



TESTING THE EFFECT OF ULTRAVIOLET C (UV-C) IN THE GERMINATION AND GROWTH OF LOCAL WHEAT SEEDS (*TRITICUM AESTIVUM* L.)

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This study aimed to test the effect of Ultraviolet C (UV-C) in the germination and growth of local wheat seeds in the grain silos in Babylon province. The study showed that UV-C, with a wavelength of 254 nm, had a good effect on the percentage of germination and growth indicators for wheat grains when the seeds were used on the filter paper as well as when cultivated in plastic pots. where It was found that the higher the exposure time for ultraviolet radiation, the percentage of germination increased, where the percentage of germination amounted to 100% at the 12 min on the blotting paper and 95% in the plastic pots compared to the control treatment which amounted to 90% on the blotting paper and 71.66% in the plastic pots. Radiation also affected on the growth indicators of wheat, where it was found that the highest the exposure time, the length of the radical increased, where it was found the largest length of the radical at the 12 min, which amounted to 8.43 cm compared to control treatment, which amounted to (5.97 cm). The radiation did not effect on the length of the plumule, which did not differ significantly from the control treatment. As for the average length of the total vegetative was found to be the best result at the 12 min amounted to 23.9 cm compared to the control treatment, which amounted to (18.3 cm). The results showed that the percentage of germination and growth for wheat grains can be increased using UV-C (UV-C), thus increasing production and improving the quality of local wheat grains.

Keywords: wheat plant, Ultraviolet radiation (UVC), wheat seeds, physical methods.

Introduction

Wheat (*Triticum aestivum*) is one of the most important grain crops in the world and occupies the largest area for crops because of its high ability to adapt in temperate environments. The importance of this crop is evident in being the first material to produce food for more than one billion people or about 35% of the world population, The importance of this product increases with the increase in the population of the world and the growing food needs, which necessitated the search for new methods to raise productivity and improve production by resorting to scientific research to solve these problems, it is also expected that the world will need 1 billion tons of wheat in 2020 (Rajaram, 2000). Physical methods were used to measure the percentage of germination and growth indicators for the wheat crop, these methods, the Ultraviolet radiation (UV-C) was used, Ultraviolet radiation (UV-C) is considered a type of Non-ionizing radiation that is used in disinfection and sterilization, it has different wavelengths ranging between 210- 3800 nm. Ultraviolet radiation has a great ability to raise the level of national production by eliminating 95% of the microbial pathogens without affecting the environment and pollution (Rassal, 2005). Some countries have succeeded in conserving food using radiation, especially grains. About 200 thousand tons of rice, wheat, and barley have been saved and it's used for human consumption without any damage. Ayala *et al.* (2005) found that the UV radiation has a significant effect on the elimination of fungi associated with wheat grains, thus affecting in increasing the quality of wheat (Hidaka and Kubota, 2006). These fungi are responsible for the decrease of the protein content, carbohydrate content, and the percentage of germination and damage to the seedling, leading to decrease the productivity of the crop (Fakhrunnisa *et al.*, 2006). Ultraviolet (UV-C) has been widely used in Food Factories, air sterilization and fruit surfaces from the fungi found on them, as well as in storage of field crops, fruits and vegetables (Rivera *et al.*, 2007 ; Begum *et al.*, 2009). This method is safe and non-polluting for the

environment (Allende *et al.*, 2006; Guerrero and Barbosa, 2004).

Materials and Methods

1- Taking samples

The samples were taken from the new Babylon silo subjected to Examination and quality standards.

2- UV-C device with a Wavelength of 254 nm

The device used in the experiment was manufactured locally from an aluminum cylindrical box, one of its ends is open, with a diameter of 60 cm and a height of 40 cm, A candle was installed in the middle to generate UV radiation, with a length of 50 cm, a wavelength of 254 nm, a radiation power of (99.52 W.m⁻²), and a power of (25 watts), it was connected to an electric source to operate when needed (Khawsh, 2013). The aim of this device is to expose the grain to the radiation, measure the percentage of germination and growth indicators for the yield, This technique is safe from the health point of view and has no secondary effects either on the wheat or the human being, since the radiation is used to disinfect water, juices, food, fruits, and vegetables (Hijnan *et al.*, 2006).

3- Testing the effect of UV-C radiation with a wavelength of 254 nm in the percentage of germination and growth indicators for local wheat grains in blotting paper

Twenty grains of the sterilized local wheat grain with 3% sodium hypochlorite was placed and washed twice with sterile distilled water to remove sterilization effects, which were then dried on the blotting paper inside a petri dish, the dish was placed at a distance of 8 cm from the source and exposed to UV-C radiation for periods time (3, 6, 9, 12 min), which were then cultivated in Petri dishes on two different layers of filter paper, where was placed ten grains in each dish with three replicates for each exposure period and three replicates for the control treatment. A 5 ml distilled water was added to each dish and incubated at a temperature of (25

± 2 °C). After seven days, the following parameters were taken (The percentage of germination and seedling lengths (the length of plumule and radical)).

4- Testing the effect of UV-C radiation with a wavelength of 254 nm in the percentage of germination and growth indicators for local wheat grains in plastic pots.

Twenty grains of local wheat grain were placed inside a petri dish at a distance of 8 cm from the source and exposed to UV-C radiation for periods time (3, 6, 9, 12 min), which were then cultivated in plastic pots, where was placed ten grains in each dish with three replicates for each exposure period and three replicates for the control treatment. the plastic pots were examined periodically and after two weeks the following parameters were taken (The percentage of germination and length of the total vegetative).

The statistical analysis

The experiments were conducted according to the Completely randomized design (CRD), with one factor. The averages were compared by using the least significant difference (L.S.D.) test under the probability level of 0.05 (Al-Rawi and Khalafallah, 1980).

Results and Discussion

Testing the effect of UV-C radiation with a wavelength of 254 nm in the percentage of germination and growth indicators for local wheat grains in blotting paper and at a temperature of 25 ± 2 ° C.

Table (1) shows that the ultraviolet radiation has led to an increase in the percentage of germination compared to the control treatment which amounted to 90% where the percentage of germination was (96.6, 96.6, 96.6, 100%), the highest increase in the percentage of germination was at the exposure periods of 12 min, which amounted to 100%. As for the average length of radical has amounted to (6.43, 8.37, 8.77, 8.43 cm) for the periods of (3, 6, 9, 12 min), respectively compared to the control treatment which amounted to (5.97 cm), where found that the highest length

of radical at the exposure period of 12 min, which amounted to (8.43 cm), While the lowest length of radical was found at the exposure periods of 3 min compared to the control treatment which amounted to (6.43). It was found that the longer the exposure period, the longer the length of the radical. As for the average length of the Plumule, there were no significant differences between the treatments compared to the control treatment. The reason for the increase in the percentage of germination is due to that the radiation work to stimulate the grains and induce the building of a new protein, thus increase the content of the Proteins in the seedlings, leading to increasing the germination and length of radical (Babak *et al.*, 2012).

Testing the effect of UV-C radiation with a wavelength of 254 nm in the percentage of germination and growth indicators for local wheat grains in plastic pots.

Table (2) shows that the effect of the exposure local wheat seeds to ultraviolet (UV-C) for periods (3, 6, 9, 12 min) in the percentage of germination, where it was shown an increase in the percentage of germination compared to the control treatment which amounted to 71.66%. It was found that the highest percentage of germination was at the exposure periods 12 min, which amounted to 95% and the lowest percentage of germination at the exposure periods 3 min, which amounted to 71.66 %, where it was found that the higher the duration of the exposure, the higher the percentage of germination in all the treatments. The relationship was positive between exposure duration and the percentage of germination. As for the average lengths of the total Vegetative was (21, 21.1, 22.3, 23.9 cm) at the exposure periods (3, 6, 9, 12 min) compared to the control treatment which amounted to 18.2 cm, where the highest length of the total Vegetative was at the exposure periods 12 min, which amounted to 23.87 cm and the lowest length of the total Vegetative was at the exposure periods 3 min, which amounted to 21 cm. It was found that the higher the duration of the exposure, the higher the length of the total Vegetative for wheat.

Table 1: The effect of UV-C radiation with a wavelength of 254 nm in the percentage of germination and growth indicators for local wheat grains in Petri dishes.

Length (cm)		The un-germinated grain (%)	Germination (%)	The exposure periods (min)
Pumule	Radicle			
7.63	5.97	10	90	0
7.80	6.43	3.4	96.6	3
7.97	8.37	3.4	96.6	6
8.50	8.07	3.4	96.6	9
12.30	8.43	0	100	12
N.S	1.90	0.66	0.66	L.S.D (0.05)

Table 2: The effect of UV-C radiation with a wavelength of 254 nm in the percentage of germination and growth indicators for local wheat grains in plastic pots.

The average length of the total Vegetative (cm)	The un-germinated grain (%)	Germination (%)	The exposure periods (min)
18.2	28.34	71.66	0
21	28.34	71.66	3
21.1	11.67	88.33	6
22.3	10	90	9
23.9	5	95	12
2.1	1.24	1.24	L.S.D(0.05)

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