research article | International Journal of Plant Sciences, (July, 2010) Vol. 5 Issue 2 : 459-462

Proliferation, rooting and acclimatization of micropropagated papaya cv. RED LADY

J.R. PATEL, R.M. PATEL, R.R. SHAH AND K.A. SHINDE

Accepted : February, 2010

SUMMARY

This study describes a protocol for rapid and large scale *in vitro* propagation of the valuable C*arica Papaya* cv. RED LADY. Culture conditions influencing shoot proliferation, rooting and acclimatization were examined. The *in vitro* shoot proliferation studied by different PGR concentration with different level of light intensity. In that Murashige and Skoog medium with 0.1 mg/l NAA and 1.0 mg/l Kinetin in 3000 Lux light intensity get maximum rate of proliferation. The *in vitro* rooting observed with different level of IBA and MS medium. Rooting treatment consisting of half MS medium supplemented with 1.0 mg/l IBA was found to be the best for early induction of roots (28 days), maximum number of root/shoot and length of root also. For acclimation 5 medium were studied. In that 70 per cent survival of plantlets in Potting mixture containing soil: sand: FYM (1/1/1:: V/V/V) was found to be suitable for hardening *in vitro* raised papaya plantlets.

Key words : Papaya, Proliferation, Rooting, Acclimatizaon

There is tremendous scope of developing fruit industry in India. The Papaya (*Carica papaya* L.) belongs to family Caricaceae. The edible fruit are available with Carica genus (Muthukrishnan and Irulappan, 1990). Papaya is a native of Tropical of North and South America (Litz, 1984).

Papaya is one the principal fruits crops of tropical and subtropical areas of the world. In India, production of papaya in the year 2005-06 was 23, 17, 200 tones obtained from an area of occupying 73,100 ha, having the productivity of 31.7 tones/ha. While Gujarat produced 3,23,000 tones papaya from an area of occupying 7,700 ha having the productivity of 41.8 tones/ha, which ranked second in the production in India. Normally, papaya (Red-Lady) is propagated through seed. No male plant hence all produced fruits. Weight about 1.5-2.0 kg. Flesh is thick, red with 13% sugars content, delicious taste and excellent aroma. It is a cross-pollinated crop, the plant raised from seeds have a mixed inheritance which make them highly variable in performance. The improvement of papaya is hindered by its heterozygosity, dioecious habit and susceptibility to diseases. Although, desirable characteristics of var. Red Lady, the growers are not able to adopt this variety due to vary high cost of seed. The importance of these problems is evident the lack of true-to-type cultivars at present. Clonal propagation is an urgent necessity for improvement of papaya. Similarly, in spite of careful realization of treatments against pest and diseases, bacterial and virus infections can not be prevented totally. The answer of these problems is expected through plant tissue culture techniques (Micro propagation).

Papaya is one of the few fruiting plants of commercial value to be propagated *in vitro* tissue culture. Various attempts have been made to propagate papaya *in vitro* through callus regeneration (Yie and Liaw, 1977), somatic embryogenesis (Litz and Conover, 1982) and shoot proliferation (Rajeevan and Pandey, 1983). Research work on different aspects of papaya tissue culture has been reviewed by Litz (1984).

MATERIALS AND METHODS

The present investigation on "Micropropagation in papaya var. Red Lady" was carried out at Biotechnology and Plant Tissue Culture Laboratory, ASPEE College of Horticulture and Forestry, Navsari Agricultural University, Navsari. Shoot tip were collected from 4-6 weeks old papaya seedling var. RED LADY. Shoot tip were washed in running tap water. Surface sterilized in mercuric chloride with 0.1 % in 3 minutes then rinsed three times in sterilize distilled water. Shoot tip established in MS medium with 0.5 mg/l BAP + 0.1 mg/l NAA and multiplication in alternate subculture on basal medium and best of establishment medium.

While standardizing the method of micropropagation

Correspondence to:
K.A. SHINDE, ASPEE College of Horticulture and Forestry, Navsari Agriculturlal University, NAVSARI (GUJARAT) INDIA
Authors' affiliations:
J.R. PATEL, R.M. PATEL AND R.R. SHAH, ASPEE College of Horticulture and Forestry, Navsari Agriculturlal University, NAVSARI (GUJARAT)

in papaya, the factors influencing *in vitro* proliferation, rooting and acclimatization of papaya, different factors were studied *i.e.* for proliferation concentration of PGR with different light intensity, for rooting different concentration of MS medium (Full, ½, ¼) with different level of IBA level tested,

In vitro raised rooted plantlets were taken out from the culture vessels. The nutrient medium was gently removed and washed thoroughly in tap water ensuring that all agar particles were completely removed without damaging the roots. The rooted plantlets were then, dipped in 0.05 per cent bavistin, (carbendazim 50 per cent WP). For acclimatization different medium were examined. They were covered with glass baker continuously for 6-7 days and kept in air conditioned room. The cover was gradually removed after 7 days, initially for 3 hours followed by 6 hours and 12 hours in next 3 days. The cover was removed during night and lights put-off for next 3-4 days. Subsequently, the period of keeping the plantlets without any cover was gradually increased and after 15 days they were brought outside the room in shade. Within next 15 days by gradually exposing them to sun, they were acclimatized to natural environment. The plantlets were successfully transplanted to soil in the field.

RESULTS AND DISCUSSION

In the present investigation it was observed that medium formulation displayed a strong effect on the growth of shoot like length of shoot, length of internodes. After multiplication shoots were placed for proliferation in different medium.

The data on proliferation response to different level of BAP, Kinetin and NAA supplemented in MS medium in combination of different light intensity are presented in Table 1. It was noticed that maximum proliferation (67 %), length of internodes (0.60 cm), length of shoot was (2.20 cm) was recorded in treatment MS medium + 1.0 mg/l Kinetin + 0.1 mg/l NAA at 3000 Lux light intensity. Similar result have been reported by Suthamathi *et al.*, 2002; Reuveni *et al*., 2004.

Shoot obtained from culture proliferation were used for rooting studies. Out of nine treatments, half strength

Table 1: Effect of BAP, KN, and NAA in MS medium with different light intensity on shoot proliferation of papaya var. RED LADY

Plant growth regulator			Light intensity	Proliferation	Length of internodes	Length of
NAA (mg/l)	BAP (mg/l)	KN (mg/l)	(Lux)	(%)	per shoot (cm)	shoot (cm)
0.1	--	--	1000	0.00 (1.28)	0.00	0.00
0.1	--	--	2000	0.00 (1.28)	0.00	0.00
0.1	--	--	3000	0.00 (1.28)	0.00	0.00
0.1	0.5	--	1000	40.83 (39.72)	0.25	1.20
0.1	0.5	--	2000	44.67 (41.94)	0.45	1.60
0.1	0.5	--	3000	62.00 (51.96)	0.51	1.70
0.1	1.0	--	1000	46.00 (42.70)	0.41	1.20
0.1	1.0	--	2000	45.00 (42.13)	0.54	1.50
0.1	1.0	--	3000	49.00 (44.43)	0.55	1.90
0.1	2.0	--	1000	30.00 (33.21)	0.33	1.20
0.1	2.0	--	2000	57.00 (49.03)	0.34	0.80
0.1	2.0	--	3000	52.00 (46.15)	0.38	1.80
0.1	--	0.5	1000	36.00 (36.87)	0.30	0.70
0.1	--	0.5	2000	38.00 (38.05)	0.39	1.20
0.1	--	0.5	3000	44.00 (41.55)	0.48	0.90
0.1	--	1.0	1000	38.00 (38.05)	0.35	1.40
0.1	--	1.0	2000	59.00 (50.19)	0.55	1.80
0.1	--	1.0	3000	67.00 (54.95)	0.60	2.20
0.1	--	2.0	1000	45.00 (42.13)	0.20	0.90
0.1	--	2.0	2000	52.00 (46.15)	0.34	1.00
0.1	--	2.0	3000	59.00 (50.19)	0.32	1.20
S.E. ±				0.68	0.01	0.03
C.D. (P=0.05)				1.94	0.32	0.11
CV %				3.12	5.60	5.48

Figure in paratheses are arc sine transformed value.

Table 2 : Effect of IBA and strength of medium on induction of rooting of papaya var. RED LADY Incubation: 6 weeks

Treatment No.	Rooting (%)	Days taken for root initiation	Length of root (cm)	No. of root / shoot	Length of shoot (cm)
MS ¼ + 0.5 mg/l IBA	0.00 (1.28)	---	0.00	0.00	0.00
MS ¼ + 1.0 mg/l IBA	65.00 (53.73)	31.67	2.00	2.00	2.50
MS ¼ + 2.0 mg/l IBA	69.00 (56.17)	36.00	0.50	2.00	1.97
MS ½ + 0.5 mg/l IBA	0.00 (1.28)	---	0.00	0.00	0.00
MS ½ + 1.0 mg/l IBA	78.00 (62.03)	28.00	6.00	5.00	4.50
MS ½ + 2.0 mg/l IBA	70.00 (56.79)	32.67	2.00	4.00	0.97
MS + 0.5 mg/l IBA	0.00 (1.28)	---	0.00	0.00	0.00
MS + 1.0 mg/l IBA	60.00 (50.77)	35.33	4.50	3.00	3.23
MS + 2.0 mg/l IBA	50.33 (45.19)	37.33	3.00	2.00	2.23
S.E. ±	0.57	1.63	0.05	0.05	0.04
C.D. (P=0.05)	1.70	4.86	0.16	0.16	0.13
CV %	2.73	12.69	4.71	4.71	4.50

Figure in paratheses are arc sine transformed value.

MS medium supplemented with 1.0 mg/l IBA was found to be the most effective (Table 2) (Fig. 1) (Plate 1) for minimum days taken for root induction (28), maximum length of root (6 cm), length of shoot (4.5 cm) and number of root/shoot (5). The present finding is supported by those of Suthamathi *et al.* (2002); Beniwal *et al.* (2006); in papaya.

The survival rate of plantlet was significantly influenced by potting mixture (Table 3). The maximum

Plate 1 : Papaya on ½ MS+0.1 mg/l

Table 3 : Effect of different potting mixtures on hardening of papaya var. RED LADY

Potting mixture	Survival of plantlets (%)	Days taken for establishment	Length of shoot (cm)
Vermiculite	63.00 (52.44)	9.75	7.60
Cocopeat	49.00 (44.43)	13.00	7.00
FYM: Soil: Sand (1:1:1 :: V/V/V)	70.00 (56.80)	8.00	8.30
Sand	20.00 (26.54)	16.00	6.80
Perlite	45.00 (42.14)	11.00	6.50
S.E. ±	0.84	1.01	0.14
C.D. (P=0.05)	2.55	0.33	0.45
CV %	3.82	5.81	4.13

Figure in paratheses are arc sine transformed value.

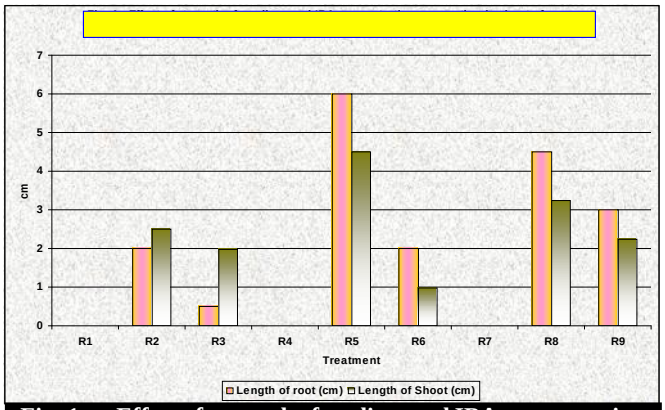

Fig. 1 : Effect of strength of medium and IBA concentration on rooting in shoot of papaya cv. RED LADY

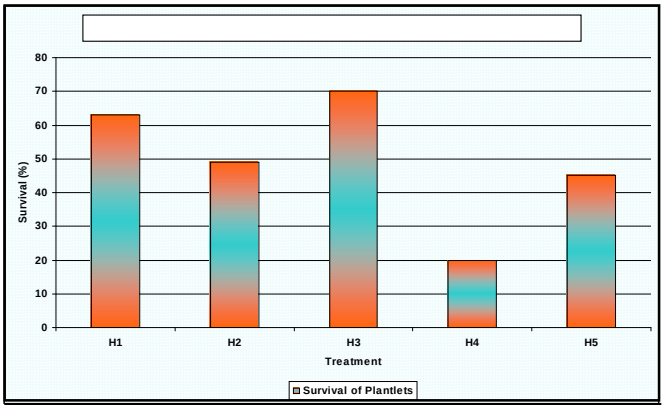

Fig. 2 : Effect of different potting mixtures on survival of plantlets of of papaya cv. RED LADY

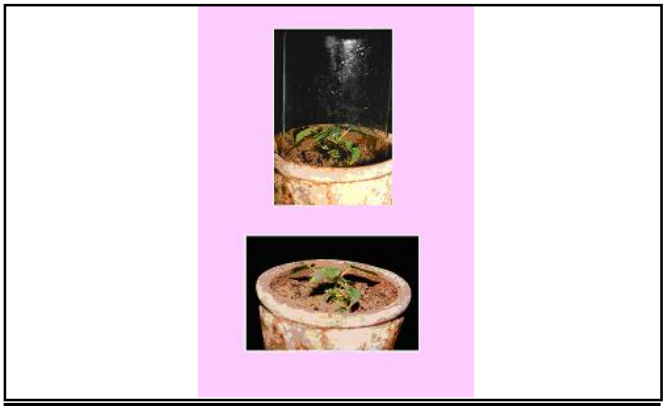

Plate 2 : Acclimatization of plantlet papaya

survival per cent (70 %), length of shoot (8.30 cm) of plantlet was observed in treatment H_3 (FYM: soil: sand V/V/V). Minimum days (8days) taken for establishment and sprouting was observed in H_3 (8.00 days) treatment (Plate 2) (Fig. 2). These observations are supported by various earlier workers Dinesh Babu *et al.*, 2000; Suthamathi *et al.*, 2002.

REFERENCES

Beniwal, V. S., Sehrawat, S. K., Dahiya, D. S. Benival, L. S. and Singh, S. (2006). Effect of season on *in vitro* regeneration of papaya. *Haryana J. Hort. Sci*., **53** (1 & 2): 35-37.

Dinesh Babu, Sathiamoorthy and Chezhiyan (2000). Rooting *In vitro*and hardening of papaya (*Carica papaya* L.) plantelets. *South Indian J. Hort.*, **48**(1-6): 23-25.

Litz, R.E. and Conover, R.A. (1982). *In vitro* somatic embryogenesis and plant regeneration from *Carica papaya* L. ovular callus. *Plant Sci. Letters*, **26**: 153-158.

Litz, R.E. (1984). Papaya. In: Handbook of Plant Cell Culture (Sharp, W. R., Evans, D. A., Ammirato, P. V. and Yamada, Y. Eds.) Macmillon Publishing Co., New York, pp. 349-368.

Muthukrishnan, C.R. and Irrulappan, I. (1990). Papaya. In:Fruits: Tropical and Subtropical (Bose, T.K. and Mitra, S.K. Eds), Naya Prakash Calcutta, pp. 304-355.

Rajeevan, M.S. and Pandey, R.M. (1983). Propagation of papaya through tissue culture. *Acta Hort*., **131**: 131-139.

Reuveni, O., Shlesinger, D.R. and Lavi, U. (2004). *In vitro*clonal propagation of dioecious *Carica papaya*. *Pl. Cell Tissue Organ Cult*., **20**(1): 41-46.

Suthamathi, S. J., Haripya, K. and Kamalakannan, S. (2002). Micropropagation cv. CO-5. *Indian J. Hort.*, **59** (1): 13-16.

Yie, S. and Liaw, S.I. (1977). Plant regeneration from shoot tips and callus of papaya. *In vitro*, **13** : 564-567.

****
*****