

Effect of Seed Storage Period and Harvesting Frequency of Fresh Fruit on Fresh Fruits and Seeds Yield in Summer Squash

Abduljabbar I. Al-Hubaity
College of Agric. And Forestry
Mosul Univ.

Sanaa M. Saleh
College of Agric.And Forestry
Duhok Univ.

Abstract

This research was conducted at the Vegetable Research Farm / Dept. of Horticulture / Agric. College /Duhok Univ., to study the effect of seed storage period and number of harvesting times of fresh fruits on fruits and seeds yield in summer squash (Local cv. Mulla Ahmad) . The results exhibited that seed storage period had no significant effect on fresh fruits yield plant⁻¹ ,while harvesting frequency of fruits affected significantly number of fruits plant⁻¹ , fruit weight and fruit yield plant⁻¹ as compared with control treatment (without fruit harvest) , and the best interaction treatment in number of fruits and fruit yield plant⁻¹ was (seed storage for one year + 2 harvesting of fruits) produced 19.15 fruit and 10.00 kg plant⁻¹ respectively . Regarding seeds yield , it was noticed a significant reduction in number of fruits held for seed production through elongation of storage period recorded (2.304 & 2.051) fruit in both seed storage treatments respectively , this trait did not affected significantly with increasing no. of fruit harvesting . Whereas , average fruit weight , seed yield plant⁻¹ and total seeds yield decreased significantly by increasing seed storage period . Concerning harvesting frequency of fruits, it caused a significant reduction in all traits related with seeds yield as compared with control treatment . The results also revealed that interaction treatment between storage period and harvesting frequency of fruits does not had a significant effect on number of fruits plant⁻¹ . The interaction treatment (seeds storage for one year + without fruits harvesting) gave the best results for most traits of seeds yield and its components recorded 1.476 kg. for fruit weight , 467.17 seeds in number of seeds fruit⁻¹ , 32.15 g in seeds weight fruit⁻¹ , 93.64 g in seed yield plant⁻¹ and 1373.34 kg ha⁻¹ for the total seeds yield.

Keywords: Storage period , Seed production , Squash

Introduction

Squash (*Cucurbita pepo* L.) is one of the most important cucurbitaceae crops .Although the area grown by this crop in Iraq has greatly increased, but the yield per unit area is still too low approximately (13.09 t ha⁻¹) (Anonymous , 2000)

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as compared with many other countries specialized in squash production (19.0 t ha^{-1}) (Anonymous, 2006) .Which needs further studies for some genetic and environmental factors in addition to cultivation practices that lead to greater crop production with good quality .Seeds are the primary base in the production of vegetable crops .Seeds of watermelon and some squash and pumpkin species are roasted and eaten as snacks, or ground as an ingredient of sauces .Several cultivars of *C. pepo* with hull-less seeds have been developed that facilitate food uses of the seeds. With an oil and protein content of 46% and 34% respectively , these could be exploited as alternative oil-bearing crops (Whitaker and Davis, 1962). Improved and better seeds result in a good quality if provided by factors that limit the production . There is no documented and dependent statistics about average production of summer squash seeds in Iraq. It is wellknown that there is enough areas in Northern region of the country were exploited to produce seeds , or some growers attempt after taking earlier harvests of fresh fruits by leaving the yield for seed production in particular during the price declining of fresh fruits .There is a lack of references present in the literature review concerning seeds production of *C. pepo* , so this study was conducted to deal with seeds storage period and frequency harvest of fruits on fresh fruits yield and seeds yield per unit area which consider as one of the important factors affecting the production of fruits and seeds yield in summer squash . Seeds storage operation was studied from many researchers due to its importance in providing a sufficient reserve of seeds in different times (Bladwin, 1942) . Kozlowiski (1971) found that variable storage conditions affect on seeds viability of *Fraxinus pennsylvanica* .Slaiman *et al* (1990) in their study concerning the effect of storage period on germination of *Fraxinus rotundifolia* Mill.,where they used three storage periods (3,6,9)months ,their results revealed existence of significant difference in seeds germination percentage specially at seeds storage after 3 and 9 months as compared with that after 6 months which gave a minimum germination % . Different behavior have been incountered among summer squash plants held for seed production as compared with their production for fresh fruits consumption .McCollam (1934) stated that growing fruits which has been left for seeds production ,have an inhibited effect on plant growth and production of female flowers in cucumber, Avila *et al* (2001) mentioned that fruits removal of wild squash *Taxana* provides an opportunity for the plants to redistribute nutrients regularly , and these plants had a rapid vegetative growth and produced high number of male and female flower buds as compared with plants left their fruits without removing for seeds production purpose . Many researchers illustrated that harvesting process induced to increase production of ethylene hormone which encourage formation and development the

female flowers in the vegetative growth .Romman (2000) said that seeds yield in cucumber decreased with increasing number of fresh fruits harvest , in addition of

decreasing the fresh fruits yield and weight of 1000 seeds .Grewal *et al* ;(1973) confirmed that seeds yield in okra plants does not highly affected by twice harvest of fresh fruits. Kassem ;(1981) in his study on eggplant, found that number of fruits , average fruit weight, seeds quantity in the fruit, seeds yields plant⁻¹ and total seeds yield per unit area, were increased by taking one harvest of fresh fruits as compared with plants have been projected with two harvest or with plants which left their fruits without harvesting. Al-Habbar and Esho;(1996) in their investigation involved two cultivars of eggplant , found that number of fruits plant⁻¹ and total yield of fruits per unit area (for consumption purpose) were increased with increasing harvesting frequency of fresh fruits. Whereas, number of fruits plant⁻¹ , average fruit weight held for seeds extraction decreased by increasing number of fresh fruits harvest , and plants left their fruits without harvest gave the highest weight of seeds plant⁻¹ and total seeds yield, and this treatment does not affected significantly with one time harvest of fruits, On the other hand, seeds weight fruit⁻¹ and seeds index did not affected by increasing number of fresh fruits harvest. Al-Habbar *et al* ;(2003) in their study on summer squash (Local cv. Mullah –Ahmed), they noticed that number of fruits and total yield of fresh fruits were significantly increased with harvesting frequency of fresh fruits. Whereas, number of fruits and fruit weight held for seeds production were decreased with increasing number of fruits harvest for more than twice. Plants with two time harvest resulted in highest seeds yield fruit⁻¹ , seeds weight plant⁻¹ , total seeds yield and weight of 1000 seeds

Materials and Methods

The study was carried out at Vegetable Research Farm of Horticulture Dept. / College of Agric. /Dohuk University during summer season of 2001. Summer squash seeds (Mulla –Ahmed cv.) were used, this variety is widespread in Iraq for its better and desirable fruits and seeds quality. The experiment involved eight treatments resulting from the interaction between two storage periods (one year and two year) and four harvesting frequency of fresh fruits

(without harvest , one harvest , two harvest and three harvest). The treatment were arranged in a factorial experiment by using RCB Design with three replicates . The data were statistically analysed following procedures outline by (Al-Rawi and Khalaf-Allah, 2000). Each experimental unit contained 2 ridges 3 m long spaced 1.5 m apart while plants were 40 cm apart within each ridge. Intercultural operation were performed to keep the plants free from weeds and pests . The plants were fertilized with 70 kg/donum of Diammonium Phosphate (DAP) 18:46:0 (Matlab *et al* , 1989). Other agricultural operation were similarly carried out at all experimental units as followed by farmers in the area. The experimental measurements were recorded as an average of five plants on: fruit diameter (cm),

number of fruits plant⁻¹, fresh weight of fruit(g), fruit yield plant⁻¹ (kg) and the components of seeds yield involving fruit weight (g), number of fruits plant⁻¹, seeds weight fruit⁻¹ (g), and seeds yield plant⁻¹.

Results and Discussion

Results recorded in table (1) showed that mean storage periods had no significant effect on fruit traits and fruits yield plant⁻¹ Fig.(1). Whereas, number of harvest revealed that one harvest had a significant effect in fruit diameter, fruit weight and fruits yield plant⁻¹ Fig (1), but in case of number of fruits plant⁻¹ trait, all number of harvest in general exhibited a significant effect as compared with control treatment (without harvest), There was a significant effect among harvest frequency treatments in fruit diameter and fruit weight, but in number of fruits plant⁻¹ and fruit yield plant⁻¹ did not reach a significance effect. On other hand, in case of the interaction between the studied factors, the best interaction treatment in no. of fruits plant⁻¹ resulted from 1st storage period with two harvest measured (19.15) fruits which non-significantly affected in comparison with the other harvesting times. The best interaction treatment in fruit diameter and weight (4.477 cm, 186.56 g) respectively as illustrated in the table(1) produced from (1st storage period + one harvest), whereas, the lowest values for these two traits (2.220 cm, 170.00 g) respectively were noticed in the control treatment. As for fruits yield plant⁻¹, Fig (2) revealed that the interaction treatment (1st storage period + second harvest) was superior over the other treatments giving the value (10.00) kg plant⁻¹, but it was non-significant with the following interaction treatments (1st storage period +3rd harvest, 2nd storage period +2nd harvest and 2nd storage period +3rd harvest). These results are in conformity with those of Avila *et al.* ;(2001) in wild squash, Al-Habbar and Esho (1996) in eggplant and Al-Habbar *et al.* ;(2003) in summer squash, who confirmed increasing no. of fruits, total fruits yield donum⁻¹ were increased by increasing harvesting times of fruits.

Data in table (2) revealed that number of fruits held for seed production were decreased no significantly by elongation of storage period which giving the values (2.304, 2.051) fruits in the two storage periods respectively. Also this trait did not affected significantly with increasing number of harvest. This result agrees with the findings of Al-Habbar and Esho (1996), Al-Habbar *et al* (2003) who says that number of fruits and average fruit weight held for seed production were decreased with increasing number of fruits harvest. In traits of average fruit weight, number of seeds fruit⁻¹, seeds weight fruit⁻¹ seeds yield plant⁻¹ and total seeds yield Fig (3), the mean storage period showed a significant decrease with increasing the storage period. This result is in harmony with finding of Kozłowski ;(1971) in *Fraxinus pennsylvanica*. The reason might be interpreted to the role of the storage period effect in decreasing the viability of the storage seeds. Regarding the effect of number of harvest the results exhibited a significant depression in all traits related for seeds yield table (2), and Fig (3) by increasing number of harvest, and the highest values produced from the control treatment as follows (1.311kg, 367.78,

28.12 g , 84.05 g , 1232.78 kg/ha) for the traits (fruit weight , number of seeds fruit⁻¹ , seeds weight fruit⁻¹ , seeds yield plant⁻¹ Fig (1) and total yield) respectively .These results are in conformity with the those of Hewedy (1978) and Romman ;(2000) in cucumber , Al-Habbar and Esho ;(1996) in eggplant, Al- Habbar *et al* ;(2003) in summer squash ,who stated that harvesting frequency of fruits resulted in decreasing seeds yield and some of its component. Whereas, Grewal *et al* (1973) found that seeds yield in okra did not affected by fruits harvest for two times .Decreasing of seeds yield may be a result of decreasing fruits number and average fruit weight which reflected in lowest no. of seeds fruit⁻¹ and seed weight fruit⁻¹ as previously mentioned.

Concerning the effect of interaction between storage period and number of harvest, the results revealed that number of fruits plant⁻¹ does not affected significantly in the all interaction treatments. In the other hand, the best interaction treatment for the most seeds traits as illustrated in table (2) and seeds yield Fig (4) was between the (1st storage period +without harvest)giving the records 1.476 kg for fruit weight, 467.17 seed in number seeds fruit⁻¹ , 32.15g for seeds weight fruit⁻¹ , 93.64 g in seeds yield plant⁻¹ and 1373.34 kg/ha for the total seeds yield

Table (1) Effect of seeds storage period and harvesting frequency of fresh fruits and their interactions on fruit traits and fruit yield in summer squash (Mulla-Ahmed cv.)

Storage period (year)	No. of Harvest	No. of fruits plant ⁻¹	Fruit diameter (cm)	Fruit weight (gm)
1	0	17.06 b	2.220 d	170.00 b
	1	18.12 ab	4.477 a	186.56 a
	2	19.15 a	3.623 bc	181.54 ab
	3	18.12 ab	2.450 d	172.32 b
2	0	16.99 b	2.017 d	171.17 b
	1	18.25 ab	4.057 ab	179.82 ab
	2	18.33 a	3.607 bc	184.20 a
	3	18.89 a	3.177 c	176.13 ab
Mean	1	18.112 a	3.192 a	177.60 a

storage period	2	18.115 a	3.214 a	177.83 a
Mean of fruit harvest	0	17.025 b	2.118 d	170.58 b
	1	18.185 a	4.267 a	183.19 a
	2	18.740 a	3.615 b	182.87 a
	3	18.505 a	2.813 c	174.22 b

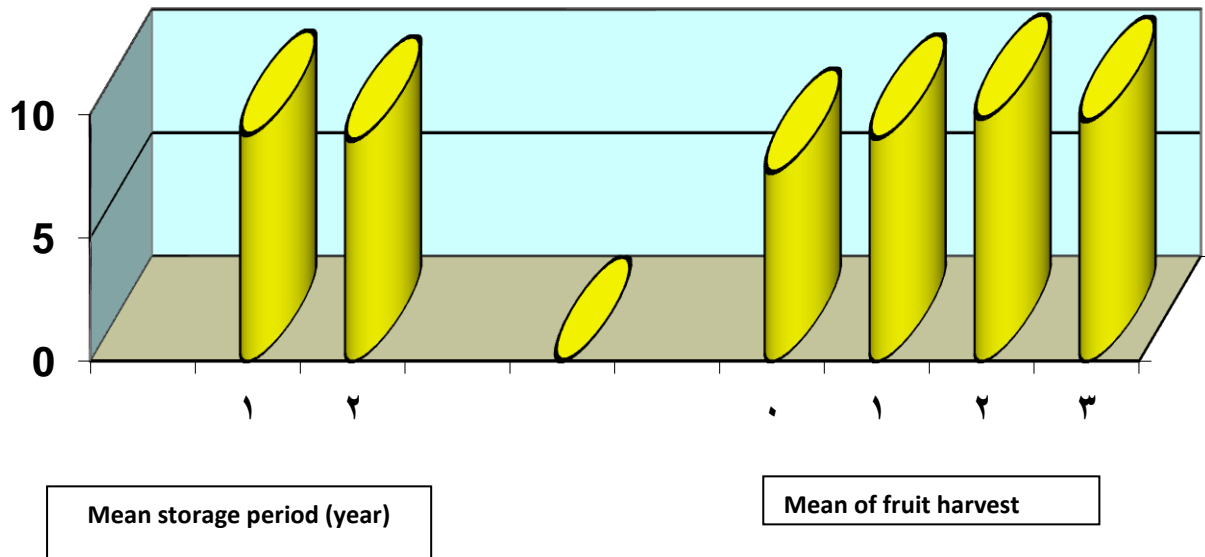
- Means followed by the same letter within a column do not differ significantly from each other using Duncans Multiple Range Test at 5% level.

Table (2) Effect of seeds storage period and harvesting frequency of fruits and their interaction on fruit traits and seeds yield in summer squash (Mulla –Ahmed cv.)

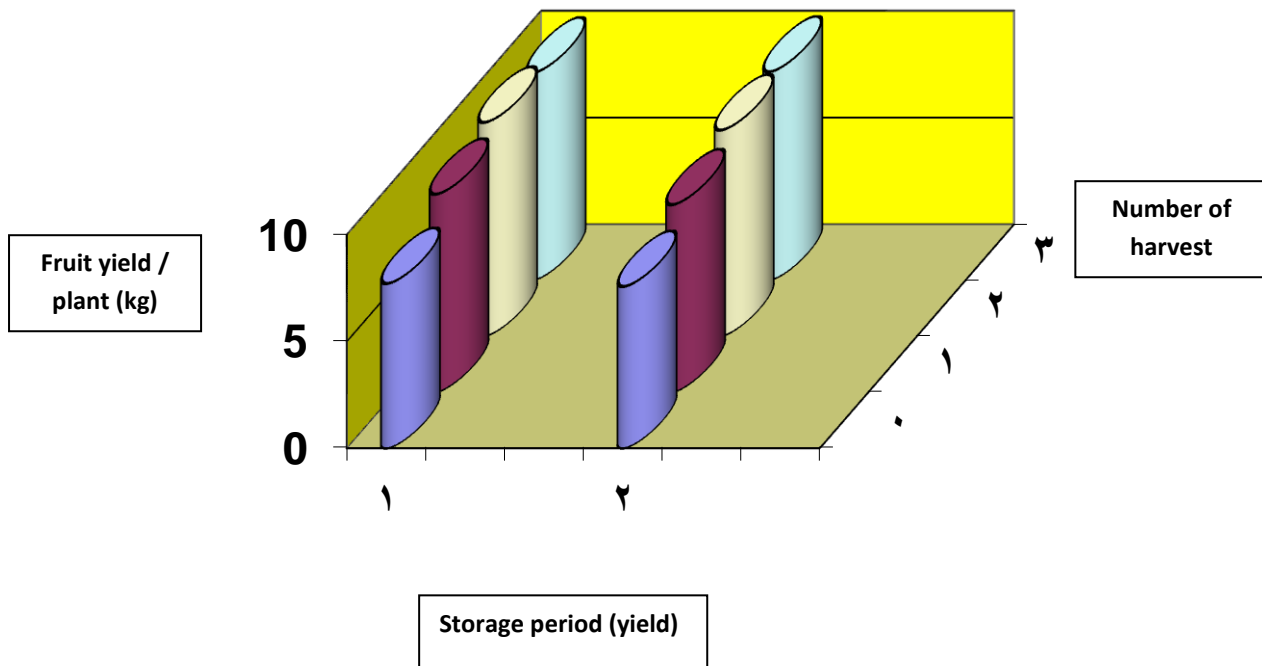
Storage period (year)	No. of Harvest	No. of fruits plant ⁻¹	Fruit weight (kg)	No. of seeds fruit ⁻¹	Seeds weight fruit ⁻¹ (gm)	Seeds yield plant ⁻¹
1	0	2.377 a	1.476 a	467.17 a	32.15 a	93.64 a
	1	2.354 a	1.262 b	355.67 b	30.58 a	60.72 b
	2	2.170 a	1.125 cd	282.73 c	23.17 b	62.98 b
	3	2.317 a	1.031 d	250.77 cd	17.01 c	34.08 e
2	0	2.170 a	1.146 c	268.40 cd	24.10 b	74.47 b
	1	2.190 a	0.872 e	250.67 cd	18.86 c	53.20 d
	2	2.000 a	0.820 e	217.97 de	12.15 d	52.20 d
	3	1.847 a	0.658 f	182.83 e	11.23 d	26.80 f
Mean storage period	1	2.304 a	1.223 a	339.08 a	25.72 a	62.85 a
	2	2.051 a	0.874 b	229.96 b	16.58 b	51.66 b

Mean of fruit harvest	0	2.273 a	1.311 a	367.78 a	28.12 a	84.05 a
	1	2.272 a	1.067 b	303.17 b	24.72 b	56.96 b
	2	2.085 a	0.972 c	250.35 c	17.66 c	57.59 b
	3	2.082 a	0.844 d	216.80 d	14.12 d	30.44 c

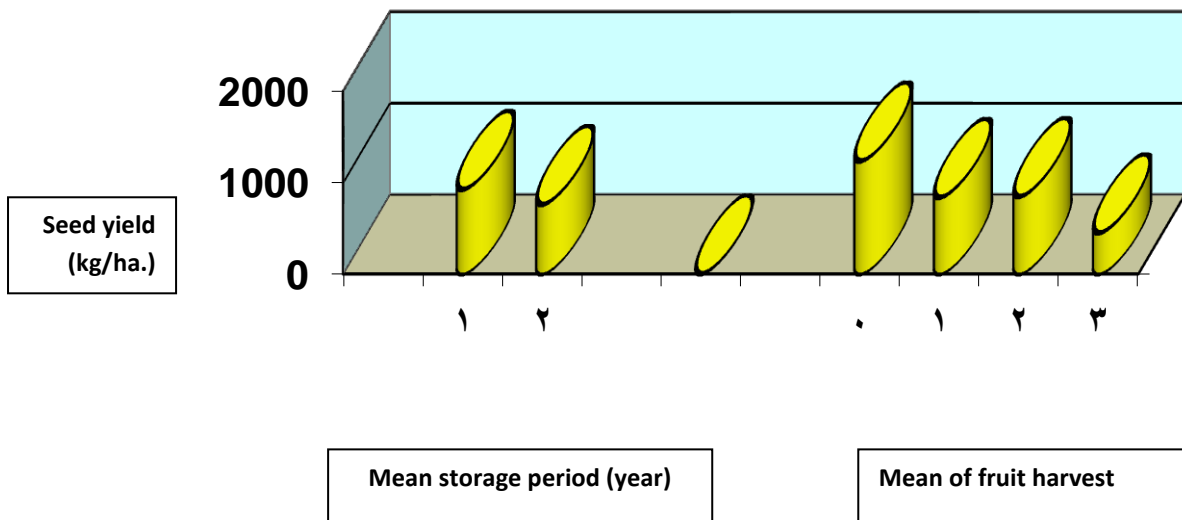
- Means followed by the same letter within a column do not differ significantly from each other using Duncans Multiple Range Test at 5% level.



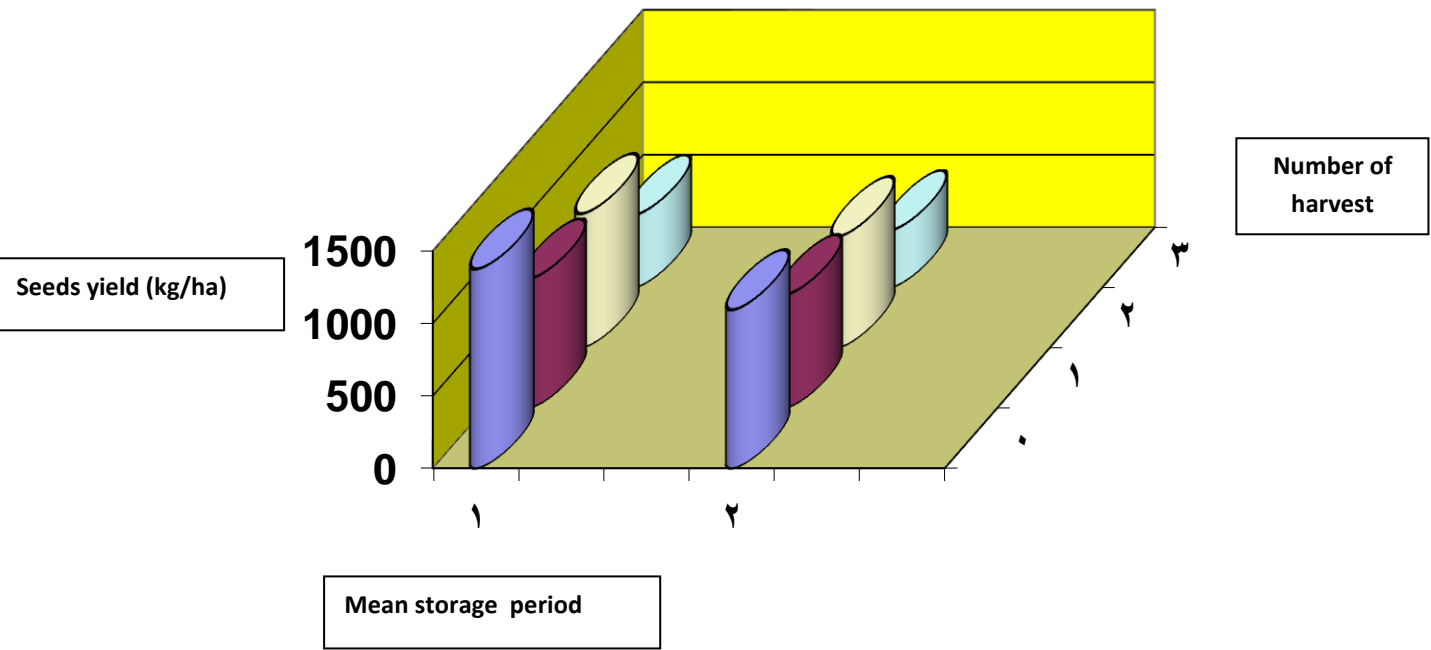
Figur (1) Effect of seeds storage period and harvesting frequency on fruit yield /plant (kg)



Figur (2) Effect of seeds storage period and harvesting frequency on fruit yield /plant (kg)



Figur (3) Effect of seeds storage period and harvesting frequency on total seeds yield (kg/ha)



Figur (4) Effect of seeds storage period and harvesting frequency on total seeds yield (kg/ha)

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تأثير فترة خزن البذور وعدد الجنيات في حاصل ثمار وبذور قرع الكوسة

سناء محمد صالح

عبد الجبار إسماعيل الحبيطي

جامعة دهوك / كلية الزراعة

جامعة الموصل/ كلية الزراعة والغابات

الخلاصة

نفذ البحث في حقل بحوث الخضراوات التابع إلى قسم البستنة / كلية الزراعة / جامعة دهوك، لدراسة تأثير فترات خزن البذور وعدد مرات جني الثمار الطازجة في الحاصل ألثمري والبذري لقرع الكوسة- الصنف المحلي(ملا أحمد). بينت نتائج التحليل الإحصائي أن فترات خزن البذور ليس لها أي تأثير معنوي في حاصل الثمار الطازجة للنبات، بينما كان لعدد مرات جني الثمار تأثيراً معنوياً على صفات عدد الثمار في النبات، وزن الثمرة وحاصل الثمار للنبات مقارنة مع معاملة الشاهد (بدون جني الثمار)، وكانت أفضل معاملة تداخل في صفتي عدد الثمار والحاصل ألثمري للنبات هي عند (خزن البذور لسنة واحدة مع اخذ جنيتين للثمار) حيث أنتجت 19,15 ثمرة و 10,00 كغم/ نبات على التوالي. وفي حاصل البذور، لوحظ انخفاض في عدد الثمار المعدة لإنتاج البذور بصورة معنوية عند إطالة فترة الخزن حيث أعطت (2,304 و 2,051) ثمرة في كلا معاملي خزن البذور على التوالي، كذلك لم تتأثر هذه الصفة معنوياً بزيادة عدد مرات جني الثمار. في حين أن صفات معدل وزن الثمرة، حاصل البذور للنبات والحاصل الكلي للبذور انخفضت معنوياً عند زيادة فترة خزن البذور. وبالنسبة لعدد مرات جني الثمار فإنها أدت إلى انخفاض معنوي في كل الصفات ذات العلاقة بالحاصل البذري مقارنة بمعاملة الشاهد. وأظهرت النتائج أن معاملات التداخل بين فترة الخزن وعدد مرات الجني لم يكن لها تأثيراً معنوياً في صفة عدد الثمار للنبات. وأعطت معاملة التداخل عند (خزن البذور لسنة واحدة + بدون جني الثمار) أفضل النتائج لمعظم صفات البذور وحاصل البذور بلغت 1,476 كغم لوزن الثمرة، 467,17 بذرة في عدد البذور /ثمرة، 32,15 غم لوزن البذور في الثمرة، 93,64 غم في حاصل البذور للنبات و 1373,34 كغم/هكتار لحاصل البذور الكلي .

الكلمات الدالة : فترة الخزن ، إنتاج البذور ، الكوسة