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OVERCOMING DORMANCY IN THE HARD SEEDS OF SOME ALFALFA CULTIVARS (*Medicago sativa* L)

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ABSTRACT

This research was carried out at Agronomy Department laboratory, Faculty of Agriculture, Mansoura University, Egypt. The germination experiments, which were set up as factorial experiments designed in randomized complete block design with four replicates. The purpose of the thesis was to find out the influence of different temperature treatments plus scarification and the same temperature without scarification on the reduction of percentage of hard seeds and improvement other germination parameters in five alfalfa cultivars (Siriver, Sewa1, Ismailia1, Balady1 and El-Wady El-Gaded1). The trial contained nineteen different treatments: this research i. e control treatment; 5 hours +5°C; 5 hours +10°C; 5 hours +20°C; 5 hours +40°C; 5 hours +80°C; 5 hours -5°C; 5 hours -10°C; 5 hours -20°C; 2 hours -80°C and the same treatments plus sandpaper scarification (s) except control treatment.

Alfalfa cultivars significantly differ in averages of hard seed percentage, percentage of abnormal seedling, percentage of dead seed, germination percentage free of hard seed, normal germs percentage, energy for germination percentage, coefficient velocity percentage, mean germination time (MGT) by days and value of the vigour percentage. Balady1 cultivar had only positive effects in all studies characters while; El-Wady El-Gaded1 cultivar had only negative effects on all germination parameters under study.

Break down dormancy treatments significantly differed in all germination parameters under study. The two treatments, -80°C+ (s) and -80°C were very efficient since they reduced the percentage of hard seeds in comparison with the control by70.455 % and 63.636 %, respectively while their influence on dead seed percentage was completely different. The treatment with -5°C had only positive effects on other germination parameters that were reflected in the highest values for germination energy and germination percentage of free of hard seed.

Keywords: Temperature, Scarification, Alfalfa cultivars, Hard seed percentage

INTRODUCTION

Alfalfa or Lucerne (*Medicago sativa* L.) is one of the world's most valuable forage legumes. It is grown for hay, pasture and silage, and is valued as a livestock feed. Alfalfa considers as the highest yield potential and one of the highest feeding values of all adapted perennial forage legumes. Although alfalfa seed production is widely distributed, essentially all commercially cultivars have high hard-seed content. Hard Seed caused by a water-impermeable seed (or fruit) coat is called physical dormancy, and it develops during maturation drying of the seed or fruit (Van Staden *et al*., 1989). Lucerne is a crop characterized by presence of hard (dormant) seed

that are viable but do not germinate in seed quality testing (Cupic *et al*., 2005). Hard alfalfa seed does not germinate due to seed plant impermeability having compacted cells with thickened outside cell walls usually coated by a wax layer and well developed cuticle (Kastori, 1984). Impermeable coat of alfalfa dormant seed can reduce germination to an extent unacceptable for commercial use (Acharya *et al.,* 1999). There were differences among alfalfa cultivars in the proportion of viable seed that was hard (Hall *et al.* 1998). Acharya *et al.,* (1999) reported significant effect of cultivars on germination and hard seed content in freshly harvested seed.

Hard seed reduction is possible by seed thinning performed either mechanically, by temperature, by chemical agents or by other ways. Hard seed reduction in total seed by temperature was obtained by Rutar *et al.* (2001). Uzun and Aydin (2004) indicated that the most effective treatment in breaking hard seed dormancy of legumes seeds was mechanic scarification.

The objective of this research was to determine the influence of different temperature plus sandpaper scarification and without scarification on seed dormancy breakdown of hard seed in some alfalfa cultivars under laboratory conditions.

MATERIALS AND METHODS

This research was conducted in Agronomy Department laboratory of the Agriculture Faculty, Mansoura University, Egypt during May 2011. Five alfalfa cultivars were selected Balady 1, Ismailia 1, Sewa 1, El-wady El-gaded 1 and Siriver, to study the influence of different physical seed treatments and mechanical seed scarification on seed dormancy breakdown of hard seed in some alfalfa Cultivars. Alfalfa seed of this study were obtained from Forage Research Department, Agriculture Research Center, except Siriver cultivar was obtained from private company, which were hand harvested, it was important to use hand harvested seeds because mechanical harvesters could pre-scarify seeds. About 10.000 intact seeds were carefully select by hand for the study. Seeds were stored at laboratory conditions in cloth bags inside paper bags under laboratory conditions. Germination tests of alfalfa were determined. Nineteen seed treatments for physical dormancy breakdown as following:

1-Control treatment: Seed was not subjected to any seed treatment, 2-Seed exposed to 5°C for 5 hours (Seed exp. to 5°C for 5 h), 3- Seed exposed to 5°C for 5 hours plus sandpaper scarification (Seed exp. to 5°C for 5 hr+S), 4- Seed exposed to 10°C for 5 hours (Seed exp. to 10°C for 5 hr), 5- Seed exposed to 10°C for 5 hours plus sandpaper scarification (Seed exp. to 10°C for 5 hr+S), 6- Seed exposed to 20°C for 5 hours (Seed exp. To 20°C for 5 hr), 7- Seed exposed to 20°C for 5 hours plus sandpaper scarification (Seed exp. To 20°C for 5 hr+S), 8- Seed exposed to 40°C for 5 hours (Seed exp. To 40°C for 5 hr), 9- Seed exposed to 40°C for 5 hours plus sandpaper scarification (Seed exp. To 40°C for 5 hr+S), 10- Seed exposed to 80°C for 5 hours (Seed exp. To 80°C for 5 hr), 11- Seed exposed to 80°C for 5 hours plus sandpaper scarification (Seed exp. To 80°C for 5 hr+S), 12-Pre-cooling

at (-5°C) for 5 hours (Seed exp. To – 5°C for 5 hr), 13- Pre-cooling at (-5°C) for 5 hours plus sandpaper scarification (Seed exp. To – 5°C for 5 hr +S), 14- Pre-cooling at (-10°C) for 5 hours (Seed exp. To – 10°C for 5 hr), 15 Pre-cooling at (-10°C) for 5 hours plus sandpaper scarification (Seed exp. To – 10°C for 5 hr+S), 16- Pre-cooling at (-20°C) for 5 hours (Seed exp. To – 20°C for 5 hr), 17- Pre-cooling at (-20°C) for 5 hours plus sandpaper scarification (Seed exp. To – 20°C for 5 hr+S), 18- Pre-cooling at (-80°C) for 2 hours (Seed exp. To – 80°C for 2 hr), 19- Pre-cooling at (-80°C) for 2 hours plus sandpaper scarification (Seed exp. To – 80°C for 2 hr+S).

After pre-treatments of alfalfa, seed was germinated for 7 days, incubating in a growth chamber adjusted to 20 ± 1 °C in a dark. For each treatment, 50 seeds were counted at random and placed on a moist germination paper in a Petri dish. There were four replicates at each treatment. Dishes were inspected daily and sterilized water added as required. The number of normal seedlings, abnormal seedlings, dead seeds and hard seed in each replicate were recorded, every 24 hours the number of germinated seeds was counted. Seeds were categorized as germinated (radical 2 mm), hard (no imbibitions or swelling) or nonviable (abnormal, dead or infected seeds) as described by International Seed Testing Association (1993). You can distinguish hard or (dormant) seeds from dead seeds by pushing down on each ungerminated seed with the flat part of a pencil eraser. If the seed does not flatten with gentle pressure, it is considered as hard seed. All seeds which had taken up no water in six days were considered as hard seed. Dead seeds which at the end of test period are neither hard nor have produced any part of a seedling.

Studied characteristics:

Seedlings were evaluated for:

1- Percentage of normal seedling = Number of normal seedling / Total number of seeds
2- Percentage of abnormal seedling = Number of abnormal seedling / Total number of seeds
3- Percentage of hard seed = Number of hard seed / Total number of seeds
4- Percentage of dead seed = Number of dead seed / Total number of seeds
5- Germination percentage = Number of germinating seeds 7 days after sowing / Total number of seeds
6-Energy of germination was recorded the 4th. Energy of germination was the percentage of germinating seeds 4 days after sowing relative to the number of seeds tested (Ruan *et al*., 2002).
7-Mean germination time (MGT): It was determined according to the equation of (Ellis and Roberts., 1981):

$$MGT = \sum dn \div \sum n$$

Where (n) is the number of seeds which were germinated on day (d), and (d) is the number of days counted from the beginning of germination.

8- Coefficient of velocity (*CV*), a unit less parameter determined by a mathematical manipulation that incorporates the number of seeds germinated and the velocity of germination was calculated using the following formula:

$$C\ V = 100\ [\sum Ni \div \sum Ni\ Ti]$$

Where *N* is the number of seeds germinated on day i and *T* is the number of days from sowing (Scott *et al*., 1984). In general, a higher *CV* value reflects increased germination and shorter germination time.

9-The value of the vigour (V) of each seed lot was calculated as a measure of the germination rate, because the values of this index reflect the germinative capability of the seeds per unit time, as recommended (Bradbeer 1988). The formula used was:

$$V = (a/1 + b/2 + c/3 + d/4 + \ldots + x/n) \times 100 / S$$

Where a, b, c . . . respectively represent the number of seeds which germinated after 1, 2, 3 . . . days of imbibitions, x is the number of seed for day n and S the total number of seeds sown.

Statistical analysis:

All data of this study were statistically analyzed according to the technique of variance (ANOVA) for the factorial Randomized Complete Block Design, by using means of "MSTAT-C" computer software package as published by Gomez and Gomez, 1984. Least Significant Difference (LSD) method was used to test the differences between treatment means at 5% level of probability as described by Snedecor and Cochran, 1980.

RESULTS AND DISCUSSION

Performance of cultivars:

The five tested cultivars of alfalfa significantly differ for averages of hard seed percentage, percentage of abnormal seedling, percentage of dead seed, germination percentage free of hard seed, normal germs percentage, energy for germination percentage, coefficient velocity percentage, mean germination time (MGT) by days and value of the vigour percentage(Tables 1, 2 and 3). Balady1 cultivar significantly exceeded other studied cultivars in percentage of normal germs percentage while; El-Wady El-Gaded1 cultivar produced the lowest averages. However, Siriver, Sewa1 and Ismailia1 cultivars produced intermediate values of these characters, respectively. Balady1 and Siriver cultivars significantly exceeded other studied cultivars in germination percentage free of hard seed, energy for germination percentage, coefficient velocity percentage and value of the vigour percentage, followed with statistical significance by Sewa1 and Ismailia1 cultivars in the second and third ranks, respectively, Vice versa, El-WadyEl-Gaded1 cultivar produced the lowest values of these characters. El-WadyEl-Gaded1 cultivar had significantly exceeded other studied cultivars in hard seed percentage, percentage of abnormal seedling and mean germination time (MGT) by days. Balady1 and Siriver cultivars none significant differences in all characters except normal germs percentage and percentage of abnormal seedling characters, Balady1 cultivar surpassed Sewa1, Ismailia1 and El-WadyEl-Gaded1 cultivars in germination percentage free of hard seed by 7.684 %, 10.447 %, 32.632%, respectively, in normal germs percentage by 14.947 %, 15.158 % and 42.974 %, respectively, in energy for germination percentage by 8.000 %, 11.815 % and 36.631 %, respectively, in coefficient velocity percentage by 2.201 %, 3.606 %, 8.600 %, respectively

and in value of the vigour percentage by 5.110 %, 7.095 %, 19.704 % . Vice versa, El-WadyEl-Gaded1 cultivar surpassed Balady1, Siriver, Sewa1 and Ismailia1 cultivars in hard seed percentage by 3.00 %, 3.394 %, 2.631 % and 1.684 %, respectively, in abnormal germs percentage by 9.369 %, 6.487 %, 0.921 % and 4.684 %, respectively, in dead seed percentage by 29.698 %, 29.540 %, 22.356 % and 20.685 %, respectively and in mean germination time (by days) by19.290 %, 19.097 %, 14.969 % and 12.153 %, respectively. Similar conclusions were reported by Acharya *et al.* (1999), Rutar *et al.* (2001) and Balouch and Sanavy (2006).

Table 1: Averages percentage of hard seed, abnormal germs (%) and dead seed percentage as affected by alfalfa cultivars and break down dormancy treatments.

Treatments	Hard seed%	Abnormal germs	Dead seed
A-Alfalfa cultivars:			
Siriver	1. 395	9. 829	1. 763
Sewa1	2. 158	15. 395	8. 947
Ismailia1	3. 105	11. 632	10. 618
Balady1	1. 789	6. 947	1. 605
El-Wady El- Gaded1	4. 789	16. 316	31. 303
F- test	**	**	**
L.S.D 5%	0. 4513	2. 0868	1. 0908
L.S.D 1%	0. 592	2. 741	1. 433
B- Break down dormancy Treatments:			
Control	4. 400	11. 700	8. 000
Seed exp. To 5°C for 5 hr	3. 200	10. 200	11. 250
Seed exp. To 5°C for 5 hr+S	2. 700	9. 800	11. 100
Seed exp. To 10°C for 5 hr	2. 500	15. 400	8. 000
Seed exp. To 10°C for 5 hr+S	2. 400	11. 400	8. 000
Seed exp. To 20°C for 5 hr	3. 800	12. 200	9. 600
Seed exp. To 20°C for 5 hr+S	2. 600	11. 550	10. 100
Seed exp. To 40°C for 5 hr	3. 500	11. 900	9. 200
Seed exp. To 40°C for 5 hr+S	3. 300	9. 700	10. 000
Seed exp. To 80°C for 5 hr	2. 500	17. 500	19. 900
Seed exp. To 80°C for 5 hr+S	2. 500	18. 800	20. 900
Seed exp. To – 5°C for 5 hr	2. 400	11. 200	8. 000
Seed exp. To – 5°C for 5 hr +S	2. 200	11. 800	9. 200
Seed exp. To – 10°C for 5 hr	2. 600	11. 700	9. 550
Seed exp. To – 10°C for 5 hr+S	2. 200	11. 800	11. 500
Seed exp. To – 20°C for 5 hr	2. 400	9. 000	9. 600
Seed exp. To – 20°C for 5 hr+S	2. 200	11. 500	9. 400
Seed exp. To – 80°C for 2 hr	1. 600	10. 100	11. 800
Seed exp. To – 80°C for 2 hr+S	1. 300	11. 200	11. 000
F- Test	**	**	**
L.S.D 5%	0. 879	4. 067	2. 126
L.S.D 1%	1. 155	5. 344	2. 793
Interaction F- test	N.S.	*	**

Table 2: Averages of germination percentage free of hard seed, normal germs (%) and energy for germination percentage as affected by alfalfa cultivars and break down dormancy treatments

Treatments	Germination free of hard seed %	Normal germs%	Energy for Germination%
A-Alfalfa cultivars:			
Siriver	96. 789	86. 868	96. 395
Sewa1	88. 895	74. 711	87. 947
Ismailia1	86. 132	74. 500	84. 132
Balady1	96. 579	89. 658	95. 947
El-Wady El- Gaded1	63. 947	46. 684	59. 316
F- test	**	**	**
L.S.D 5%	1.248	1. 770	1. 251
L.S.D 1%	1.640	2. 325	1. 644
B- Break down dormancy Treatments:			
Control	86. 700	75. 900	84. 500
Seed exp. To 5°C for 5 hr	85. 700	75. 500	84. 400
Seed exp. To 5°C for 5 hr+S	86. 200	76. 400	85. 300
Seed exp. To 10°C for 5 hr	89. 500	76. 800	85. 700
Seed exp. To 10°C for 5 hr+S	89. 600	78. 200	86. 800
Seed exp. To 20°C for 5 hr	87. 400	74. 600	86. 200
Seed exp. To 20°C for 5 hr+S	87. 300	75. 000	85. 300
Seed exp. To 40°C for 5 hr	87. 300	75. 400	85. 500
Seed exp. To 40°C for 5 hr+S	86. 700	77. 000	85. 200
Seed exp. To 80°C for 5 hr	77. 600	60. 100	76. 300
Seed exp. To 80°C for 5 hr+S	76. 400	56. 900	74. 000
Seed exp. To – 5°C for 5 hr	89. 600	78. 400	87. 800
Seed exp. To – 5°C for 5 hr +S	88. 600	76. 800	87. 800
Seed exp. To – 10°C for 5 hr	87. 300	75. 600	84. 800
Seed exp. To – 10°C for 5 hr+S	86. 300	73. 800	85. 200
Seed exp. To – 20°C for 5 hr	88. 000	78. 900	86. 800
Seed exp. To – 20°C for 5 hr+S	88. 400	76. 900	86. 900
Seed exp. To – 80°C for 2 hr	86. 600	76. 500	84. 600
Seed exp. To – 80°C for 2 hr+S	87. 700	76. 500	87. 100
F- Test	**	**	**
L.S.D 5%	2.434	3. 450	2. 440
L.S.D 1%	3.198	4. 533	3.206
Interaction F- test	**	**	**

Break down dormancy treatments effect:

The results in Tables 1, 2and 3 indicated that break down dormancy treatments had significant effects on averages of hard seed percentage, percentage of abnormal seedling, percentage of dead seed, germination percentage free of hard seed, normal germs percentage, energy for germination percentage, coefficient velocity percentage, mean germination time (MGT) by days and value of the vigour percentage. Exposed alfalfa seed to cold stratification treatment at (-80°C) for 2 hours plus sandpaper scarification treatment and exposed alfalfa seed to cold stratification treatment at (-80°C) for 2 hours treatment significantly reduced hard seed percentage by 70.455 % and 63.636% compared with control treatment, respectively. exposure seed to a temperature of cold stratification treatment at (-5°C) for 5 hours treatment had significant positive effects that were reflected in the highest value for germination percentage free of hard seed

and energy for germination percentage without significant negative effects for other traits when compared to control treatment. While, the treatment with cold stratification treatment at (-80°C) for 2hours obtained the lowest value and significantly reduced of hard seed percentage with significantly increase of germination percentage free of hard seed and energy for germination percentage but with significant negative effects for dead seed percentage and coefficient velocity percentage when compared to control treatment, Vice versa, exposed seed to a temperature of (80°C) for 5 hours plus sandpaper scarification and exposed seed to a temperature of (80°C) for 5 hours treatments had a negative effects for all traits. Similar conclusions were recorded by Egley (1989), Rutar *et al*. (2001), Uzun and Aydin (2004) and Narem and Xu (2009).

Table 3: Averages coefficient velocity (C.V %), mean germination time (MGT by days) and values of the vigour as affected by alfalfa cultivars, break down dormancy treatments and their interaction.

Treatments	C. V. %	MGT days	VALUES OF THE VIGOUR
A-Alfalfa cultivars:			
Siriver	47. 796	2. 097	46. 952
Sewa1	45. 678	2. 204	41. 964
Ismailia1	44. 273	2. 277	39. 979
Balady1	47. 879	2. 092	47. 074
El-Wady El- Gaded1	39. 279	2. 592	27. 370
F- test	**	**	**
L.S.D 5%	0. 551	0. 038	0. 615
L.S.D 1%	0. 724	0. 050	0. 808
B- Break down dormancy Treatments:			
Control	46. 121	2. 174	41. 797
Seed exp. To 5°C for 5 hr	45. 327	2. 217	40. 422
Seed exp. To 5°C for 5 hr+S	46. 067	2. 192	41. 032
Seed exp. To 10°C for 5 hr	44. 109	2. 299	42. 039
Seed exp. To 10°C for 5 hr+S	45. 569	2. 228	42. 651
Seed exp. To 20°C for 5 hr	44. 610	2. 317	40. 504
Seed exp. To 20°C for 5 hr+S	45. 185	2. 234	41. 318
Seed exp. To 40°C for 5 hr	45. 850	2. 202	41. 549
Seed exp. To 40°C for 5 hr+S	46. 278	2. 178	41. 676
Seed exp. To 80°C for 5 hr	40. 808	2. 475	33. 602
Seed exp. To 80°C for 5 hr+S	38. 747	2. 614	32. 327
Seed exp. To – 5°C for 5 hr	46. 164	2. 171	42. 894
Seed exp. To – 5°C for 5 hr +S	47. 117	2. 151	42. 520
Seed exp. To – 10°C for 5 hr	45. 408	2. 254	41. 362
Seed exp. To – 10°C for 5 hr+S	45. 185	2. 235	40. 370
Seed exp. To – 20°C for 5 hr	45. 467	2. 207	41. 712
Seed exp. To – 20°C for 5 hr+S	45. 826	2. 192	42. 113
Seed exp. To – 80°C for 2 hr	44. 949	2. 257	40. 670
Seed exp. To – 80°C for 2 hr+S	45. 849	2. 201	41. 770
F- Test	**	**	**
L.S.D 5%	1. 074	0. 075	1. 200
L.S.D 1%	1. 412	0. 098	1. 577
Interaction F- test	**	**	**

Interactions effect:

The results in Tables 4 to 11 indicated percentage of abnormal seedling, percentage of dead seed, germination percentage free of hard seed, normal germs percentage, energy for germination percentage, coefficient velocity percentage, mean germination time (MGT) by days and value of the vigour percentage were significantly affected by the interaction between cultivars and break down dormancy treatments. Vice versa, hard seed percentage didn't affected by the interaction. exposed Balady cultivar seed to a temperature of (10°C) for 5 hours surpassed other treatments where recorded the highest averages of normal germs percentage and energy for germination percentage, the lowest averages percentage of abnormal seedling, percentage of dead seed. In addition, exposed Balady1 cultivar seed to cold stratification at (-10°C) for 5hours plus scarification treatment surpassed other treatments where recorded the highest averages of germination percentage free of hard seed and energy for germination percentage, exposed Balady1 cultivar seed to cold stratification at (-20°C) for 5hours had the lowest averages percentage of abnormal seedling, exposed Balady1 cultivar to control treatment had the lowest averages percentage of dead seed and sown Balady1 cultivar exposed seed to cold stratification at (-20°C) for 5hours plus scarification treatment surpassed other treatments where recorded the lowest averages percentage of abnormal seedling.

Table 4: Abnormal germs percentage as affected by the interaction between cultivars and break gown dormancy treatments

Treatments	Siriver	Sewa1	Ismailia1	Balady1	El-Wady El-Gaded1
Break down dormancy Treatments:					
Control	11. 000	17. 500	7. 500	4. 500	18. 000
Seed exp. To 5°C for 5 hr	8. 000	11. 000	11. 500	5. 000	15. 500
Seed exp. To 5°C for 5 hr+S	9. 500	10. 000	7. 000	5. 500	17. 000
Seed exp. To 10°C for 5 hr	9. 000	11. 500	12. 500	3. 500	13. 000
Seed exp. To 10°C for 5 hr+S	8. 000	`13. 000	11. 000	5. 000	20. 000
Seed exp. To 20°C for 5 hr	9. 500	15. 000	13. 000	4. 500	19. 000
Seed exp. To 20°C for 5 hr+S	6. 750	15. 500	13. 000	8. 000	14. 000
Seed exp. To 40°C for 5 hr	7. 500	16. 000	9. 500	9. 000	17. 000
Seed exp. To 40°C for 5 hr+S	8. 500	15. 000	10. 000	4. 000	11. 000
Seed exp. To 80°C for 5 hr	16. 500	17. 000	27. 000	12. 000	15. 000
Seed exp. To 80°C for 5 hr+S	19. 00	20. 000	21. 000	17. 500	16. 000
Seed exp. To – 5°C for 5 hr	8. 500	14. 500	8. 500	7. 000	17. 000
Seed exp. To – 5°C for 5 hr +S	8. 500	14. 000	10. 000	8. 000	18. 000
Seed exp. To – 10°C for 5 hr	10. 500	12. 000	11. 000	10. 000	15. 000
Seed exp. To – 10°C for 5 hr+S	12. 500	11. 000	13. 500	6. 500	15. 500
Seed exp. To – 20°C for 5 hr	8. 500	12. 500	5. 000	5. 000	14. 000
Seed exp. To – 20°C for 5 hr+S	11. 500	13. 000	7. 000	3. 500	22. 500
Seed exp. To – 80°C for 2 hr	5. 500	12. 000	12. 500	6. 000	14. 500
Seed exp. To – 80°C for 2 hr+S	8. 000	15. 000	10. 500	7. 500	15. 000
F- Test	*				
L.S.D 5%	9. 095				
L.S.D 1%	-				

Table 5: Percentages of dead seed as affected by seed break down dormancy of alfalfa cultivars

Treatments	Siriver	Sewa1	Ismailia1	Balady1	El-Wady El-Gaded1
Break down dormancy Treatments:					
Control	1. 500	7. 000	7. 500	1. 000	23. 000
Seed exp. To 5°C for 5 hr	1. 500	6. 500	12. 500	2. 000	33. 750
Seed exp. To 5°C for 5 hr+S	1. 500	5. 500	11. 500	2. 000	35. 000
Seed exp. To 10°C for 5 hr	1. 000	5. 500	6. 000	1. 000	36. 500
Seed exp. To 10°C for 5 hr+S	2. 000	7. 500	7. 500	1. 000	22. 000
Seed exp. To 20°C for 5 hr	1. 500	11. 000	7. 500	1. 500	26. 500
Seed exp. To 20°C for 5 hr+S	2. 500	5. 000	11. 000	3. 000	29. 000
Seed exp. To 40°C for 5 hr	1. 000	4. 500	11. 500	1. 500	27. 500
Seed exp. To 40°C for 5 hr+S	1. 000	7. 500	7. 500	2. 000	32. 000
Seed exp. To 80°C for 5 hr	6. 000	12. 000	22. 500	3. 500	55. 500
Seed exp. To 80°C for 5 hr+S	3. 500	13. 500	25. 000	2. 500	60. 000
Seed exp. To – 5°C for 5 hr	1. 000	9. 500	9. 500	1. 500	18. 500
Seed exp. To – 5°C for 5 hr +S	1. 500	8. 500	7. 500	1. 500	27. 000
Seed exp. To – 10°C for 5 hr	1. 500	11. 500	8. 250	1. 000	25. 500
Seed exp. To – 10°C for 5 hr+S	1. 000	8. 500	11. 500	1. 000	35. 500
Seed exp. To – 20°C for 5 hr	1. 500	11. 000	8. 000	1. 000	26. 500
Seed exp. To – 20°C for 5 hr+S	1. 500	10. 500	6. 500	1. 000	27. 500
Seed exp. To – 80°C for 2 hr	1. 000	14. 500	8. 500	1. 500	33. 500
Seed exp. To – 80°C for 2 hr+S	1. 500	10. 500	12. 000	1. 000	30. 000
F- Test	**				
L.S.D 5%	4. 755				
L.S.D 1%	6. 252				

Table 6: Percentages of germination free of hard seed as affected by seed break down dormancy of alfalfa cultivars

Treatments	Siriver	Sewa1	Ismailia1	Balady1	El-Wady El-Gaded1
Break down dormancy Treatments:					
Control	96. 500	89. 000	86. 500	95. 000	70. 000
Seed exp. To 5°C for 5 hr	96. 000	91. 500	84. 500	96. 000	60. 500
Seed exp. To 5°C for 5 hr+S	97. 000	93. 500	86. 000	96. 000	58. 500
Seed exp. To 10°C for 5 hr	97. 500	92. 500	91. 500	97. 500	68. 500
Seed exp. To 10°C for 5 hr+S	97. 000	91. 000	89. 500	98. 000	72. 500
Seed exp. To 20°C for 5 hr	97. 000	85. 000	88. 500	96. 000	67. 000
Seed exp. To 20°C for 5 hr+S	96. 500	92. 500	85. 500	95. 500	66. 500
Seed exp. To 40°C for 5 hr	97. 000	92. 000	84. 000	97. 000	66. 500
Seed exp. To 40°C for 5 hr+S	97. 000	89. 500	89. 000	95. 500	62. 500
Seed exp. To 80°C for 5 hr	92. 500	85. 500	75. 000	94. 500	40. 500
Seed exp. To 80°C for 5 hr+S	94. 000	84. 500	72. 500	95. 500	35. 500
Seed exp. To – 5°C for 5 hr	98. 000	89. 000	87. 000	97. 000	77. 000
Seed exp. To – 5°C for 5 hr +S	97. 500	89. 500	89. 500	96. 500	70. 000
Seed exp. To – 10°C for 5 hr	97. 000	86. 500	85. 500	97. 000	70. 500
Seed exp. To – 10°C for 5 hr+S	98. 000	90. 000	85. 000	98. 500	60. 000
Seed exp. To – 20°C for 5 hr	97. 500	87. 000	89. 500	97. 500	68. 500
Seed exp. To – 20°C for 5 hr+S	97. 500	88. 500	91. 500	97. 500	67. 000
Seed exp. To – 80°C for 2 hr	98. 000	83. 500	89. 500	97. 000	65. 000
Seed exp. To – 80°C for 2 hr+S	97. 500	88. 500	86. 500	97. 500	68. 500
F- Test	**				
L.S.D 5%	5.442				
L.S.D 1%	7.151				

Table 7: Percentages of normal germs as affected by seed break down dormancy of alfalfa cultivars

Treatments	Siriver	Sewa1	Ismailia1	Balady1	El-Wady El-Gaded1
Break down dormancy Treatments:					
Control	85. 500	71. 500	79. 500	91. 000	52. 000
Seed exp. To 5°C for 5 hr	88. 000	80. 500	73. 000	91. 000	45. 000
Seed exp. To 5°C for 5 hr+S	87. 500	83. 500	79. 000	90. 500	41. 500
Seed exp. To 10°C for 5 hr	88. 500	81. 000	79. 000	94. 000	41. 500
Seed exp. To 10°C for 5 hr+S	89. 000	78. 000	78. 500	93. 000	52. 500
Seed exp. To 20°C for 5 hr	88. 000	70. 000	75. 500	91. 500	48. 000
Seed exp. To 20°C for 5 hr+S	87. 500	77. 000	72. 000	87. 500	51. 000
Seed exp. To 40°C for 5 hr	89. 500	76. 000	74. 500	88. 000	49. 000
Seed exp. To 40°C for 5 hr+S	88. 500	74. 500	79. 000	91. 500	51. 500
Seed exp. To 80°C for 5 hr	76. 000	68. 500	48.000	82. 500	25. 500
Seed exp. To 80°C for 5 hr+S	75. 000	61. 000	51. 500	78. 000	19. 000
Seed exp. To – 5°C for 5 hr	89. 500	74. 500	78. 500	90. 000	59. 500
Seed exp. To – 5°C for 5 hr +S	89. 000	75. 500	79. 500	88. 500	51. 500
Seed exp. To – 10°C for 5 hr	86. 500	74. 500	74. 500	87. 000	55. 500
Seed exp. To – 10°C for 5 hr+S	85. 500	79. 000	71. 500	92. 000	41.000
Seed exp. To – 20°C for 5 hr	89. 000	74. 00	84. 500	92. 500	54. 500
Seed exp. To – 20°C for 5 hr+S	86. 000	75. 500	84. 500	94. 000	44. 500
Seed exp. To – 80°C for 2 hr	92. 500	71. 500	77. 000	91. 000	50. 500
Seed exp. To – 80°C for 2 hr+S	89. 500	73. 500	76. 000	90. 000	53. 500
F- Test	**				
L.S.D 5%	7. 716				
L.S.D 1%	10. 138				

Table 8: Percentages of energy for germination as affected by seed break down dormancy of alfalfa cultivars

Treatments	Siriver	Sewa1	Ismailia1	Balady1	El-Wady El-Gaded1
Break down dormancy Treatments:					
Control	96. 000	88. 500	83. 000	94. 500	69. 000
Seed exp. To 5°C for 5 hr	95. 000	91. 000	80. 500	96. 000	59. 500
Seed exp. To 5°C for 5 hr+S	97. 000	92. 500	86. 000	96. 000	55. 000
Seed exp. To 10°C for 5 hr	96. 500	91. 000	87. 500	97. 000	56. 500
Seed exp. To 10°C for 5 hr+S	96. 500	90. 500	89. 000	98. 000	60. 000
Seed exp. To 20°C for 5 hr	97. 000	83. 000	86. 500	95. 000	61. 000
Seed exp. To 20°C for 5 hr+S	96. 500	92. 500	84. 000	94. 500	59. 000
Seed exp. To 40°C for 5 hr	96. 500	91. 000	83. 500	97. 000	59. 500
Seed exp. To 40°C for 5 hr+S	97. 000	89. 500	87. 500	95. 500	56. 500
Seed exp. To 80°C for 5 hr	92. 500	84. 000	71. 500	93. 500	40. 000
Seed exp. To 80°C for 5 hr+S	92. 500	83. 000	67. 000	94. 000	33. 000
Seed exp. To – 5°C for 5 hr	98. 000	88. 500	85. 000	94. 000	73. 500
Seed exp. To – 5°C for 5 hr +S	97. 500	87. 500	88. 500	95. 500	70. 000
Seed exp. To – 10°C for 5 hr	96. 500	84. 500	85. 500	97. 000	60. 500
Seed exp. To – 10°C for 5 hr+S	97. 500	91. 500	82. 500	98. 000	56. 500
Seed exp. To – 20°C for 5 hr	96. 500	85. 000	88. 000	96. 500	68. 000
Seed exp. To – 20°C for 5 hr+S	97. 000	86. 500	89. 500	96. 500	65. 000
Seed exp. To – 80°C for 2 hr	98. 000	82. 500	88. 000	97. 000	57. 500
Seed exp. To – 80°C for 2 hr+S	97. 500	88. 000	85. 500	97. 500	67. 000
F- Test	**				
L.S.D 5%	5. 456				
L.S.D 1%	7. 169				

Table 9: Percentages of coefficient of velocity as affected by seed break down dormancy of alfalfa cultivars

Treatments	Siriver	Sewa1	Ismailia1	Balady1	El-Wady El-Gaded1
Break down dormancy Treatments:					
Control	47. 317	46. 957	43. 490	47. 580	45. 263
Seed exp. To 5°C for 5 hr	48. 650	42. 887	43. 115	49. 347	42. 637
Seed exp. To 5°C for 5 hr+S	48. 395	46. 802	47. 602	49. 365	38. 170
Seed exp. To 10°C for 5 hr	47. 833	45. 557	43. 877	48. 055	35. 222
Seed exp. To 10°C for 5 hr+S	48. 622	47. 670	45. 680	49. 495	36. 380
Seed exp. To 20°C for 5 hr	49. 490	44. 517	44. 105	47. 718	37. 220
Seed exp. To 20°C for 5 hr+S	48. 620	47. 118	44. 293	47. 877	38. 017
Seed exp. To 40°C for 5 hr	48. 623	47. 690	46. 335	48. 518	38. 085
Seed exp. To 40°C for 5 hr+S	48. 878	47. 872	46. 180	48. 847	39. 612
Seed exp. To 80°C for 5 hr	43. 542	41. 182	33. 960	43. 205	42. 153
Seed exp. To 80°C for 5 hr+S	40. 963	37. 580	37. 378	44. 632	33. 182
Seed exp. To – 5°C for 5 hr	49. 490	46. 600	45. 078	46. 780	42. 873
Seed exp. To – 5°C for 5 hr +S	48. 633	46. 740	47. 493	47. 920	44. 800
Seed exp. To – 10°C for 5 hr	48. 168	47. 038	47. 115	48. 770	35. 947
Seed exp. To – 10°C for 5 hr+S	48. 400	47. 420	42. 060	48. 885	39. 160
Seed exp. To – 20°C for 5 hr	46. 670	45. 338	46. 425	47. 153	41. 750
Seed exp. To – 20°C for 5 hr+S	48. 307	45. 647	45. 535	48. 158	41. 485
Seed exp. To – 80°C for 2 hr	48. 525	46. 795	44. 925	48. 385	36. 113
Seed exp. To – 80°C for 2 hr+S	49. 000	46. 468	46. 545	49. 008	38. 225
F- Test	**				
L.S.D 5%	2. 403				
L.S.D 1%	3. 157				

Table 10: Mean germination time by days as affected by seed break down dormancy of alfalfa cultivars

Treatments	Siriver	Sewa1	Ismailia1	Balady1	El-Wady El-Gaded1
Break down dormancy Treatments:					
Control	2. 116	2. 130	2. 309	2. 104	2. 213
Seed exp. To 5°C for 5 hr	2. 058	2. 333	2. 320	2. 026	2..348
Seed exp. To 5°C for 5 hr+S	2. 067	2. 139	2. 101	2. 026	2. 625
Seed exp. To 10°C for 5 hr	2. 092	2.197	2. 283	2. 082	2. 843
Seed exp. To 10°C for 5 hr+S	2. 057	2. 098	2. 191	2. 021	2. 775
Seed exp. To 20°C for 5 hr	2. 021	2. 253	2. 270	2. 096	2. 946
Seed exp. To 20°C for 5 hr+S	2. 057	2. 123	2. 261	2. 089	2. 639
Seed exp. To 40°C for 5 hr	2. 058	2. 098	2. 160	2. 062	2. 633
Seed exp. To 40°C for 5 hr+S	2. 046	2. 089	2. 168	2. 047	2. 538
Seed exp. To 80°C for 5 hr	2. 297	2. 432	2. 949	2.318	2. 380
Seed exp. To 80°C for 5 hr+S	2. 443	2. 669	2. 683	2. 242	3. 030
Seed exp. To – 5°C for 5 hr	2. 020	2. 146	2. 218	2. 139	2. 334
Seed exp. To – 5°C for 5 hr +S	2. 057	2. 143	2. 106	2. 088	2. 362
Seed exp. To – 10°C for 5 hr	2. 079	2. 232	2. 124	2. 051	2. 786
Seed exp. To – 10°C for 5 hr+S	2. 067	2. 110	2. 382	2. 046	2. 571
Seed exp. To – 20°C for 5 hr	2. 144	2. 208	2. 157	2. 123	2. 404
Seed exp. To – 20°C for 5 hr+S	2. 071	2. 196	2. 200	2. 082	2. 411
Seed exp. To – 80°C for 2 hr	2. 061	2. 139	2. 230	2. 067	2. 786
Seed exp. To – 80°C for 2 hr+S	2. 041	2. 148	2. 151	2. 041	2. 624
F- Test	**				
L.S.D 5%	0. 168				
L.S.D 1%	0. 220				

Table 11: Value of the vigour as affected by seed break down dormancy of alfalfa cultivars

Treatments	Siriver	Sewa1	Ismailia1	Balady1	El-Wady El-Gaded1
Break down dormancy Treatments:					
Control	46.790	42.790	40. 075	46. 505	32. 825
Seed exp. To 5°C for 5 hr	47. 422	40. 888	38. 932	47. 583	27. 282
Seed exp. To 5°C for 5 hr+S	46. 553	44. 950	41. 625	47. 625	24. 407
Seed exp. To 10°C for 5 hr	47. 660	43. 933	42. 375	48. 155	28. 072
Seed exp. To 10°C for 5 hr+S	47. 810	44. 310	42. 390	48. 667	30. 078
Seed exp. To 20°C for 5 hr	48. 167	39. 443	41. 105	46. 265	27. 540
Seed exp. To 20°C for 5 hr+S	47. 042	44. 545	39. 968	46. 618	28. 418
Seed exp. To 40°C for 5 hr	47. 593	44. 200	39. 935	47. 667	28. 352
Seed exp. To 40°C for 5 hr+S	47. 792	43. 540	42. 365	47. 208	27. 475
Seed exp. To 80°C for 5 hr	42. 002	37. 175	27. 825	42. 950	18. 060
Seed exp. To 80°C for 5 hr+S	40. 758	34. 285	29. 557	44. 245	12. 790
Seed exp. To – 5°C for 5 hr	48. 670	42. 810	40. 815	47. 098	35. 077
Seed exp. To – 5°C for 5 hr +S	47. 873	43. 198	43. 452	47. 035	31. 042
Seed exp. To – 10°C for 5 hr	47. 395	41. 758	41. 250	47. 708	28. 700
Seed exp. To – 10°C for 5 hr+S	47. 807	43. 767	38. 025	48. 645	25. 408
Seed exp. To – 20°C for 5 hr	46. 767	41. 008	42. 930	47. 130	30. 725
Seed exp. To – 20°C for 5 hr+S	47. 635	41. 965	43. 510	47. 725	29. 732
Seed exp. To – 80°C for 2 hr	48. 060	40. 155	41. 885	47. 460	25. 793
Seed exp. To – 80°C for 2 hr+S	48. 292	42. 600	41. 573	48. 127	28. 258
F- Test	**				
L.S.D 5%	2. 683				
L.S.D 1%	3. 526				

The highest averages of coefficient velocity percentage were obtained with exposed Balady1 cultivar seed to cold stratification at (-5°C) for 5hours treatment or exposed seed to a temperature of (10°C) for 5 hours plus scarification treatment, exposed Siriver cultivar seed to cold stratification at (-5°C) for 5 hours treatment the results indicated that highest averages of energy for germination percentage, value of the vigour percentage and the lowest averages percentage of mean germination time (MGT) by days.In addition, exposed Siriver cultivar seed to cold stratification at (-80°C) for 2hours treatment surpassed other treatments where recorded the highest averages of energy for germination percentage. It could be noticed that exposed Siriver cultivar seed to a temperature of (10°C) for 5 hours treatment surpassed other treatments where recorded the lowest averages of dead seed percentage, exposed El-Wady El-Gaded1 cultivar seed to a temperature of (80°C) for 5 hours plus sandpaper scarification treatment recorded the lowest value of germination percentage free of hard seed, normal germs percentage, energy for germination percentage, coefficient velocity percentage and value of the vigour percentage, the highest value of dead seed percentage and mean germination time (MGT) by days. In addition, exposed Ismailia1 cultivar seed to a temperature of (80°C) for 5 hours treatment had the highest value percentage of abnormal seedling.

Conclusions

For maximizing breakdown dormancy of hard seed and improving germination characters by exposure seed to a temperature of cold stratification treatment at (-80°C) for 2hours plus sandpaper scarification. It had the lowest value and significantly reduced of hard seed percentage with significantly increase of germination percentage free of hard seed and energy for germination percentage but with significant negative effects for dead seed percentage and coefficient velocity percentage when compared to control treatment. While, exposure seed to a temperature of cold stratification treatment at (-5°C) for 5 hours treatment obtained significant positive effects that were reflected in the highest value for germination percentage free of hard seed and energy for germination percentage without significant negative effects for other traits. Balady1 and Siriver cultivars surpassed when compared to other studied cultivars under laboratory testing conditions, El-Wady El-Gaded1 cultivar more affected by Break down dormancy treatments when compared to other studied cultivars,

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كسر السكون فى البذور الصلدة لبعض أصناف البرسيم الحجازى

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أقيمت هذه التجربة خلال شهر مايو ٢٠١١ م بمعمل قسم المحاصيل – كلية الزراعة – جامعة المنصورة. نفذت التجربة في تصميم تجربة عامليه في قطاعات كاملة العشوائية في أربع مكررات، تهدف هذه الدراسة إلى كسر السكون في البذور الصلدة لبعض أصناف البرسيم الحجازي و تحسينا لبعض صفات الإنبات وذلك باستخدام بعض المعاملات الطبيعية مثل اختيار الصنف المناسب و تعريض البذور لدرجات حرارة مختلفة سواء مرتفعة أو منخفضة مع استخدام الصنفرة للبذور و كذلك بدون صنفرة مع نفس معاملات الحرارة، لتحقيق هذا الهدف أقيمت تجربة معملية لدراسة تأثير خمس أصناف من البرسيم الحجازي وهى سيرفر ، سيوة١ ، اسماعيلية١ ، بلدى١ ، الوادي الجديد١ لمعاملات كسر طور السكون ببعض المعاملات الطبيعية وهى كنترول بدون معاملة بالحرارة أو الصنفرة ، تعريض البذور لدرجة حرارة (٥°م) لمدة خمس ساعات ، تعريض البذور لدرجة حرارة (٥°م) لمدة خمس ساعات مع الصنفرة ، تعريض البذور لدرجة حرارة (١٠°م) لمدة خمس ساعات ، تعريض البذور لدرجة حرارة (١٠°م) لمدة خمس ساعات مع الصنفرة ، تعريض البذور لدرجة حرارة (٢٠°م) لمدة خمس ساعات ، تعريض البذور لدرجة حرارة (٢٠°م) لمدة خمس ساعات مع الصنفرة ، تعريض البذور لدرجة حرارة (٤٠°م) لمدة خمس ساعات ، تعريض البذور لدرجة حرارة (٤٠°م) لمدة خمس ساعات مع الصنفرة ، تعريض البذور لدرجة حرارة (٨٠°م) لمدة خمس ساعات ، تعريض البذور لدرجة حرارة (٨٠°م) لمدة خمس ساعات مع الصنفرة ، تعريض البذور للتبريد على درجة حرارة (- ٥°م) لمدة خمس ساعات ، تعريض البذور للتبريد على درجة حرارة (- ٥°م) لمدة خمس ساعات مع الصنفرة ، تعريض البذور للتبريد على درجة حرارة (- ١٠°م) لمدة خمس ساعات ، تعريض البذور للتبريد على درجة حرارة (- ١٠°م) لمدة خمس ساعات مع الصنفرة ، تعريض البذور للتبريد على درجة حرارة (- ٢٠°م) لمدة خمس ساعات

، تعريض البذور لدرجة حرارة (- ٢٠°م) لمدة خمس ساعات مع الصنفرة ، تعريض البذور للتبريد على درجة حرارة (- ٨٠°م) لمدة ساعتان ، تعريض البذور للتبريد على درجة حرارة (- ٨٠°م) لمدة ساعتان مع الصنفرة و وكذلك التفاعل بينهم وأثر ذلك على بعض قياسات الإنبات

أظهرت النتائج المتحصل عليها اختلاف الأصناف تحت الدراسة إختلافاً معنوياً في قياسات نسبة البذور الصلدة (%) ، نسبة البادرات غير الطبيعية (%) ، نسبة البذور الميتة (%) ، نسبة الإنبات بدون البذور الصلدة (%) ، نسبة البادرات الطبيعية (%) ، طاقة الإنبات (%) ، معامل سرعة الإنبات (%) ، متوسط مدة الإنبات (عدد الأيام) و قيمة حيوية البذور (%). أوضحت النتائج تفوق الصنف بلدى١ عن بقية الأصناف تحت الدراسة بينما أعطى الصنف الوادي الجديد١ أقل النتائج في جميع قياسات الإنبات .

تشير النتائج المتحصل عليها إلى تأثير معنوي بين معاملات كسر السكون على صفات نسبة البذور الصلدة (%) ، نسبة البادرات غير الطبيعية (%) ، نسبة البذور الميتة (%) ، نسبة الإنبات بدون البذور الصلدة (%) ، نسبة البادرات الطبيعية (%) ، طاقة الإنبات (%) ، معامل سرعة الإنبات (%) ، متوسط مدة الإنبات (عدد الأيام) و قيمة حيوية البذور (%) ، أظهرت النتائج المتحصل عليها أن تعريض البذور للتبريد على درجة حرارة (- ٥°م) لمدة خمس ساعات أدى إلى الحصول على أعلى القيم و زيادة معنوية في نسبة الإنبات بدون البذور الصلدة و طاقة الإنبات (%) دون التأثير معنويا علي باقي القياسات مقارنة بمعاملة الكنترول، كما أشارت النتائج إلى أن تعريض البذور للتبريد على درجة حرارة (- ٨٠°م) لمدة ساعتان مع الصنفرة أدى إلى الحصول على أقل القيم و نقص معنوي في نسبة البذور الصلدة، مع زيادة معنوية في نسبة الإنبات بدون البذور الصلدة و طاقة الإنبات (%) ولكن أثرت بشكل معنوي سلبيا على نسبة البذور الميتة (%) و معامل سرعة الإنبات (%)مقارنة بمعاملة الكنترول.

قام بتحكيم البحث

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