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Vegetative propagation in *Jatropha curcas* L.

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ABSTRACT

The present paper reports improved technology for vegetative propagation of mature elite *Jatropha curcas* is highly desirable. Keeping this in mind, an attempt was made to standardize the technique of its vegetative propagation by stem cutting with varying thickness viz. <1cm, 1-1.5cm and >1.5cm. Juvenile and mature stem cuttings of this plant were tested for their rooting and sprouting ability. Cuttings were treated with different concentrations (50, 100, 200, 400, 600, 800 and 1000 ppm) of auxins (IBA and NAA) along with distilled water (control). IBA and NAA at 100ppm showed the best result compared to other treatments. IBA treatment reponsed better as compared to NAA. Supra optimal level of auxins treatment causing reduction in rooting.

Key words: *Jatropha curcas,* vegetative propagation, stem cutting Indole-3- butyric acid (IBA), α Naphthaline acetic acid (NAA).

INTRODUCTION

Among the non-edible TBOs, the most promising *Jatropha curcas* L. (Euphorbiaceae) has been identified as an alternative source for bio-diesel production, energy security and other eco-economic products. It is being promoted as a bio-fuel crops not only across the nation and globe. (Solanki, 2005). It is adverse resistant hardy perennial, growing in rainfed dry situation under wide range of climatic and edaphic adaptability. It can survive and thrive under hard climatic conditions (Diwaker, 1993; Tewari 1994). It can be grown successfully as an agroforesty crop on wastelands to barren and marginal lands (Heller, 1997). Presently Government of India is focusing for growing *Jatropha* plants on unutilized wastelands throughout the country. It cab be establish from seeds/seedlings and vegetatively from cutting during February-March and can be live up to 50 years. Being cross-pollinated, multiplication to obtain uniform and superior propagules, clonal approach is the only way out. Desired plant species can be propagated vegetatively through branch cutting as it is simple, cheap, and rapid and also ensures preparation of desired characteristics. Growing of higher number of seedlings of CPTs in short period can be achieve through stem cutting with induced rooting by using phytohormone. Hence, the present investigation has conducted to produce genetically identical individuals in short period under agro-climatic condition in North Bihar.

MATERIAL AND METHODS

The experiment was conducted during February to April 2006 under poly-house at Department of Forestry, Rajendra Agricultural University, Pusa, Samastipur, Bihar (25°59'N latitude 85°48' E longitude at altitude of 52.95 m above mean sea level). The climate of the area was typical monsoon type with three seasons viz., rainy (July-October), winter (November-February) and summer (March-June). Long term mean annual rainfall was 1170 mm of which 85% was received during the rainy seasons. Mean monthly temperature ranged

Table 1: Effect of different soaking treatment on thin (<1cm) Jatropha cutting for sprouting and rooting.

Soaking Treatment	Sprouting (%) in days				Rooting in days							
	15	30	45	60	15		30		45		60	
					Rooting (%)	Root length (cm)	Rooting (%)	Root length (cm)	Rooting (%)	Root length (cm)	Rooting (%)	Root length (cm)
IBA												
0	3.5	8.5	18.2	30.2	-	-	5.1	0.30	14.5	2.5	24.1	3.0
50ppm	4.2	10.5	20.1	32.5	-	-	7.5	0.35	15.1	3.0	27.5	3.5
100ppm	5.5	15.1	26.7	40.6	-	-	8.2	0.50	20.2	3.5	32.1	4.5
200ppm	3.8	8.4	17.8	28.7	-	-	4.5	0.35	13.3	2.4	22.2	3.0
400ppm	3.0	7.3	16.2	26.8	-	-	3.1	0.30	12.1	2.0	20.5	2.8
600ppm	2.8	6.4	15.4	25.2	-	-	2.5	0.28	11.5	1.8	19.2	2.6
800ppm	2.5	5.2	14.0	25.0	-	-	2.0	0.25	10.5	1.5	18.4	2.5
1000ppm	1.5	3.1	11.5	22.1	-	-	1.5	0.20	8.2	1.0	15.3	2.0
Mean(x)	3.35	8.06	17.49	28.89	-	-	4.3	0.32	13.18	2.21	22.41	2.99
S.D.	1.06	1.84	2.07	2.32	-	-	1.53	0.29	1.83	0.81	2.25	0.84
C.V.(%)	31.64	22.83	11.84	8.03	-	-	35.58	90.63	13.88	39.27	10.04	28.09
NAA												
O	3.1	7.5	16.1	28.2	-	-	4.3	0.25	14.3	1.4	25.1	3.0
50ppm	3.5	12.5	18.3	32.3	-	-	5.2	0.30	16.4	2.5	26.2	3.5
100ppm	5.2	14.5	22.5	38.4	-	-	6.8	0.40	18.8	3.0	30.4	4.0
200ppm	3.1	7.1	15.5	25.5	-	-	3.1	0.28	11.5	1.5	20.1	2.5
400ppm	2.5	6.5	13.4	23.5	-	-	2.4	0.15	10.1	1.0	18.5	2.0
600ppm	2.2	4.5	12.5	22.2	-	-	1.5	0.05	9.5	0.8	17.1	1.5
800ppm	2.0	4.3	12.2	20.1	-	-	1.5	0.05	8.2	0.5	16.2	1.0
1000ppm	0.8	2.5	8.8	14.5	-	-	1.0	0.00	6.5	0.2	13.8	005
Mean(x)	2.8	7.43	14.91	25.63	-	-	3.26	0.19	11.91	1.36	20.93	2.25
S.D.	1.10	1.97	1.98	2.63	-	-	1.37	0.36	1.99	0.95	2.31	1.07
C.V.(%)	39.29	26.51	13.28	10.26	-	-	42.02	189.47	16.71	69.85	11.04	47.56

Table 2: Effect of different soaking treatment on medium (1-1.5cm) Jatropha cutting for sprouting and rooting.

Soaking Treatment	Sprouting (%) in days				Rooting in days							
	15	30	45	60	15		30		45		60	
					Rooting (%)	Root length (cm)	Rooting (%)	Root length (cm)	Rooting (%)	Root length (cm)	Rooting (%)	Root length (cm)
IBA												
0	8.1	26.2	35.4	56.5	-	-	9.1	0.42	31.5	2.6	42.1	6.0
50ppm	10.2	32.4	38.1	62.4	-	-	11.0	0.55	36.2	3.8	54.5	6.4
100ppm	13.4	45.5	60.2	65.1	-	-	18.2	0.75	55.1	5.2	60.5	7.5
200ppm	8.5	26.8	34.3	45.2	-	-	9.5	0.40	35.3	2.75	52.1	6.2
400ppm	5.1	24.3	30.5	35.3	-	-	8.2	0.30	31.2	1.75	37.1	4.7
600ppm	4.2	20.8	24.2	30.4	-	-	6.5	0.28	28.5	1.50	35.2	4.2
800ppm	3.5	18.2	22.6	28.2	-	-	4.5	0.25	29.1	1.0	32.2	3.5
1000ppm	2.4	16.7	12.7	23.1	-	-	3.5	0.12	23.3	0.75	27.3	1.25
Mean(x)	6.93	26.36	35.25	43.28	-	-	8.81	0.38	95.76	2.42	42.59	4.97
S.D.	1.88	2.94	3.62	3.92	-	-	2.07	0.43	43.13	1.19	3.32	1.36
C.V.(%)	27.13	11.15	11.22	9.06	-	-	23.50	113.16	13.70	49.17	7.80	27.36
NAA												
O	10.2	28.5	35.2	50.1	-	-	9.2	0.4	35.4	1.8	13.2	5.0
50ppm	11.5	28.2	40.1	48.2	-	-	10.1	0.36	38.2	2.5	47.5	5.5
100ppm	12.1	30.1	45.2	53.3	-	-	11.2	0.6	42.1	3.5	54.0	6.5
200ppm	6.4	20.8	28.4	38.2	-	-	7.5	0.35	28.2	1.75	35.6	4.8
400ppm	4.5	15.4	22.5	27.1	-	-	5.4	0.2	25.5	1.25	30.0	3.5
600ppm	3.5	13.4	18.8	25.2	-	-	4.5	0.18	22.6	1.0	28.5	2.4
800ppm	3.2	12.5	16.6	22.8	-	-	3.5	0.12	20.6	0.75	25.2	2.2
1000ppm	1.0	6.6	10.2	16.9	-	-	2.4	0.04	18.7	0.5	22.4	0.5
Mean(x)	6.55	19.44	27.13	35.1	-	-	6.73	0.28	28.91	1.63	35.84	3.8
S.D.	1.98	2.87	3.38	3.60	-	-	1.74	0.41	2.85	0.96	3.25	1.37
C.V.(%)	30.23	14.76	12.46	10.26	-	-	25.85	146.43	9.86	58.90	9.07	36.05

Table 3: Effect of different soaking treatment on thick (>1.5cm) Jatropha cutting for sprouting and rooting.

Soaking Treatment	Sprouting (%) in days				Rooting in days							
	15	30	45	60	15		30		45		60	
					Rooting (%)	Root length (cm)	Rooting (%)	Root length (cm)	Rooting (%)	Root length (cm)	Rooting (%)	Root length (cm)
IBA												
0	10.2	30.6	40.2	60.5	-	-	10.2	0.52	35.1	3.5	45.6	7.0
50ppm	12.5	35.1	42.1	65.1	-	-	12.4	0.62	38.9	4.2	48.2	7.5
100ppm	15.3	50.5	75.4	90.2	-	-	20.5	0.84	62.2	7.4	705	10.1
200ppm	9.4	32.3	40.3	50.4	-	-	11.4	0.55	36.5	3.1	45.7	7.0
400ppm	5.1	25.6	30.4	35.3	-	-	9.3	0.35	32.4	2.5	40.2	5.0
600ppm	4.8	22.1	26.5	31.5	-	-	6.4	0.30	30.9	1.95	36.8	4.7
800ppm	4.3	20.2	25.2	30.5	-	-	5.1	0.25	30.3	1.5	35.1	4.0
1000ppm	2.4	18.5	15.1	25.4	-	-	4.3	0.15	25.2	0.5	30.2	1.5
Mean(x)	8	29.35	36.94	48.61	-	-	9.95	0.45	36.44	3.08	44.04	5.85
S.D.	2.06	3.12	4.11	4.51	-	-	2.20	0.46	3.24	1.40	3.39	1.56
C.V.(%)	25.75	10.63	11.13	9.40	-	-	22.11	102.22	8.89	45.45	7.70	26.67
NAA												
O	8.4	25.1	35.2	50.3	-	-	8.5	0.42	32.1	2.4	42.5	6.0
50ppm	11.5	28.2	38.5	53.2	-	-	12.4	0.53	37.4	3.5	45.4	6.5
100ppm	13.6	35.3	50.6	66.6	-	-	18.1	0.70	55.6	5.1	60.5	8.5
200ppm	8.4	30.1	38.2	45.4	-	-	10.4	0.45	34.2	2.3	40.3	6.4
400ppm	4.3	24.5	28.1	34.5	-	-	8.8	0.25	30.2	1.5	36.2	4.5
600ppm	3.9	22.2	24.5	29.4	-	-	6.5	0.2	9.11	20.3	2.5	3.8
800ppm	3.5	18.2	23.3	27.8	-	-	4.3	0.15	28.1	0.75	30.1	3.1
1000ppm	1.5	15.5	14.1	23.5	-	-	2.5	0.05	34.1	0.43	26.2	1.0
Mean(x)	6.89	24.89	3156	14.34	-	-	8.94	0.34	33.85	2.15	39.21	4.98
S.D.	2.00	2.45	3.26	3.74	-	-	2.14	0.45	3.01	1.20	3.17	1.48
C.V.(%)	29.03	9.84	10.33	9.05	-	-	23.94	132.35	8.89	55.81	8.08	29.72

between 2.9°C (in January) and 36.8°C (in June). Branch cutting having length 20-25cm of eight year old CPTs of provenance R.A.U Pusa with varying thickness viz. <1/cm, 1-15cm and >1.5cm were taken end leaves were removed. The top cut ends were sealed with molten wax to reduce the water loss. The experiment was conducted in completely randomized block design (8 IBA×8NAA×3 replication ×10 cutting each replicate = 1920 cutting). Stem cutting were treated with different concentration of IBA and NAA solution at 50, 100, 200, 400, 600, 800 and 1000 ppm for twenty-four hours by dippings 5cm basal portion in the solution.

The treated cuttings were planted in ordinary nursery bed having sand and FYM mixture (1:1). The observations were recorded for sprouting (%), rooting (%) and root length (cm) at 15, 30, 45 and 60 days. The cutting were irrigated twice a day regularly to avoid desiccation and treated with Bavistin (0.2%) solution at every fortnightly interval to avoid fungal infection.

RESULTS AND DISCUSSION

Perusal of table 1, 2 and 3 revealed the induced response of different in respect to sprouting (%), rooting (%) and root length. Generally, sprouting was initiated after 15 days while rooting after 30 days of treatments. Best rooting observed at 60 days of treatment in thick stem cutting (>1.5cm diameter) at 100 ppm of IBA and NAA treatment compare to other treatments. Contrary to present experimental finding Dhillon *et al.* (2006). Observed maximum induced rooting at 2000ppm IBA and 1500ppm NAA treatments for 16 hours only. The IBA treatment showed better response compare to NAA. Similar result were reported in *Jatropha curcas* by Narin and Watna (1983). Parhiban *et al*.(1999). Supra optimal level of auxins concentration treatment causing reduction in rooting. Similar result were found by Nanda *et al.* (1968). Present investigation suggested optimum thickness (>1.5cm diameter) of Jatropha stem cutting and 100ppm IBA and NAA treatment for24 hours soaking may be exploited for quick vegetative propagation under North Bihar agro-climatic condition.

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