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STANDARDIZATION OF TEMPERATURE AND MEDIA FOR GERMINATION OF PAPAYA (*CARICA PAPAYA* L.) CV. SURYA

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Abstract

A study was carried out to know the optimum fruit maturity stages, ideal temperature and media, dormancy breaking methods on seed quality parameters of papaya (*Carica papaya* L.) cv. Surya. Seeds extracted from fruits harvested at 1/4th, 1/2, 3/4th and Complete yellow/orange and after ripening were subjected to germination after removal of sarcotesta at different temperature (20, 25, 30, 35**,** 20-30, 20-35 and 25-35°C) and at different media (BP, TP, Sand and Coir pith). The results revealed that seeds extracted from freshly harvested complete yellow/orange and 1/4th yellow/orange fruits subjected to after ripening recorded higher germination (52.50 and 94.00%), TDH activity (1.249 and 1.204), lower EC (0.101 and 0.131) and higher field emergence (48.0 and 72.00%) respectively. 25-35°C alternate temperature, Sand and BP media recorded higher germination (89.00, 85.70 and 81.20%), speed of germination (48.56, 32.16 and 27.52) respectively.

***Key words*:** papaya, germination, TDH activity, Temperature, different media

Introduction

Due to its striking nutritional and medicinal values, papaya fruit has occupied a unique place in the diet of people. It is a wholesome fruit having more carotene compared to other fruits such as apples, guavas, plantain, etc. It is one of the richest sources of vitamin A. It also contains vitamin C in appreciable quantity besides being high in sugars and pectins. The raw fruits are used for the treatment of gastric ulcers and other related stomach ailments. A ripen papaya fruit is delicious, nutritive, digestive and wholesome for people of all ages and hence papaya tree finds a place in almost every backyard. All these aspects have made papaya an ideal dessert fruit.

Propagation by seed is the universally followed method of multiplication in papaya. Though this m-ethod does not safeguard the purity of the progeny, it is inevitable because of the absence of any commercially feasible vegetative propagation technique. With the commercialization of papaya cultivation, the demand for quality seeds of well established varieties has increased. Few attempts have been made in the past to develop effective methods of producing quality seeds and maintain their viability.

Material and Methods

The fresh seed is extracted from matured papaya fruits which had high initial moisture content were dried to safe moisture content of 8% by spreading on open air trays. The germination test was carried out in double chamber seed germinator. For alternate temperature, the lower temperature was maintained for 16 hours and higher temperature for 8 hours on each day. The germination paper was used for the test as per ISTA specification. The paper being used in the study was porous and free from toxic chemicals and water soluble dyes. For seed germination, the rolled towel method was used. The rolled towels were placed in slant position in the germinator maintained in the required temperature levels.

The germination test was conducted for seeds by employing "Between Paper" method. The germination counts were taken every day until the completion of germination. The cumulative germination was calculated on the basis of number of seedlings germinated on each day. Besides, the fresh ungerminated, abnormal and chaffy seeds were also identified and expressed in percentage to reveal the occurance of dormancy.

Seed recovery (%)

The seed recovery (%) was calculated based on the quantity of seeds obtained with fruit of net plot area. Seeds were dried to seven to eight per cent moisture content and seed recovery was calculated.

Total dehydrogenase activity (A480)

Tz vigor test of different vigour levels was determined by estimating the total dehydrogenase activity. Ten seeds are selected randomly and preconditioned by imbibing the seeds for 24hours.After the removal of seed coat, the embryos were soaked in 0.5 per cent 2,3,5-triphenyl tetrazolium chloride (TTC) solution in a test tube and incubated at 25°C ± 1°C in dark for 16 hours. Then they were washed thoroughly with distilled water, the red coloured formazan from stained embryos was extracted, by soaking the stained embryos with 5ml of 2- methoxy ethanol for 8 hours in an airtight container. The extract was decanted and the colour intensity was measured with the help of spectrophotometer (Model-Systronics UV-VIS spectrophotometer 1l7) at 480 nm. The dehydrogenase activity was expressed in terms of Absorbance at 480 nm.

Results and Discussion

The study result indicated that germination percentage in alternate temperature 25–35°C registered maximum (89.00 %) and it was significantly higher germination compared to 20–30°C (81.50%) and 20–35°C (73.00%) alternate temperature as 20–30°C stands second position which is near to the germinability of alternate temperature 25–35°C. This is in accordance with finding of Yogeesha *et al.,* (2007) and Zade *et al.,* (1992).Significant effect on speed of germination was observed and it recorded highest at alternate temperature 25–35°C (48.56) compared to 20–35 °C (18.49) and lowest at 20–30°C alternate temperature (15.54).The seedling length was significantly highest at 25–35°C alternate temperature (19.52 cm) followed by 20–35 °C (15.89) and it was lowest at 20–30°C (13.08).Significant difference was observed in seedling dry weight and the highest was noticed in 20–30°C alternate temperature (3.95 mg) followed by 25–35°C (3.75 mg) and lowest in 20- 35°C (3.20 mg).The seedling vigour index-I significantly differed and recorded higher in 25–35°C (1749) followed by 20- 35°C (1163) and the least was observed in 20–30°C (1066).Seedling vigour index-II was significantly highest at 20–30°C alternate temperature (338) compared to 25–35°C (334) and at 20-35°C alternate temperatures (235) as I mentioned in table

Germination per cent was found the highest in sand (85.75%) followed by coir pith (85.33%), BP (81.16%) and TP (9.33%). This is in agreement with the work of Sivasubramanian (1996), Ferrari (1991), Bhagat *et al.*, (1992), Jethani, (1982), Zade *et al.,* (1991 and 1992).The sand and coir pith have more aeration permitting more oxygen which promoted more germination percentage.The speed of germination was highest in sand media (32.16) followed by BP (27.52), coir pith (19.52) and least was observed in TP (4.43). This is in agreement with the observation of Kurdikeri *et al.,* (1995).The seedling length, (16.16cm) and seedling dry weight (3.82 mg) were higher in BP and sand than other media. Seedling vigour index-I (1326) and seedling vigour index –II (328) were statistically highest in BP and sand compared to coir pith and BP.

Table 1. Influence of different temperatures on seed quality parameters of papaya (*Carica papaya* L.)

Treatment	Germination (%)	Speed of germination	Seedling length (cm)	Seedling dry weight (mg)	Seedling vigour index-I	Seedling vigour index-II
T_1:20-30°C	81.50 (64.57)	15.54	13.08	3.95	1066	338
T_3:20-35°C	73.00 (58.80)	18.49	15.89	3.20	1163	235
T_2: 25-35°C	89.00 (71.30)	48.56	19.52	3.75	1749	334
Mean	81.16	27.53	16.16	3.63	1326	302
S.Em.±	01.47	05.60	00.55	0.14	71.00	19.04
CD (0.05p)	04.32	16.53	01.62	0.45	209.45	60.92

Table 2 .Interaction of temperature and substrata on seed quality parameters of papaya(*Carica papaya* L.)

Treatment	Germination (%)				Speed of germination				Seedling length (cm)		
	BP	Sand	Coir pith	TP	BP	Sand	Coir pith	TP	BP	Sand	Coir pith
T_1	81.50 (64.50)	82.50 (66.24)	87.90 (72.78)	07.50 (15.66)	15.54	35.08	26.51	4.06	13.08	14.02	13.39
T_2	73.00 (58.80)	77.72 (62.05)	91.90 (75.70)	05.00 (12.56)	18.48	20.30	21.46	1.68	15.89	12.21	12.08
T_3	89.00 (71.30)	96.95 (82.10)	76.00 (49.64)	15.50 (23.15)	48.55	41.18	10.58	7.56	19.52	13.31	11.79
Mean	81.16	85.75	85.33	9.33	27.52	32.19	19.52	4.43	16.16	13.18	12.42
SEm±	2.245	6.425	4.307	1.509	8.351	4.603	3.060	0.698	0.812	0.688	0.685
CD (0.05p)	7.182	NS	NS	4.828	26.716	14.726	9.789	2.236	2.599	NS	NS

NS: Non significant, BP: Between paper, TP: Top of paper
T_1: 20-30°C
T_2:20-35°C
T_3: 25-35°C
Figures in parentheses Are arc sine transformed values

Table 3.Interaction of temperature and substrata on seedling dry weight (mg), seedling vigour index-I and seedling vigour index-II in papaya (*Carica papaya* L.)

Treatment	Seedling dry weight (mg)			Seedling vigour index-I			Seedling vigour index-II		
	BP	Sand	Coir pith	BP	Sand	Coir pith	BP	Sand	Coir pith
T_1	3.95	3.82	3.97	1066	1137	1178	338	316	348
T_2	3.20	3.75	3.75	1163	951	1108	235	291	344
T_3	3.75	3.90	3.40	1749	1291	898	334	378	258
Mean	3.63	3.82	3.70	1326	1126	1061	302	328	317
SEm±	0.14	0.10	0.28	105.84	121.68	70.93	19.04	26.46	26.04
CD (0.05p)	0.45	NS	NS	338.58	NS	NS	60.92	NS	NS

Conclusion

The study result indicated that germination percentage in alternate temperature 25–35°C registered maximum (89.00 %) and it was significantly higher germination compared to 20–30°C (81.50%). Germination per cent was found the highest in sand (85.75%)followed by coir pith (85.33%), because of more oxygen permitting through the medium

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