Effect Of Growing Media, Seed Sizes And Stratification On Germination And Subsequent Seedling Growth Of Loquat (*Eriobotrya Japonica L*)

Fakhraddin M. Hama Salieh[1] Hasan S. Shekh- Marif[1] Faraydwn K. Ahmad[1]

- **[1] University of Sulaimani- Faculty of Agricultural Sciences**
- Date of research received 3/4/2016 and accepted 21/9/2016

Abstract

The experiment was conducted in a lathhouse of the department of Horticulture, Faculty of Agricultural Sciences, University of Sulaimani during 2014 growing season. Three growing media, two seed sizes as well as stratification periods {direct or no stratification and moist chilling at 3 ± 1^0C for two weeks} were used for the purpose of their influences on the germination and subsequent seedling growth of loquat. Randomized Complete Block Design with three replicates was used and analysis of variance carried out and then the treatment means were compared according to Duncan's Multiple Range Test at 0.05 level. The data revealed that growing media had a significant effect on most characteristics: peat moss recorded the highest value for germination percentage (67.158%), seedling length (9.478 cm), seedling diameter (0.682 cm) and leaves area (84.366 cm^2), while the highest germination percentages resulted were 57.861% and 56.333% for moist chilling for two weeks and small seeds respectively. Small seeds combined with each peatmoss and moist chilling for two weeks gave (77.083 and 62.611)% germination successively as the maximum germination percentages. Finally, combination of small seeds moist chilled for two weeks and grown in peat moss gave the highest germination percentage (90.833%).

Key words: Loquat, Sowing media, stratification, Seedling and Germination.

تأثير أوساط الزراعة وحجم البذور والتنضيد البارد الرطب على انبات البذور والنمو اللاحق لشتلات الينكي دنيا (*Eriobotrya japonica* L.)

فخرالدين مصطفى حمه صالح[1] حسن شيخ فرج شيخ مارف[1] فريدون كريم احمد[1]

- **[1] جامعة السليمانية – فاكلتي العلوم الزراعية**
- تاريخ تسلم البحث 2016/4/3 وقبوله 2016/9/21

الخلاصة

أجريت الدراسة في الظلة الخشبية التابعة لقسم البستنة، فاكلتي العلوم الزراعية، جامعة السليمانية خلال موسم النمو لعام 2014 بهدف دراسة تأثير ثلاث أوساط زراعية للنمو، حجمين للبذور والتنضيد البارد الرطب على نسبة الانبات والنمو اللاحق لشتلات الينكي دنيا. أستعملت تجربة عاملية بتصميم القطاعات العشوائية الكاملة بثلاث مكررات ومن ثم قورنت المعاملات حسب أختبار دنكن المتعدد الحدود على مستوى 0.05. تشير البيانات أن للأوساط الزراعية تأثير معنوي في معظم الصفات المدروسة. سجلت أعلى قيم لنسبة الأنبات (67.158%)، أرتفاع الشتلات (9.478سم) ،قطرساق الشتلات (0.682 سم) والمساحة الورقية (84.366 سم^2) في البيتموس في حين أن كل من التنضيد البارد الرطب والبذور الصغيرة الحجم قد أعطى 57.861 % و 56.333% كأعلى نسبتي أنبات على التوالي. إن التداخل بين البذور الصغيرة الحجم مع كل من البيتموس والتنضيدالباردالرطب لمدة أسبوعين قدأنتج أعلى معدلين لنسبة الأنبات وهما 77.083% و 62.611% على التوالي. كما وأن تداخل البذور الصغيرة الحجم والتنضيد الباردالرطب ووسط البيتموس قد سجل أعلى معدل لنسبة الأنبات (90.833%).

الكلمات المفتاحية : ينكي دنيا، التنضيد البارد، الانبات.

Introduction

Loquat (*Eriobotrya japonica* Lidl., *Rosaceae*) is a subtropical evergreen fruit tree. Seedlings are commonly produced in nurseries and used as rootstocks for commercial loquat cultivars. Generally, it is suffering from lack of germination percentage as well as slower growth rate (Gugliuzza et al., 2014). Loquat fruits appear in the market in a period when other fresh fruits are rarely available, so

they are of special interest for humans. Nutritional values of the fruits are relatively high as they are rich in minerals and vitamins (Karadeniz, 2003). Gelik et–al.,2006 and Adam (2007) found that maximum germination percentage of kiwi seeds (99.17%) occurred when they were sown in peatmoss under 35^0C. Also, Adam, 2007 recorded the highest germination rate (43.84%) for guddaim when peatmoss was used as a growing media, whereas river silt resulted in 12.64 cm as a highest shoot length . El- Dengawy (2005) found that moist –chilling for 3 weeks or a week is suitable for promoting the germination of Loquat seeds and improving growth characteristics of the subsequent seedlings.

The aim of the study is to find an applicable method to increase loquat seed germination and improve the characteristics of the subsequent seedlings.

Materials and Methods

The experiment was conducted during 2014 growing season in a lath house belongs to the department of Horticulture, faculty of Agricultural Sciences, University of Sulaimani, Iraqi Kurdistan region. Mature loquat cultivar fruits were collected on May 15, 2014 from a healthy, disease free tree grown in a house garden in Sulainami city. Seeds were then separated from the flesh (pulp) and immersed in water to discard the floating ones; sunken seeds were washed with warm water at 51^oc for 10 minutes (Hafez, 2005) and sterilized with sodium hypochlorite (1% V/V) also for 10 minutes. Clean and sterilized seeds spread evenly on absorbent paper and dried at room temperature. Later, they were categorized into two various groups according to the weights (Seeds less than 1.5 g named small while those more than 1.5g big).

Half number of each group was moist chilled (stratified) in peat moss at 3 ± 1^0C for two weeks and then sowed in seedbeds, whereas the other half was sown directly (with no stratification) using three different types of growing media: sand, peat moss and combination of the two (1:1 V/V) which were sterilized previously with 1% of 37% formalin (Chupp, 2006). Factorial experiment with three factors (seed sizes, growing media and stratification) was used according to Randomized Complete Block Design with three replicates. The following characteristics were taken on November 1, 2014: germination percentage, seedling length, seedling diameter, leaves area per plant using Area Meter-AM200 and leaves number.

Results and Discussion

Table (1) shows that growing media had significant effect on the germination percentage, peat moss recorded 67.158% which is superior significantly to both loam and mixture of peat moss and loam, and the latest indicated the lowest value (38.92%). The result is in conformity with the results of many workers (Gelik et al., 2006 and Adam,2007). The table shows no significant effect of the seed sizes. On the other hand, moist chilling at 3^0C for two weeks had significant effect on germination percentage (57.86%) compared to (47.72%) for direct sowing. The result is in conformity with the result of (El- Dengawy, 2005). Maximum value for germination was observed for the interaction between peat moss and small size seeds (77.08%) which is superior significantly to the other similar interactions. The interaction between peatmoss and moist chilling seeds for two weeks showed the highest value (74.58%) which is superior significantly to the other two way interactions. Small seeds interacted with moist chilling for two weeks gave (62.61%) germination which is superior significantly to big size and direct sowing interaction. The interaction between small size seeds with moist chilling for two weeks and peat moss recorded the highest value (90.83%) which is superior significantly to the other three way interactions.

Table (2) shows that peat moss resulted in the highest seedling length(9.47cm) which is superior significantly to the mixture of peat and loam but not with the loam, whereas no significant effects for both seed sizes and stratification were recorded with regard to the seedling length. The table indicates that peatmoss interacted with big size seeds gave maximum seedling length (9.94cm) which is not different significantly with the other interactions except big or small size interacted

with the loam. On the other hand, direct sowing interacted with peat and loam mixture recorded the highest value (10.07cm) which is different significantly from both direct and moist chilling for two weeks interacted with loam as well as moist chilling interacted with the mixture of peat and loam. Also big size seeds interacted with direct sowing gave the highest seedling length (9.92cm) which exceeded significantly the other interactions except small seeds interacted with moist chilling for two weeks. Big size seeds sown directly in Peat and loam mixture recorded the highest value seedling length (10.66 cm) which is superior significantly to big seeds moist chilled for two weeks and sown either in loam or in peat and loam mixture as well as small seeds interacted with direct sowing in loam. These results appeared to be similar to that of (Adam, 2007)

Table (1) Individual and interaction effects of growing media, seed sizes and stratification on the germination percentage of loquat seeds.

Germination Percentage				
Seed Sizes	Growing Media			Seed Sizes
	Peatmoss	Loam	Peat+Loam	
Big	57.233 b	37.250 c	53.283 bc	49.256 a
Small	77.083 a	40.583 c	51.333 bc	56.333 a
Growing Media	67.158 a	38.917 c	52.308 b	
Stratification	Growing Media			Stratification
	Peatmoss	Loam	Peat+Loam	
Direct	56.733 ab	34.667 d	48.783bcd	47.728b
Moist chilling	74.583 a	43.167cd	55.833bc	57.861a

Seed Sizes	Stratification	Growing Media			Seed Sizes× Stratification
		Peatmoss	Loam	Peat+Loam	
Big	Direct	56.133 bc	26.000 d	54.067 bc	45.400 b
	Moist chilling	58.333 bc	48.500 bcd	52.500 bc	53.111ab
Small	Direct	63.333 b	43.333 bcd	43.500b cd	50.056 ab
	Moist Chilling	90.833 a	37.833 cd	59.167bc	62.611a

Values not associated with the same letter are significantly different at 0.05 levels according to Duncan's Multiple Range Test.

Table (2) Individual and interaction effects of growing media, seed sizes and stratification on length of loquat seedlings.

Seedling Length (cm)				
Seed Sizes	Growing Media			Seed Sizes
	Peatmoss	Loam	Peat+Loam	
Big	9.942a	7.665b	9.068ab	8.892a
Small	9.015ab	7.825b	8.815ab	8.552a
Growing Media	9.478a	8.942ab	7.745b	
Stratification	Growing Media			Stratification
	Peatmoss	Loam	Peat+Loam	
Direct	9.573ab	7.882b	10.078a	9.178a
Moist chilling	9.383ab	7.608b	7.805b	8.266a

Seed Sizes	Stratification	Growing Media			Seed Sizes× Stratification
		Peatmoss	Loam	Peat+Loam	
Big	Direct	10.550a	8.553ab	10.660a	9.921a
	Moist chilling	9.333ab	6.777b	7.477b	7.862b
Small	Direct	8.597ab	7.210b	9.497ab	7.862b
	Moist chilling	9.433ab	8.440ab	8.133ab	8.669ab

Values not associated with the same letter are significantly different at 0.05 levels according to Duncan's Multiple Range Test.

Table (3) shows no significant effects of both growing media and stratification on the stem diameter of seedlings while big size seeds (0.71cm) were superior significantly to the small. No significant effects were found among big size seeds combined with both direct and moist chilling for two weeks as well as small size seeds interacted with the moist chilling while they exceeded significantly the combination of small seeds sown directly. Big size seeds interacted with peatmoss (0.79cm) was superior significantly to the other interactions except big size combined with both loam and mixture of peat and loam. No significant effects were found among stratification combined with the growing media. Similar results were observed by (Adam, 2007). Big size seeds directly sown in peatmoss gave highest value (0.91cm) which was superior significantly to some the other three way interactions.

Table (3) Individual and interaction effects of growing media, seed sizes and stratification on stem diameter loquat seedlings.

Seedling Stem Diameter (cm)				
Seed Sizes	Growing Media			Seed Sizes
	Peatmoss	Loam	Peat+Loam	
Big	0.792a	0.683ab	0.672ab	0.716a
Small	0.572b	0.553b	0.588b	0.571b
Growing Media	0.682a	0.618a	0.630a	
Stratification	Growing Media			Stratification
	Peatmoss	Loam	Peat+Loam	
Direct	0.688a	0.612a	0.612a	0.637a
Moist chilling	0.672a	0.625a	0.648a	0.649a
Seed Sizes	Stratification	Growing Media			Seed Sizes× Stratification
		Peatmoss	Loam	Peat+Loam	
Big	Direct	0.917a	0.687abc	0.753ab	0.786a
	Moist Chilling	0.667abc	0.680abc	0.590bc	0.645a
Small	Direct	0.460c	0.537bc	0.470c	0.489b
	Moist Chilling	0.683abc	0.57abc	0.707abc	0.653a

Values not associated with the same letter are significantly different at 0.05 levels according to Duncan's Multiple Range Test.

Table (4) declares that peat moss was superior significantly to other growing media with regard to leaves area (84.36 cm^2). Small size seeds (80.01cm^2) exceeded significantly the big size while moist chilling for two weeks (79.63cm^2) was superior significantly to the direct sowing. Peatmoss combined with small size seeds recorded the highest value (88.4 cm^2) which was superior significantly to all other interactions. Peatmoss interacted with both direct sowing and moist chilling for two weeks seeds as well as the mixture of peat and loam combined with the moist chilling were superior significantly to the other interactions. Small size seeds combined with both direct sowing and the moist chilling as well as big size seeds interacted with the moist chilling exceeded significantly the big size combined with direct sowing. Finally, small size seeds grown directly in peat moss recorded maximum leaves area (93.16 cm^2) which was superior significantly to all the other three way interactions.

Table (5) Explains that mixture of peat and loam obtained the highest number of leaves / plant (4.167) which was superior to loam but not to peatmoss. No significant effect of both seed size and stratification was noticed. Big size seeds combined with the mixture of peat and loam gave the highest number of leaves / plant (4.20) which is not different significantly from the other synonymous interactions except big size seeds interacted with loam. Both direct and moist chilled seeds interacted with the mixture of peat and loam gave highest values

(4.18 and 4.15 successively) which were not superior significantly to the other interactions except the moist seeds sown in loam. No significant effects were found between the seed sizes and stratification though the big sizes interacted with direct planting recorded the highest number (4.08). Finally, big size seeds sown directly in a mixture of peat and loam gave the highest leaves number/plant (4.3) which was not different significantly from the other three way interactions except the big seeds sown in a loam and moist chilled for two weeks.

Table (4) Individual and interaction effects of growing media, seed sizes and stratification on leaves area (cm^2)/ Plant

Leaves Area (cm^2)/ Plant				
Seed Sizes	Growing Media			Seed Sizes
	Peatmoss	Loam	Peat+Loam	
Big	80.311b	69.066d	77.366bc	75.588b
Small	88.400a	73.433cd	78.211bc	80.018a
Growing Media	84.366a	71.255c	77.251b	
Stratification	Growing Media			Stratification
	Peatmoss	Loam	Peat+Loam	
Direct	84.488a	70.691b	72.722b	75.960b
Moist Chilling	84.244a	71.800b	82.854a	79.630a

Seed Sizes	Stratification	Growing media			Seed sizes× Stratification
		Peatmoss	Loam	Peat+Loam	
Big	Direct	75.803cd	65.688e	73.055d	71.516b
	Moist Chilling	84.831b	72.453de	81.681bc	79.655a
Small	Direct	93.161a	75.711cd	72.400de	80.433a
	Moist Chilling	83.650b	71.160de	84.026b	79.616a

Values not associated with the same letter are significantly different at 0.05 levels according to Duncan's Multiple Range Test.

Table(5) Individual and interaction effects of growing media, seed sizes and stratification on leaves number / Plant

Leaves Number / Plant				
Seed Sizes	Growing Media			Seed Sizes
	Peatmoss	Loam	Peat+Loam	
Big	3.933ab	3.267b	4.200a	3.800a
Small	3.800ab	3.650ab	4.133ab	3.861a
Growing Media	3.867ab	3.458b	4.167a	
Stratification	Growing media			Stratification
	Peatmoss	Loam	Peat+Loam	
Direct	3.867ab	3.650ab	4.183a	3.900a
Moist Chilling	3.867ab	3.267b	4.150a	3.761a

Seed sizes	Stratification	Growing media			Seed Sizes× Stratification
		Peatmoss	Loam	Peat+Loam	
Big	Direct	4.100a	3.867ab	4.300a	4.089a
	Moist Chilling	3.767ab	2.667b	4.100a	3.511a
Small	Direct	3.633ab	3.433ab	4.067a	3.711a
	Moist Chilling	3.967a	3.867ab	4.200a	4.011a

Values not associated with the same letter are significantly different at 0.05 levels according to Duncan's Multiple Range

References

1. Adam, N.S.I. (2007). The effect of growing media and temperature on seed germination and seedling growth of Guddaim (*Grewia tenax* forsk) , M.Sc. thesis. Department of Horticulture, Faculty of Agriculture. University of Khartoum.
2. Chupp,C.(2006). Manual of vegetable plant diseases.1st Ed. Discovery Publishing House. New Delhi-India.
3. El-Dengawy, E.F.A.(2005). Promotion of seed germination and subsequent seedling growth of loquat (*Eribotrya japonica*, Lindl) by moist – chilling and GA3 applications Scientia Horticultrae 105:331-342.
4. Gelik, H., H. Zenginbal and M.Ozcan (2006). Enhancing germination of Kiwifruit seeds with temperature, medium and gibberellic acid. Hort. Sci. (PRAGUE), 33(1):39-45.
5. Gugliuzza,G; M. Militello and G. Talluto V. Farina(2014). Use of seeds from local loquat ecotypes for rootstock production. Cited from, Anno di publicazione IV international symposium on loquat 2014.
6. Hafez, O.M. (2005).Evaluation of growth characteristics of some citrus rootstocks using protein finger print technique. American-Eurasian J. Agric.& Environ. Sci. 1(3):243-248.
7. Karadeniz,T.(2003). Loquat (*Eribotrya japonica*, Lindl.) growing in Turkey. First international symposium on loquat.