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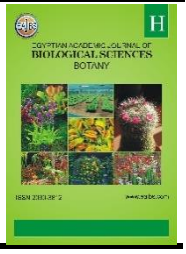

The Role of Some Studied Factor on The *Sorghum bicolor* Germination

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ABSTRACT

The purpose of the current experiment was to compare the effects of a plant growth regulator (GA3) on the germination and growth of Sorghum seeds when it was soaked in distilled water that had been heated and when it was not heated (Sorghum bicolor). In order to create healthy seedlings, the seeds were treated with GA3 (0.2, 0.7, and 1.0) mg.L-1 along with a comparison treatment (0.0 mg.L-1) and soaked in water at two different temperatures (25 oC and 70 oC) for 24 hours.

The speedy and uniform germination of Sorghum seeds and the development of seedlings, according to the study's findings, suggest excellent seed vigor. In comparison to the control, GA3 significantly affected the rate of germination. In terms of germination rate, shoot and root length, fresh and dry weight, and germination rate, GA3 at 1.0 mg. L-1 with soaking in hot water provided the greatest response. The corresponding values were 100.0%, 6.17 cm, 19.67 cm, 221.0 m-g, and 35.90 mg, respectively.

In comparison to water that is at room temperature and is uncontaminated, soaking in hot water has a considerable impact on the percentage of sorghum seeds that germinate.

INTRODUCTION

A grass species named Sorghum bicolor, sometimes called big millet, durra, or milo is grown for its grain, which is used as food for both people and animals as well as for the manufacturing of ethanol. Sorghum is the fifth-most significant cereal crop in the world after rice, wheat, maize, and barley (Mutegi et. al., 2010).

Sorghum is a plant that can withstand a broad variety of temperatures, as well as hazardous soils and high elevations, and it can bounce back from droughts. Flatbreads, a common staple in many cultures, are made from this grain. Almost 9% of it is normally protein. The traditional corn broom is also made using it. Since it can thrive in harsher areas than maize or sugarcane, the species may be utilized as a source for ethanol fuel production. In certain circumstances, it may even be preferable to other crops (Quinby and Karper, 1954).Since it affects the establishment and eventual performance of the plantlets, seed germination is one of the most important and decisive stages in the life cycle of plant species. Germination-related chemical reactions are started by water. Water is necessary for germination to take place. Controlling bacterial and certain fungal diseases within and outside of seeds using hot water seed treatment is a very easy and efficient process. Newly

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harvested seed is more heat-resistant than seed that has been in storage for one or two years. Doussi and Thanos (1994).

Plant species have developed such that their seeds may sprout at a certain range of temperatures. The pace of metabolic processes in the seed is influenced by temperature. In general, metabolism moves more quickly in warm than in cold climates (Gosling et al, 1995).

Several seed species' dormancy has been demonstrated to be broken by growth regulator treatments called gibberellins, which are typically gibberellic acid GA3. Many seeds quickly sprout after being pre-soaked with GA3. This study's primary goal was to do just that by employing various doses of gibberellic acid (GA3), both with and without soaking in heated distilled water, to promote seed germination and subsequent growth in the sorghum plant (Dweikat and Lyrene, 1988).

MATERIALS AND METHODS

The research was done at the University of Raparin's plant lab over the course of a single month in June 2022. The study's goal was to determine how plant growth regulator (GA3) affected the germination and development of sorghum seeds when it was soaked in heated distilled water and when it wasn't (Sorghum bicolor).

1-Sterilization and Seed Planting: The sorghum seeds were delivered in good health, and they were sterilized by being washed with liquid soap and one drop of sodium hypochlorite NAOCI, then three times with sterile distilled water.

2-Studied Quality: The seed was subjected to two treatments, which included soaking it for 24 hours in distilled water at temperatures of 70°C and 25°C with and without the addition of any further heat (Fig.1). Petri dishes with a diameter of 9 cm were used to cultivate 10 different seed types on a layer of filter paper (5).

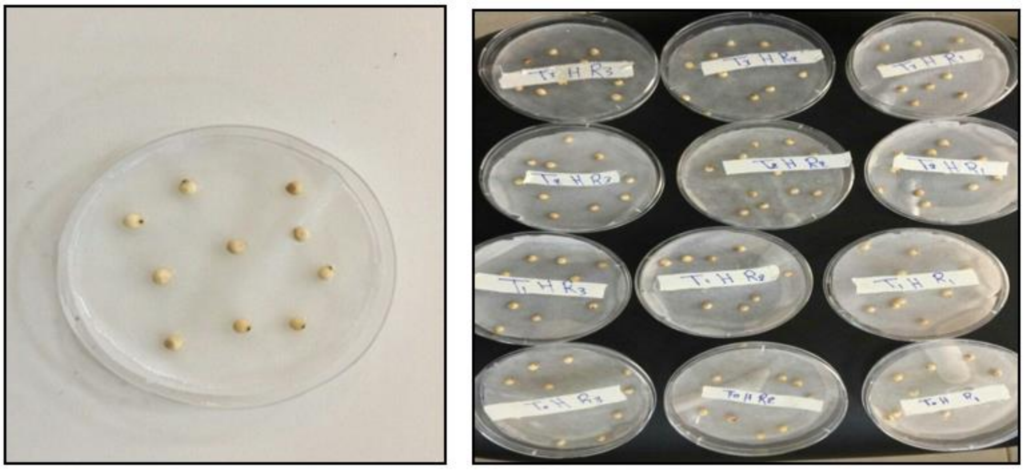

Fig.1: Distribution of seeds in the Petri dishes.

Four days after sowing, the seed started to germinate. One week later, once the cultures had grown, all the researched characters' properties (Fig. 2) were recorded daily. Following two weeks, one sample was chosen from each replication to measure the growth parameters shown in Figure (3). The percentages of germination of the seeds were computed in accordance with the seed testing guidelines (ISTA, 1996).

The Germination Ratio is calculated as follows: 100 divided by the total number of seeds sown.

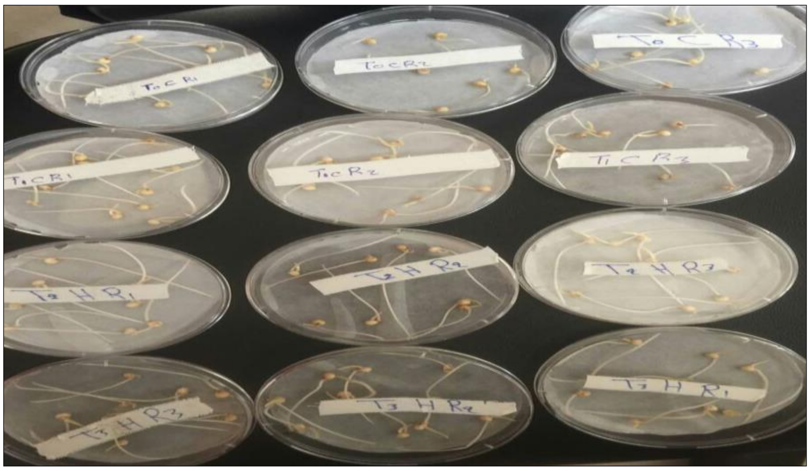

Fig .2: Germination of Sorghum seeds after one week.

The length of shoot and root Figure (4), recording fresh and dry weight for plantlet, shoots and roots were oven dried at 40^{o}C for 72 hours.

Fig.3: measure the length of the root.

Fig.4: seeds of Sorghum after two week

3- Experimental design:

The study relied on Complete Randomized Design (C.R.D), 10 seeds were used in each treatment, and each trial was replicated three times which means a total of 30 trials. Average results were obtained in each trial based on less difference and 5% approximate ratio was given (least significant differences).

RESULTS

Effect of Heating and GA3 on Seed Germination and Seedling Growth of Sorghum:

The structure of the seed, which consists of a cover, an embryo, and some extra nutrients, allows the embryo to survive the interval between seed maturity and seedling establishment, assuring the beginning of the next generation. Even when the environment (i.e., water, temperature, and light) is favorable for germination, seeds sometimes do not germinate (Doussi and Thanos, 1994). The percentages of germination for the sorghum seeds treated with heated distilled water, GA3, or untreated distilled water (control) are listed in Table (1).

Table 1: Effect of soaking water temperature and GA3 concentrations on seed germination and seedling growth of Sorghum.

Treatment	Germination ratio (%)	Shoot Length (cm)	Root Length (cm)	Fresh Weight (mg)	Dry Weight (mg)
CO	83.3	2.00	11.67	78.0	23.33
C1	90.0	3.33	13.00	123.4	23.97
C2	96.7	4.50	17.33	192.5	29.67
C3	90.0	5.67	16.67	202.6	31.07
H0	86.7	2.33	12.67	92.0	26.30
H1	93.3	4.17	11.33	155.6	29.73
H2	96.7	5.33	18.00	209.9	32.73
H3	100.0	6.17	19.67	221.0	35.90
L.S.D.	9.99	1.81	4.54	20.18	3.52

The results demonstrated that treatments of (0.2, 0.7, and 1.0) mg, as well as seed with hot water, substantially impact germination. The germination percentage and growth properties of L-1 GA3 have steadily improved. Figure (5) A-B-C-D-E, In GA3 1.0 mg, the maximum germination ratio, shoot and root length, and fresh and dry weight were found. L-1 with hot water (100.0%, 6.17cm, 19.67cm, 221.0mg, and 35.90mg) The heights (83.3%, 2.0 cm, 11.67 cm, 78.0 mg, and 23.33 mg, respectively) significantly increased as compared to control and non-heating water.

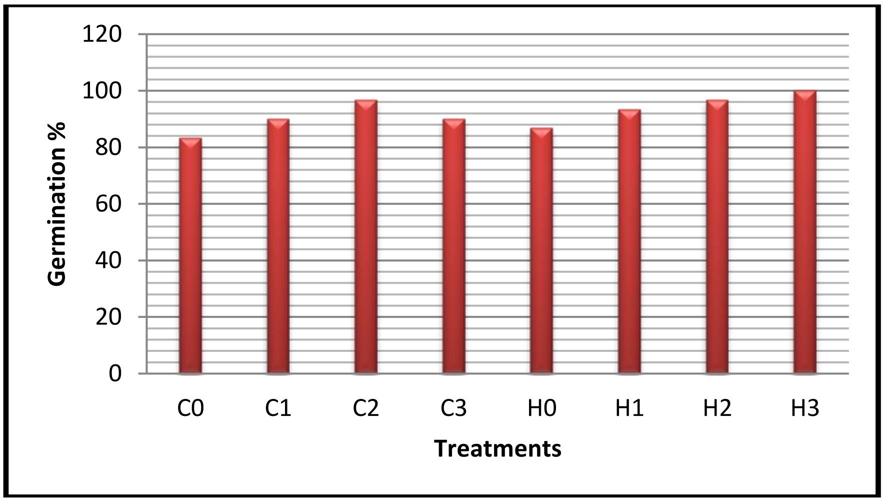

Fig. 5-A: Germination ratio of Sorghum seeds

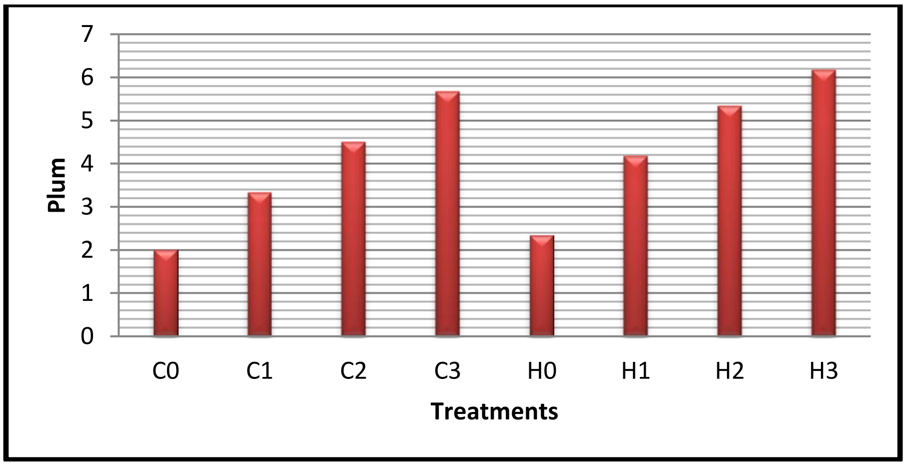

Fig. 5-B: Shoot length of Sorghum plantlet

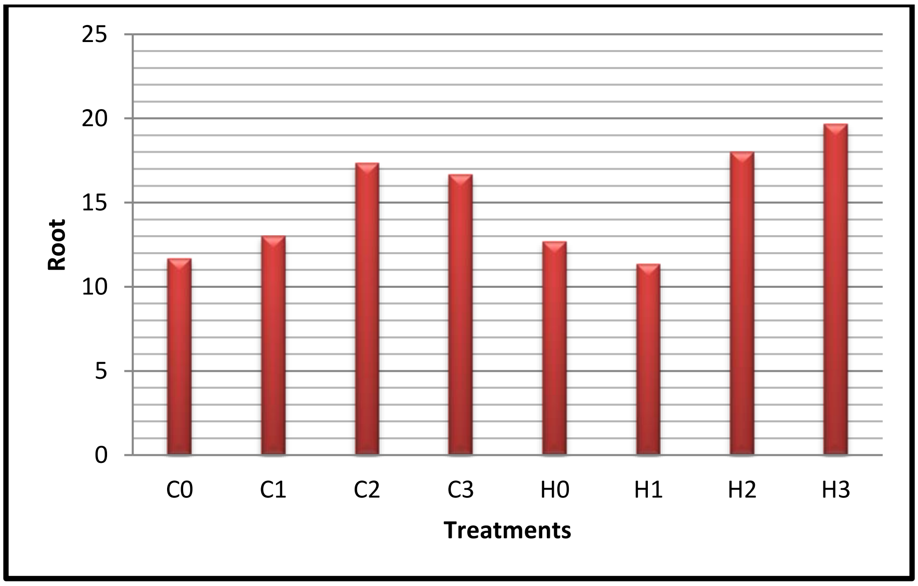

Fig5-C: Root length of Sorghum plantlet

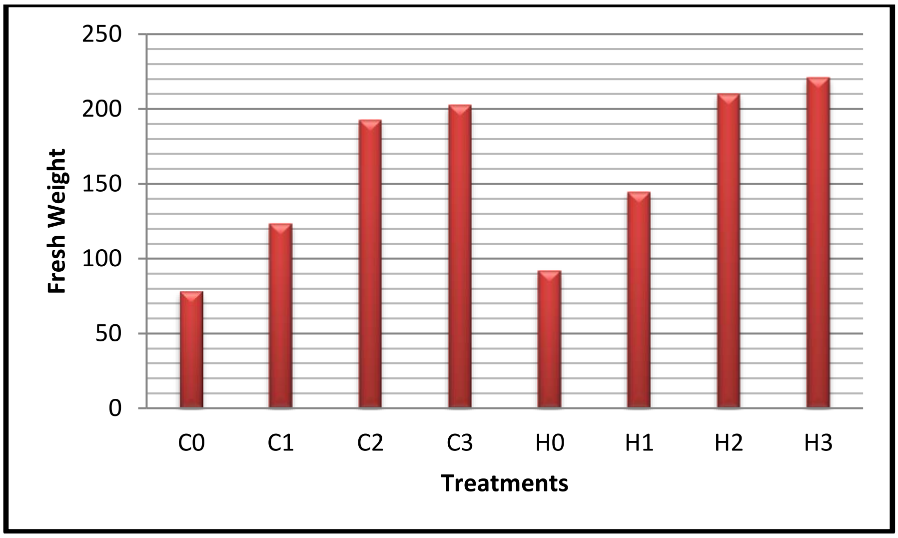

Fig. 5-D: Fresh weight of Sorghum plantlet

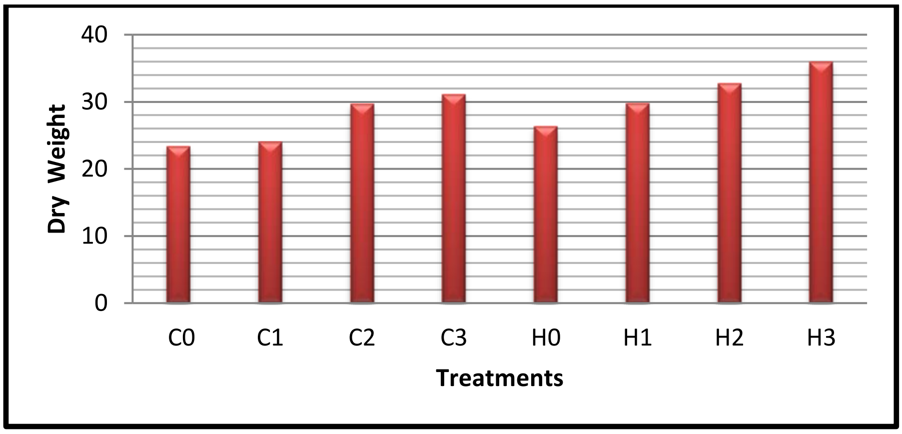

Fig. 5-E: Dry weight of Sorghum plantlet

DISCUSSION

In the germination process, there are three main phases. Intake of water, a rise in metabolic activity, and cell swelling are three examples. The seed absorbs water, which triggers the start of germination. Without water, there will be no germination. The cells become turgid or stiff as they hydrate and enlarge. Cellular respiration, which turns carbohydrates into energy, is sped up as a result of the wetness. Baskin and Baskin (1998)

Hot water treatment has been shown to improve germination by influencing a number of variables, including seed coat permeability for water, which may interfere with the seed coat's capacity to absorb water and increase seed hydration, relative hardness of the seed coat, and seed coat thickness. The pace of metabolic processes within the seed is affected by hot water. The basic rule is that warm water has a quicker metabolism than cold water (Bell and Willams, 1998 and Hoersten and Luecke, 2001).

By encouraging the release and transmission of calcium from the cell wall into the cytoplasm, which creates the conditions for water absorption and cell development, the GA3 hormone promotes cell size. After the cell has grown, GA3 is deactivated, and calcium is then reintroduced to the cell wall to harden it. Following the active absorption stage, which occurs after the seed has absorbed water, the embryo produces GA3 and prompts aleuronic cells to produce hydrolytic enzymes like - and -amylase, which hydrolyzes starch to glucose, and the enzyme protease, which breaks down protein reserves into amino acids. The root and shoot meristems are the places where the carbohydrates and amino acids are directed to promote cell development and differentiation (Richards *et. al.,* 2001).

Conclusion:

- Soaking the seed in hot water (70oC) increased seed germination and prevented contamination.
- Using a greater concentration of GA3 promoted vegetative development and increased seed germination.

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