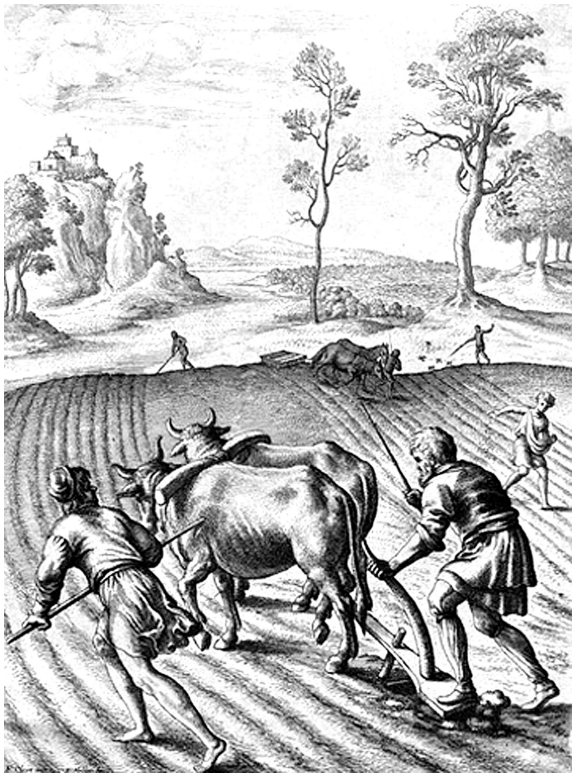
ISSN : 1812-5379 (Print)
ISSN : 1812-5417 (Online)
http://ansijournals.com/ja

JOURNAL OF AGRONOMY



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Pakistan Journal of Agronomy 2 (4): 209-213, 2003
ISSN 1680-8207

An Investigation on Parthenocarpy in Some Summer Squash (*Cucurbita pepo* L.) Cultivars

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Abstract: This study was conducted to determine the parthenocarpic fruit set ability of some summer squash (*Cucurbita pepo* L.) cultivars (Eskenderany F_1, Topkapı F_1, Acceste F_1, Sakız and Urfa Yerli). One day before anthesis, female flowers were clipsed and isolated with sellofan or pistil was plucked. Parthenocarpic response affected on cultivars, treatments, years and planting periods. Parhenocarpic fruit set ability of hybrid cultivars were more than open pollinated cultivars, Urfa Yerli wasn't parthenocarpic fruit set but other cultivars varied in the amount of fruit set without pollination. Pistil plucked applications had more parthenocarpic fruit set than clipsed and isolated with sellofan applications. Parthenocarpic fruit set was high in 2001 for clipsed flowers but it was high in 2000 for pistil plucked flowers. First growing period was the best for pistil plucked flowers, but it was second period for clipsed and isolated flowers in both years.

Key words: *Cucurbita pepo*, parthenocarpy, fruit set ability

Introduction

Firstly, parthenocarpy used for greenhouse cucumber cultivars (*Cucumis sativus* L.) in 19th century for high yield and ability to fruit set without pollination. Parthenocarpic fruit set ability is very important in greenhouse production especially when pollinating insects were absent (Robinson, 1993; Robinson and Reiners, 1999). Parthenocarpy was observed most greenhouse species; melon, squash, tomato and pepper (Rylski and Aloni, 1990)

Parthenocarpy stimulated in squash by growth regulators (Gustafson, 1941; Mori, 1947; Takashima and Hatta, 1955; Suleiman and Suwwan, 1990; Atasayar and Vural, 1993), pollen extracts (Gustafson, 1937), isolating of female flowers (Robinson, 1993; Robinson and Reiners, 1999) and using male steril lines (Carle, 1997).

Parthenocarpy is important when squash grown in under protected cultivation or open field out of season because male flowers or pollinating insects may be absent. Squash cultivars differ in sex expression and fruit set may be poor early in the season when prices are often highest (Wien, 1997). Low night temperature and short day stimulated parthenocarpy in cucumber and squash (Nitsch ***et al.***, 1952; Globerson, 1971; Rylski, 1974). Parthenocarpy could permit the use

of highly female cultivars early in the season without concern for pollination (Robinson and Reiners, 1999). Disease-resistant cultivar had good parthenocarpic response and parthenocarpic set fruit was affected seasonal variation and fruit type (Robinson, 1993).

Durham (1925) closed 301 female flowers of squash plants to prevent insect pollination, but none fruit set. Nitsch (1952) found that "Acorn" winter squash would produce parthenocarpic fruit, but only after producing many female flowers that didn't set fruit. But "Royal Acorn" didn't set fruit in Robinson and Reiners (1999) tests, which were terminated before the parthenocarpic stage of development described by Nitsch (1952). Parthenocarpy would be recessive character, parthenocarpic fruits couldn't grow like normal fruits (Nijs and Balder, 1983) and competition the other parts of plant. Parthenocarpic fruits harvest period was wide apart (Nijs and Veldhuyzen, 1982). Nijs and Zanten (1982) obtained parthenocarpic set fruit in DG-4 (1420 g), Poseidon (1391 g), Cocozelle (1101 g), Black Jack (1011 g), Ston's Green (398 g) and Ambassador (365 g) cultivars. Om and Hong (1989) reported that "Zucchini" and "Caserta" were among the best of the 64 cultivars they tested for fruit set in an insect-proof greenhouse. Atasayar and Vural (1993) isolated female flowers with pens and derived parthenocarpic fruits in Eskenderany F_1, Jedida F_1 and Saray F_1 cultivars (7.8, 8.0 and 8.7 fruit-plant, respectively). Robinson (1993) found that important differences existed among summer squash cultivars for parthenocarpic fruit set. Dark green cultivars gave the best parthenocarpic fruit set and parthenocarpic fruit set rate was 82% in Chefini Hybrid, 75% in Gold Strike, 71% in Black Beauty, 67% in Black Magic and 50% in NY-82-138 (Robinson and Reiners, 1999).

The aim of this research was to investigate the possibility of stimulating parthenocarpy in squash (*Cucurbita pepo* L.).

Materials and Methods

As plant material, hybrids (Eskenderany F_1, Topkapı F_1 and Acceste F_1) and open-pollinated cultivars (Sakız and Urfa Yerli) were used. The seeds were sown and planted different periods (Table 1). Seeds were sown in pots filled with a mixture of 1 peatmoss : 1 potting soil : 1 sand (v/v). Plants were planted in open field with single row systems for both years. Spaces between and within rows were arranged (Eskenderany F_1, Topkapı F_1 and Acceste F_1 100 × 60 cm, Sakız 120 × 70 cm, Urfa Yerli 150 × 100 cm) according to genotypes habits. In different growing seasons, nutrition components were given through soil. Plant health was protected with fungicides and insecticides, weeds were controlled by cultivation and hand weeding regularly.

Two different application treated one day before anthesis to determination parthenocarpic fruit set ability of cultivars. Female flowers petals were clipsed with aluminium clips and isolated with sellofan bag or female flowers pistils were plucked. Untreated or open flowers were removed to prevent development of open pollinated fruit and promote the isolated or pistils plucked flowers. Parthenocarpic fruit set rates were recorded for each cultivar at the marketable fruit stage (immature).

Table 1: Sown and planting times of cultivars

2000				2001			
1. period		2. period		1. period		2. period	
Sowing	Planting	Sowing	Planting	Sowing	Planting	Sowing	Planting
10 May	27 May	5 June	23 June	13 May	7 June	7 June	26 June

All trials included three replications of eleven plants for each cultivar/treatment. A randomized complete-block design was used. Data were obtained on percent and analysed with transformation through EXCEL.

Results and Discussion

There were no significant differences of applications on marketable fruit shape. Mature fruit which was obtained from clipsed or pistil plucked applications were seedless and proved parthenocarpy.

Cultivars and applications gave different ability to parthenocarpic fruit set in 2000 and 2001 (Table 2 and Table 3). Hybrid cultivars were the best than the open pollinated cultivars, generally. It was 5.85% in hybrids and 2.90% in open pollinated cultivars for clipsed flowers, 25.29% in hybrids and 11.03% in open pollinated cultivars for pistil plucked flowers. This is indicated that parthenocarpy is depend on genetically diversity and combined cultivars or breeding lines have more parthenocarpic ability. Dark green, zucchini-type cultivar Acceste F_1 and the green, striped cultivars Eskenderany F_1 and Topkapı F_1 had good parthenocarpic fruit set in this research. Nijs and Zanten (1982) found that dark green fruited summer squash lines produced most parthenocaropic fruit. But, Robinson and Reiners (1999) tests shown that some of the zucchini-type lines (Ambassador and Onyx) produced poorly parthenocarpic yield and the green, striped cultivars (Caserta and Cocozelle) set parthenocarpic fruit. Om and Hong (1989) reported that Caserta has ability parthenocarpic fruit set. The light green with scalloped edge cultivar Sakız gave constantly parthenocarpic yield. Om and Hong (1989) and Robinson and Reiners (1999) reported that the scallop-type cultivars had poor parthenocarpic fruit set. On the other hand, light green, egg shaped cultivar Urfa Yerli had no parthenocarpic response.

Both our 2000 and 2001 years, pistil plucked flowers gave highly parthenopcarpic response than the clipsed and isolated flowers (22.4 and 5.5%, respectively). Parthenocarpic fruit set was 2.25 and 6.6% for clipsed and isolated flowers and it was 29.27 and 16.46% for pistil plucked flowers 2000 and 2001, respectively.

Pistil plucked application gave the high parthenocarpic response in first growing period but clipsed and isolated flowers gave the high performance in second growing period, in 2000 and 2001. The parthenocarpic yield was 29.4% in first period and 16.4% in second period for pistil plucked flowers and it was 3.1% in first period and 8.6% in second period for clipsed and isolated flowers in 2000 and 2001, respectively.

Parthenocarpic fruit set ability which is controlled by a single recessive gene, designated s2 (Carle, 1997) in summer squash is not usable economical meaning in favorable conditions.

Table 2: Total number female flower clipsed and isolated with sellofan bag and mean of parthenocarpic fruit set of squash cultivars

	Total number female flowers clipsed and isolated with sellofan bag				Mean parthenocarpic fruit set (% ± SE)			
	2000		2001		2000		2001	
Cultivars	1.P	2.P	1.P	2.P	1.P	2.P	1.P	2.P
Eskenderany F_1	82	14	125	102	1.2±0.7	0	5.6±2.7	13.7±4.4
Acceste F_1	62	50	134	100	1.6±0.7	4.0±1.1	0	0
Topkapı F_1	60	34	140	94	3.3±1.2	0	3.6±0.5	13.8±2.0
Sakız	81	26	84	69	0	0	0	2.9±1.2
Urfa Yerli	71	2	30	13	0	0	0	0

Table 3: Total number female flowers pistil plucked and mean of parthenocarpic fruit set of squash cultivars

	Total number female flowers pistil plucked				Mean parthenocarpic fruit set (% ± SE)			
	2000		2001		2000		2001	
Cultivars	1.P	2.P	1.P	2.P	1.P	2.P	1.P	2.P
Eskenderany F_1	197	91	116	74	48.2±8.2	14.3±4.7	25.0±3.9	21.6±7.2
Acceste F_1	156	100	137	69	43.6±11.7	31.0±17.1	13.9±3.8	1.5±0.6
Topkapı F_1	199	84	135	52	31.7±11.8	20.2±6.2	33.3±13.9	19.2±5.0
Sakız	31	82	89	42	0	15.9±3.0	10.1±2.3	7.1±3.0
Urfa Yerli	19	47	41	39	0	0	0	0

Therefore, breeding or selecting of summer squash has parthenocarpic fruit set ability, in protected cultivation, under low temperature and pollinating insect was absent, can provide fruit set and effective.

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