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FRUIT SET OF LOW CHILLING APPLE CULTIVARS AS AFFECTED BY VARIOUS POLLINIZERS

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Abstract

The blooming period of Dorsett Golden cultivar was 35-38 days, which coincides with the blooming period of Anna (28-32 days). Ein-Shemer blooming period was comparably shorter (14-21 days). This period did not completely coincide with the blooming period of "Anna".

The highest fruit set was obtained under open pollination conditions. The best pollinizer for "Anna" cultivar was "Dorsett Golden" which gave the highest fruit set (65.00 and 66.66%) compared to Ein-Shemer pollinizer which gave the lowest (4.03 and 35.00%) in two seasons.

The pollen viability of the three cultivars ranged from 73.30 to 86.10% in 15% sucrose.

INTRODUCTION

Recently, between 1980-1981 several apple cultivars including Anna, Dorsett Golden and Ein-Shemer were introouced from USA by the Agriculturla Development System Project of the Ministry of Agricultural (Stino, *et al.* 1985). These cultivars need cross pollination for better cropping. They are diploid (2n=34) cultivars (Brooks and Olmo, 1972).

A study on the compatibility of these cultivars is required in order to offer the most favourite conditionss of pollination to obtain the highest fruit setting.

Croker *et al*, (1981) postulated that pollination with pollen of Dorsett Golen, F1W 22 or self pollen, Anna was shown to be self-infertile but compatible with the other two cultivars. Dorsett Golden is recommended as a pollinator because, it has the same flowring period as Anna.

Popov (1986) studied self pollination in relation to pollen quality and seasonal conditions. Best results were obtained open pollination in all apple cultivars.

Pollen germination and inter pollination in relation to fruit set in almond were demonstrated by Inder *et al.* (1987). They found that pollen viability was over 95% and pollen germination was over 90%, however fruit set ranged from

10. 42 to 16.23% through open pollination and from nil to 38.41% by cross pollination.

The aim of this study is to find out the suitable Pollinizer for getting high fruit set.

MATERIALS AND METHODS

In 1986, three mature uniform and productive six years old Anna apple trees and its two pollinizers "Dorsett Golden" and Ein-Shemer were selected; at the ADS introduction at El Kanater Research station.

Blooming dates of the three cultivars were recorded, during two seasons (1986 and 1987). The effect of open pollination, self pollination, emasculation without pollination, straight and reciprocal crossing on the fruit setting were studied in two seasons. All treatments were accomplished by leaving only two flowers per spur. Theflowers in all treatments except in the open pollination were protected from pollen contamination contamination by using glassine paper bags. Pollen grains were collected from flowers flowers at balloon stage and spread an a paper in the laboratory for 24 hours to dry. Then the pollen grains were stored in container placed in desiccatorsat 4^{o}C. The two flowers at balloon stage per spur were emasculated before adhiscence by removing the anthers carefully. This was carried out on twenty five spurs/tree totalling fifty flowers per tree of the tree apple cultivars i.e. 150 flowers for treatment. Flowers were bagged and pollination was performed after 24 hours from emasculation.

The total number of a certain cross and its reciprocal was three hundred flowers. After a month data were recorded for fruit set. Pollen germination of the three apple cultivars was studied in different sucrose concentration of 5.10, 15, and 20% in sterilizer petri-dishes.

The data were recorded and analyzed statistically by using the analysis of variance method according to Snedecor *et al.* (1972).

RESULTS AND DISCUSSION

1. Blooming period :

The period of blooming of Anna apple and the two pollinizer Dorsett Golden and Ein-Shemer during the two seasons 1986 and 1987 are presented in Fig. 1. The Dorsett Golden blooming period consistently matches with Anna in both seasons. Blooming period for Ein-Shemer was comparably shorter and covered only the last ten days of the Anna blooming period in the first season. In the second season, it was covering only about twenty days of the period and missed both the first and the last weeks of the blooming period of Anna. It is necessary that the blooming period of

each, coincides with, or at least to overlap for a reasonable period with the other cultivar, to ensure cross pollination between different cultivars. These findings are in agreement with those of Bodecs *et al*, (1980) on other cultivars and confirm which those of Crocker *et al* (1981) who stated that Anna was highly self-unfruitful and should be planted with a pollinizer to ensure good fruitset. Dorsett Golden was cross compatible with Anna, thus it is recommended as the preferred poilinizer.

2. The effect of different pollination treatments on fruit setting:

Table 1 shows that fruit set, in most different pollination treatments were higher in the second season (1987) than in the first one. This can be attributed to the fact that blooming season was longer in the second than in the first season which may allow a longer overlaping blooming for different studied cultivars.

High fruit set was recorded for Anna when Dorsett Golden was used as a pollinizer 65.00 and 66.66%, respectively in two seasons, however, very low percentages were obtained when Ein-Shemer was used as a male (4.03 and 35.00% in both seasons). This great discrepancy between the fruit set percentages in the two seasons, could be attributed to the fact that some unfavourable environmental conditions affectin fruit season. These indicate that Dorsett Golden is a better pollinizer for Anna than Ein-Shemer.

A previous investigation showed high compatibility of Anna with Iw-22 (Crocker *et al*; 1981).

General trends can be observed in the two seasons with the three cultivars. Open pollination gave the highest fruit set followed by self pollination, whereas emasculation without pollination produced no fruit set or the least value crosses between cultivars resulted in a great variability in fruit set ranging 4.03 to 75.60% in 1986 and 33.33 to 92.76% in 1987. Dorsett Golden under open pollination conditions gave the highest fruit set (86.66%) in two seasons. Fruit set percentages were very close for Anna and Ein-Shemer in two seasons (63.33 and 65.00% for Anna in 1986 and 1987, respectively, and 63.33% for Ein-Shemer in both seasons).

With all examined cultivars in the two seasons, fruit set percentages in self pollination were always lower than that recorded under open pollination conditions. Under self pollination conditions, Dorsett Golden gave the highest percentages (26.66 and 40.00% in 1986 and 1987, respectively) Anna gave 16.66 and 36.66 and 36%, while Ein-Shemer gave 16.66 and 15.0% in the two seasons, respectively. Emasculation without pollination caused complete failure in fruit setting in both seasons, in the case of Anna and Ein-Shemer while, in Dorsett Golden, a drastic dropping in fruit set (8.33%) was recorded in 1986 however this was relatively increased (30.00%) in 1987.

Table 1. The percentage of fruit setting of the three apple cultivars under different conditions in two seasons 1986 and 1987.

Variety	Open Pollination	Self Pollination	Emascula-tion without pollination	Different combinations
Anna (A)	63.33	16.66	0.00	AxD 65.00 AXE 4.033
Dorsett Golden (D)	86.88	2.66	8.33	DXA 75.60 DXE 66.66
Ein-Shemer (E)	63.3	16.66	0.33	EXA 10.0C EXD 45.00
L.S.D. at 0.05 for cultivar x treatment			3.35	
Season, 1987				
Anna (A)	65.00	36.66	0.00	AxD 66.66 AXE 35.00
Dorsett Golden (D)	86.66	40.00	35.00	DXA 92.76 DXE 65.53
Ein-Shemer (E)	63.33	15.00	00.00	EXA 33.33 EXD 58.33
L.S.D. at 0.05 for cultivar x treatment			16.79	

Mean separation by L.S.D. 0.05 (Snedecor, 1972).

These observations on self and natural open pollination support the suggetion of Brown (1975) that practically all apple cultivars are sefl-incompatible to some extent, some are completely so, and even thoe which appear to be self-compatible, set more fruit with higher seed number when pollinated with a cross-compatible cultivars, indicating that even in such cases some degree of self incompatibility is persent. In this context Crane and Lawrence (1952) found that the percentage of fruit set in some apple cultivars ranged from 0.00 to 9.60% under selfing conditions.

3. Pollen viability:

Table 2 shows the percentage of germination of pollen grains of the three studied apple cultivars in both seasons. The highest percentage of viable pollen was recoded when sucrose concentration was 15%. Ean-Shemer gave the highest percentage of viability (86.00 and % in both seasons). Anna and Dorsett Golden showed close values ranging in lower percentages of pollen germination of the three apple cultivars. This trend of results confirms that of Duganova (1969) who found that the majority of apple varieties except triploid cultivars, showed 70-90% pollen germination in glucose or sucrose solutions.

Table 2. Percentage of pollen grain germination for "Anna" apple and the two pollinizers "Dorsett Golden" and "Ein-Shemer" using different sucrose concentrations in the two seasons 1986 and 1987.

Variety	Sucrose concentration %			
	5	10	15	20
		Season 1986		
Anna (A)	9.00	41.20	73.30	12.09
Dorsett Golden (D)	30.19	52.70	77.30	26.30
Ein-Shemer (E)	42.50	47.60	82.00	53.50
			6.69	
	L.S.D. at 0.05 for cultivar x treatment			
		Season, 1987		
Anna (A)	12.00	51.30	76.23	14.20
Dorsett Golden (D)	24.00	50.30	73.80	22.00
Ein-Shemer (E)	40.33	43.80	86.10	50.80
	L.S.D. at 0.05 for cultivar x treatment 519			

Mean separation by L.S.D. 0.05 (Snedecor, 1972).

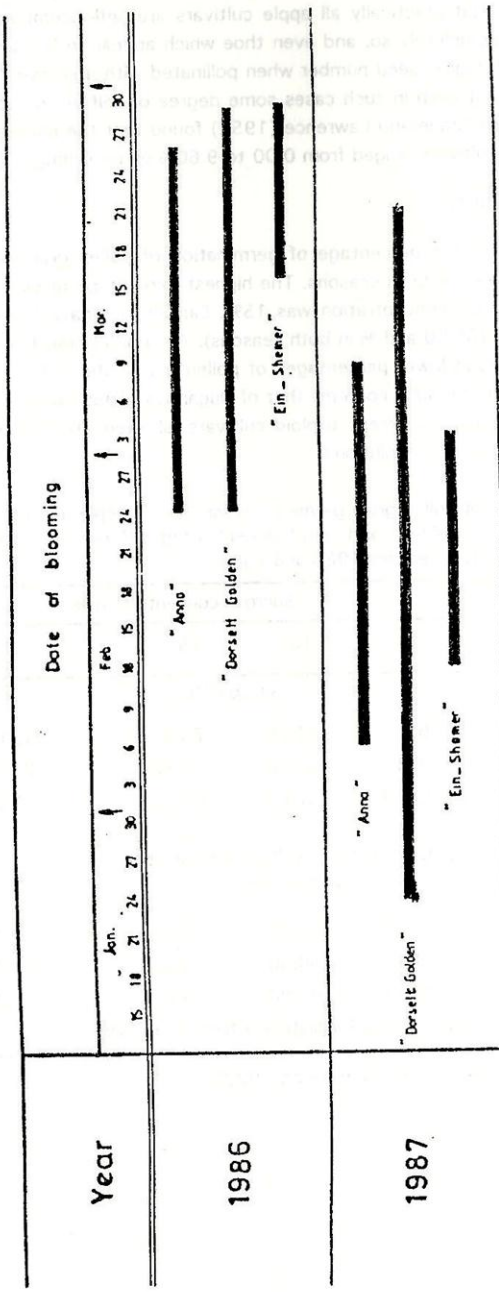

Fig. 1. Blooming periods of "Anna" apples and the two pollinizers, "Dorsett Golden" and "Ein-Shemer" during the two seasons (1986 and 1987).

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تأثير اختلاف الملقح على عقد الثمار فى أصناف التفاح ذات احتياجات البرودة القليله

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نظرا لأهمية وتأثير صنف التفاح الملقح على نسبة العقد للصنف المزروع فقد وجد من نتائج هذه الدراسة عندما زرع صنفى التفاح الدورست جولدن وعين شمير كملقحين لصنف التفاح الآنا الآتى:-

١ . تقاربت فترة تزهير التفاح الآنا من فترة تزهير صنف الدورست جولدن بعكس الحال فى صنف العين شمير الذى كانت فترة تزهيره قصيرة وغير متطابقة لفترة تزهير صنف الآنا.

٢. أعلى نسبه لعقد الثمار كانت للتلقيح المفتوح (الطبيعى) بعكس الحال فى حاله التلقيح الذاتى أو فى حالة خصى الأزهار وتركها بدون تلقيح.

٣. أفضل ملقح لصنف التفاح الآنا هو صنف تفاح دورست جولدن حيث أعطى أعلى نسبه من عقد الثمار . خلال موسمين الدراسه بينما كانت أقل نسبه لعقد الثمار عندما لقح الآنا بالعين شمير.

٤. أفضل تركيز لآنبات حبوب اللقاح لأصناف الآنا دورست جولدن عين شمير هو ١٥٪ من سكر السكروز لموسمى الدراسه.