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Effect of seed revitalization techniques on some biomarkers of wheat seed growth

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Abstract
A laboratory experiment was carried out during the agricultural season 2022-2023 to identify the response of seeds of two bread wheat cultivars (Abo-Raghif - Al-Forat) to some techniques of stimulating germination treatments. The number of these treatments was 4 (soaking for one hour in water - soaking for two hours - treating the seeds with gibberellin Before planting - treating seeds with boron before planting). The laboratory experiment was carried out according to the experimental design (CRD) with three replications. The results of the experiment were summarized as follows: The cultivar Abo-Raghif was significantly superior in most of the studied traits to the cultivar Forat, as it recorded the highest mean for the traits (germination percentage, root length, stem length, seedling strength) was (90.00% - 5.75 cm-78.50cm- 1246.9)) in sequence. The variety Forat excelled in the speed of germination, recording 75.4%. As for the treatments for activating seed germination, the treatment of seeds with gibberellin was superior in all the studied characteristics (germination speed, germination rate, root length, shoot length, seedling strength), recording the highest rates, as it reached (83.3% - 91.67% -71.67 cm - 86.83 cm - 14.53.3) sequentially. The bilateral interaction between the Abo-Raghif variety and the gibberellin treatment had significant superiority in most of the studied traits over most of the other combinations.

Keywords: Abo-Raghif cultivar**;** gibberellin**;** Forat cultivar; Boron.

Introduction

The seed is considered the main input in the agricultural production process of any crop, and high-quality seeds are the most important pillar in the success of cultivation, as they give a high rate of germination and emergence, which results in the formation of healthy seedlings with good growth. In addition to the fact that it gives a clear impression of the extent to which the seeds bear the inappropriate conditions, this, therefore, leads us to the ideal field establishment, which is one of the most important factors for the establishment of the crop in the field, which reflects well on the growth and emergence of the crop, and then on the production in quantity and quality (Noaema et al., 2020 a).

The development of agricultural programs depends primarily on seeds with latent genetic potential transferred to them from the mother plant, which must be preserved because they represent the biological address of the potential productive capacity that determines the characteristics of plants produced from the cultivation of those seeds. Moreover, the main biological function of seeds for plant species is to ensure their survival and spread in an environmental range suitable for their preservation (Bareke, 2018). Seeds vary in terms of laboratory performance in the characteristics of germination, emergence, and seedling strength as a result of their influence on genetic factors and various environmental stresses, which are reflected negatively on seed behavior and may cause a decrease in its quality, which can be seen through delayed germination and its heterogeneity. Genotypes with high-stress tolerance may be used in transgenic tolerance (Wannamaker and Pike, 1987).

Pre-sowing seed treatments may also have an important role, as these treatments promote the emergence and growth of seedlings in non-saline areas (Khan, 1992). It is necessary to select such options, testing technologies that enhance the seed activity that performs better germination and growth of the seedling under different conditions (Noaema et al., 2020 b).

Combining plant growth regulators during the revocation period and the initial setting improved seed performance in several vegetable crops after pre-sowing and other pre-sowing treatments. Typical responses to pretreatment in terms of rapid emergence and uniformity in seedbed media and a wider temperature range

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lead to improved germination, plant growth in the field, and product yield and quality, especially under unfavorable conditions (Halmer, 2004). Several studies indicated that Gibberellic Acid is more important than other growth regulators regarding seed germination (Naqvi, 1999) and significantly improves germination (Naidu, 2001; Gregori et al., 2001). Milosevic and Malisevec (2004) indicated the role of growth regulators in improving the germination and development of seeds of seedlings of various cereal crops.

The study aimed to know the effect of some seed stimulation technologies on some vital traits of seed growth of two wheat cultivars.

Materials and Methods

A laboratory experiment was carried out during the agricultural season 2022-2023 to identify the response of seeds of two cultivars of bread wheat (Abo-Raghif - Al-Forat); it is denoted by symbols (V1, V2)to some techniques of stimulating germination treatments. The number of these treatments was 4 (soaking for one hour in water - soaking for two hours - treating the seeds with gibberellin Before planting - treating seeds with boron before planting); it is denoted by symbols (T1, T2, T3, T4) where the laboratory experiment was carried out according to the experimental design (CRD) with three replications sequentially.

Each of the following traits was measured: (germination speed, germination rate, root length, shoot length, and seedling strength)

Results and Discussion

Germination speed (%)

The results showed in Table (1) that the germination activation treatments had a significant effect on the studied trait (germination speed %). In contrast, neither the cultivars nor the interaction between the experimental treatments significantly affected the studied trait.

The T3 treatment (treatment of seeds with gibberellins) recorded a significant superiority over all other treatments and a germination speed of 83.3%. The superiority of gibberellin treatment may be due to the role that gibberellin plays in improving the germination and growth of crop grains (Przetakiewiz et al., 2003).

Table (1): Speed germination (%) of seeds of two wheat cultivars, according to effect of some Seed activation treatments and their interaction

Variety (V)	**Seed activation treatments (T)**				**Variety average**
	T1	T2	T3	T4	
Abo-Raghif	63.3	73.3	81.7	76.7	73.8
Al-Forat	68.3	70.0	85.0	78.3	75.4
Treatments average	65.8	71.7	83.3	77.5	
LSD T		LSD V		LSD T*V	
7.80		NS		NS	

Percentage germination (%)

Table (2) results indicate a significant effect of wheat cultivars, seed activation treatments, and the interaction between the factors on the studied trait (germination percentage).

Abo-Raghif cultivar was significantly superior to the Al-Forat cultivar, recording the highest germination rate of 90.00%, while the Al-Forat cultivar reached 83.75%. The discrepancy between the cultivars may be due to their genetic variation (Table 2).

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As for the T3 treatment, the germination percentage of the seeds with which it was treated was 91.83%, and the lowest percentage of germination was recorded by soaking the seeds for one hour in water T1. The superiority of gibberellin treatment may be attributed to the role of gibberellin in improving germination and seedling growth (Gregori et al., 1995; Noaema et al., 2020 c).

The combination of Abo-Raghif cultivar with treatment T4 had a significant superiority in this trait, amounting to 95.00%.

Table (2): Percentage germination (%) of seeds of two wheat cultivars, according to effect of some Seed activation treatments and their interaction

Variety (V)	**Seed activation treatments (T)**				**Variety average**
	T1	T2	T3	T4	
Abo-Raghif	85.00	90.00	90.00	95.00	90.00
Al-Forat	78.33	76.67	93.33	86.67	83.75
Treatments average	81.67	83.33	91.67	90.83	
LSD T		LSD V		LSD T*V	
5.445		3.850		7.700	

Root length (cm)

The results of Table (3) showed that the seed activation treatments had a significant effect on the studied trait (root length cm) and the interaction between the factors, but the cultivars did not have any significant effect on that trait.

The results of Table 3 indicate that the treatment of seeds with gibberellin T3 was significantly superior to the rest of the treatments and achieved the longest root length of 7.167 cm, while the shortest was for the treatment of T1. Perhaps this is because the gibberellin treatment increased the germination rate (Table 1) and the germination percentage (Table 2), so the root length increased.

The results of the same Table also showed that the combinations of the third treatment, T3, with both cultivars, achieved the highest root length of 7.167 cm. This may be due to the importance of gibberellins referred to above.

Table (3): Root length (cm) of seeds of two wheat cultivars, according to effect of some Seed activation treatments and their interaction

Variety (V)	**Seed activation treatments (T)**				**Variety average**
	T1	T2	T3	T4	
Abo-Raghif	4.667	5.300	7.167	6.767	5.975
Al-Forat	5.300	4.733	7.167	6.567	5.942
Treatments average	4.983	5.017	7.167	6.667	
LSD T		LSD V		LSD T*V	

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0.2030	NS	0.287**0**

Shoot length (cm)

The results of Table (4) indicate a significant effect for each seed activation treatment and the interaction between the factors in the trait Shoot length (cm), and the cultivars did not record any significant effect in that trait.

The results of Table 4 indicate that the treatment of seeds with gibberellin T3 was significantly superior to the rest of the treatments and achieved the longest shoot length of 8.683 cm, while the shortest was for the treatment of T1. Perhaps this is because the gibberellin treatment increased the germination rate (Table 1) and the germination percentage (Table 2), so the root length increased.

The results of the same Table also showed that the combinations of the third treatment, T3, with both cultivars, achieved the highest root length of 8.767 cm. This may be due to the importance of gibberellins referred to above.

Table (4): Shoot length (cm) of seeds of two wheat cultivars, according to effect of some Seed activation treatments and their interaction

Variety (V)	**Seed activation treatments (T)**				**Variety average**
	T1	T2	T3	T4	
Abo-Raghif	7.367	7.767	8.600	7.667	7.850
Al-Forat	6.867	7.533	8.767	8.033	7.800
Treatments average	7.117	7.650	8.683	7.850	
LSD T		LSD V		LSD T*V	
0.3008		NS		0.4255	

Seedling power

Table (5) results indicate a significant effect of wheat cultivars, seed activation treatments, and the interaction between the factors on the studied trait (Seedling power).

Ab0-Raghif cultivar was significantly superior to the Al-Forat cultivar, recording the highest germination rate of 1246.9, while the Al-Forat cultivar reached 1162.0. The discrepancy between the cultivars may be due to their genetic variation (Table 5).

As for the T3 treatment, the germination percentage of the seeds with which it was treated was 1453.3, and the lowest percentage of germination was recorded by soaking the seeds for one hour in water T1. The reason for the superiority of gibberellin treatment may be attributed to the role of gibberellin in improving germination and seedling growth (Gregori et al., 1995).

The combination of Abo-Raghif cultivar with treatment T3 had a significant superiority in this trait, amounting to 1488.4.

Table (5): Seedling power of seeds of two wheat cultivars, according to effect of some Seed activation treatments and their interaction

Variety (V)	**Seed activation treatments (T)**	**Variety average**

	T1	T2	T3	T4	
Abo-Raghif	1021.3	1176.2	1418.3	1372.1	1246.9
Al-Forat	954.0	940.3	1488.4	1265.3	1162.0
Treatments average	988.3	1058.5	1453.3	1318.2	
LSD T		LSD V		LSD T*V	
77.0		54.5		109.0	

Conclusions:

The treatment of seeds with gibberellin had a clear effect on the effect and increase of the vital processes related to germination and seed growth. The cultivar Abo-Raghif excelled in most of the characteristics of germination and growth studied, as well as its response to gibberellin in the right direction to increase the activity of germination and growth of seeds.

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