% less base diameter than those of their control plants respectively. In this treatment, the O-4 and R-26 plants had 9% and 8% less base diameter than their control plants respectively.

Among the test cultivars, the O-4 is the most susceptible while D-154 is the most tolerant to waterlogging condition. In context to plant height, the cultivars (CVL-1 and D-154) of *Corchorus capsularis* showed similar reaction to standing water treatment while the R-26 of *Corchorus olitorius* showed better performance in waterlogged condition than O-4, irrespective of age and duration of submersion (Prodhan *et al.*, 2001). In a variety, the age of the plant is the most important determinant factor for water tolerance. The 60 days old plants of D-154, CVL-1 and R-26 can successfully withstand waterlogging condition and their fortnightly increase in base diameter had been found to be satisfactory while the 90 days old plants of O-4 can withstand submersion with success (Fig. 1). Chaudhury and Basak (1969) also found that 8 varieties of *Corchorus capsularis* and 7 varieties of *Corchorus olitorius*, grown under 10 cm standing water, showed the reduction in base diameter by 2.4% and 28.3% in comparison with that of control. The present findings on lateral growth of jute plant are in fair agreement with the reports of the previous workers (Chaudhury and Basak, 1969; Kar, 1959; Kar and Sarkar, 1957, 1962). The plants of *Corchorus capsularis* had been found to withstand waterlogging condition after they attain a height of 3-4 feet (Kundu, 1956). According to Bhattacharyya and Palit (1984), the 30 days old plants of *Corchorus capsularis* and *Corchorus olitorius* show heavy reduction in growth while the 90 days old ones exhibit no significant reduction in plant growth.

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