

## EFFECT OF TEMPERATURE AND GERMINATION MEDIA ON A VIABILITY OF POLLEN GRAIN OF FIVE PISTACHIO MALE STRAINS

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### ABSTRACT

This experiment was conducted to evaluate the effect of germination media and three temperatures on five male strains of pistachio at research center of agriculture faculty – Aleppo, (Arab center). In this experiment, the rates of pollen germination were tested in different germination media (sucrose 10%, sucrose 10%+0.25 gr. boric acid P L. and sucrose 10%+0.0625 gr. boric acid P L.) with 3 temperature levels (10, 20 and 30°C). The media was contain 3 gr. agar per liter of water. The results showed that male strain 36 was gave the best germination rate, (78.33 % and tube length 796.1micron) as compared with other strains, and male strain 47 was the lower (63.11%, 511.3 micron) tube germination and tube length (63.11%, 511.3 micron) respectively, but all were gave high rates of germination. sucrose 10% media gave the best germination rate (77.07%) and sucrose 10%+ 0.25 gr. boric acid P L. gave the lowest germination rate (62.2%), sucrose 10%+0. 0.25 gr. boric acid P L. gave highest tube germination length (777.68micron), where as 10% sucrose +0.0 625gr. boric acid P L. was the lowest tube length (499.88micron). On the other hand, 30°C gave the best germination rate and pollen tube germination length (88.73% and 1005.26 micron), however 10°C gave lowest rates of these parameters (45.53% and, 244.3 micron) for germination rate and tube pollen length respectively. Generally, all media were gave highest significant results in germination rates and pollen tube length for all strains at all temperatures. we conclude that sucrose 10% was better media for pollen germination and sucrose 10%+0. 25 gr. boric acid P L. was the best for pollen tube length.

### INTRODUCTION

Pistachio trees are dioecious with male and female flowers on separate trees. Male and female trees must be present for cross pollination and fruit set. In the Arab Center Farm for studies of Arid Zone and dry lands at Aleppo, there are a lot of different male strains used as a pollinators of pistachio trees. It is necessary to know a viability and germination rate of pollen grain before pollination date to be able to ensure fruit set (Dafni & Firmage, 2000). There are many studies published about germination media and temperature in recent years. Sfindiaro *et al.*, (2006) reported that pollen viability in TTC test was ranged between 85.7 and 98.85% in different male types of pistachio.

Hadj-Hassan (1985) was arranged male types of pistachio according to germination rate from weak to excellent germination (less than 25% weak, 26- 40 % medial, 41- 60 % good and highest than 61% excellent viability).

Acar and AK (2007) Reported that the highest germination rate of pistachio pollen was obtained from sucrose 20% (87.78%), and they found that adding  $H_3BO_3$  20 and 70 ppm germination rate obtained over 80%. Ulkumen (1945) reported that the highest germination rate was obtained from 10 and 15% sucrose solution in *Pistacia vera*, *P. terebinthus*, *P. atlantica*. Therios *et al*(1985) showed that maximum germination obtained at 35, 20 and 25% sucrose for the clones A, B and C of pistachio male strains respectively.

This experiment shows that sucrose concentrations may change from male type to another type. According to Atli *et al*(1995) The highest pollen germination rate of pistachio was observed by using 15% sucrose solution in tube method, and 10% sucrose solution in Petri dish method. Crane *et al*(1974) reported that the highest germination rate obtained was 94% by using 10% sucrose solution at pistachio pollen. Beside that, 72% germination rate was obtained by using 15% sucrose solution. AK *et al*(1995) reported that the best pollen germination rate was obtained by using 10-15% sucrose solution. Mlika(1991) mentioned that the pollen germination rate was obtained in pistachios ranged from 57-59% by using 10-20% sucrose solution. Cagler & Kaska(2007) reported that germination rate of pistachio pollen was ranged between 55-69% using 15% sucrose solution for many male types.

The aim of this study was to investigate the pollen germination rate and germination of tube length of pistachio male trees at different media and temperatures because there were no studies about pollen tube length in Arab Center Farm at Aleppo-Syria.

## MATERIAL AND METHODS

In this experiment 5 male strains of pistachio(36, 38, 42, 47, and 57) grown in pistachio orchard at Arab center farm in Aleppo were used as material. Pollen collection: The branches of selected male types were taken to the laboratory conditions (20 c) before the cluster dehisced pollen, and they were put in glass container filled with water. After waiting one night, the pollen had been taken and sowed with brush to the different germination media.

The germination media: 10% Sucrose, 10% sucrose+0.25gr. boric acid P L. media and 10% sucrose+0.0625 gr. boric acid P L. media, adding 3 g agar per 1 liter to each media.

The germination temperatures were: 10, 20 and 30°C. The experimental design: we used factorial design with 3 factors: (5 male strains, 3 media and 3 temperature). arranged in 3 replications with M-Stat .C. Program. Germination rate was recorded by Eq:  $G.R = \frac{\#G_{pollen}}{\# \text{ of total pollen}} \times 100$ , and pollen tube length/micron by using scale lens Fig (5).

The pollen grain counting and pollen tube length were performed after 24 hours in incubation at 3 temperatures .fig (1-5)



Figure1: pollen grain collection

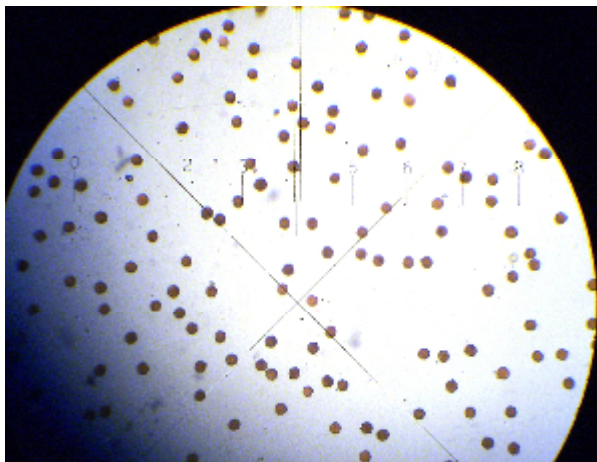


Figure2: pollen grain before germination

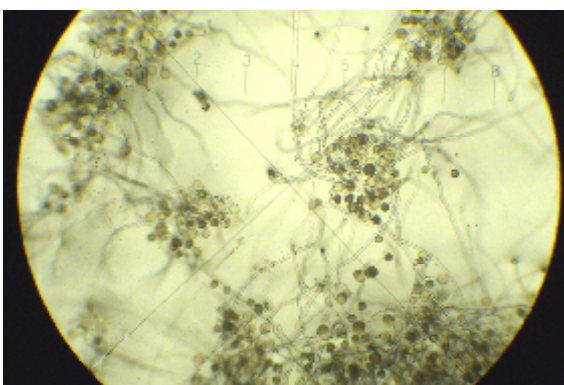


Figure 3:pollen germination and pollen length at tube 30°c

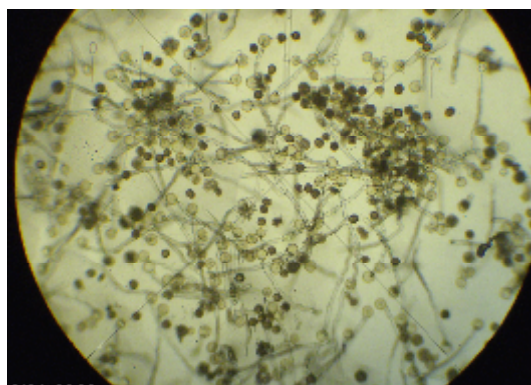


Figure 4:pollen germination and tube length at20°c



Figure5:pollen germination and pollen tube length at10 °c

### RESULTS AND DISCUSSION

Effect of different germination media on the germination rate of selected male strains at Arab center orchard were given in table 1.

The pollen germination rate was better in male No.36 (78.33%) than the other male types, however male No.47 was the lowest (63.11 %).The germination rate of males ranged between 63.11% - 78.33%.

Table 2 :indicate the effect of different germination media on the length of pollen tube of selected male strain at Arab center orchard .

Table(1): Effect of different media on germination rate% of pistachio male types at 2008 season.

Strain\media	10 %sucrose	10 %sucrose 0.25gr boric	10%sucrose+0. 0625gr. boric	mean
36	85 ab	63.33 h	86.67 a	78.33 a
38	83.33 b	71.67 fg	75 de	76.67 b
42	80.33 c	70 g	76.67 d	75.67 b
47	63.33 h	54.33 i	71.67 fg	63.11 d
57	73.33 ef	51.67 i	73.33 ef	66.11 c
mean	77.07 a	62.2 c	76.67 b	
Treat.	L.S.D 0.01			% CV 5.65
Strain	1.559			
Media	1.208			
Media x strain	2.701			

Results indicated that 10%sucrose was better media in germination rate (77.07%), where as 10 %sucrose+0.25gr. boric acid P L gave the lowest germination rate (62.2%) related to toxic effect of boric acid at high concentration .

Table(2): Effect of different media on pollen tube length (micron) of five pistachio male types at 2008 season.

Strain\media	10%sucrose	10%sucrose+ 0.25gr boric	10%sucrose+0.0625gr. boric	mean
36	809.3 c	102^ a	555.3 g	796.1 a
38	750 d	805.4 c	73^.^,^ e	731.3 b
42	611 f	638.7 e	527.7 h	592.47 d
47	395.3 j	861.0 b	277.7 k	511.3 e
57	861.0 b	555.3 g	500.0 i	638.8 c
Mean	684.5 b	777.68 a	499.88 c	
Trt	L.S.D 1%			% CV 3.69
Strain	12.83			
Media	9.94			
mediax strain	22.23			

10%sucrose+ 0.25gr. boric acid PL was the better media in pollen tube length (777.68micron), compared to 10%sucrose(684.5) and 10%sucrose +0.0625gr boric acid p L (499.88 micron).

Male No.36 was the better in pollen tube length (796.1 micron) than other Strain ,and male No.47gave the lowest tube length (511.3 micron) .The lengths of pollen tube were arranged from 511.3 to 796.1 micron.

The results of this study indicated ,that the length of pollen tube germination was increased with increasing of boric acid concentrations .

Table 3 indicate the effect of different temperatures on germination rate of selected pistachio male types .

Table(3): Effect of different temperatures on germination rate % of pistachio male types at 2008 season.

Strain\temp.	10°c	20°c	30°c	mean
36	65 g	78.33 e	91.67 a	78.33 a
38	48.33 h	88.33 b	93.33 a	76.67 b
42	48.33 h	86.67 bc	92 a	75.67 b
47	21 j	85 cd	83.33 d	63.11 d
57	45 i	70 f	83.33 d	66.11 c
Mean	45.53 c	81.67 b	88.73 a	
Trt	1% LSD			%CV 5.65
Strain	1.559			
temperature	1.432			
temperature x strain	3.202			

Male No.36 gave the highest germination rate than others (78.33%) where as the male No.47 gave the lowest germination rate than other strain (63.11%) .The germination rate were ranged between 63.11 and 78.33%. The temperature 30°c showed the highest germination rate (88.73%) compared to other temperatures, where as temperature10°c gave the lowest germination rate (45.53%) . We observed that the germination rate was increased with temperature increasing .We observed that the high temperature (30 c) was a suitable to germination of pollen grain.

Table 4 showed the effect of different temperatures on pollen tube length of selected types of pistachio males at.30°c temperature.

The temperature at30°c gave the highest pollen tube length (1005.26 micron) when compared to other strains, where as the 10°c gave the lowest tube length (244.3 micron). Male No.36 gave the highest tube length (796.1 micron) ,however the male No. 47 gave the lowest tube length (511.3 micron) than other strains .These results indicate the role of genetic variation between male types and high temperature in increasing pollen tube length as we mentioned .

Table(4): Effect of different temperatures on pollen tube length( micron) of five pistachio male types at 2008 season.

Strain\temp.	10°c	20°c	30°c	Mean
36	527.7 j	916.7 e	944 d	796.1 a
38	222.0 l	805.7 g	1166. a	731.3 b
42	222.3 l	499.7 k	1055 b	592.47 d
47	111 n	589.7 i	833.3 f	511.3 e
57	138.7 m	750 h	1028 c	638.8 c
Mean	244.3 c	714.16 b	1005.26 a	
Trt	LSD 1%			% CV 3.69
Strain	12.83			
temperature	8.495			
Temperature x strain	19			

Table 5 explain the effect of interaction among media , temperature and strain on germination rate of five selected male types of pistachio at Arab center orchard at Aleppo.

The results in table5 showed that there were a significant different between interaction treatments. Male No.36grown on 10% sucrose media at 20°c temperature gave the highest germination rate (100%), whereas Male No. 47 at 10°c temperature with 10% sucrose + 0.0625gr. boric acid p L media gave the lowest germination rate(3%).

The germination rate of males was affected by interaction between male types X media X temperature which were ranged between 63.11% to 78.33%.

Table 6 showed the effect of interaction among media X temperature and strain on pollen tube length of selected male types of pistachio.The male No.47 pollen tube grown in (10% sucrose+0.25gr. boric acid at 30°c temperature gave the highest pollen tube length (1500micron) with a significant differences than other treatments, where as this male No. 47 grown with the same media at 10°c temperature gave the lowest pollen tube length (83micron). That mean their are differences between males at different temperatures and different media. The length of pollen tube arranged from 511.3 to 796.1.We observed that the high length of pollen tube in10% sucrose +0.25gr. boric acid P L media ,that mean the increasing of boric acid concentration caused an increase in tube length .

Results indicated that male strain types of pistachio was differ in germination rate and pollen tube length that means, male types of pistachio was differ in germination rate,this variation may be related to the genetic features ,these results agree with (Hadj-Hassan,1985). On the other hand 10% Sucrose media gave better result than other media (Acar &AK,2007), and this result in accordance with (Johri and Vasil,1961), (Crane *et al*,1974). The adding of boric acid to media gave good result at low concentration, and this result agree with (Therios *et al*, 1985; AK,*et al*,1995). The adding of boric acid to media gave better result in germination rate at low concentration, however the pollen tube length was the highest in10% sucrose + 0.0625gr. boric acid media, and this result agree with (Therios *et al*,1985;AK,*et al*,1995). This study showed that the media concentration was changed from male type to other. We observed that the germination rate and the pollen length increased when temperature increased because temperature at 30 c promote germination of pollen .

### CONCLUSION

Using of 10% Sucrose media at 20-30°c for pollen germination and 10% sucrose+0.25gr. boric acid P L at30°c to increasing tube length, and gave the best results .

Tble(5): Effect of interaction among media , temperature and strain on germination rate% of five pistachio male types in 2008 season.

Strain	Temp.	Media			mean
		10%sucrose	10%sucrose +0.25 gr. boric	10%sucrose +0.0625gr. boric acid	
36	10	95 ab	10 m	90 bc	78.33 a
	20	100 a	85 cd	90 bc	
	30	60 hi	80 de	95 ab	
38	10	60 hi	30 l	55 ij	76.67 b
	20	95 ab	90 bc	80 de	
	30	95 ab	95 ab	90 bc	
42	10	50 jk	30 l	65 gh	75.67 b
	20	95 ab	85 cd	80 de	
	30	96 a	90 ab	85 cd	
47	10	30 ef	30 l	3 n	63.11 d
	20	85 cd	90 bc	80 de	
	30	75 ef	95 ab	80 de	
57	10	55 ij	15 m	65 gh	66.11 c
	20	80 de	45 k	85 cd	
	30	85 cd	70 fg	95 ab	
Trt.		LSD 1%	% C.V		
Strain		1.559	5.65		
Media		1.208			
Temp.		1.432			
Str x med		2.701			
Str. X temp		.3.202			

Table (6): Effect of interaction between media , temperatures and strain on pollen tupe lengt (micron) of pistachio male types in 2008 season.

strain	Temp.	media			mean
		10%sucrose	10%sucrose+0.25gr. boric	10%sucrose+0.0625gr. boric acid	
36	10	250 k	1250 c	83 m	796.1 a
	20	1166. d	1083.3 e	583 h	
	30	1000 f	1000 f	750 g	
38	10	250 k	333 j	83 m	731.3 b
	20	1000 f	1000 f	417 i	
	30	1000 f	1333 b	1166 .d	
42	10	250 k	250 k	167 l	592.47
	20	583 h	583 h	333 j	

	30	1000 f	1166. d	1000 f	d
47	10	167 l	83 m	83 m	511.3 e
	20	436 i	333 j	1000 f	
	30	583 h	1500 a	417 i	
57	10	250 k	83 m	83 m	638.8 c
	20	1000 f	1000 f	250 k	
	30	1333 .b	1333. b	417 i	
Trt.	LSD %1				
Strain	12.83				
Media	9.94				
Temp.	8.495		% C.V		
Str x med	22.23		3.69		
Str. X temp	19				
Med x temp.	14.71				
St. x med. x temp.	32.90				

### تأثير درجات الحرارة و اوساط الانبات في نسبة انبات حبوب اللقاح وطول الانبوبة لقاحية لخمس سلاسل من الفستق الحلبي المذكرة

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### الخلاصة

أجريت هذه الدراسة لتقييم تأثير أوساط غذائية ودرجات حرارة مختلفة على نسب الإنبات لحبوب لقاح ٥ سلاسل مذكرة من الفستق الحلبي المزروعة في مركز أبحاث كلية الزراعة في المسلمية - حلب (بستان المركز العربي) في الموسم ٢٠٠٨. استخدمت الأوساط الغذائية سكروز ١٠%, سكروز ١٠% + ٦٢٥ غم حمض البوريك و سكروز ١٠% + ٢٥٠ غم حمض البوريك إضافة إلى ٣ غم من اجار / ليتر ودرجات حرارة ١٠ و ٢٠ و ٣٠ م استخدم التصميم العاملي في التجربة بثلاث عوامل ٥ سلاسل هي ( ٣٦, ٣٨, ٤٢, ٤٧, ٥٧), ٣ اوساط ودرجات حرارة (١٠, ٢٠, ٣٠ م) وبثلاث مكررات. تبين من الدراسة أن السلالة ٣٦ قد أعطت أعلى نسبة إنبات ٧٨.٣٣% وطول انبوبة لقاحية ٧٩٦.١ مايكرون مقارنة ببقية السلالات الأخرى في حين أعطت السلالة ٤٧ أقل نسبة إنبات ٦٣.١١% واقصر طول انبوية لقاحية ٥١١.٣ مايكرون, وأعطى الوسط سكروز ١٠% أفضل نسبة إنبات لحبوب اللقاح ٧٧.٠٧%, أما الوسط سكروز ١٠% + ٢٥٠ غم حمض البوريك فقد أعطى أقل نسبة إنبات ٦٢.٢% واطول انبوية لقاحية ٧٧٧.٦٨ مايكرون مقارنة ببقية الأوساط من ناحية أخرى كانت درجة الحرارة ٣٠ م أفضل درجة من حيث نسبة إنبات حبوب اللقاح ٨٨.٧٣% وطول الانبوية اللقاحية ١٠٠٥.٢٦ مايكرون, وأعطت درجة حرارة ١٠ م أقل نسبة إنبات ٤٥.٤٣% واقصر طول انبوية لقاحية ٢٤٤.٣ مايكرون. علما ان جميع الأوساط ودرجات الحرارة المستخدمة قد اعطت نسب إنبات عالية لجميع السلالات المدروسة. نستنتج ان الوسط سكروز ١٠% هو أفضل وسط لانبات حبوب اللقاح بينما كان الوسط سكروز ١٠% + ٢٥٠ غم حمض البوريك أفضل وسط لطول الانبوية اللقاحية .

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