

Study The Effect of Shading, Seeds Storage Methods and GA₃ Treatment on Nutrient State and Chlorophyll Content of Loquat Seedlings *Eriobotrya japonica* Lindl.

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ABSTRACT

Key words:

Shading, Storage, GA₃, chlorophyll, nutritional, loquat.

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This study was carried out in the Nursery of the college of Agriculture / University of Duhok / Kurdistan region/Iraq during growing seasons 2013 to study the effect of shading, seeds storage methods and GA₃ treatments on nutritional status and chlorophyll content of loquat seedlings. Shading percentage (direct sunlight and 50 % shading), three methods of storage, without storage (direct planting), one month in refrigerator and one month in room condition) and three concentration of GA₃ (Zero, 250, 500 mg/L⁻¹).

Results obtained that the room storage significantly increased N percentage in leaf, whereas the both sunlight and 500 mg.L⁻¹ GA₃ effect significantly on the chlorophyll content ,P and K percentage in the leaf of Loquat seedling ,while refrigerator significantly increased chlorophyll content in the leaf. The interaction between the studied factors also significantly affected on the nutritional status and chlorophyll content of loquat seedlings, the interaction of sunlight + room storage + 500 mg.L⁻¹ GA₃ was the best treatment.

دراسة تأثير التظليل وطريقة تخزين البذور والمعاملة بالجبرلين (GA₃) على الحالة الغذائية ومحتوى الكلوروفيل لشتلات الينكي دنيا البذرية (*Eriobotrya japonica* lindl.) .

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الخلاصة

هذه الدراسة اجريت في مشتل كلية الزراعة جامعة دهوك اقليم كردستان/العراق خلال موسم النمو 2013 لدراسة تأثير التظليل وطريقة خزن البذور والنقع بحامض الجبرليك (GA₃) على الحالة الغذائية ومحتوى الكلوروفيل في اوراق شتلات الينكي دنيا البذرية.

التظليل بمستويين (زراعة مباشرة في الشمس و 50% ظل) وثلاث طرق لخزن البذور وهي عدم خزن البذور (زراعة مباشرة) وخزن البذور لمدة شهر في الثلاجة وخزن البذور لمدة شهر في ظروف الغرفة ، وثلاثة تراكيز من حامض الجبرليك (GA₃) (صفر و 250 و 500 ملغم.لتر⁻¹). فاشارت النتائج الى ان خزن الغرفة زادت معنويا من نسبة النتروجين في الاوراق في حين الشمس و GA₃ 500 ملغم. لتر⁻¹ اثرت معنويا على نسبة الفسفور والبوتاسيوم والكلوروفيل في الاوراق بينما ضوء الشمس وخزن البذور في الغرفة زادت معنويا محتوى الاوراق من الكلوروفيل. والتداخل بين العوامل الثلاثة في الدراسة ايضا اثرت معنويا في الحالة الغذائية ومحتوى الكلوروفيل في اوراق شتلات ينكي دنيا البذرية وان احسن معاملة كانت معاملة التداخل بين ضوء الشمس وخزن الغرفة و 500 ملغم.لتر⁻¹ GA₃ .

الكلمات المفتاحية:

التظليل ، طريقة تخزين البذور ، GA₃ ، الحالة الغذائية ، الكلوروفيل ، الينكي دنيا .

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I. Introduction:

The Loquats (*Eriobotrya japonica* lindl) are evergreen trees with beautiful, coarsely textured leaves of deepest jade green. The loquat is native to southeastern China. It was introduced into Japan and became naturalized there in early times. It has also become naturalized to India and several other areas (Morton, 1987; Taskin and S. Erdal, 2011).

Loquat fruits used to eat as fresh fruits after maturity and are used in the manufacture of sweets jams; Loquat fruit contains sugars, fats and protein as well as calcium, iron, phosphorus and fiber (Bal , 2003). Loquats are easy to grow and are used some times as an ornamental plant.

In general seeds are used for propagation only when the trees are growing as rootstocks or ornamental plants. The seeds must be washed and planted in flats or pots after removed from the fruits and the seedlings should be transplanted when reached 6 to 7 inches in high. Using of loquat seedling as rootstock usually results in a relatively large tree with a high canopy. The seeds should be planted directly once extracted from the ripe fruits during the months of April, June and July (Pathak and .Gautam, 1985).

The trees of seedlings Loquat planted in open method may be exposed to environmental damage, especially direct sunlight damage that may lead to the burning of seedlings and trees leaves and lead to weaker growth in seedlings and shading process may reduce this damage. In Iraq, the proportion of solar radiation is very high, especially in the summer so that the temperature rise is very large, which sometimes leads to the reduction of the growth and development of shoots and fruiting.

The knowledge of the factors affecting seed germination and vegetative growth is considered the foundation in improving. The researchers cared much to fruit trees for their economic and nutritional importance that included all aspects of care planting seeds and trees and seedling production.

Factors affecting the percentage of seeds germination and the vegetative growth (shoots) are the basis for the improvement of seedling, these factors including, lighting or shading, storage methods as well as Gibberellic acid. The seeds are very sensitive to drought so storage for a long time and loses its vitality quickly (Osman, *et al.*, 1998) which results lack of seedlings and low nutritional state .

Since the intensity of solar radiation is very high in Iraq especially in the summer so that the temperature may rise very significantly, this sometimes leads to the reduction of nutritional state of the shoots. Jackson and Palmer (1977) carried out a study on apple trees grafted on the rootstock M26, the light was withheld by 62.75 % and 89% at the stage of full bloom in two successive seasons. Results indicated that the shading reduced the chlorophyll content. Darnell and Ferree (1983) found in a study conducted on the apple trees that 75% of shading significantly reduced the number of leaves and nutritional state of the tree. Al-Zebari (2013) showed that there are significant effects of shading on germination of Loquat seeds and their effect on growth (stem length, stem diameter, leaves number and length of roots)

Therefore, this study was carried out to investigate the effect Shading, methods of Storage and soaking in concentration of GA₃ in nutritional state and chlorophyll content of Loquat Seedlings.

II. Materials and Methods :

This study was carried out in the Nursery of the College of Agriculture and Forestry / Duhok University /Iraq, during growing season 2013 to investigate the effect of shading, seeds storage methods and soaking in GA₃ solution in the nutritional state and chlorophyll content of Loquat Seedlings. The experiment consisted of Shading percentage (direct sunlight and 50% shading), three method of storage [without storage (direct planting), one month in room condition and one month in refrigerator] and three concentration of GA₃ (Zero, 250, 500 mg.L⁻¹) on leaves chlorophyll content and nutritional state of Loquat Seedlings.

The seeds were collected from 20 years old trees. After the transaction of the treatment the seeds were sowing out (direct sunlight) and inside the lath house to reduce the density of sunlight and summer heat to founding the best method to production nursery seedlings. Sowing the seeds was

done after collecting in 27/6/2013 in river soil. The experiment was arrangement as completely randomized block design. The results were analyzed statistically by using SAS program (2003), the treatments were compared according to Duncan's multiple test at 5% level of portability (Al- Rawi and Khalafalla, 2000).

Potential effects of effect Shading, Storage and GA₃ were estimated in terms of the change in nutritional state percentage (Nitrogen, Phosphorus and Potassium percentage and chlorophyll content (SPAD) in leaves of Loquat Seedlings in December..

Treatments were as follows:

1-Shading (1- Shading (50% =Shading) 2-Sunlight (100%= Sun).

2-Storage (1-Not storage = Direct planting) 2-Storage one month in refrigerator. 3-Storage one month in room condition).

3- GA₃, three concentrations (Zero, 250,500 mg.L⁻¹ GA₃) used at storage and soaking in solution for 10 seconds.

III. Results and discussion:

Chlorophyll content (SPAD):

It's clear from table (5) that all treatment significantly affected on the chlorophyll content in the leaf, maximum values (38.70, 38.88 and 37.89 SPAD) were resulted in plants planted in sunlight, stored in room condition and flooded in GA₃ at 500 mg. L⁻¹ compared to the lowest values (33.21, 30.34 and 33.92 SPAD) resulted in seedlings planted inside lath house (50 % shading), stored one month in refrigerator and untreated with GA₃ respectively, in favor of the interaction between the studied factors, the same table shows that the best chlorophyll content was resulted from the interaction of sunlight + room storage, sunlight + 500 mg. L⁻¹GA₃ and room storage + 500 mg.GA₃ compared to the minimum chlorophyll content from the interaction of shading 50 % + refrigerator storage, shading 50 % + 0 mg. L⁻¹ GA₃ and refrigerator storage + 0 mg. L⁻¹ GA₃ respectively.

Concerning the interaction among the three study factors, the highest value (45.53 SPAD) was resulted from the interaction of sunlight + room storage + 500 mg. L⁻¹ GA₃ while the lowest value (25.65 SPAD) was from the interaction of shading 50 % + refrigerator storage + 0 mg. L⁻¹ GA₃.

Table (1) : Effect of shading, seeds storage methods and GA₃ concentrations on chlorophyll content of loquat seedling.

Shading	Storage Method	GA ₃ (mg.L ⁻¹)			Shading + Storage	Shading effect
		0	250	500		
Shade	Non stored	33.27 b-f	36.54 a-e	37.41 a-e	35.74 b	33.21 b
	Refrigerator	25.65 f	28.65 ef	31.43c-f	28.58 c	
	Room	34.05 b-f	33.93 b-f	37.93 a-e	35.30 b	
Sun light	Control	39.97 a-d	41.80 a-c	42.80 ab	41.52 a	38.70 a
	Refrigerator	31.93 c-f	32.17 c-f	32.23 c-f	32.11 bc	
	Room	38.64 a-e	43.23 ab	45.53 a	42.47 a	
Shading + GA3	Shad	30.99 c	33.04 bc	35.59 a-c	Storage effect	
	Sun	36.85 ab	39.07 a	40.19 a		
Storage + GA3	Control	36.62 ab	39.17 a	40.10 a	38.63 a	
	Refrigerator	28.79c	30.41 bc	31.83 bc	30.34 b	
	Room	36.34 ab	38.58a	41.73 a	38.88 a	
GA3 effect		33.92 b	36.05 ab	37.89 a		

Means with the same letter are not significantly different according to Duncan's multiple ranges test at 5% level.

Nitrogen percentage in leaf (N %):

Data in table (2) indicates that both shading and GA3 had no significant effect on the nitrogen percentage in the leaf, whereas method of storage significantly affected on nitrogen percentage in the leaf, maximum value (2.056 %) was resulted in plants grown from seeds stored month in room condition compared to the lowest value (1.544 %) resulted in plants grown from seeds sowing directly after collection.

Concerning the interaction between the studied factors, the table shows that the maximum nitrogen percentage was obtained from the interaction of shading 50 % + room storage, sunlight + 500 mg.L⁻¹ GA3 and room storage + 500 mg.L⁻¹ GA3 compared to the minimum nitrogen percentage from the interaction of shading 50 % + sowing directly (un stored), shading 50 % + 0 GA3 and sowing directly (un stored) + 0 mg L⁻¹ GA3 respectively.

Concerning the interaction of the three study factors, the highest value (2.300 %) nitrogen was resulted from the interaction of sunlight + room storage + 500 mg.L⁻¹ GA3 while the lowest value (1.300 %) nitrogen was from the interaction of shading 50 % + sowing directly (Non stored) + 0 mg.L⁻¹ GA3.

Table (2) : Effect of shading, seeds storage method and GA₃ concentrations on nitrogen percentage in leaf of loquat seedling.

Shading	Storage Method	GA ₃ (mg.L ⁻¹)			Shading + Storage	Shading effect
		0	250	500		
Shade	Non stored	1.300 b	1.367 b	1.800 ab	1.489 b	1.752 a
	Refrigerator	1.633 ab	1.633 ab	1.667 ab	1.644 ab	
	Room	2.100 a	1.967 ab	2.000 ab	2.122 a	
Sun light	Control	1.467 b	1.667 ab	1.667ab	1.600 ab	1.807 a
	Refrigerator	1.733 ab	1.767 ab	2.000 ab	1.833 ab	
	Room	1.767 ab	1.900 ab	2.300 a	1.989 ab	
Shading + GA3	Shad	1.678 a	1.656 a	1.922 a	Storage effect	
	Sun	1.656 a	1.778 a	1.989 a		
Storage + GA ₃	Control	1.383 b	1.517 b	1.733 ab	1.544 b	
	Refrigerator	1.683 ab	1.700 ab	1.833 ab	1.739 a b	
	Room	1.933 ab	1.933 ab	2.300 a	2.056 a	
GA3 effect		1.667 a	1.717 a	1.956 a		

Means with the same letter are not significantly different according to Duncan's multiple ranges test at 5% level.

Phosphorus percentage in leaf (P %):

Table (3) indicates that both shading and GA3 had a significant effect on the phosphorus percentage in the leaf, highest phosphorus percentage (0.036 and 0.035 %) were resulted in plants cultivated in direct sunlight and the seeds treated with 500 mg.L⁻¹ GA3 compared to the lowest phosphorus percentage (0.020 and 0.022 %) resulted in plants grown from plants cultivated in lath house (shading 50%) and untreated seeds (zero, mg.L⁻¹ GA₃) respectively. whereas method of storage had no significant effect on phosphorus percentage in the leaf.

Same table shows the interactions between the study factors, the maximum phosphorus percentage was obtained from the interaction of sunlight + sowing directly (non stored), sunlight + 500 ppm GA3 and sowing directly (non stored) + 500 mg.L⁻¹ GA3 compared to the least phosphorus percentage from the interaction of shading 50 % + sowing directly (non stored), shading 50 % + 0 mg L⁻¹ GA3 and sowing directly (non stored) + 0 mg.L⁻¹ GA3 respectively.

Concerning the interaction of the three study factors, the best phosphorus percentage (0.070 %) was resulted from the interaction of sunlight + sowing directly + 500 mg. L⁻¹ GA3 mg. L⁻¹ while the

lowest value (0.015 %) was from the interaction of shading 50 % + sowing directly + 0 mg L⁻¹ GA₃.

Table (3): Effect of shading, seeds storage method and GA₃ concentrations on phosphorus percentage in leaf of loquat seedling(%)

Shading	Storage Method	GA ₃ (mg.L ⁻¹)			Shading + Storage	Shading effect
		0	250	500		
Shade	Non stored	0.015 c	0.020 c	0.020 c	0.018 d	0.020 b
	Refrigerator	0.017 c	0.025 bc	0.024 bc	0.022 cd	
	Room	0.019 c	0.018 c	0.022bc	0.020 cd	
Sun light	Control	0.025 bc	0.036 bc	0.070 a	0.044 a	0.036 a
	Refrigerator	0.026 bc	0.029 bc	0.035 bc	0.030 bc	
	Room	0.029 bc	0.034 bc	0.041 b	0.034 ab	
Shading + GA3	Shad	0.017 c	0.021 c	0.022 bc	Storage effect	
	Sun	0.026 bc	0.033 b	0.049 a		
Storage + GA ₃	Control	0.020 b	0.028 b	0.045 a	0.031 a	
	Refrigerator	0.021 b	0.027 b	0.029 ab	0.026 a	
	Room	0.024 b	0.026 b	0.031 ab	0.027 a	
GA3 effect		0.022 b	0.027 b	0.035 a		

Means with the same letter are not significantly different according to Duncan's multiple ranges test at 5% level.

Potassium percentage in leaf (K%):

Data in table (4) clearly shows that both shading and GA₃ concentration had significant effect on the potassium percentage in the leaf, maximum K percentage (42.31 and 40.99 %) were resulted in plants cultivated in direct sunlight and the seeds treated with 500 mg.L⁻¹ GA₃ compared to the minimum K percentage (35.26 and 36.42 %) obtained in plants cultivated in lath house (shading 50%) and untreated seeds (GA₃) respectively. whereas method of storage had not significant effect on K percentage in the leaf.

Concerning the interaction, same table shows that the maximum potassium percentage was obtained from the interaction of sunlight + room stored, sunlight + 500 mg. L⁻¹ GA₃ and refrigerator stored + 500 mg. L⁻¹ GA₃ compared to the least K percentage from the interaction of shading 50 % + sowing directly (non stored), shading 50 % + 0 mg. L⁻¹ GA₃ and sowing directly (non stored) + 0 mg. L⁻¹ GA₃.

Triple interactions led also significant differences in Potassium percentage in leaf of loquat seedling, the highest rate in the treatment of sun + + refrigerator +500 mg.L⁻¹ GA₃ reached 47.13%, while the lowest rate was in the treatment of non shade + non stored+0 mg/L⁻¹ GA₃ reached 32.00 %.The reason this may be due to the combined effect of three factors studied in this trait.

Conclusions:

The objective of this study was to define the effect of the shading, storage and GA₃ concentrations on the nutritional status percentage and chlorophyll content of Loquat seedlings.

The results of this study explain that the shading effect significantly on chlorophyll content and the potassium percentage, storage effect significantly on chlorophyll content and the nitrogen percentage, potassium percentage and GA₃ concentrations effect significantly on chlorophyll content and the phosphorus + potassium percentage of Loquat seedlings .

The best treatment was (the treatment of sun + Room+500 mg. L⁻¹ of GA₃ in percentage of nitrogen and chlorophyll content) (the treatment of sun + Non stored +500 mg. L⁻¹ of GA₃ in percentage of phosphorus),and (the treatment of sun + refrigerator +500 mg.L⁻¹ of GA₃ in percentage of potassium) of Loquat seedlings.

Table (4) : Effect of shading, seeds storage method and GA₃ concentrations on Potassium percentage in leaf of loquat seedling.

Shading	Storage Method	GA ₃ (mg.L ⁻¹)			Shading +Storage	Shading effect
		0	250	500		
Shade	Non stored	32.00 f	35.00 def	36.00 c-f	34.33 b	35.26 b
	Refrigerator	33.67 ef	35.33 c-f	40.33 a-f	36.44 b	
	Room	33.67 ef	35.33 c-f	36.00 c-f	35.00 b	
Sun light	Control	38.27 b-f	44.00 abc	45.40 ab	42.56 a	42.31 a
	Refrigerator	37.80 b-f	38.40 b-f	47.13 a	41.11 a	
	Room	43.13 a-d	45.60 ab	41.07 a-e	43.27 a	
Shading + GA3	Shad	33.11 c	35.22 cd	37.44 cd	Storage effect	
	Sun	39.73 bc	42.67 ab	44.53 a		
Storage + GA ₃	Control	35.13 b	39.50 ab	40.70 ab	38.44 a	
	Refrigerator	35.73 b	36.87 b	43.73 a	38.78 a	
	Room	38.40 ab	40.47 ab	38.53 ab	39.13 a	
GA3 effect		36.42 b	38.94 ab	40.99 a		

Means with the same letter are not significantly different according to Duncan's multiple ranges test at 5% level.

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