Effect of Some Abiotic Environmental Stresses on Some Physical Characteristics of Wheat Seeds (Triticum Aestivum L.)

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Abstract

The experiment was carried out in the laboratory of the General Company for Grain Trade, Al-Diwaniyah Governorate, variety Ibaa 99 during the season of 2021, to find out the effect of some abiotic environmental stresses (heat and humidity) on some physical characteristics of the wheat seeds (Triticum aestivum L.) The experiment was conducted according to a randomized complete block design (RCBD) for experiments. Factorial with three replications, the first factor included three levels of temperature (-7, 25 and 35°C) and the second factor three levels of humidity (12, 14 and 16%). The temperature level of 35 °C was superior to the specific weight and gave the highest specific weight of 77.02 kg / Hectoliter and the weight of 1000 grains 34.49 g, the moisture level of 16% exceeded the specific weight and gave the highest specific weight of 77.80 kg / Hectoliter, and the weight of 1000 grains 34.48 g.

Keywords: Abiotic environmental stresses, Wheat , Temperature level, Specific weight.

1. Introduction

The world produces annually about 620 million tons of wheat (Triticum spp. L.), which constitutes about 20% of the dietary energy (calories) consumed by humans. It is estimated that more than 75% of the world's population consumes wheat as an essential part of their daily diet [1]. Abiotic environmental stresses and nutritional imbalances cause a decrease in wheat production in many environments, [2] the increase in grain moisture leads to a decrease in the percentage of germination and the oil content in it. It was found that the percentage of germination of rice seeds increased significantly due to the decrease in the initial moisture content of the seeds. And the highest germination percentage of seeds with moisture content (14%) and after (3) months of storage reached (94.5%), [3] indicated that wheat seeds at moisture (16%) and temperature (21) °C lost their vitality during (50) days, and (20) days less than the allowed storage time. [4] found a significant decrease in the germination rate of corn kernels stored at moisture content (14.8%) for a period of five months, and between [5], that moisture factor is the main cause of grain spoilage, and that wheat kernels can be stored with moisture (12%) for a period of (22) twenty-two years and at a temperature of (5) °C, while preserving the vitality of the seeds at (95%), [6] found a significant decrease in the components of the grain of oil, starch and protein, justifying this by infection with fungi that were encouraged by the high moisture content of the grain. 14% for each consignment when stored temporarily and the safest and preferred is (13%) and from the study conducted by [7], on the percentage of germination of wheat grains when stored on different moisture contents, different temperatures and different mechanical damages, it was found that the percentage of germination was (41%) when stored at (4°C) and mechanical damage (24%) and the storage period (36.5) days, while the percentage of germination was (88.3%) when stored at (4) degrees Celsius and with a moisture content of (15%) for a period of (1049) Day, as [8] found a decrease in dry matter percentage in grains stored with high moisture contents compared to those stored with low moisture contents.

2. Materials and Methods

The experiment was carried out in the laboratory of the General Company for Grain Trade, Al-Diwaniyah Governorate, where a sample of wheat of the Ibaa 99 variety was obtained from the Seed Certification Department in Diwaniyah, a type registered and approved by the National Committee for Registration of Iraqi Varieties. as in the approved method mentioned in the regulatory guide for the work of the laboratories of the General Organization for Grain and its affiliated facilities by [9] and the required amount of water was determined to raise the moisture content to the required limits by a square method. Pearson reported by [10], the grain moisture was 6.5% and its specific weight was 81.4 kg / hecatoliter. The samples were
weighed by 300 g for each sample, then the cold modification method was followed to obtain the required moisture contents 12, 14 and 16% indicated by [11] and the samples were saved from Each moisture content in tight nylon bags, then the samples were stored in incubators with three replicates at a temperature of (-7, 25 and 35 °C), and the water was mixed with the grains and stirred in a circular motion inside the bag to allow the water to penetrate into the components The samples were distributed from each moisture content in tight nylon bags, then the samples were stored according to the above-mentioned temperatures for a storage period of ten days, and ten grams were taken from each storage and moisture content treatment, and then they were cultivated. A randomized complete block design with a factorial experiment was used at the probability level (p<0.05), and Duncan's test was used to distinguish the different averages of the coefficients.

2.1 Studied traits

- Germination percentage
- weight of 1000 grains,
- specific weight

3. Results and Discussion

3.1 Germination percentage

The results of Figure (1) showed that there were significant differences between the temperature and humidity treatments in the percentage of germination. The results of Figure (1) showed that the temperature level of 35 °C with a humidity level of 16% was superior to the percentage of germination and gave the highest percentage of germination amounted to 97%, while the temperature (-7 °C) with a humidity level of 12% recorded the lowest germination rate reached 88% because an increase in the rate of water absorption will necessarily be associated with an increase in the percentage of dissolved oxygen in the moisture, which contributes to an increase in enzymatic activity and the disintegration of food reserves and their transfer and then to the main growth areas in the embryo (the root tip And the tip of the terminal bud, which leads to the rapid transfer of seeds from the stage of physiological germination to morphological germination,[12]. as well as due to the activity of fungi at this moisture level inside the grain, which leads to killing the embryo and reducing the percentage of germination, this is supported by what I found [12,13].

3.2 Specific weight (kg / hectoliter)

The results of Table (1) showed that there were significant differences in the specific weight between the temperature parameters and the humidity parameters and the interaction between them. as the temperature level 35 °C superior to the specific weight which registered the highest specific weight amounted 77.02 kg / hectoliter, while the level of temperature gave 25 m minimum specific weight 76.10 kg/ha The results also showed that the 16% exceeded the specific weight and gave the highest specific weight 77.80 kg/ hectoliter, while the moisture level 12% gave the lowest specific weight 76.13 kg/ha, and the reason for this is due to the weight between The two moisture levels in addition to the loss of grain components due
to respiration and infection with fungi, and this was indicated by [1,4] and found by [7]. The results of Table (1) showed that there were significant differences in the interaction between temperature and moisture treatments of specific weight. Interaction treatment of 35 °C * 16% gave the highest value of specific weight of 77.02 kg / hectoliter.

Table 1. Shows the effect of temperature and humidity on the specific weight of wheat plants (kg / hectoliter).

| Humidity treatments% | Temperature levels | Average |
|----------------------|--------------------|---------|
|                      | -7                 | 25      | 35      | 76.13b |
| 12                   | 76.00              | 75.67   | 76.73   | 76.72ab |
| 14                   | 77.13              | 76.43   | 76.60   | 76.72ab |
| 16                   | 76.47              | 76.29   | 77.73   | 76.89a  |
| Average              | 76.53b             | 76.10b  | 77.02a  |         |
| L.S.D 0.05           | 0.70               | 0.70    | 1.33    |         |

3.3 Weight of 1000 grains

The results of Table (2) showed that there were significant differences in the weight of 1000 grains between the temperature and humidity treatments and the interaction between them. The results showed that the temperature level of 35 °C was superior to the weight of 1000 grains and gave the highest weight of 1000 grains 34.49 g, while the temperature level gave 25 °C. The lowest weight of 1000 grains was 32.57 g. The Table (2) results of showed that the moisture level of 16% exceeded the weight of 1000 grains and gave the highest weight of 1000 grains of 34.48 g, while the moisture level of 12% gave the lowest weight of 1000 grains of 32.68 g. This is due to the fact that high humidity encouraged respiration and the activity of fungi on Both, which led to an increase in the loss of grain stock compared to moisture (10%), and this was indicated by [4,2] concluded. The results of Table (2) showed that there were significant differences in the interaction between temperature and moisture treatments, and the weight of 1000 grains, and the interaction treatment 35 °C * 16% gave the highest value of weight of 1000 grains 34.67 g.

Table 2. Shows the effect of temperature and humidity on the weight of 1000 grains of wheat plants (g).

| Humidity treatments% | Temperature levels | Average |
|----------------------|--------------------|---------|
|                      | -7                 | 25      | 35      | 32.68b |
| 12                   | 33.17              | 29.57   | 35.30   | 33.86ab |
| 14                   | 34.50              | 33.57   | 33.50   | 34.48a  |
| 16                   | 34.20              | 34.57   | 34.67   |         |
| Average              | 33.96ab            | 32.57b  | 34.49a  |         |
| L.S.D 0.05           | T                  | T       | T*H     | 1.82    |

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