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PROPAGATION OF *CAPPARIS DECIDUA* THROUGH CUTTINGS

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Introduction

Capparis decidua (Forsk.) Edgew. (Syn. *C. aphylla* Roth) locally known as 'ker', 'kareer', 'teent' or 'dhalu' is an economically and ecologically important fruit plant of hot arid regions of the world. It finds uses as medicine, food and fuel. Pickle of caper fruits (berries) is a popular culinary art. Despite its immense value, systematic cultivation of this crop for sustainable and profitable production has not been taken up till now. This is due to the fact that appropriate propagation techniques are lacking to produce true to type plants. Earlier attempts to propagate this species through vegetative means yielded very low rate of success (Vashishtha, 1987; Meghwal and Vashishtha, 1998; Shekhawat, 1994). The poor rooting of cuttings was considered as major constraint for multiplication of this valuable species. Keeping in view its socio-economic importance, an attempt was made to standardize the vegetative propagation of this plant. Accordingly, study was undertaken on vegetative propagation of ker.

Material and Methods

Two experiments were laid out to evaluate the effect of type, time of taking cutting and application of plant growth regulators (PGRs), using cuttings from natural population of plants at Central Institute for Arid Horticulture (CIAH), Bikaner from September 2001 to December 2002. Experiments were conducted both in Nursery shade Net House and under controlled conditions in Growth Chamber.

Experiment I – Standardization of nature of cuttings : A pot experiment was conducted in growth chamber and nursery shade net house at CIAH, Bikaner during September 2001. The growth chamber was maintained at 33°C with 70-80 % RH. Three types of cuttings were used in the experiment *viz.* softwood, semi-hard wood and hardwood. The diameter of wood, semi-hard wood and hardwood cuttings was 0.40-0.60 cm, 0.95-1.25 cm and 1.20-1.30 cm, respectively. All the cuttings were treated with IBA (5000 ppm) Thymine (1000 ppm) before planting. The concentration of IBA was selected based on earlier studies (Shekhawat, 1994). Ten cuttings were planted in each treatment and each treatment was replicated thrice. The CRD design was adopted in the experiment. Observations on per cent sprouting and rooting were recorded.

Experiment II – Standardization of time and optimum concentration of PGRs : The experiment was conducted using only semi-hardwood cuttings. The cuttings were collected from natural population growing adjoining the CIAH campus. These cuttings were given the quick dip treatment with IBA (5000, 7500 and 10,000 ppm) along

with 1000 ppm Thymine. For infiltration of IBA, two dipping media viz., aqueous and organic solvent [Dimethyl Sulphoxide (DMSO)] were used. In addition to above, a combination of IBA and NAA was also applied. The details of the treatments are given in Table 2. For each treatment, a total of 30 cuttings were planted in polythene tubes filled with sand + soil mixture and observation of per cent sprouting and final survival was recorded. The experiment was conducted in nursery shade net house.

The experiment was repeated at monthly interval starting from January 2002 to December 2002 to assess the optimum time of taking cuttings and optimum concentration of PGRs to be used for maximum sprouting and establishment. Observation for sprouting and rooting was recorded up to three months after planting of cuttings. The experiment was laid out in factorial in Completely Randomized Design and data were analysed after angular (arc sin) transformation using windostat software (version 6.1).

Results and Discussion

Experiment I : Data presented (Table 1) revealed that off three types of cuttings planted, only semi-hardwood cuttings showed sprouting under both conditions viz., growth chamber and nursery shade net house (40 and 30%, respectively). The sprouts produced in growth chamber failed to produce roots, whereas in nursery shade net house, 20 per cent cuttings produced roots.

Similar results have also been presented in earlier studies of Vashishtha (1987) who reported that in *C. decidua* semi-hardwood cuttings gave better response. However, the semi-hardwood cuttings have shown better response to IBA application in citrus (Gangwar and Singh, 1968) and in custard apple (Bankar, 1989). The reason for not getting success in sprouting and rooting of softwood and hardwood cuttings may be attributed to the immaturity and very hard tissues, respectively at the base of the cuttings.

Experiment II : Perusal of data (Tables 2 and 3) revealed that under shade net house conditions, the cuttings of *C. decidua* are hard to sprout and root. The cuttings sprouted and produced roots only when treatment with PGRs was applied. The month-wise study further revealed that January, March and August - November is the best time to take cuttings for the vegetative propagation of *C. decidua*.

Table 1

Effect of nature of cutting on sprouting and rooting of C. decidua

Type of cutting	Per cent sprouting		Per cent rooting	
	Growth chamber	Nursery shade net house	Growth chamber	Nursery shade net house
Softwood	0	0	0	0
Semi-hardwood	40	30	0	20
Hardwood	0	0	0	0

Table 2

Effect of different plant growth regulators on per cent sprouting of Capparis decidua

Treatment	Per cent Sprouting												
	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	0 (4.06)	0 (4.06)	10 (16.35)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0.83 (5.08)
IBA (5000 ppm) + 1000 ppm thymine (Aqueous)	10 (16.35)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	10 (16.35)	0 (4.06)	10 (16.35)	2.50 (7.13)
IBA (7500 ppm) + 1000 ppm thymine (Aqueous)	0 (4.06)	20 (4.06)	0 (26.07)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	20 (26.07)	10 (16.35)	0 (4.06)	4.17 (8.75)
IBA (10000 ppm) + 1000 ppm thymine (Aqueous)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	10 (16.35)	10 (16.35)	1.67 (6.11)
IBA+NAA (7500 ppm) + 1000 ppm thymine (Aqueous)	10 (16.35)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	10 (16.35)	0 (4.06)	1.67 (6.11)
IBA+NAA (10000 ppm) +1000 ppm thymine (Aqueous)	0 (4.06)	0 (4.06)	10 (16.35)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0.83 (5.08)
IBA (5000 ppm)+ 1000 ppm thymine (DMSO)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	10 (16.35)	0 (4.06)	0.83 (5.08)

Contd...

1	2	3	4	5	6	7	8	9	10	11	12	13	14
IBA (7500 ppm) + 1000 ppm thymine (DMSO)	20 (26.07)	10 (16.35)	30 (26.00)	0 (4.06)	0 (4.06)	0 (4.06)	10 (16.35)	30 (26.00)	40 (39.148)	30 (26.00)	20 (26.07)	10 (16.35)	16.67 (20.96)
IBA (10000 ppm) + 1000 ppm thymine (DMSO)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0.00 (4.06)
IBA+NAA (7500 ppm) + 1000 ppm thymine (DMSO)	10 (16.35)	0 (4.06)	10 (16.35)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	10 (16.35)	0 (4.06)	10 (16.35)	3.33 (8.15)
IBA+NAA (10000 ppm) + 1000 ppm thymine (DMSO)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0.00 (4.06)
Mean	4.55 (9.41)	0.90 (5.17)	7.27 (12.04)	0.00 (4.06)	0.00 (4.06)	0.00 (4.06)	0.90 (5.17)	2.73 (6.69)	3.64 (7.25)	6.36 (10.92)	5.45 (10.53)	3.64 (8.53)	

	PGR	Month	PGR x Month
SEm±	1.31	0.90	2.99
CD at 5%	2.73	1.78	5.89

(Data in parentheses are arc sin transformed values)

Table 3

Effect of different plant growth regulators on per cent Rooting of Capparis decidua

Treatment	Per cent Sprouting												
	Jan.	Feb.	March	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Mean
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Control	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0.00 (4.06)
IBA (5000 ppm) + 1000 ppm thymine (Aqueous)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	10 (16.35)	0 (4.06)	10 (16.35)	1.67 (6.16)
IBA (7500 ppm) + 1000 ppm thymine (Aqueous)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	20 (26.07)	10 (16.35)	0 (4.06)	2.50 (7.13)
IBA (10000 ppm) + 1000 ppm thymine (Aqueous)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0.00 (4.06)
IBA+NAA (7500 ppm) + 1000 ppm thymine (Aqueous)	10 (16.35)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0.83 (5.08)
IBA+NAA (10000 ppm) +1000 ppm thymine (Aqueous)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0.00 (4.06)
IBA (5000 ppm)+ 1000 ppm thymine (DMSO)	0 (4.06)	0 (4.06)	0 (4 06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	10 (16.35)	0 (4.06)	0.83 (5.08)

Contd...

1	2	3	4	5	6	7	8	9	10	11	12	13	14
IBA (7500 ppm) + 1000 ppm thymine (DMSO)	20 (26.07)	0 (4.06)	10 (16.35)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	20 (26.07)	40 (39.15)	30 (26.00)	20 (26.07)	10 (16.35)	12.50 (16.95)
IBA (10000 ppm) + 1000 ppm thymine (DMSO)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0.00 (4.06)
IBA+NAA (7500 ppm) +1000 ppm thymine (DMSO)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0.00 (4.06)
IBA+NAA (10000 ppm) +1000 ppm thymine (DMSO)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0 (4.06)	0.00 (4.06)
Mean	2.73 (7.17)	0.00 (4.06)	0.91 (5.17)	0.00 (4.06)	0.00 (4.06)	0.00 (4.06)	0.00 (4.06)	1.82 (6.06)	3.64 (7.25)	5.45 (9.81)	3.64 (8.29)	1.82 (6.29)	

	PGR	Month	PGR x Month
SEm±	0.85	0.55	1.82
CD at 5%	1.76	1.08	3.58

(Data in parentheses are arc sin transformed values)

The seasonal variation in rooting of cuttings has been documented (Singh, 1959; Singh *et al.*, 1960; Singh, 1963). It has been shown that in sweet lime, late summer season gave good response (Singh *et al.*, 1960). In ker, Vashishtha (1987) suggested that August-September is the appropriate time to take cuttings under Jodhpur conditions. In a later study Meghwal and Vashishtha (1998) again reported that July-August is the appropriate period for taking the cuttings. The results of present investigation are in line with those reported earlier except that under Bikaner conditions the optimum time for taking the cutting is September-October. This may be due to the enough atmospheric humidity (45%) and congenial temperature (32.5 and 19°C; Maximum and Minimum, respectively) prevailing during these months, which not only prepare plants for vegetative growth but also prevents the drying of the cuttings in nursery.

Perusal of data presented in Tables 2 and 3 reveals that the semi-hardwood cuttings failed to sprout and produced roots where PGR treatment is not given (control) in all months. However, when the cuttings were given dip treatment in solution of IBA and Thymine showed some response. It is evident from Tables 2 and 3 that lower concentration of IBA (upto 5000 ppm) gave low response towards sprouting and rooting. However, application of 7500 ppm IBA along with 1000 ppm Thymine gave the better response, with nearly 40 % sprouting and rooting during September.

Among various growth promoting substances, IBA has gained more popularity for vegetative propagation through cuttings bec e of its ability to produce roots, chemical stability and low mortality in plants (Soni, 1970). Thereby, majority of studies done earlier have employed either IBA or NAA to induce rooting in cuttings. It has been demonstrated that phalsa cuttings can produce rooting when treated with 1000 ppm IBA solution, as against no rooting in untreated cuttings (Jauhari, 1960). Enhanced rooting by application of IBA in cuttings has also been shown by Misra and Jauhari (1970).

Further, it has been demonstrated that concentration of IBA varies with species for promoting rooting. It has been shown that phalsa cutting can produce roots with 100 ppm IBA whereas custard apple require 2500 ppm IBA (Bankar, 1989). In *C. decidua*, Vashistha (1987) reported best response with 1000 ppm IBA, whereas Shekhawat (1994) claimed the best response under 5000 ppm IBA. Our results are in line as reported earlier and demonstrate that 7500 IBA along with 1000 ppm Thymine gave the best response.

While comparing the medium of PGR solution, it was observed that when cuttings were treated with 7500 ppm IBA + 1000 ppm Thymine in DMSO, they gave better response. That organic medium helps in producing better response has been documented by Felker and Clark (1981) and Klass *et al.* (1987) in *Prosopis* spp. This may be on account of faster infiltration of PGRs in cuttings with DMSO medium as compared to aqueous medium.

Thus, from the foregoing account it may be concluded that for the vegetative propagation of *C. decidua*, the most preferred material is semi-hardwood. The best months for taking the cutting are

September-November and a treatment with 7500 ppm IBA along with 1000 ppm Thymine in DMSO produced promising results.

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SUMMARY

The investigation was conducted at CIAH, Bikaner to standardize the type, time of taking cuttings and effect of plant growth regulators on propagation behaviour of ker (*C. decidua*). Out of three types (hardwood, semi-hardwood and softwood) only semi-hardwood cuttings showed sprouting (40%) and rooting (20%). In round the year study, at monthly, interval to evaluate the effect of IBA and/or NAA, it was observed that January, March and August to November are the suitable months for taking cuttings and IBA (7500 ppm) + Thymine (1000 ppm), prepared in DMSO medium, was found to be the optimum concentration.

कैपिरस डेसिडुआ का कलम द्वारा प्रवर्धन

आर० भार्गव, पीयूष वर्मा, पी०एल० सरोज व एन० चौहान

सारांश

केन्द्रीय शुष्क बागवानी संस्थान, बीकानेर में कैर (*कैपेरिस डेसिडुआ*) की कलम का प्रकार, कलम लेने का समय एवं उन पर पादप वृद्धि नियामकों के प्रभावों का मानकीकरण करने हेतु अध्ययन किया गया। तीन प्रकार (हार्डवुड, सेमी-हार्डवुड व सोफ्टवुड) की कलमों में से केवल सेमी-हार्डवुड कलमों में ही स्फुटन (40 प्रतिशत) व जडें (20 प्रतिशत) पाई गई। आई.बी.ए तथा/अथवा एन.ए.ए. के प्रभाव का मूल्यांकन करने हेतु वर्ष पर्यन्त अध्ययन में, जो कि मासिक अन्तराल पर किया गया था, जनवरी, मार्च एवं अगस्त से नवम्बर माह तक का समय कलम लेने हेतु उपयुक्त पाया गया और पादप वृद्धि नियामको के उपचारों में से अनुकूलतम सांद्रता 7500 पीपीएम आई.बी.ए. + 1000 पीपीएम थायमीन जो कि डीएमएसओ में बनाया गया था, पाई गई।

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