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Selection and Evaluation of some Elite Papaya (*Carica papaya* L.)

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A SELECTION and evaluation study of fifty strains of papaya trees (Carica papaya L.) was conducted during 2005 and 2006 growing seasons. Only ten out of the tested strains could be considered as the promising. Therefore, they evaluated vegetatively, chemically, phonologically and genetically. Results showed that strains Nos.3& 10 recorded the highest value of tree height in the first and second growing seasons,respectively. Tree diameter ranged from 12 to 18.6 cm in the first season, and from 13.9 to 21.1 cm in the second season for strains Nos. 2 and 9, respectively. Fruit shape was influenced by fruit length/fruit diameter ratio (L/D), i.e., strains Nos. 4 and 10 have long oval shape, however, strain No. 2 takes almost a roundish shape. On the other hand, number of flowers reached the maximum value (43) in June and 40 in September, respectively with strains Nos. 8 and 1 in the first and second season, respectively, whereas number of flowers decrease during December. Three strains (Nos. 1, 6 and7) have the potential to produce a hermaphrodite progeny derived by self-pollinating. Moreover, strain No. 6 recorded the highest yield (105.9 Kg) in the first season, while strain No. 3 revealed the highest yield in the second season (101.6 Kg). SSR markers revealed a high degree of polymorphism and heterozygosity.

The common papaya (Carica papaya L.) is an important tropical fruit crop belongs to family Caricaceae with a yielding potential of approximately 45 tons/hectare (Chan-Tai et al., 2003). It is grown in Brazil, Australia, south Africa, south-East Asia, Hawaii, India and other tropical areas (Giacometti, 1987). Papaya is a polygamous species with both unisexual and bisexual tree types although hermaphrodite plants are preferred for commercial cultivation, sex expression and fruit development are greatly influenced by environmental conditions (Sondur *et al.*, 1996). It is cultivated for its ripe fruits, favored for people in the tropical area as breakfast fruit, and as an ingredient in jellies, preserve, or cooked in various way. Papain, the proteolytic enzyme, has a wealth of industrial uses. It has milk-clotting (rennet) and protein digesting properties. Active over a wide pH range, papain is useful in medicine, combating dyspepsia and other digestive orders. Cosmetically, it is used in some dentifrices, shampoos and face-lifting preparations. It is also used in the manufacture of rubber from Heave. Recently, the FAD has cleared chymopapain for intradiscal injection in patients with documented herniated lumber intervertebral discs. Fruit and seed extracts have pronounced bactericidal activity against different genus of bacteria (Emeruwa, 1982).

Material and Methods

This study was carried out in El-Dokki, Egypt during 2005 and 2006 growing seasons using 50 papaya trees planted at a distance 2 x 2 m. Data was recorded on thirty trees which appeared as good strains and only data of 10 strains were promising as recorded in the results. The following parameters were studied:

Vegetative growth

During spring (March), the following vegetative parameters were recorded:

total number of leaves for each tree, plant height (cm) for each tree, stem diameter (cm) at a height of 25 cm of the ground; and total number of shoots/per tree.

Flowering

Total number of flowers and percentage of fruit set were estimated four times (March, June, September and December) during both growing seasons.

Hermaphrodite test

Self pollination was performed by bagging the shoots at balloon stage. Fifteen flowers were bagged in March to examine the hermaphrodite trait.

Fruit characteristics

During September, ripping fruits were collected and the following characteristic were estimated: (i) fruit weight (g); (ii) fruit width (cm); (iii) fruit length (cm); flesh thickness (cm); (iv) weight of seeds (g); (iv) total soluble solids (TSS): A hand rafractometer was used to determine the percentage of total soluble solids of juice in (^{0}Brix) (%); (v) Titratable acidity % of the juice was determined in terms of citric acid percentage per 100 g of fresh juice after being tartarted with 0.1 sodium hydroxide using phenolphthaline as indicator according to A.O.A.C (1975); (vi) tannins content was determined in juice by the method described by Winton and Winton (1945); (vii) total sugar % was determined by using the phenol sulpphuric acid metod (Smith et al., 1965) and the concentrations were calculated from a stanmdard curve of glucose gm/100 gm fresh weight; (viii) Vitamin C: Amount of ascorbic acid in different papaya strains juioce were estimated by the use of 2,6- Di chlorophynyl-endophynol dye and 3% oxalic acid as a substrate. It was calculated as mg/100ml of juice (Lucas, 1944).

Yield

Yield was estimated (average fruit weight X total number of fruits)

Characterization of evaluated strains by microsatellite markers:

DNA isolation was performed according to Probeski *et al.* (1997) and PCR amplification was carried out according to John *et al.* (2006).Five primer pairs flanking simple sequence repeats (SSR) were employed to investigate the level of polymorphism among 10 papaya strains. These primers were derived from published sequences representing the repeat enriched papaya genomic library (John *et al.*, 2006).

Statistical analysis

The experiment included in this study followed a complete randomized design in factorial experiment. The obtained data was subjected to analysis of variance (ANOVA) according to Sendecor and Cochran (1980).

Results and Discussions

Ten out the fifty strains were selected as a promising for its characteristics.

Vegetative growth

Results revealed that vegetative parameters were differing with a wide range among the tested stains. Plant height e.g. ranged from 210 to 268 cm in the first season, and from 227 to 288 cm in the second season (strains No. 1 and 10. respectively) (Table 1). In this respect, Singh and Gorak (1998) stated that, a rapid increase in plant height development was observed between the age of 4 and 10 months. On the other hand, data showed that strain No. 2 recorded the lowest value of trunk diameter in both seasons (12 and 13.9 cm, respectively). While strain No. 9 recorded the highest value of trunk diameter in both seasons (18.6 and 21.1 cm, respectively). Dwivedi et al. (1999) showed that plant height was correlated with plant girth. Moreover, leave number increased greatly in the second season in compare with the first one, it ranged from 26 to 70 for strains No. 4 and 1, respectively. Whereas, it ranged from 42 to 90 for strains Nos. 7 and 1, respectively. Allan (2001) revealed that the cool sub-tropical conditions active leaves appear during autumn and winter.

Shoots number was 3 for strain No. 6 in the first season and strain No. 4 in the second season; whereas was 6 shoots for strains Nos. 2 and 7 in the first and 7 shoots for strains Nos. 1 and 6 in the second season.

TABLE 1. Vegetative growth parameters measured in ten papaya strain in 2005&2006 seasons.

Strain No.	2005 Season				2006 Season			
	Tree Height	Tree Diameter	Leaf No.	Shoot No	Tree Height	Tree Diameter	Leaf No.	Shoot No
1	210.0	17.7	70	5	227.0	19.3	90	7
2	229.0	12.0	39	6	242.0	13.9	62	4
3	268.0	18.1	47	5	282.0	20.5	59	4
4	247.0	13.3	26	4	263.0	15.1	47	3
5	235.2	14.5	30	-	250.0	15.9	53	4
6	230.3	13.8	27	3	239.3	16.1	45	7
7	263.0	15.7	29	6	282.0	18.2	42	6
8	260.1	15.1	32	-	282.5	17.8	52	4
9	242.0	18.6	41	4	250.9	21.1	60	-
10	265.4	15.4	37	5	288.0	18.6	70	-

Flowering and percentage of fruit set

Number of flowers in both seasons recorded a maximum values (43 flowers in June) with the strain No. 8, and 40 flowers in September in the second season

with strain No. 1 (Table 2). It is clear that flowers number decrease during December. On the other hand, average number of flowers recorded the highest number in March (24.3 flowers) during the first season and 28.2 flowers in September during the second season. Brunner (1998) reported that no significant differences observed between pruned and unpruned plants for flowering date. However, Singh and Gorak (1998) stated that planting in October and September produced the fewest male plants and most the female and hermaphrodite plants.

Percentage of fruit set varied among the tested strains during both growing seasons (Table 3). Some of the studied strain showed the highest percentage of fruit set (31% and 29%) in September during 2005 and 2006 seasons for strains Nos. 2 and 5, respectively. However, in March during first and second seasons, strains Nos. 10 and 4 recorded the highest percentage of fruit set (25% and 28%, respectively). Moreover, during December in both seasons revealed a great decreasing in fruit set percentage. It is clear that there is no obvious trend to the effect of the tested strains or dates on the fruit set number, this may be due to the origin of this st rains as a seedy plants.

As for fruits number, strain No. 10 recorded the highest number (23 fruits) in September during 2005 season. While strain No. 8 showed the highest number (29 fruits) in June during 2006 season. On the other hand, the lowest number (8 fruits) was recorded by strain No. 9 in June, 2005 and 11 fruits for strains Nos.1 and 5 in June and December, respectively, of 2006 season. From the results of flowering, fruit set and fruiting, it is clear that strain No.1 produced the highest average number of flowers (22.3 and 23 flowers) in both seasons, however, strain No. 4 produced the lowest number in both seasons (12 and 14.3 flowers, respectively). Moreover, average percent of fruit set was high with strains Nos. 2 and 6 (19.8% and 20.8%) in the first and second seasons, respectively. Moreover, the lowest average number of fruit set was observed by strain No. 1 (14.0 and 15.3) in the first and second seasons, respectively. Strains Nos. 5 and 6 revealed the highest number of fruits (17.8 and 20) in the first and second seasons, respectively. The lowest number of fruits (13 fruits) was observed with strain No. 3 in the first and 16.3 fruits for strains Nos. 1 and 3 in the second season.

TABLE 2. Flowering, fruit set and fruiting behavior of the ten tested papaya strains during 2005 and 2006 growing seasons.

Strain No.	March 2005			June 2005			September 2005			December 2005			Average		
	Flower No.	Fruit set No.	Fruit No.	Flower No.	Fruit set No.	Fruit No.	Flower No.	Fruit set No.	Fruit No.	Flower No.	Fruit set No.	Fruit No.	Flower No.	Fruit set no.	Fruit No.
1	30	10	20	20	13	11	39	18	15	-	15	13	22.3	14	14.5
2	25	20	15	30	18	18	29	31	19	-	10	11	21	19.8	15.8
3	32	15	18	29	11	10	21	25	11	-	18	13	20.5	17.3	13
4	25	18	15	-	10	21	23	17	13	-	20	12	12	12.3	15.3
5	15	21	20	40	8	14	-	25	18	5	13	19	15	16.8	17.8
6	24	14	22	18	14	11	28	23	17	-	19	14	16.8	17.5	16
7	22	17	15	4	20	17	35	17	13	13	20	20	18.5	18.5	16.3
8	20	20	10	43	15	21	10	20	15	-	13	15	18.3	17	15.3
9	35	10	19	20	17	8	17	22	20	-	19	17	18	17	16
10	15	25	18	32	18	13	18	19	23	-	11	11	16.3	18.3	16.3
Mean	24.3	17	17.2	23.6	14.4	14.4	21	21.7	16.4	1.8	15.8	14.5			

TABLE Con. 2

Strain No.	March 2006			June 2006			September 2006			December 2006			Average		
	Flower No.	Fruit set No.	Fruit No.	Flower No.	Fruit set No.	Fruit No.	Flower No.	Fruit set No.	Fruit No.	Flower No.	Fruit set No.	Fruit No.	Flower No.	Fruit set no.	Fruit No.
1	22	15	20	30	19	11	40	17	15	-	10	19	23	15.3	16.3
2	31	22	22	16	22	20	25	25	18	3	13	19	18.8	20.5	19.8
3	25	21	20	17	21	13	21	21	22	-	18	10	19.8	20.3	16.3
4	23	28	16	10	.16	12	14	19	27	10	5	15	14.3	17	16
5	18	16	27	25	11	19	23	29	16	5	14	11	17.8	17.5	18.3
6	20	18	18	15	18	19	28	28	25	10	19	18	18.3	20.8	20
7	19	20	21	19	25	13	19	24	20	-	11	13	14.3	20	17.8
8	23	13	18	13	21	29	28	18	8	9	17	16	18.3	17.3	17.8
9	21	19	25	18	14	23	33	20	12	-	13	14	18	16.5	18.5
10	24	14	19	24	26	25	39	23	15	-	15	20	21.8	19.5	19.8
Mean	22.6	18.6	20.6	21	17.8	18.4	28.2	22.4	17.8	3.7	13.5	15.5			

Physical characteristic of fruits

Results showed that fruit length was highest (25.1 cm) with strain No.10 and 24.3 cm with strain No.3 in the first and second seasons, respectively. However, the lowest value of fruit length (15.3 cm) was observed by strain No. 6 and 11.9 cm for strain No. 1 in first and second seasons, respectively. On the other hand, fruit diameter does not reveal significant differences that showed with fruit length among the tested strain. *i.e.*, the highest value (7.8 and 8.1cm) was recorded by strains Nos. 5 and 8 in the first and second seasons, respectively. While the lowest value (6.8 and 5.2 cm) was obtained by strains Nos. 4 and 1 in the first and second seasons, respectively. The ratio between fruit length (L) and fruit diameter (D) was calculated to determine the differences among the tested strains in shape. This ratio (L/D) was ranged from 2.1 (strain No .6) to 3.4 (strain No. 4) in the first season, and from 1.8 (strain No. 6) to 3.3 (strain No. 4) in the second one. It is apparent that fruit shape was influenced by the L/D ratio, e.g. strains Nos. 4 and 10 have a long oval shape, moreover, strain No. 2 takes almost a roundish shape (Fig. 1), while strain No. 9 showed an ovate shape. In this respect, Kashyap and Patel (1993) evaluated a new papaya strain (Barwani Red) and stated that, the fruit is long oval to ovate in shape, medium to large in size (59.0 cm long and 36.2 cm girth).

Fruit and seed weight differed from each evaluated strain to another during both growing seasons. The highest weight of fruit was observed by strain No. 3 (1875.2 and 1562.5 gm) in the first and second seasons, respectively; whereas the lowest weight, was observed by strain No. 2 (805 and 542.5 gm) in both seasons. In this respect, Kashyap and Patal (1993) stated that evaluated papaya strain "Barwani Red" recorded a weight of 1.65 Kg/fruit.

Seed weight was ranged from 56.3 to 129.8 gm (strains Nos. 10 and 4, respectively) in the first season. Meanwhile, during the second season it ranged from 62.3 to 135 gm for strains No. 7 and 4, respectively. Ghanta et al., (1995) demonstrated that papaya cv. Ranchi raised the highest average fruit weight, longest fruits.

As for flesh thickness, it was 2.9 cm for strain No.7 in the first season and 3.9 cm for strain No. 4 in the second season. The thinnest value (2.1 cm) was given by strains Nos. 5 and 10 in the first season, while it was 3.0 cm for strains Nos. 1, 2, 5 and 7 in second seasons.

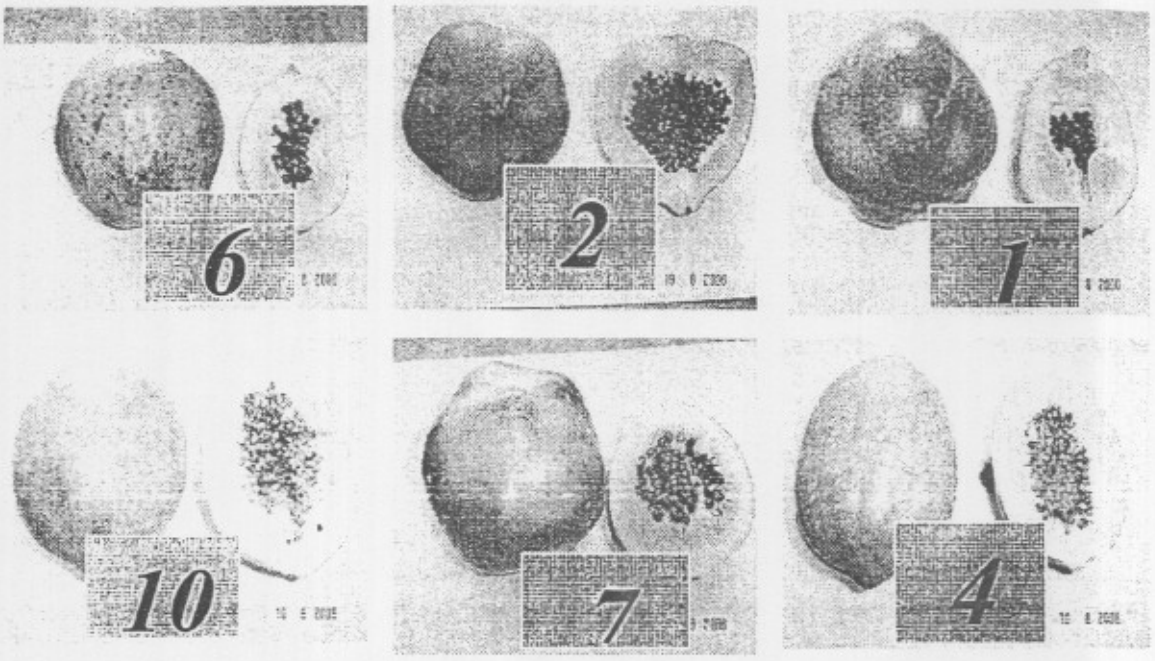

Fig. 1.Different form types of papaya fruits.

Chemical fruit characteristics

Table 4 summarizes the effect of the studied strains on its chemical contents. Concerning vitamin C, the highest content was given by strain No. 4 (58.9 mg/100 ml) in the first season and strain No. 9 (58.1 mg/100 ml) in the second season. However, the lowest content of vitamin C was found with strain No. 1 in both seasons (45.3 mg/100 ml and 47.8 mg/100 ml, respectively). Vinci et al. (1995) demonstrated that all tropical fruits contain relatively high levels of ascorbic acid varying between 20 and 90 mg/100 gm. Concerning, percentage of total sugar, it was ranged from 9.3% (strain No. 1) to 13.2% (strains Nos. 2 and 7) in the first season, however, in the second season, it was ranged from 10.1 (strain No.1) to 14.2% (strain No. 7).

As regards to tanines and T.S.S a slight differences were noticed among the tested strains. Strains Nos. 3 and 4 recorded the highest value of tanines in the first season (5.1 and 5.2%, respectively). However, it was 4.9% for strain No. 6 and 4.8% (strains Nos.3, 4 and 8) in the second season.

The highest percentage of T.S.S was detected in strain No. 8 (13.4%) in the first season and strain No. 3 (14%) in the second one. An intermediate value (13.1%) of T.S.S was recorded by strains Nos. 3, 4, 6 and 10 in the first season and strains Nos. 8 and 9 in the second season.

As for acidity, the highest percentage (0.45 and 0.48%) were given by strains Nos.7 and 4 (in the first and second seasons, respectively). However,, the lowest percentage was obtained by strain No. 9 in both seasons (0.29 and 0.32%, respectively).

Concerning the ratio between T.S.S/acidity and T.S.S/sugar,the highest ratio was observed in strain No. 9 in both seasons (44.5 and 40.9, respectively for T.S.S/acidity, and 39.7 and 37.2, respectively for sugar/acidity). Meanwhile, strain No. 3 showed the lowest T.S.S/ acidity and sugar/acidity ratio (31.2 and 28.3, respectively) in the first season, while in the second season, the lowest T.S.S/acidity and sugar/acidity ratio was observed by strain No.4 (25.8 and 26.04, respectively).

Hermaphrodite examination

Papaya is polygamous: male, females and hermaphroditic flowers are distributed on separate papaya plants and sex types are revealed only after flowering. Therefore, this trait was studied in the present investigation. As shown in Table 5, two out of fifteen bagging flowers were self pollinated with strain Nos. 1 and 7in first season,while strains Nos.1 and 6 produced two selfed flowers in the second season. However, strain No. 6 produced three hermaphrodite flowers in the first season. In this respect, Storey (1969) proposed that the sex of papaya is determined by three homologous gene complexes. The genotypes of the male, hermaphrodite and female plants are Mm, Mm and mm, respectively. Genotypes with homozygous dominant alleles are lethal (Storey, 1953). On the other hand, Chan-Tai et al. (2003) stated that, the hermaphroditic papaya bearing perfect flowers and producing fruits shaped from long-cylindrical to ellipsoidal, is preferred by markets in Hawaii, Japan South-East Asia and Taiwan.

Yield

Table 5 summarizes the average yield of each strain, it is obvious that strain No. 6 has the potential to produce the highest average yield (105.9 Kg) in the first season. Meanwhile, strain No. 3 recorded the highest average yield (101.6 Kg) in the second season. The lowest average of yield was obtained by strain No. 2 (50.9 and 42.9 Kg) in both seasons, respectively. Kashyap and Patel (1993), demonstrated that the average annual yield of "Barwani Red" is 90-95 Kg per tree. However, Singh and Sharma (1996) mentioned that the selected PAU, showed a high performance, with significantly higher fruit yield (50 Kg per plant). Moreover, Biswas (1995) stated that the highest number of fruits per plant (42.0) and the highest yield of fruits (1171 t/ha) were observed from plants treated with MH at 600 mg/Litre.

TABLE 3.Physical characteristic of the tested papaya fruits.

Strain No.	Growing season 2005							Growing season 2006						
	Fruit length (cm)	Fruit diameter (cm)	L/D	(cm)	Fruit weight (gm)	Seed weight (gm)	Flesh thickn -ess (cm)	Fruit length (cm)	Fruit diameter (cm)	L/D	(cm)	Fruit weight (gm)	Seed weight (gm)	Flesh thickness (cm)
1	17.1	6.9	2.5	46	1785	71.2	2.6	11.9	5.2	2.2	30.9	1407.5	65	3.0
2	18	7.3	2.5	51	805	71.3	2.7	14.9	5.9	2.5	35.8	542.5	71.5	3.0
3	20.9	7.2	2.9	49	1875.5	65.4	2.3	24.3	7.5	3.2	39.4	1562.5	110	3.5
4	23	6.8	3.4	47	1275	129.8	2.4	20.2	6.2	3.3	41.5	882.5	135	3.9
5	20	7.8	2.6	53	1395	73.2	2.1	16.3	7.1	2.3	42.9	1241.1	105	3.0
6	15.3	7.4	2.1	51	1656	75.1	2.3	12.5	6.9	1.8	45.3	1075.5	93	2.5
7	18.9	6.9	2.7	47	920.3	57.3	2.9	14.9	7.1	2.1	39.9	812.5	62.3	3.0
8	17.2	7.1	2.4	52	1001.3	67.4	2.2	20.3	8.1	2.5	48.2	835	71.5	2.9
9	19.8	7.4	2.7	46	1050.9	73.4	2.3	21.2	7.5	2.8	38.2	1125	88.2	2.3
10	25.1	7.8	3.2	45	897.2	56.3	2.1	22.1	7.3	3.0	43.2	832.4	70.9	3.1
L.S.D 5%	5.03	1.95	1.12	5.31	7.82	5.31	0.81	4.91	1.23	0.93	5.46	6.96	4.86	1.15

TABLE 4. Chemical characteristic of the tested papaya fruits.

Strain No.	2005							2006						
	V.c Mg/100ml	Total Sugar	Tannies %	Acidity %	T.S.S	T.S.S/ Acidity	T.S.S/ Sugar	V.c Mg/100ml	Total Sugar	Tannies %	Acidity %	T.S.S	T.S.S/ Acidity	T.S.S/ Sugar
1	45.3	9.3	4.5	0.32	13.3	41.6	29.1	47.8	10.1	4.1	0.35	12.0	34.3	28.9
2	50.2	13.2	3.2	0.35	13.2	37.7	37.7	52.3	11.1	3.4	0.39	13.8	35.4	28.5
3	53.4	11.9	5.1	0.42	13.1	31.2	28.3	50.1	12.8	4.8	0.37	14.0	37.8	34.6
4	58.9	12.4	5.2	0.41	13.1	31.95	30.2	57.3	12.5	4.8	0.48	12.4	25.8	26.04
5	49.5	10.5	3.8	0.33	12.8	38.8	31.8	50.9	11.4	4.1	0.36	12.9	35.8	31.7
6	52.6	11.9	4.6	0.39	13.1	33.6	30.5	54.8	13.1	4.9	0.37	12.8	34.6	35.4
7	47.8	13.2	3.9	0.45	12.9	28.7	29.3	49.8	14.2	3.2	0.41	12.9	31.5	34.6
8	50.1	12.1	4.7	0.34	13.4	39.4	35.6	54.3	13.5	4.8	0.38	13.1	34.5	35.5
9	54.8	11.5	4.5	0.29	12.9	44.5	39.7	58.1	11.9	3.7	0.32	13.1	40.9	37.2
10	46.3	10.8	4.3	0.31	13.1	42.3	34.8	49.9	11.8	4.2	0.38	12.8	33.7	31.1
L.S.D 5%	4.39	1.17	1.05	0.15	3.11	6.22	3.82	5.17	1.52	1.12	0.18	2.03	5.21	4.23

TABLE 5. Yield (Kg) and hermaphrodite character as revealed by the tested papaya strains.

Strain No.	Yield (Kg)		Hermaphrodite	
	2005	2006	2005	2006
1	105.3	91.8	2	2
2	50.9	42.9	-	-
3	97.5	101.6	-	-
4	78.0	56.5	-	-
5	99.3	90.8	-	-
6	105.9	86.0	3	2
7	60.0	57.9	2	1
8	61.3	59.5	-	-
9	67.3	83.3	-	-
10	58.5	65.9	-	-

Genetic characterization of papaya strains by SSR markers

In this study five primer pairs flanking simple sequence repeats (SSR) were employed to investigate the level of polymorphism among 10 papaya strains. These primers were derived from published sequences representing the repeat enriched papaya genomic library (John et al., 2006). The five SSR primer sets revealed 15 alleles across the 10 strains with an average of 3 alleles per locus (Table 6). The number of alleles per locus ranged from 2 to 4 with an average of 2.2 per locus. The size of alleles detected by the five SSR primers ranged from 193-410 pb, this reflect a large difference in the number of repeats between the different alleles.

The tested primers pairs revealed polymorphic bands (Fig. 2) ranging from zero to four (CIR30 and CIR10) with a total polymorphic bands of 11 and an average of 2.2 polymorphic bands per locus. The percentage of polymorphism ranged from 0 to 100% (CIR30 and CIR10, respectively)

The amplification of more than one band per genotype by some SSR primers, may be due to the residual heterozygosity. In the present study, the observed heterozygosity was calculated as a ratio between heterozygous genotypes and total analyzed genotypes for each locus (Table 6). The observed heterozygosity ranged from 0 to 0.61. On the other hand, expected heterozygsity is the possibility that two individuals taken at random from a given sample will have different alleles at a locus, and was calculated as B=np/(np+nnp), where B is the fraction of polymorphic loci, and nnp is the number of non-polymorphic loci. The expected heterozygosity ranged from 0 to 0.73.

Three out of the tested primers characterized four strains. Strain No.1 characterized by CIR6 with both positive unique markers (279 and 281 bp) and negative unique marker (269 bp). Moreover, the CIR10 characterized strains Nos. 3 and 8 by unique positive markers at molecular weight of 281 and 410 bp, respectively. While, CIR20 revealed a positive unique marker with strain No. 5 at molecular weight 205 bp. In this respect, John *et al.* (2006) demonstrated that two to eight alleles per locus were revealed with an average of 3.8. They also mentioned that the average of observed and expected heterozygosity were 0.42 and 0.57, respectively

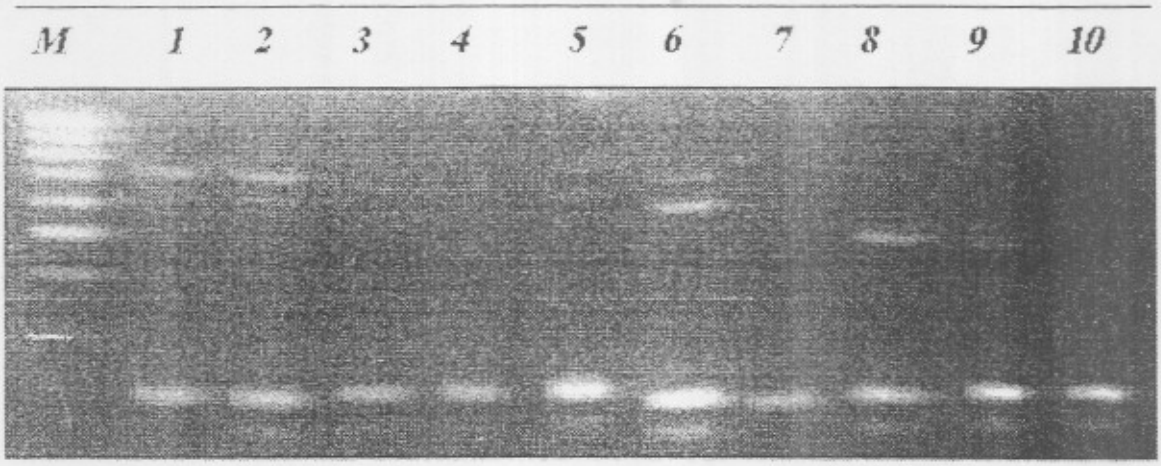

Fig. 2. Polymorphism as revealed by CIR30 locus, M is a 1 Kbp ladder marker, strains are represented as 1 to 10.

TABLE 6. Characteristic of optimization, observed & total number of alleles, polymorphism, observed, heterozygosity (Ho) and expected heterozygosity(HE) and unique markers revealed by SSR markers.

Locus name	Motif repeat	Ta (^{0}C)	Observed Size(bp)	Total # polymorphic alleles	Polymorp- hic alleles	% of polymorphism	H_o	H_E	Unique markers			
									Locus	Marker size	Positive markers	Negative markers
CIR6	$(TG)_{10}(AG)_7(GA)_{10}$	48	269-281	5	3	60	0.61	0.60	CIR6	269	-	1
CIR10	$(TA)_4....(AG)_{18}$	46	251-410	4	4	100	0.22	0.73		279	1	-
CIR20	$(TC)_9$	50	179-350	3	2	66.7	0.39	0.60		281	1	-
CIR23	$(TC)_8$	50	193-283	2	2	100	0.45	0.48				
CIR30	$(CT)_7.....(CT)_4$	51	228	1	-	0	0	0	CIR10	281	3	-
										410	8	-
									CIR20	205	5	-

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انتخاب و تقييم بعض سلالات البذرية المتميزة من الباباظ/البابايا

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تم انتخاب وتقييم ١٠ سلالات من أصل ٥٠ سلالة بذرية من الباباظ/البابايا وذلك بالزراعات المحمية بالدقي في مصر خلال الموسمين الزراعيين ٢٠٠٥ و٢٠٠٦. تم تقييم السلالات العشرة خضرياً وكيمانياً وزهرياً وثمرياً ووراثياً.

سجلت السلالة رقم١، ١٠ أعلى ارتفاع للنباتات في الموسم الاول و الثانى على التوالى، تراوح سمك جذع الشجرة بين ١٢-١٨,٦ سم في الموسم الأول في حين تراوح في الموسم الثاني مابين ١٣,٩-٢١,١ سم لسلالتين رقم ٢ و ٩، على التوالي. تأثر شكل الثمار (بخصوص ارتفاع الثمرة وقطرها) فعلى سبيل المثال أخذت السلالتان ٤ و ١٠ الشكل البيضاوي المطاول.

من ناحية أخرى وصل عدد الأزهار إلى أعلى رقم (٤٣ و ٤٠) في يونيو وسبمتبر، مع السلالتين رقم ٨ و ١ في الموسمين الأول والثاني، على التوالي. وكان من الواضح أيضاً وجود نقص كبير في عدد الأزهار إن لم يكن منعدماً خلال شهر ديسمبر.

كانت للسلالات ذات الأرقام ١، ٦ و ٧ القدرة على إنتاج ثمار بدون الحاجة للتلقيح عندما تم تكيسها للقيام بعملية التلقيح الذاتي.
أوضح استخدام الميكروستالايت وجود اختلافات بين السلالات المدروسة وكذلك وجود درجات مختلفة من الهيتروزيجوزتى.