

**FERTILITY, FRUIT SET AND FRUIT PHYSICAL AND CHEMICAL  
 PROPERTIES AS AFFECTED BY SN/PL RATIO AND DIFFERENT  
 POLLINIZERS FOR THREE PLUM CULTIVARS  
 BY**

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**ABSTRACT**

This investigation was carried out during the three successive seasons of 2001, 2002 and 2003 on three Japanese plum (*Prunus saliciana*) cultivars; Santa-Rosa, Durado and Eldorado in order to study the relationship between stamen number/pistil length ratio, pollen viability and fruit set of the three plum cultivars. Also, the effect of different pollinizers on physical and chemical properties of fruits of plum cultivars under the study was studied. The results showed that, Durado cv. had the highest value of stamen number (SN), the longest pistil length (PL) and the highest viability of pollen grains followed by Santa-Rosa and Eldorado cvs. Durado cv. had the highest value of SN/PL ratio followed by Eldorado cv. and Santa-Rosa cv. which had the lowest SN/PL ratio. Selfing of both Durado and Eldorado cvs exhibited very high SN/PL ratio and a low fruit set percentage, while Santa-Rosa cv. exhibited low SN/PL ratio and a high fruit set percentage. So, when SN/PL decreases, self fertility increases and reverse. Moreover, data indicated that, no metaxenia effect was observed on both fruit and stone weight in the pollinated plum fruits as well as T.S.S% in fruit juice. However, pollen grains from different cultivars had various effects on the shape of plum fruit. In addition, the pollen source had significant effect on acidity and sugar/acid ratio of fruits.

**Keywords:** *Prunus saliciana*, Stamen number/pistil length ratio, viability, fruit set, Pollinizer, metaxenia.

**INTRODUCTION**

Most commercial plums are classified as European ( $2n = 48$ ) [*Prunus domestica* L.] and Japanese ( $2n = 16$ ) [*Prunus saliciana* Lind L.]. Plum is considered as one of the most important deciduous fruit in Egypt. Plum production depends on self and cross incompatibility between different cultivated cultivars, weather conditions, cultural practices and also pest management. Cross-pollination is important for fruit set of partial self fertile and self/cross incompatible plum cultivars (Kellerhals, 1986; Stsger, 1989; Chung *et al.*, 1998 and Montagnon and Reynier, 2002)

The ratio of stamen number/pistil length (SN/PL) correlated with self fertile than in self sterile cultivars. The SN/PL ratio is reliable as a measure for fertility in *Prunus domestica* L. (plum) and it is relatively constant from year to year (Suranyi, 1976).

The plum cultivars were classified into 3 groups, with small (20-23), medium (24-27) and large (28-32) number of stamens. The stamens number of self-fertile cultivar is lower and their annual variability higher than in partially self-fertile or self-sterile cultivars (Suranyi and Toth, 1977). Pistils were longest in the partially self-fertile cultivars, somewhat shorter in the self-fertile cultivars and shortest in the self sterile and partially self-sterile cultivars. The SN/PL ratios for self-fertile, partially self-fertile, partially self sterile and self sterile cultivars were as 1.85, 2.04, 2.24 and 2.35 respectively (Suranyi, 1978). Both Stanley and Santa-Rosa plum cultivars exhibited a high fruit set percentage and low SN/PL ratio, while Formosa and Laroda cultivars exhibited a low fruit set percentage and very high SN/PL ratio (Al-Joumayly, 2002).

It is well known that cross pollination increased fruit weight (Zaki, 1965; Gurmenvski, 1977 and El-Sherbini, 1982). They found that, cross pollination increased fruit weight of Leconte, Beuud Hardenpot pear cvs and Bricher apple cv., respectively. On the other hand, Church and Williams (1983) and Arafat (1989) reported that, no metaxinal effects on size and weight of fruits resulted from cross pollination for Cox Orange Pippin apple cv. and Leconte pear cv., respectively were detected.

Concerning fruit shape (L/D ratio), El-Sherbini (1982) on Bricher apple cv.; Arafat (1989) on Leconte pear cv., Khalil (1989) on Anna apple cv. and Ali (1992) on Leconte pear cv. found that metaxina affect fruit L/D ratio. Whereas, Degman and Auchter (1934) and Zaki (1965) reported that, no metaxinal effects on fruit shape for apple and Leconte pear cvs, respectively.

El-Sherbini (1982) on Bircher apple cv.; Iyer and Randhawa (1965) on Bahrri grape and Wallace and Lee (1999) on mandarin cv. stated that, pollen source significantly increased sugar content and decreased acidity than self pollination whereas, Griggs and Glaypool (1957) on Bartlatt pear cv.; Church and Williams (1983); on Cox Orange Pippin apple cv. reported that no metaxinal effect on sugar content and acidity in self and cross pollinated fruits.

This investigation os based on studying the relationship between stamen number/pistil length ratio, pollen viability and self fertility as well as effect of pollen parent on physical and chemical properties of fruits.

## MATERIALS AND METHODS

The present study was conducted during the three successive seasons of 2001, 2002 and 2003 on 12 trees of the three plum cvs (Eldorado, Durado and Santa-Rosa) *Prunus saliciana*. The trees were about 13 years old, grown in a clay soil at planting distance of 4 × 4 meters in El-Kanater Experimental Station.

Horticulture Research Institute. The selected trees were vigorous, free from any pathogenic symptoms and subjected to the ordinary horticultural practices.

The following parameters were studied:

- 1- The relationship between stamen number/pistil length ratio and the fertility of plum flowers:  
Number of stamens per flowers for each variety under the study as well as pistil length (mm) was determined in order to calculate the stamen number (SN)/pistil length (PL) ratio.  
Each cultivar was represented by 5 replicates. Each replicate contained 50 flowers selected at random. Moreover, fruit set after self-pollination was correlated with the SN/PL ratio to determine degree of self-fertility
- 2- Studying the viability of pollen grains:  
Pollen was collected to determine the viability for the three studied cultivars. The flowers of each cultivar were collected at the balloon stage just one day before anthesis and placed on paper at room temperature. After one day the pollens of each cultivar were collected in glass tube separately. Pollen viability was determined using 2, 3, 5-triphenyl tetrazolium chloride (TTC) staining solution. 1 part 10% TTC: 10 parts 60% sucrose solution according to the method described by Oberle and Weston (1953).
- 3- Effect of pollinizers on physical properties of fruits:
  - 3.1 Fruit and stone weight (grams):
  - 3.2. Fruit shape index: fruit shape was determined by comparing the ratio of the longitudinal length to the transverse diameter (L/D ratio) according to Westwood (1978).
- 4- Effect of pollinizers on chemical properties of fruits:
  - 4.1 Total soluble solids % (T.S.S): by using an ABBE refractometer as described in A.O.A.C. (1990).
  - 4.2 Total acidity %: was measured according to A.O.A.C. (1990). Acidity was expressed as mg malic acid per 100 ml.
  - 4.3 T.S.S/Acidity ratio: was calculated as a ratio between T.S.S.% and acidity %.

#### **5- Statistical analysis:**

The obtained data were subjected to analysis of variance (ANOVA) according to Snedecor and Cochran (1972). M. Static program was used to compare between the means of combinations according to Waller and Duncan, (1969) at probability of 5% level.

## **RESULTS AND DISCUSSION**

### **4.1. The relationship between stamen number /pistil length ratio and the fertility of the three studied cultivars.**

Data in Table (1) show the stamen number, pistil length and stamen number/pistil length ratio of the plum cvs under study during the three studied seasons.

Results indicated that *Durado cv* had the higher stamens number in the three seasons of study. Although *Eldorado cv* had more stamens number than

Santa-Rosa in the first season, there was no significant differences between them while there was significant differences in the third season of study.

As for pistil length, data cleared that Durado cv had the longest pistil in the three seasons of study. Moreover, Santa-Rosa cv differed significantly than Eldorado cv in the first season, while; the reverse was true for Eldorado and Santa-Rosa cvs in second and third seasons.

As for SN/PL ratio, data showed that Durado cv had higher value of SN/PL ratio than other cultivars in the three experimental seasons. Whatever there were no significant differences between Eldorado cv and Santa-Rosa cv in the first and second seasons, SN/PL ratio of Eldorado was higher than Santa-Rosa. On the other hand, Eldorado cv differed significantly than Santa-Rosa cv in the third experimental season of study.

**Table (1): Stamen number (SN), Pistil length (PL) and SN/PL ratio in Santa-Rosa, Durado and Eldorado plum cultivars in 2001, 2002 and 2003 seasons.**

Years	Cultivars	SN	PL	SN/PL ratio
2001	Santa -Rosa	20.92 B	7.85 A	2.73 B
	Durado	29.81 A	8.53 A	3.53 A
	Eldorado	21.30 B	7.04 B	3.06 B
2002	Santa -Rosa	20.84 B	7.99 B	2.60 B
	Durado	30.44 A	8.42 A	3.67 A
	Eldorado	20.47 B	7.01 B	2.97 B
2003	Santa -Rosa	21.34 C	8.20 B	2.60 B
	Durado	30.83 A	9.09 A	3.42 A
	Eldorado	25.2 B	7.67 B	3.30 A

Concerning the relationship between SN/PL ratio and fertility, Table (2) clearly showed that, Durado cv had the highest values of SN/PL ratio. While its selfing as will be shown later achieved the lowest fruiting percentage in the three seasons of study. So, this cultivar could be considered as low-fertility cv. SN/PL ratio of Eldorado cv was higher than SN/PL ratio of Santa-Rosa cv. while fruiting percentage of Santa-Rosa was higher than Eldorado cv in both first and second seasons. Therefore the fertility of Santa-Rosa cv is higher than Eldorado cv. Conversely, in the third season of study, fruiting percentage in Eldorado selfing was higher than Santa-Rosa selfing.

It seems that self-fertile cultivars have longer pistil than low-fertile cv and the low-fertile cultivar has more stamens than high-fertile ones. Also, SN/PL ratio is significantly higher in low-fertile cultivars than in high fertile cultivars.

The obtained results are in harmony with the findings of Suranyi, (1976) who reported that in plum (*Prunus domestica*). SN/PL ratio is lower in self-fertile than in self-sterile cvs. Also, Suranyi and Toth (1977) mentioned that, the number of stamens of self-fertile cvs is lower and their annual variability is higher than in

partially self-fertile or self-sterile cvs. Moreover, Suranyi (1978) indicated that, pistils were longest in the partially self-fertile cvs, somewhat shorter in the self-fertile cvs and shortest in the self-sterile and practically self-sterile cvs.

**Table (2): Relationship between SN/PL value and fruit set percentage after self pollination in Santa-Rosa, Durado and Eldorado plum cultivars during 2001,2002 and 2003 seasons.**

Years	Cultivars	SN/PL ratio	Fruiting percentage
2001	Santa -Rosa	2.73 B	29.43 A
	Durado	3.53 A	1.59 B
	Eldorado	3.06 B	5.38 B
2002	Santa -Rosa	2.60 B	2.63 A
	Durado	3.67 A	0.00 A
	Eldorado	2.97 B	1.141 a
2003	Santa -Rosa	2.60 b	2.1 AB
	Durado	3.42 A	0.00 B
	Eldorado	3.30 a	3.16 a

In addition, Al-Joumayly (2002) reported that, both Stanley and Santa-Rosa plum cv. exhibited a high fruit set percentage and low SN/PL ratio, while Formosa and Laroda cv. exhibited a low fruit set percentage and very high SN/PL ratio.

Meaningful SN/PL ratio should be based on the classification of *Prunus* cultivars. Once the range of SN/PL ratios are established within the species these ratios could be used for selecting self-fertile phenotypes from any seedling population.

**4.2. Pollen viability.**

Data presented in Table (3) show pollen viability of Santa Rosa, Durado and Eldorado plum cvs during 2001, 2002 and 2003 seasons. Results indicated that pollen of the three plum cvs used in the study showed high rates of viability in all seasons of study. Durado cv. had the highest rate of pollen viability in comparison with other cultivars. Such results are in harmony with the findings of Lee (1980), he reported that the germination rate in vivo of some plum cvs varied considerably from one year to the other and the rate was higher in vivo than in vitro (ranging from 32% to 96%). In addition, Bijwa *et al.*, (1990) found that plum cultivar Kala Amritsar exhibited the highest pollen viability (90%). Also, Bozhkova (1995) classified pollen germination of *Prunus cerasifera* varieties into four groups. Low (up to 42 %), moderate (43-62 %), high (63-81%) and very high (over 81%) germinability.

**Table (3): Percentage of pollen viability of Santa-Rosa, Durado and Eldorado cultivars in 2001, 2002 and 2003 seasons.**

Years	Cultivars	Pollen stained red (%) after 24 h
2001	Santa-Rosa	72.28 A
	Durado	69.83 A
	Eldorado	73.47 A
2002	Santa-Rosa	76.79 A
	Durado	78.50 A
	Eldorado	73.32 A
2003	Santa-Rosa	76.93 B
	Durado	84.85 A
	Eldorado	70.44 B

### 4.3 Effect of different pollinizers on physical properties of fruit.

#### 4.3.1. Fruit and stone weight.

Data in Table (4) exhibit the effect of pollen parent on fruit weight. It is clearly shown that, the highest value of fruit weight was achieved with Santa-Rosa free pollinated flowers while; the reverse was true with Durado open pollinated flowers in the first season. In addition, Eldorado free pollinated flowers had significantly lower fruit weight compared to Santa-Rosa open pollinated flowers. In addition, data clearly showed that, fruit weight was not affected by pollen parent. Whereas, when Durado was pollinated with Santa-Rosa the fruit weight was significantly reduced in the second season. However, it gave the same fruit weight as fruit obtained from open pollinated flowers in the first and third seasons. In view of the female parent effect, it is clearly show that, fruit weight was significantly increased when Eldorado cv. was pollinated with Durado pollen in comparison with Eldorado cv. free pollinated flowers in all seasons. The reverse was true when Santa-Rosa cv. was pollinated with the same male parent, which, significantly reduced the fruit weight as compared with open pollinated Santa-Rosa cv. flowers in the first and third seasons. Regarding the effect of pollen parent on stone weight, Data in Table (4) clearly showed also that, there was no effect of pollen parent on stone weight. Such results are in contrast with those obtained by Zaki (1965) on Leconte pear fruit, Gurmenvski (1977) on Beurred Hardenpot pear and El-Sherbini (1982) on apple. They reported that cross-pollination increased fruit weight in many varieties of pears and apples. On the other hand, these results agreed with the findings of Church and Williams (1983) on Cox orange pippin apple was found that no metaxenial effects on size and weight were seen in the pollinated Cox apple fruit. Moreover, Arafat (1989) reported that, artificial hand cross-pollination with Hood or Bartlett pollen grains did not affect "Leconte" pear fruit weight.

#### 4.3.2. Fruit shape index.

Shape is a function of length and diameter of the fruit. The obtained results in Table (5) clearly showed that there are differences in fruit shape among different crosses.

Table (4): Effect of polinizers on fruit weight and seed weight of Santa-Rosa, Duradoi and Eldorado cultivars during 2001, 2002 and 2003 growing seasons

Combination		Fruit weight (gm)			Seed weight (gm)		
Female	Male	1 <sup>st</sup> Season	2 <sup>nd</sup> Season	3 <sup>rd</sup> Season	1 <sup>st</sup> Season	2 <sup>nd</sup> Season	3 <sup>rd</sup> Season
Santa-Rosa	Open (control)	47.55 A	28.11 CD	47.54 AB	1.11 A	0.99 B	1.11 BC
	Selfing	38.88C	30.64 BCD	1.19 CD	0.99 BC	1.04 B	1.13 BC
	Durado	37.21 CD	31.72 BCD	40.23 D	1.11 A	1.33 A	1.14 B
	Eldorado	43.40 B	36.89 AB	46.01 BC	1.10 A	1.36 A	1.21 AB
Durado	Open (control)	27.31 G	28.64 CD	30.72 E	0.85 EF	0.9 B	0.92 D
	Selfing	---	---	---	---	---	---
	Durado	31.94 EF	31.39 BCD	32.04 E	0.87 DE	0.94 B	0.79 D
	Eldorado	27.67 G	21.23 E	33.00 E	0.95 CD	0.67 C	0.87 D
Eldorado	Open (control)	33.84 DEF	26.68 DE	40.09 D	0.95 CD	0.74 C	1.14 B
	Selfing	30.81 FG	32.14 BCD	51.62 A	0.78 F	0.92 B	1.34 A
	Durado	38.95 C	2.30 A	45.49 BCD	1.06 AB	0.99 B	1.16 B
	Eldorado	35.72 CDE	33.93 BC	43.69 BCD	1.00 BC	0.96 B	0.95 CD

\*\* Means having the same letter (s) in each column are statistically insignificant at 5% level.

Data clearly showed that, a significant differences were found among parents in fruit shape. Meanwhile, the highest value of L/D ratio (>1) was obtained from Santa-Rosa free pollinated flowers in all seasons. Therefore, fruits of this cv. seemed to be oblong in their shape. On the contrary, Durado free pollinated flowers exhibit the lowest value of L/D ratio (<1) in both the first and second seasons. So that, fruit of this cv. appeared to be ovate in their shape, while, open pollinated Eldorado cv. flowers had slightly lower value of L/D ratio in comparison with Santa-Rosa free pollinated flowers in the first and second seasons, so that fruits of Eldorado cv. seemed to be round in their shape.

It is evident from table (5) the effect of different pollen types on L/D ratio on the fruit. The pollen parent significantly affected fruit shape. When Durado pollen was used either with Eldorado or Santa-Rosa as a female parent L/D ratio of fruit was significantly decreased compared with L/D ratio of fruits obtained from open pollinated flowers of both female parents.

Moreover, the L/D ratio of Durado fruit was significantly increased when pollinated with both Santa-Rosa and Eldorado cvs as compared with L/D ratio of fruits obtained from free pollinated flowers. On the other hand, there were no significant differences between Santa-Rosa fruits resulted from cross-pollination with Eldorado pollen grains and Eldorado fruit which were obtained from cross-pollination with Santa-Rosa pollen due to slight difference between fruits in L/D ratio resulting from open pollinated flowers for each female parent.

These results are similar to those of several investigators such as El-Sherbini (1982) who found that when Red Bircher apple cv., was crossed with Baladi apple pollen, the obtained fruits were more flat in their shape. Moreover, Khalil (1989) reported that the fruit shape of "Anna", "Dorsett Golden" and "Ein-shemer" was influenced by the type of the pollen parent. When "Anna" was crossed by "Dorsett Golden" the obtained fruits were round and flat, while when "Ein-shemer" was used as a pollinizer, round and elongated fruits were obtained.

In addition, Arafat (1989) working on Leconte pear cultivar, fruits resulted from artificial pollination with "Hood or Bartlett cvs" pollen grains, had oblongated shape. Also, Ali (1992) found that, pollen grains from different cultivars have different effect on the shape of Leconte pear fruits. When Leconte cv. was crossed with Kieffer cv. flat fruits were obtained while, other pollinizers such as L.S.3 and Pineapple decreased L/D ratio.

Conversely, the former results contradicted those obtained by Degman and Auchter (1934) on Summer Rombo, Delicious and Rome apple cvs. They stated that crossing with other apple cvs did not affect fruit length, diameter and length to diameter ratio. In addition, (Zaki, 1965) working on Leconte pear cv. reported that no metaxenia effect on shape of fruit resulted from cross-pollination with Hood or Pineapple pollen.

#### **4.4 Effect of different pollinizers on chemical properties of fruit.**

##### **4.4.1. Percentage of total soluble solids.**

Data presented in Table (5) showed that, the percentage of total soluble solids were not affected by cross-pollination. This may be due to slight differences in values of T.S.S percentage between most of cross and open pollinated flowers in the first season of study. Although, this difference was clearer in the second and third season of study.

Such results are in harmony with the findings of Griggs *et al.*, (1957) on Bartlett pear cv., they found that no significant differences between seedless and seeded Bartlett pear in soluble solids content. Similarly, Church and Williams (1983) working on Cox orange pippin apple cv. they reported that no metaxenia effect on sugar content was seen in pollinated Cox's fruits. Also Kitat *et al.*, (1973) found that in Balady, Agami and Housseni lime fruits the type of pollen did not influence T.S.S of fruit juice. Moreover, Arafat (1989) reported that the total soluble solids was not affected by different pollination treatments on "Leconte" pear fruit.



**Table (5): Effect of different pollinizers on fruit shape index of Santa-Rosa, Durado and Eldorado cultivars during 2001, 2002 and 2003 seasons.**

Cobination +		Fruit shape index (length: diameter)		
Female	Male	1 <sup>st</sup> season	2 <sup>nd</sup> season	3 <sup>rd</sup> Season
Aanta-Rosa	Open (control)	1.06 A	1.01 A	1.03 A
	Selfing	1.02 BC	1.00 A	1.0 A
	Durado	0.93 E	0.92 CD	0.94 B
	Eldorado	1.03 AB	1.01 A	1.04 A
Durado	Open (control)	0.85 G	0.86 D	0.86 CD
	Selfing	-----	-----	-----
	Durado	0.89 F	0.87 CD	0.8 D
	Eldorado	0.91 F	0.90 CD	0.88 C
Eldorado	Open (control)	1.02 BC	0.98 AB	1.03 A
	Selfing	1.00 C	0.93 BC	1.03 A
	Durado	0.97 D	0.96 ABC	0.9 B
	Eldorado	1.02 BC	1.01 A	1.04 A

\*\*Means having the same letter(s) in each column are statistically insignificant at 5%.

On the other hand, the obtained results are not in agreement with those obtained by Iyer and Randhawa (1965) who found that the amount of total soluble solids on Palastanian apple cultivar was higher in fruits obtained from cross-pollination than those produced by self-pollination. Also, using Bharrri grape cultivar, they reported that the lowest content of T.S.S was found in selfed fruits while the highest was found in fruits pollinated with Bharate grape cv. Similarly, El-Sherbini (1982) on Red Bircher nmapple cv. stated that cross pollination resulted in fruits with higher T.S.S than fruits resulted from self or open pollination. Moreover, Wallace and Lee (1999) stated that pollen source significantly affected sugar content of mandarin cultivars. 'Ellenor' and 'murocott' pollen significantly increased sugar content of 'Imperial' fruits compared to self and open pollinated fruits.

**4.4.2 Percentage of acidity.**

Data in Table (6), clearly showed that, Durado cv. free pollinated flowers gave the highest value of acidity percentage in the second season. Santa-Rosa gave statistically the same result in comparison with Durado free pollinated flowers in all seasons. However, the lowest acidity% was obtained from Eldorado free pollinated flowers in all seasons of study.

In addition, data indicated that, pollen parent had a direct influence on acidity percentage of fruits. Whereas, the female parent Eldorado cv. either with Durado or Santa-Rosa significantly increased acidity% of fruits in comparison with Eldorado free pollinated flowers. Meanwhile, acidity of Eldorado fruit was more affected with Durado than with Santa-Rosa as male parents, while, the reverse was true, when Eldorado pollen was used either with Durado or Santa-Rosa female parents. It significantly decreased acidity% of fruits comparing with

open pollination. Also, it is obvious that, when Durado cv. was pollinated with Santa-Rosa there were no statistically significant differences compared with Durado free pollinated flowers in both the second and third seasons of study. In addition, when Santa-Rosa was pollinated with Durado, it gave nearly the same value of acidity % as compared to the control in the second season, while, it was significantly increased in the first and third seasons of study. Moreover, there were no significant differences between these combinations (Durado × Santa-Rosa or Santa-Rosa × Durado) in the first and second seasons.

**Table (6): Effect of different pollinizers on total soluble solids %, acidity % of Santa Rosa, Durado and Eldorado cultivars during 2001,200 and 2003 growing season.**

Continuation		Fruit weight (gm)			Seed weight (gm)		
Female	Male	1 <sup>st</sup> Season	2 <sup>nd</sup> Season	3 <sup>rd</sup> Season	1 <sup>st</sup> Season	2 <sup>nd</sup> Season	3 <sup>rd</sup> Season
Santa-Rosa	Open (control)	47.55 A	28.11 CD	47.54 AB	1.11 E	0.99 B	1.11 BC
	Selfing	38.88 C	30.64 BCD	1.19 CD	0.99 BC	1.04 B	1.13 BC
	Durado	37.21 CD	31.89 AB	0.23 D	1.11 A	1.33 A	1.14 B
	Eldorado	43.0 B	36.89 AB	46.01 BC	1.10 A	1.36 A	1.21 AB
Durado	Open (control)	27.31 G	28.64 CD	30.72 E	0.85 EF	0.94 B	0.92 D
	Selfing	—	—	—	—	—	—
	Durado	31.94 EF	31.39 BCD	32.04 E	0.87 DE	0.94 B	0.79 D
	Eldorado	27.67 G	21.23 E	33.00 E	0.95 CD	0.67 C	0.87 D
Eldorado	Open (control)	33.84 DEF	26.68 DE	40.09 D	0.95 CD	0.74 C	1.14 B
	Selfing	30.81 FG	32.14 BCD	51.62 A	0.78 F	0.92 B	1.34 A
	Durado	38.95 C	42.30 A	45.49 BCD	1.06 AB	0.99 B	1.16 B
	Eldorado	35.72 CDE	33.93 BC	43.69 BCD	1.00 BC	0.96 B	0.95 CD

The obtained results are not in agreement with those obtained by Digman and Aughter (1934) who studied the metaxenia in Summer Rambo, Delicious and Rome apple cvs. As they found that pollen parent did not consistently influence the acid content of fruits in any of the crosses.

Moreover, Church and Williams (1983) reported that no metaxenia effect on acidity was seen in pollinated Cox orange Pippin apple fruits. Also, Kitat *et al.*, (1973) on Balady, Agami and Housseni Lime fruits reported that the type of pollen parent did not affect the acidity content in fruit Juice. On the other hand the former results did not coincide with those obtained by El-Sherbini (1982) who worked on Red Bircher apple cv., and found that hand cross pollination resulted in fruits with lower acidity than fruits of self-pollination.

**4.4 3. T.S.S: acidity ratio.**

It is clear from the data in Table (7) that, the highest value of T.S.S: acidity ratio was achieved with Eldorado free pollinated fruits in the first and third seasons. On the contrary, significant reduction in T.S.S: acidity ratio was detected by both free pollinated Durado and Santa-Rosa cv. fruits as compared with open pollinated Eldorado cv. There were no significant differences between them in all seasons.

In addition. Data in Table (7) indicated that, pollen parent significantly affected T.S.S/acidity ratio. The female parent Eldorado cv. had significantly lower T.S.S/acidity ratio in both Eldorado × Santa-Rosa, Eldorado × Durado combinations as compared with its open pollinated fruits in all seasons and there were no significant differences between them. On the other hand, when both Durado and Santa-Rosa cvs pollinated with Eldorado pollen the value of T.S.S/acidity ratio was increased as compared with T.S.S: acidity ratio of both Durado and Santa-Rosa open pollinated flowers in all seasons. There was no significant-differences between Durado × Santa-Rosa and Santa-Rosa × Durado combinations and their open pollinated flowers in T.S.S/acidity ratio in the first and second seasons.

The obtained results are not in agreement with those obtained by Wallace and Lee (1999) who studied the metaxenia in mandarin cultivars. They reported that, pollen source had no significant effect on citric acid content or sugar/acid ratio.

**Table (7): Effect of different pollinerzgers on total soluble solids/acidity of Santa-Rosa, Durado and Eldoradocultivars during 2001, 2002 and 2003 seasons.**

Cobination		T.S.S./Acidity		
Female	Male	1 <sup>st</sup> season	2 <sup>nd</sup> season	3 <sup>rd</sup> Season
Aanta-Rosa	Open (control)	16.53 B	17.83 C	12.29 BC
	Selfing	17.00 B	16.75 C	10.75 C
	Durado	14.00 B	17.31 C	11.02 C
	Eldorado	22.18 A	24.02 A	20.8 A
Durado	Open (control)	15.94 B	15.93 C	15.35 B
	Selfing	-----	-----	-----
	Durado	24.80 A	20.29 B	21.94 A
	Eldorado	14.56 B	15.22 C	13.2 BC
Eldorado	Open (control)	25.92 A	23.22 A	22.63 A
	Selfing	21.25 A	20.52 B	21.20 A
	Durado	16.96 B	15.15 C	14.97 B
	Eldorado	17.72 B	16.87 C	14.29 BC

Generally, we can conclude that, the ratio of SN/PL is correlated with self-fertility for these studied cvs. Both Durado and Eldorado plum cvs exhibited a low fruit set and very high SN/PL ratio, while Santa-Rosa cv. exhibited a high

fruit set percentage and low SN/PL ratio. Also, Santa-Rosa and Eldorado cvs are suitable pollinizers for Durado cv. In addition, no metaxenic effect was observed on both fruit and stone weight in the pollinated plum fruits as well as T.S.S in fruit juice. However, pollen grains from different cvs had various effects on the shape of plum fruits and had significant effect on acidity and sugar/acid ratio. So, SN/PL ratio can be considered as an indicator for self-fertility for the studied plum cultivars during the seasons of the study.

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تأثير نسبة عدد المتوك/طول عضو التانيث على الخصوبة وعقد الثمار وتأثير الملقحات المختلفة على الصفات الطبيعية والكيميائية لثلاثة أصناف من البرقوق

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أجريت الدراسة خلال ثلاثة مواسم متتالية (٢٠٠١، ٢٠٠٢، ٢٠٠٣) علي ثلاث اصناف من البرقوق الياباني (دورادو، سانتاروزا، الدورادو) عمر ١٣ سنة بمزرعة محطة بحوث البساتين بالقناطر الخيرية بهدف دراسة عدد المتوك وطول عضو التانيث بالأزهار والعلاقة بينهما وتأثير ذلك علي نسبة العقد وكذا خصوبة حبوب اللقاح لكل صنف وايضاً دراسة تأثير الآباء في مختلف التهجينات علي خصائص الثمار الطبيعية والكيميائية وأظهرت النتائج أن أزهار صنف دورادو كانت تحتوي علي أعلى عدد من الأسدية وأعلى حيوية لحبوب اللقاح يليه صنف الدورادو والسانتاروزا وأن أزهاره تمتلك أعضاء تانيث أطول يليه صنف السانتاروزا ثم الدورادو. كانت نسبة عدد المتوك/طول عضو التانيث أعلى معنوياً لأزهار صنف دورادو يليه صنف الدورادو ثم السانتاروزا. أعطى صنف السانتاروزا أعلى نسبة عقد تلاح صنف الدورادو ثم صنف دورادو الذي اعطي أقل نسبة عقد اي أنه كلما زادت الخصوبة الذاتية كلما قلت نسبة عدد المتوك/طول عضو التانيث والعكس صحيح. لم يكن هناك تأثير للآباء علي كلا من وزن البذرة والثمرة وانخفضت نسبة طول/قطر الثمار عند التلقيح الخلطي بحبوب لقاح صنف دورادو لكلا من صنفى سانتاروزا والدورادو بينما زادت نسبة طول/قطر الثمار عند التلقيح الخلطي بحبوب لقاح كلا من صنفى سانتاروزا والدورادو لصنف دورادو بينما لم يكن هناك فرق معنوي في نسبة طول/قطر ثمار صنف سانتاروزا الناتجة من التلقيح الخلطي بحبوب لقاح صنف الدورادو وثمار صنف الدورادو الناتجة من التلقيح الخلطي بحبوب لقاح صنف سانتاروزا.

كذلك لم تتأثر النسبة المئوية للمواد الصلبة الذاتية لثمار الثلاث اصناف الناتجة من معاملات التلقيح المختلفة في حين زادت النسبة المئوية لحموضة ثمار صنف الدورادو الناتجة من التلقيح الخلطي بحبوب لقاح صنفى سانتاروزا ودورادو وقلت لثمار صنفى سانتاروزا ودورادو الناتجة من التلقيح الخلطي بحبوب لقاح صنف الدورادو ولم يكن هناك فرق في هذه النسبة للثمار عند تلقيح صنف السانتاروزا بحبوب لقاح صنف دورادو أو العكس. كما تأثرت أيضاً النسبة المئوية للمواد الصلبة الذاتية/حموضة الثمار بنوع حبوب اللقاح.

بصفة عامة أظهرت الدراسة أنه يمكن الاعتماد علي نسبة عدد المتوك/طول عضو التانيث كمؤشر للخصوبة الذاتية للصنف حيث تزيد هذه النسبة بإنخفاض نسبة عدد المتوك/طول القلم والعكس صحيح. كذلك لم يؤثر نوع الآباء في مختلف التهجينات علي النسبة المئوية للمواد الصلبة الذاتية بينما أثر نوع الآباء علي النسبة المئوية للمواد الصلبة الذاتية/حموضة الثمار للأصناف الثلاثة خلال مواسم الدراسة.