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Effect of Priming on Wheat (*Triticum aestivum L.*) Germination and Seedling Development

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ABSTRACT

This study was done in Agric. Botany Department lab., Fac. of Agric., Mansoura Univ, during the season of 2019 for evaluating the promoting roles of grain priming and duration on germination and seedling vigor of *Triticum aestivum* L.cv. "Misr 1"). Grains were primed for 8, 16, and 24 h either in water, zinc sulfate (Zn at 100, 150, and 200 ppm), or humic acid (HA, at 1500, 3000, and 4500 ppm); besides dry grain as a control. Results designated that grain priming considerably improved seedling vigor index represented by germination %, shoot and root length, shoot and root fresh and dry weight. Priming in HA at 3000 ppm for 16 h was the most effective treatment that increased the germination%, germination speed index, germination index, and coefficient of germination by 49%, 51%, 47%, and 5%, respectively relative to the control. Meanwhile, the corresponding increases in response to Zn at 150 ppm for 16 h were 44%, 46%, 5%, and 43% respectively. In addition, hydro-priming was effective when used for 16 h relative to the other hydro-priming durations or to the control. So, the priming duration of 16 h gave the highest values compared with other tested priming durations. From the current outcomes, it could be established that the priming of grains has a substantial effect on enhancing wheat germination and seedling development.

Keywords: Germination, Humic, Priming, wheat, Zinc

INTRODUCTION

Wheat (*Triticum aestivum L.*) represents the major essential food crop; it accounts for nearly 20% of the human foodstuff needed and it is cultivated on approximately 2.15 M ha worldwide (CGIAR, 2014). Considering the increase in world inhabitants and the existing scarcity of food worldwide, the assessment of novel strategies for increasing crop productivity represents an imperative issue (Siahoosh and Dehanianb, 2011). Wheat establishment phase includes three sensitive stages: germination, emergence, and early seedling growth. Germination represents the most decisive phase in crop establishment, therefore accelerating and homogenizing germination is a prerequisite for crop development (Harris, 1996). Within drought conditions, cereal germination tends to be asymmetrical and can extend over long periods (Bougne *et al.*, 2000), leading to poor crop stands, and dynamically growing weeds that compete with the economical crops on light, water, and nutrients (Kropft and Van Laar, 1993).

Seed priming represents a vital seed enhancement strategy that is successfully applied for several crops that will accelerate the germination and seedling establishment under normal and stressful circumstances (Khafagy *et al.*, 2017; Khan *et al.*, 2017). Priming reduces, the time between sowing and emergence, and enhances germination homogeneity and seedling growth. In addition, priming accelerates several physiological processes, including DNA replication, ATP availability, biosynthesis of proteins, and the repair of cellular biomembranes and facilitating germination (Chen and Arora, 2013; Hussain *et al.*, 2015). Moreover, priming improves osmotic adjustments (Bradford, 1986), membrane re-organization (Fujikura and Karssen, 1995), and promote antioxidant enzymes (Roqueiro *et al.*, 2012). Consequently, it boosts seed performance with fast and homogeneous germination, healthy and vigorous seedling, as well as the seedling's emergence of different crops (Vaz Mondo *et al.*, 2016; Yücel and Heybet, 2016; Khafagy *et al.*, 2017; Khan *et al.*, 2017; Patel *et al.*, 2017; Shah *et al.*, 2017). Priming duration was also determined as an important factor for the realization of the priming-positive outcomes (Ghassemi-Golezani *et al.*, 2008).

Priming technique can be done using diverse techniques viz., hydro-priming (soaking in water), halo-priming (soaking in salt solutions), osmo-priming (soaking in osmotic solutions such as polyethylene glycol), bio-stimulants inducers (salicylic acid and ascorbic acid) and solid-matrix priming (Farouk and El-Saidy, 2013; Rehman *et al.*, 2015; Ruttanaruangboworn *et al.*, 2016; Vaz Mondo *et al.*, 2016; Khafagy et al., 2017; Khan *et al.*, 2017; Shah *et al.*, 2017). Zinc (Zn) is an energetic microelement needed for different plant species, as it has several serious purposes. It performs as a cofactor for about 300 enzymes and is also a precursor for tryptophan which represents the main materials for auxin production (Aravind and Prasad, 2003). Additionally, Zn may be used for maintaining the integrity of biological membranes, protein biosynthesis, photosynthesis, pollen development, and disease resistance (Alloway, 2008; Hajibol and and Amirazad, 2010). Humic acid (HA) is a vital component and a familiar part of soil organic matter. It has been utilized by several agronomists and farmers for enhancing soil conditions and crop development (Khattak *et al.*, 2006). In addition to its beneficial effects, treating seeds

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with HA was reported to enhance crop yield (Kaya and Khawar, 2005).

The current investigation was done to evaluate the effect of certain priming treatments for durations on wheat grain germination and seedling growth to assist wheat growers in identifying the most excellent priming solution and duration that is consistently cost-effective to meet fulfill the objective of early seedling establishment, thereby, increasing yield income.

MATERIALS AND METHODS

The current investigation was done at Agricultural Botany Department lab., Faculty of Agriculture, Mansoura University, during the season of 2019. Wheat (Triticum aestivum L. cv. “Misr 1”) grains were obtained from Agric. Res. Cent., Egypt. The experiment comprised 2 factors, the first factor was priming methods (a) hydro-priming “soaking in water", (b) zinc sulfate priming (Zn, El Nasr Pharmaceutical Chemicals Co., Egypt., at 100, 150, or 200 mg/L), (c) humic acid priming (HA, at 1500, 3000 and 4500 g/L). The second factor is the priming durations, either for 8, 16, or 24 h). A factorial completely randomized design with 3 replicates was performed. The grains were surface sterilized for five min with 1% of sodium hypochlorite, then ethyl alcohol (96%) for 30 s followed by distilled water three times. The subsequent priming method was implemented in the experiment: a single layer of wheat grains was submerged in every priming solution in the dark at laboratory temperature; the ratio of solution volume to grain weight was 5:1 (ml/g). After soaking, the grains were rinsed three times in distilled water. The primed grains were surface-dried under to their unique water content before sowing. Five replicates of forty grains each were placed on every germination plate (10 x 10 cm). Germination plate was checked every day and then distilled water was added to compensate for evaporation loss. Grains are deliberated physiologically germinated when the radical was about 2-3 mm in length (ISTA,1996).

Germination parameters

The daily counts of germinated grains were recorded up to seven days from grain planting. G%= (normal seedlings number/ total number of grains) x 100. The speed of germination index (SGI) was estimated followed ISTA (1996) equation. The germination index (GI) was estimated following AOSA (1990) equation; GI = Germination % in individually treatment/ Germination % in control. Finally, co-efficient germination (CG) was estimated following the equation introduced by Copeland (1976).

Seedling parameters

At 25 days from planting, seedling growth parameters were recorded, including shoot and root length (cm), shoot and root fresh and dry weights (g), and seedling vigor index (SVI). Commonly, SVI was assessed following the Vashisth and Nagarajan (2010) equation; SVI = (Seedlings length x Germination%)/100.

Statistical Analysis

The data were statistically analyzed using COSTATC statistical package. A one-way analysis of variance (ANOVA) has been utilized to evaluate the effect of priming treatments and durations on wheat germination and seedling growth. Means were separated by Tukey's Honestly Significant Differences test at a 0.05 probability level, and significant differences were indicated by different letters. Data existed as means±standard error of three replicates.

RESULTS AND DISCUSSION

Results

Germination Parameters

Results indicated that grain priming treatments significantly affected G%, SGI, GI, and CG (Figure 1).

Fig. 1. Effect of grains priming and duration treatments on germination %, speed of germination index, germination index and co-efficient of germination of wheat 7 d after sowing. Data present the mean ±SE of n=3, significant difference between treatments was tested by one way analysis of variance (ANOVA). Different letters in each column indicate significant differences p≤ 0.05 according to Tukey's Honestly Significant Differences (HY-D1, hydropriming for 8h ; HY-D2, hydropriming for 16h ; HY-D3, hydropriming for 24h; Zn1-D1, zinc sulfate at 100 ppm for 8 h; Zn1-D2, zinc sulfate at 100 ppm for 16 h; Zn1-D3, zinc sulfate at 100 ppm for 24 h; Zn2-D1, zinc sulfate at 150 ppm for 8 h; Zn2-D2, zinc sulfate at 150 ppm for 16 h; Zn2-D3, zinc sulfate at 150 ppm for 24 h; Zn3-D1, zinc sulfate at 200 ppm for 8 h; Zn3-D2, zinc sulfate at 200 ppm for 16 h; Zn3-D3, zinc sulfate at 200 ppm for 24 h; HA1-D1, humic at 1500 ppm for 8 h; HA1-D2, humic at 1500 ppm for 16 h; HA1-D3, humic at 1500 ppm for 24 h; HA2-D1, humic at 3000 ppm for 8 h; HA2-D2, humic at 3000 ppm for 16 h; HA2-D3, humic at 3000 ppm for 24 h; HA3-D1, humic at 4500 ppm for 8 h; HA3-D2, humic at 4500 ppm for 16 h; HA3-D3, humic at 4500 ppm for 24 h).

In general, all priming treatments significantly increased the germination parameters of wheat grains. The most effective treatment, in this regard, was priming in HA at 3000 ppm for 16 h which increased G%**,** SGI, GI, and CG by 49%, 51%, 47%, and 5%, respectively, relative to non-primed grains. Within Zn-primed grains, the most effective level was 150 ppm for 16 h which led to corresponding increases amounted to 44%, 46%, 43%, and 5%, respectively, relative to control. The data also indicated that hydro-priming was effective when used for 16 h, relative to other hydro-priming durations or control.

Seedling growth Parameters:

1. Shoot and root length

All priming treatments significantly raised the shoot and root length of wheat seedlings (Figure 2).

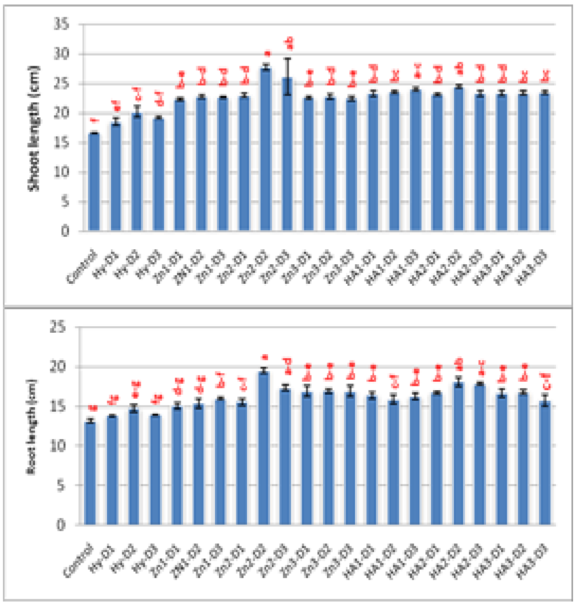

Fig. 2. Effect of grains priming and duration treatments on of shoot and root length of wheat 25 d after sowing. Data present the mean ±SE of n=3, significant difference between treatments was tested by one way analysis of variance (ANOVA). Different letters in each column indicate significant differences p≤ 0.05 according to Tukey's Honestly Significant Differences (HY-D1, hydropriming for 8h ; HY-D2, hydropriming for 16h ; HY-D3, hydropriming for 24h; Zn1-D1, zinc sulfate at 100 ppm for 8 h; Zn1-D2, zinc sulfate at 100 ppm for 16 h; Zn1-D3, zinc sulfate at 100 ppm for 24 h; Zn2-D1, zinc sulfate at 150 ppm for 8 h; Zn2-D2, zinc sulfate at 150 ppm for 16 h; Zn2-D3, zinc sulfate at 150 ppm for 24 h; Zn3-D1, zinc sulfate at 200 ppm for 8 h; Zn3-D2, zinc sulfate at 200 ppm for 16 h; Zn3-D3, zinc sulfate at 200 ppm for 24 h; HA1-D1, humic at 1500 ppm for 8 h; HA1-D2, humic at 1500 ppm for 16 h; HA1-D3, humic at 1500 ppm for 24 h; HA2-D1, humic at 3000 ppm for 8 h; HA2-D2, humic at 3000 ppm for 16 h; HA2-D3, humic at 3000 ppm for 24 h; HA3-D1, humic at 4500 ppm for 8 h; HA3-D2, humic at 4500 ppm for 16 h; HA3-D3, humic at 4500 ppm for 24 h).

The most effective treatment in this regard was Zn-priming at 150 ppm for 16 h which increased the length of the shoot and root by 71% and 48%, respectively, relative to the control treatment. HA-priming at 3000 ppm for 16 h ranked second in this respect where it increased these parameters by 38% and 51%, respectively, over non-primed grain. Data additionally proved that hydro-priming was more effective when used for 16 h, relative to the other hydro-priming durations or to control.

2. Fresh and dry weight of both seedling shoots and roots

All priming treatments considerably raised the shoot and root fresh and dry weight of wheat seedlings (Figure 3 & 4).

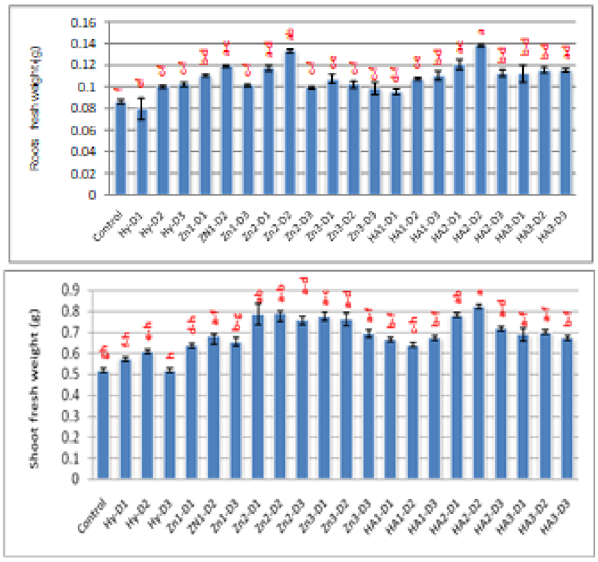

Fig. 3. Effect of grains priming and duration treatments on shoot and root length of wheat 25 d after sowing. Data present the mean ±SE of n=3, significant difference between treatments was tested by one way analysis of variance (ANOVA). Different letters in each column indicate significant differences p≤ 0.05 according to Tukey's Honestly Significant Differences (HY-D1, hydropriming for 8h ; HY-D2, hydropriming for 16h ; HY-D3, hydropriming for 24h; Zn1-D1, zinc sulfate at 100 ppm for 8 h; Zn1-D2, zinc sulfate at 100 ppm for 16 h; Zn1-D3, zinc sulfate at 100 ppm for 24 h; Zn2-D1, zinc sulfate at 150 ppm for 8 h; Zn2-D2, zinc sulfate at 150 ppm for 16 h; Zn2-D3, zinc sulfate at 150 ppm for 24 h; Zn3-D1, zinc sulfate at 200 ppm for 8 h; Zn3-D2, zinc sulfate at 200 ppm for 16 h; Zn3-D3, zinc sulfate at 200 ppm for 24 h; HA1-D1, humic at 1500 ppm for 8 h; HA1-D2, humic at 1500 ppm for 16 h; HA1-D3, humic at 1500 ppm for 24 h; HA2-D1, humic at 3000 ppm for 8 h; HA2-D2, humic at 3000 ppm for 16 h; HA2-D3, humic at 3000 ppm for 24 h; HA3-D1, humic at 4500 ppm for 8 h; HA3-D2, humic at 4500 ppm for 16 h; HA3-D3, humic at 4500 ppm for 24 h).

The most effective treatment in this regard was priming in HA at 3000 ppm for 16 h which boost the fresh and dry weight **of** seedling shoots and roots by 58% and 59%, 98%, and 51%, respectively compared with the control. Within Zn-priming treatments, the treatment in which it was applied at 150 ppm for 16 h was the most effective in inducing fresh, dry weight of both seedling shoots and roots where they have been increased by 53% and 54%, 87%, and 51%, respectively, compared with control. In addition, compared with control, hydro-priming didn't considerably affect the fresh weight of either seedling shoots or roots. Conversely, hydro-priming for 16 h significantly raised the dry weight of both seedling shoots and roots.

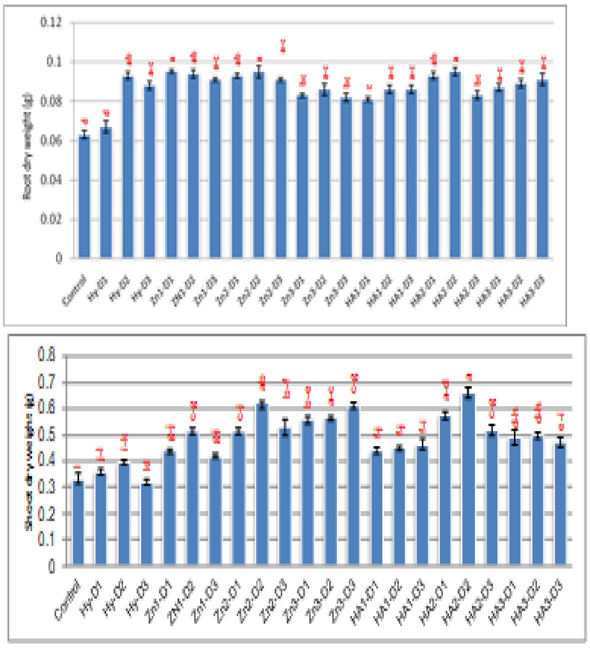

Fig. 4. Effect of grains priming and duration treatments on dry weight of shoot and root of wheat 25 d after sowing. Data present the mean ±SE of n=3, significant difference between treatments was tested by one way analysis of variance (ANOVA). Different letters in each column indicate significant differences p≤ 0.05 according to Tukey's Honestly Significant Differences (HY-D1, hydropriming for 8h ; HY-D2, hydropriming for 16h ; HY-D3, hydropriming for 24h; Zn1-D1, zinc sulfate at 100 ppm for 8 h; Zn1-D2, zinc sulfate at 100 ppm for 16 h; Zn1-D3, zinc sulfate at 100 ppm for 24 h; Zn2-D1, zinc sulfate at 150 ppm for 8 h; Zn2-D2, zinc sulfate at 150 ppm for 16 h; Zn2-D3, zinc sulfate at 150 ppm for 24 h; Zn3-D1, zinc sulfate at 200 ppm for 8 h; Zn3-D2, zinc sulfate at 200 ppm for 16 h; Zn3-D3, zinc sulfate at 200 ppm for 24 h; HA1-D1, humic at 1500 ppm for 8 h; HA1-D2, humic at 1500 ppm for 16 h; HA1-D3, humic at 1500 ppm for 24 h; HA2-D1, humic at 3000 ppm for 8 h; HA2-D2, humic at 3000 ppm for 16 h; HA2-D3, humic at 3000 ppm for 24 h; HA3-D1, humic at 4500 ppm for 8 h; HA3-D2, humic at 4500 ppm for 16 h; HA3-D3, humic at 4500 ppm for 24 h).

3. Seedling Vigor Index (SVI):

All priming treatments considerably improved SVI over non-primed treatment (Figure 5). The most effective treatment in this regard was priming in Zn at 150 ppm for 16 h that increased SVI by 120 % relative to control. Additionally, HA at 3000 ppm for 16 h increased SVI by 115 % compared with control.

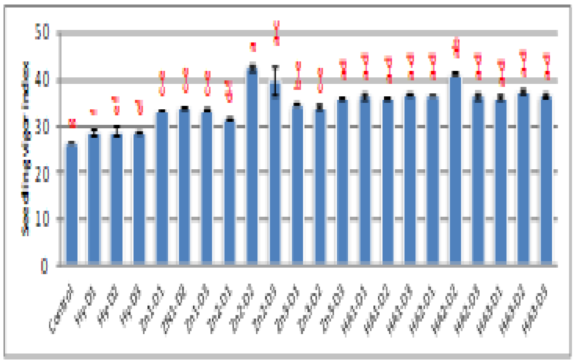

Fig. 5. Effect of grains priming and duration treatments on seedling vigor index of wheat 25 d after sowing. Data present the mean ±SE of n=3, significant difference between treatments was tested by one way analysis of variance (ANOVA). Different letters in each column indicate significant differences p≤ 0.05 according to Tukey's Honestly Significant Differences (HY-D1, hydropriming for 8h ; HY-D2, hydropriming for 16h ; HY-D3, hydropriming for 24h; Zn1-D1, zinc sulfate at 100 ppm for 8 h; Zn1-D2, zinc sulfate at 100 ppm for 16 h; Zn1-D3, zinc sulfate at 100 ppm for 24 h; Zn2-D1, zinc sulfate at 150 ppm for 8 h; Zn2-D2, zinc sulfate at 150 ppm for 16 h; Zn2-D3, zinc sulfate at 150 ppm for 24 h; Zn3-D1, zinc sulfate at 200 ppm for 8 h; Zn3-D2, zinc sulfate at 200 ppm for 16 h; Zn3-D3, zinc sulfate at 200 ppm for 24 h; HA1-D1, humic at 1500 ppm for 8 h; HA1-D2, humic at 1500 ppm for 16 h; HA1-D3, humic at 1500 ppm for 24 h; HA2-D1, humic at 3000 ppm for 8 h; HA2-D2, humic at 3000 ppm for 16 h; HA2-D3, humic at 3000 ppm for 24 h; HA3-D1, humic at 4500 ppm for 8 h; HA3-D2, humic at 4500 ppm for 16 h; HA3-D3, humic at 4500 ppm for 24 h).

Discussion

The influence of priming treatment on the germination process proved that germination was raised in primed grains owing to accelerating several metabolic and biochemical pathways. This process induced prompt germination and therefore seedling emergence can be enhanced (Andoh, and Kobata, 2002). Priming treatments stimulate the activities of hydrolyzed enzymes like α-amylase (Kaur *et al.*, 2002; Farooq *et al.*, 2006b), which accelerate the breakdown of food reserves and the supply of energy to embryos grow (Kaur *et al.*, 2002; Farooq *et al.*, 2006a,b). Seed priming enhances plant establishment by triggering physio-biochemical pathways and molecular modifications (Farooq *et al.*, 2006b; Chen *et al.*, 2012).

The current outcomes recognized that the application of HA accelerates a substantial improvement in germination parameters (G %, SGI, GI, and CG) and seedling growth parameters (length, fresh and dry weight of shoots and roots and SVI). The enhancing effect of HA on different aspects of plant growth and development was well-documented (Sheriff, 2002; Eyheraguibel *et al.*, 2008; Ulukan, 2008;

Gulser *et al*., 2010). Mosa-pour *et al*. (2014) recorded that HA influenced positively the germination rate of *Calendula officinalis*. Sabzevari *et al.* (2009) recognized that HA at 54 mg l^{-1} increased wheat germination parameters. Because of its small molecular weight, HA is absorbed rapidly by the seed, thereby increasing the absorption of nutrients like nitrogen and phosphorus (Asenjo *et al*., 2000), subsequently, stimulating seeds germination (Piccolo *et al*., 1993). Two effects were pointed out to account for the effect of HA on germination: its direct effect through the assimilation of plant growth substances (Nardi *et al*., 2002) and its indirect effect via enhancing the absorption of nutrients (Chen and Aviad, 1990). Cordeiro *et al*. (2011) assessed the influence of HA on corn's root growth and observed that 3 mM of HA could increase corn root fresh and dry weights. The promotive effect of HA on plant biomass may be due to its enhancing effect on chlorophyll pigments, consequently, increasing photosynthesis and biomass accumulation (Ahmed *et al* 2013). In addition, HA may promote root's dry weight through its hormonal influences (Ghasemi *et al.*, 2012). Consistent with Rubio *et al*. (2009) outcomes, the enhancing impact of HA on stem growth may have resulted from its effects on root's H^+-ATPase activity and the distribution of nitrates in root and stem that consecutively induces multiple changes in cytokines, polyamines, and abscisic acid assimilation. The hormone-like activity of HA on cellular respiration, photosynthesis, membrane permeability, protein assimilation, and numerous enzymatic reactions may also account for its positive effects on plant growth (Canellas, *et al*., 2002).

Our results indicated that Zn priming improves wheat germination and seedling development. In accord with our findings, Zn-priming significantly enhanced root length and dry weight in rice seedlings (Prom-u-thai *et al.* 2012). In addition, Zn-priming has been utilized efficiently in several plants, e.g., maize (Imran *et al* 2018), barley (Ajouri et al 2004), rice (Prom-u-Thai et al., 2012), and soybean (Muhammad *et al.*, 2017), for enhancing seed germination and induced environmental stress resistance. Moreover, a sufficient Zn concentration of seed is crucial for seedling vigor and plant tolerance to environmental factors throughout the germination and early growth stage (Cakmak,2008). The enhancing impact of Zn-priming on germination and seedling development may have resulted from the participation of Zn in the premature stages of coleoptile and radicle growth (Ozturk *et al.*, 2006). Zn-priming boosts seedling relative control owing to uniform and accelerated germination (Rehman *et al*., 2015). It has been argued that Zn has imperative biochemical functions throughout germination and seedling development (Cakmak, 2008). Zinc is important in protein assimilation and gene expression (Broadley *et a*l., 2007). It was estimated that 10 % of the proteins in biological systems required Zn for their structural and functional integrity (Andreini *et al.,* 2006). On the other hand, during germination, the accumulation of reactive oxygen species (ROS) is a well-documented phenomenon (Cakmak *et al.*, 1993; Bailly *et al*., 2002) and Zn plays an essential role in ROS detoxification in plant cells (Cakmak, 2000; Broadley *et al.*, 2007).

The results of the current investigation indicated that hydropriming was effective when used for 16 hon inducing germination and enhancing seedling growth. Our findings agree with those of McDonald (2000); Maiti *et al.* (2006); Moghanibashi *et al.* (2012) who proved that hydro-priming is an efficient method for improving seed vigor and reducing average germination time. In this context, Pallavi *et al.* (2010) proved that hydro-priming of sunflower seeds led to increased seedling vigor. In addition, hydro-priming increased germination percentage and resulted in strong seedlings of barley and maize (Aziza *et al.*, 2004; Harris *et al.*, 2007). The seedlings that grow rapidly produce large and strong seedlings over the slow-growing seedlings (Mcdonald, 2000; Jayad, 2008; Nawaz *et al*., 2013). The enhancing impact of hydro-priming on inducing germination and advancing seedling development may be due to hydropriming-induced softening of the seed coat and stimulating early metabolic activities and accelerating germination (Pagano et al, 2017). Additionally, hydropriming may promote antioxidants that improve the germination rate. (Paparella. *et al*,2015)

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تأثير التهيئةعلى إنبات الحبوب ونمو بادرات القمح

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الملخص

أجريت هذه الدراسة في معمل قسم النبات الزراعي، كليه الزراعة، جامعة المنصورة، خلال موسم 2019، لتقييم التأثير المنشط لعمليات تهيئة البذور ومُدتها، علي إنبات وحيوية نبات القمح (*Triticum aestivum L.* cv. Misr 1). تم نقع الحبوب لفترات زمنية (8، 16، 24 ساعة) باستخدام مجموعة من المواد (ماء ، كبريتات زنك بتركيز 100 ، 150 ، 200 جزء في المليون وحمض الهيوميك بتركيز 1500 ، 3000 ، 4500 جزء في المليون) بجانب الحبوب الجافة ككنترول. أشارت النتائج إلى أن جميع معاملات تهيئة الحبوب أدت إلى حدوث زيادات معنوية في مؤشرات قوة البادرات، ممثلة بنسبة الإنبات، وطول كل من المجموع الجذري والخضري للبادرات، الوزن الطازج والجاف للمجموع الجذري والخضري للبادرات. في معظم الحالات ، كانت المعاملة الأكثر فاعلية هي استعمال الهيومك بتركيز 3000 جزء في المليون لمدة 16 ساعة، والتي زودت نسبة الإنبات ، دليل سرعة الإنبات ، دليل الإنبات ، والكفاءة المشتركة للإنبات ، بنسبة 49٪ ، 51٪ ، 47٪ ، و 5٪ على التوالي مقارنة بالكنترول (الحبوب الجافة). علي الجانب الآخر، فكان تركيز كبريتات الزنك 150 جزء في المليون، لمدة 16 ساعة هو الأكثر فاعلية والتي أدت إلي زيادة الصفات سابقة الذكر بنسبة 44٪ و 46٪ و 43٪ و 5٪، على التوالي مقارنه بالكنترول. تشير النتائج أيضًا أن عمليات التهيئة بالماء لمدة 16 ساعة كانت أفضل معاملة مقارنة بمدد النقع الأخرى بالماء أو الحبوب الجافة. طبقاً للنتائج المُتحصل عليها، يمكننا الإشارة إلي أن عمليات تهيئة الحبوب تُحسن من إنبات ونمو بادرات القمح.

الكلمات الداله: الإنبات، الهيوميك، تهيئة الحبوب، القمح، الزنك