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EFFICIENCY OF USING GARLIC AND MORINGA EXTRACTS AS A PRIMING FOR IMPROVING GERMINATION TRAITS AND SEEDLING GROWTH OF MAIZE (*Zea mays*, L.)

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ABSTRACT

One of the best strategies to enhance seed germination is treating seed before planting with some plant extracts. Germination and seedling growth of maize seed treated with Garlic (GE) or Moringa oleifera leaf extracts (MLE) were investigated as a priming at Seed Technology Res. Dept., ARC, Egypt. Aqueous extracts of Garlic and Moringa oleifera were used to prime seed of maize (Zea mays, L.) by soaking for 20 hours with different concentrations (0.25, 0.50 and 1.0g/mm) comparing with hydro-priming (soaking in water) and control (no-soaking) each with four replications. This experiment evaluated the best concentration to enhance the germination and seedling of maize hybrid SC-168 by using GE and MLE extracts. Seed germination (%),Germination rate, (GR, day), germination speed index (SGI), mean germination rate (MGR, day), germination vigor index (GVI), seedling shoot length (cm), seedling root length (cm), seedling length (cm), seedling fresh weight (g), seedling dry weight, (g), seedling vigor 1 (SV1), seedling vigor 2 (SV2) and seedling water content (WC%) as affected by plant extracts-priming treatments were studied. Results showed that germination characters improved with Moringa oleifera leaves extract (MLE) followed by garlic extracts (GE) under laboratory conditions. The concentrations 0.25 and 0.50 g/mm MLE gave higher values for germination percentage and germination rate, while 0.5 and 1.0 g/mm GE gave the higher values for speed germination rate. It also significantly increased in all seedling traits by using plant extracts; GE was superior to MLE as compared with hydro-priming and control. During seedling growth under field conditions, the primed seeds by plant extracts significantly increased in all traits as field emergence leaves traits, seedling vigor II. This suggests that soaking in Garlic extract as priming at 1.0 g then 0.5 g/mm concentrate and Moringa oleifera leaves extract at 0.25g/mm under 20 hour soaking were suitable treatments that can improve seed germination and seedling growth in the maize single cross hybrid 168.

Key words***: Zea mays* L., Germination, Seedling growth, *Allium sativum*, *Moringa oleifera*.**

INTRODUCTION

Maize is one of the important cereal crops in the world for using as food for human and feed for animals (Chandrasekaran *et al* 2010). In Egypt, it is the third most important cereal crop both in terms of production and area after Wheat and Rice. Its production is about 21.90 % of the total cereals production in the world (FAO, 2011). Maize is high yielding, readily digested and cheaper than other crops. It is also a versatile crop, growing across a range of agro ecological zones. Every part of the Maize plant has an economic value such as grain; leaves, stalk, tassel and ear all can be used to produce a large variety of food and non-food products (ElKholy *et al* 2005). Increasing yield and productivity at acceptable levels has become a primary

objective of breeding and improvement program (de Faria *et al* 2013 and Ahmed *et al* 2022)

Seed priming is a pre-sowing strategy, for improving seedling structure, by enhancing pre-germination metabolic activity prior to emergence of the radicle and generally enhances germination rate and plant performance. Priming is soaking of seeds in a solution, followed by drying of seeds that initiates (McDonald. 2000).With priming, the process of germination is encouraged by soaking seeds in solutions containing of varied compounds, such as salts, growth regulators or phytohormones, metals. Same authors reported that primed seeds gave better germination, and high growth even under stress conditions. Priming is one of the seed enhancement methods that might be resulted in increasing germination and emergence under different stress conditions such as temperature, drought and salinity stress (Sedghi *et al* 2010).

Moringa oleifera belongs to family *Moringaceae*. There are about 13 species of *Moringa oleifera* is most widely grown. Since leaves of Moringa are rich in zeatin, it can be used as natural source of cytokinin (Fuglie, 1999). In addition, *Moringa oleifera* leaves are also rich in carotenoids, ascorbates, potassium, calcium and phenols, which have plant growth inhancing capabilities and often applied as exogenous plant growth promotors (Foidl *et al* 2001). Antioxidants like glutathione and ascorbic acid, which are found at high concentrations in *Moringa oleifera* chloroplasts, are crucial for plant defense against oxidative stress addition to essential macro and micro elements, ascorbic acid, carotenoids, gibberellins and zeatin (Noctor and Foyer, 1998; and Hala and Nabila, 2017). In view of all authors reported, it is hypothesized that priming with leaf extract from *Moringa oleifera* , having a number of plant growth promoters, vitamins, mineral nutrients and in a naturally balanced composition, which may enhance the plant development. Soaking maize seeds in *Moringa oleifera* leaf extract achieved the highest values of germination traits and early seedling growth (Ahmed and El-Mahdy, 2022).

Garlic (*Allium sativum*) is a highly nutritive value extract; it contains a big number of enzymes, which are very important and more than 200 biochemical compounds such as Vitamins and Antioxidants (Mohamed and

Akladious, 2014). It includes high content of Sulphur and Volatile compounds as Allicin, Aliin, Ajoene, Allylpropyl, Diallyl, Trisulfide, Sallylcysteine, Sallylmercaptocystein, Vinyldithiines and others contents (Mohamed and Akladious, 2014 and El-Saadony *et al*2017). Also, garlic is considered as a source of vitamins especially, Vitamin B complex and Vitamin C, Antioxidants, Flavonoids and Minerals such as K, P and Se (Pekowska and Skupień, 2009; and Abayomi *et al* 2018).

This research is aimed to study the effect of garlic extract (GE) and *Moringa oleifera* leaves (MLE) extract on germination traits and seedling growth compared with non- priming in maize hybrid SC.168. The present research had two objectives, i.e. finding how primed seeds of maize react to GE and MLE and observing the impact of different concentration on the seedling growth of maize.

MATERIALS AND METHODS

Laboratory and field emergence experiments were conducted at the Seed Preservation Laboratory, Department of Seed Technology, Institute of Field Crops Research, Agricultural Research Center, and at Greenhouse of Field Crops Research Department, Agricultural Research Center, Giza, Egypt. The study aims to evaluate the effect of different concentration (0.25, 0.50 and 1.00 g at the ratio of 1:10 (w/v) from Garlic extract (GE) and Moringa leaves extract (MLE) bedside to soaked in water only (hydro-priming) and control (un-treated) on germination traits, seedling growth and vigor beside to field performance characteristics of maize (*Zea maize*, L.). The experiment was laid out in Completely Randomized Design (CRD) with four replications. Maize seeds (cv. hybrid SC-168) were obtained from Maize Research Department, FCRI, ARC.

A. Lab. Experiment.

The experiment was artificially created in the sterilized Petri dishes. Four replicates of 100 seeds (25 seeds/ replicate) each from every treatment were planted in 15-cm diameter Petri dishes moistened with distilled water, incubated in a growth chamber at 25ºC and laid in Factorial Completely Randomized Design (CRD). When a 2 mm radical had emerged from the seed coat, normal seedlings were counted and then germination percentage

was calculated (ISTA 1999) beside to other germination and seedling growth traits.

Preparation of extracts

Garlic cloves and fresh Moringa leaves were air-dried, then ground to keep in powder form. The crude powders were stored in paper bags at room temperature. Stock GE and MLE were obtained by soaking (0.25, 0.5 and 1.0 g at the ratio of 1:10 (w/v) turn to 100mm) of the GE and MLE powder in distilled water at room temperature (15 ± 2^{o}C) for 20 to 24 hours with occasional shaking in the dark. The mixture was filtered through three layers of cheesecloth to remove the fiber debris. Three different concentrations for both of extracts (i.e., 0.25, 0.5 and 1 g at the ratio of 1:10 (w/v) turn to 100mm) were prepared, in addition to the control (distilled water).

Seed preparation

Maize seeds of single cross 168 were disinfected with 0.1% $HgCl_2$ solution for 5 minutes and washed 3-4 times with distilled water to remove its traces. This was done by dipping the 25 viable seeds of each replicate randomly selected into each treatment solution of Garlic, Moringa leaves extracts and hydro-priming for 20 hours (Ahmed and El-Mahdy, 2022) then washed 3-4 times with distilled water after that treated seeds were air dried at room temperature for 24 hours then sowed in growth chamber at 25±2°C.

Germination test

Germination test was performed according to ISTA (1999), whereas 25 treated and untreated seeds of maize were sown in each sub replication in sterilized Petri dishes covered at the bottom with two sheets of Whitman filter paper, then placed in an incubator at 25±2°C for 7 days. Total numbers of seeds germinated were counted daily and percentage was calculated at 7th day.

Germination (%): (The number of germinated seeds/The total number) X 100.

Germination Rate (GR)

Germination Rate (GR) was calculated according to the following formula of Bartlett (1937).

GR= a + (a +b) + (a + b + c) …… (a + b + c + m)/ n (a + b + c + m).

Where a, b, c are No. of seedlings in the first, second and third count, m is No. of seedlings in final count, n is the number of counts.

Speed germination test (SGI)

Seeds were observed daily for each replicate and considered germinated following radical emergence. Germinated seeds were counted and removed from the Petri dishes.

Speed Germination Index (SGI) was calculated as described in the Association of Official Seed Analysis (A.O.S.A., 1983) by following formula:

SGI= (No. of germinated seed/days of first count) + (……./…….) + (No. of germinated seed/days of final count). Seeds were considered germinated when the radical was at least 2 mm long.

Mean Germination Time (MGT)

Mean Germination Time (MGT) was calculated based on the following equation of Ellis and Roberts (1981). MGT= Σ Dn/ Σn, where (n) is the number of seeds, which were germinated on day, (D) is number of days counted from the beginning of germination.

Seedling traits (length and weight)

Seedling root and shoot length (cm): It was measured on ten normal seedlings at 7 days after planting.

Seedling fresh and dry weight (g): Ten normal seedlings at 7^{the} day after planting were measured to determine fresh weight then the seedlings were dried in hot-air oven at 85^{o} C for 12 hours to obtain the seedling dry weight (g).

Germination vigor index (GVI)

Germination vigor index (GVI) was calculated based on the following equation**:** N x SDW (mg), where N is total germinated seeds and SDW is shoot dry weight of seedling (mg).

Seedling vigor

Seedling vigor was determined as the product of the germination percentage and that of seedling length and seedling dry weight. It was calculated following Abdul Baki and Anderson (1973) as:

Vigor index I = Germination (%) x Total seedling length (cm).

Vigor index II = Germination (%) x Total seedling dry weight (g).

Seedling water content (WC %)

It was determined at 7^{the} day from planting, according to the formula:

WC (%) = (FW-DW / FW) x 100, where FW = fresh weight and DW = dry weight (Black and Pritchard, 2002).

B. Field emergence experiment.

Control and Treated seeds were sown in 10 kg plastic pots (25 cm in each) containing moist Clay and Sand (2/1, respectively), replicated four times and were placed in Greenhouse during summer season and laid in Factorial Completely Randomized Design (CRD). Tested characters were field emergence (%), Leaf length (cm), Leaf width (cm), Shoot thickness (mm), seedling fresh wt., seedling dry wt., and seedling vigor after 18 days from sowing.

Statistical analysis:

Analysis of variance of studied traits of two seasons was performed. The least significant difference (L.S.D) test was performed with a significance level of 5% (Gomez and Gomez, 1984). The measured variables were analyzed by ANOVA using MSTATC statistical package (Freed, 1991).

RESULTS

A. Lab. experiment.

1- Interaction between plant extracts (GE and MLE) and different concentrations on germination characteristics and seedling growth parameters of hybrid maize cultivar SC-168.

1.1. Germination Characteristics

Data illustrated in Fig. (1) clearly indicated significant ($P < 0.05$) differences between all treatments for all seed germination characters. The highest values of G % was observed on seed treatments by MLE at 0.25, 0.5 conc. followed by the rest of treatments, which were not significant, while control recorded the lowest percentage compared with other treatments. Compared to other treated and untreated seed, MLE (0.25 and 0.50g) had the highest value of GR (1.50 and 0.89) respectively, when all GE treatments (0.25, 0.50 and 1.0g) gave the maximum value of GR (0.59, 0.58 and 0.56, respectively).

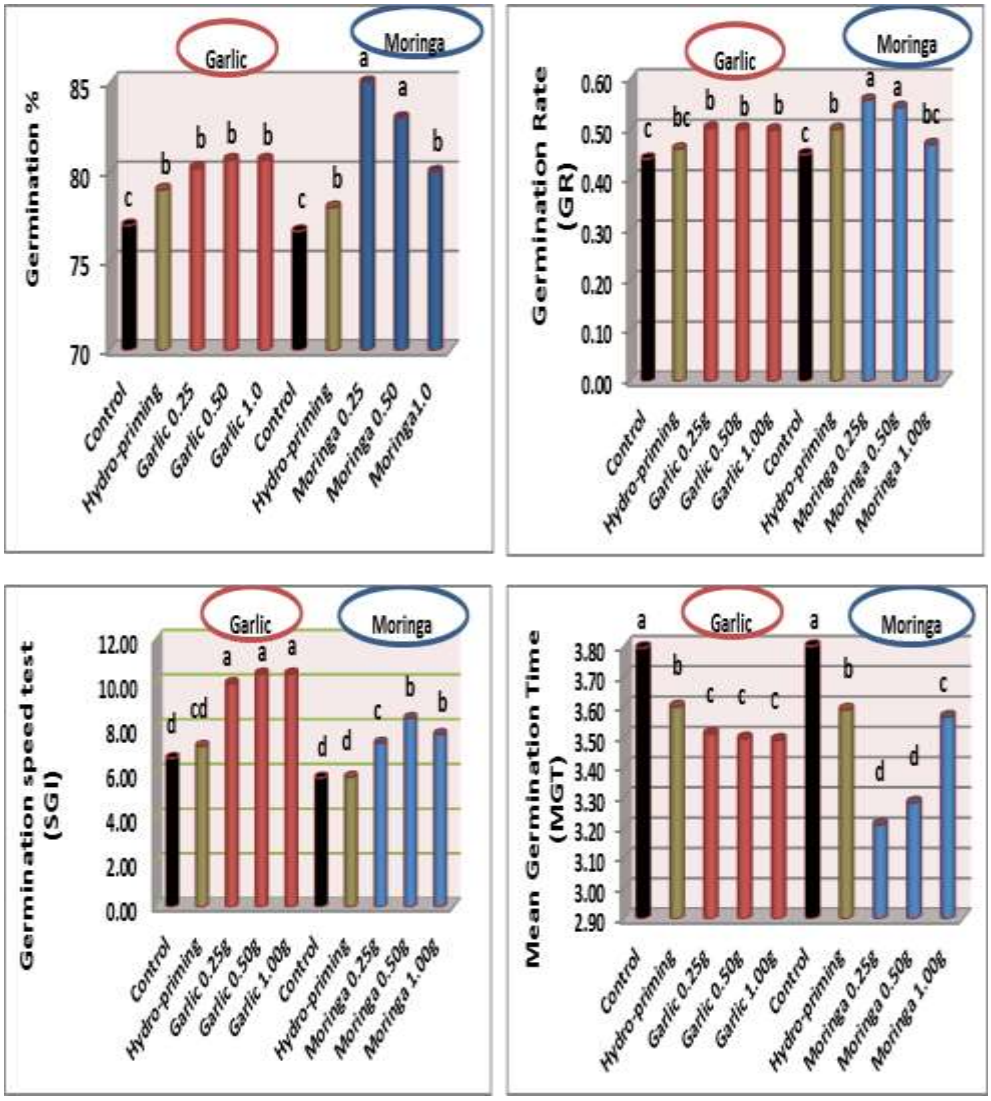

Fig. 1. Seed germination parameters of maize seed hybrid SC-168 treated with different concentrations from Garlic and Moringa leaves extracts comparing with Hydro-priming and Control (un-treated).

However, the lowest values were shown by control compared with other treatments in Fig. (1). Moreover, SGI is demonstrated in Fig. (1), data indicated that GE treatments reached the maximum SGI which were (10.43) for 1.0g, (10.43) for 0.5g and (10.01) for 0.25g followed by MLE which were (6.44) for 0.25g and (5.72) for 0.5 g compared with hydro-priming and control which recorded the lowest values. Meanwhile, Fig. (1) illustrates the MGT of the maize seed under the treatments, it indicates that highly significant differences were observed between different treatments. Where control showed the highest value followed by the hydro-priming as seen in (Fig.1). The concentrations 0.25g and 0.50g MLE were the lowest value compared to other treatments and control as follow; 3.21 and 3.28, respectively.

1.2. Seedling parameters

Data presented in Fig. (2 & 3) show significant effect of seed treatments by plant extracts (GE and MLE) and hydro-priming on shoot length (cm), root length (cm), seedling length (cm), seedling fresh weight (g) , seedling dry weight(g), seedling vigor I, seedling vigor II and seedling water content of maize germinated under different seed treatments levels. The data clear that treated seed by GE and MLE caused improvement of above mentioned parameters compared to hydro-priming and un-treated seed under corresponding laboratory conditions.

The present study also indicates that all the treated seed significantly improved Shoot, root and seedling length, however, seed treated with 1.0, 0.50 and 0.25 GE succeed to improve these traits and gave higher values 18.5, 16.6 and 16.4 cm, respectively for shoot, 8.6 and 8.6 cm by 1.0 and 0.50 conc. GE for root; and 27.1, 25.0 and 24.6 cm by 1.0, 0.50 and 0.25 conc. GE for seedling length. While, the MLE gave moderate values by 0.25 and 0.50 conc followed by hydro-priming. whereas, the lowest values were given by control compared with other treatments. Most of seed treatments resulted in higher seedling fresh weight (g) compared with that of control, the higher values were for garlic 1.0 and 0.50 then MLE with 0.25 and 0.50. While the lower value was with control (Fig. 2).

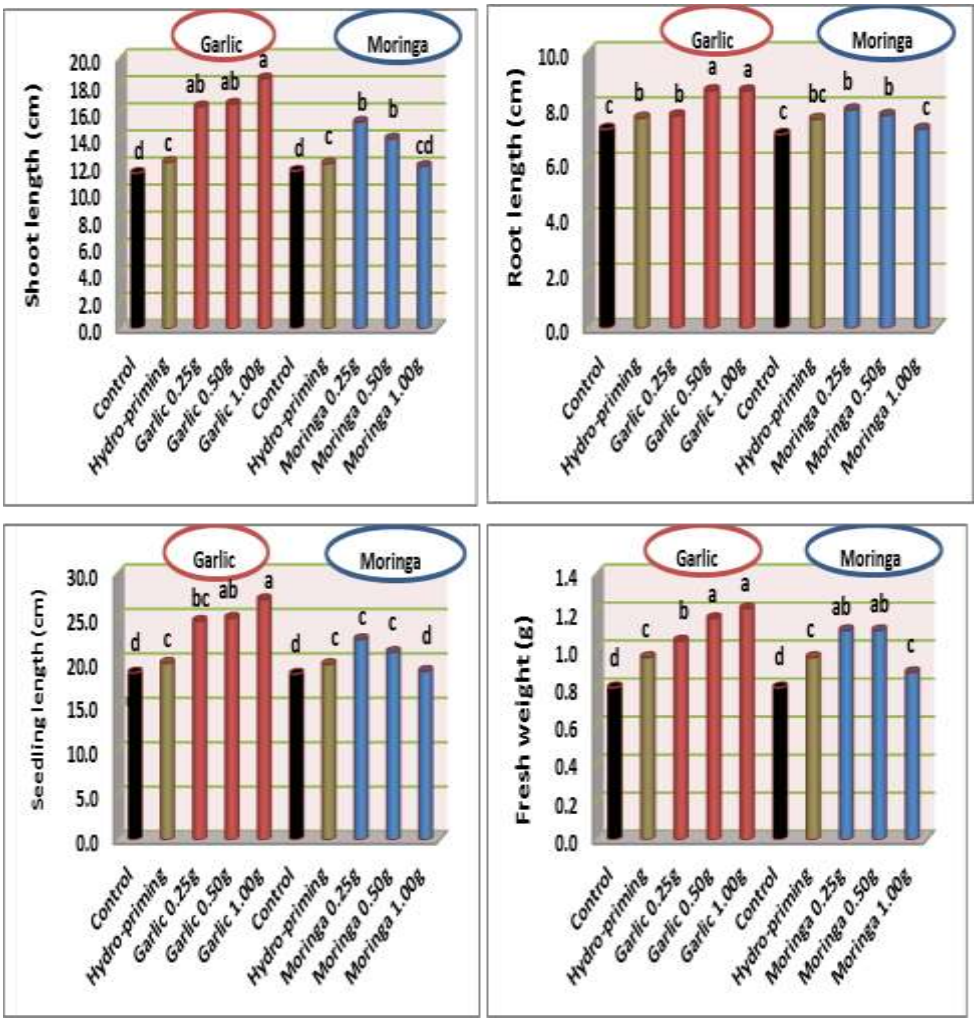

Fig. 2. Seedling parameters of Maize seed hybrid (168) treated by different concentrations from Garlic and Moringa leaves extracts comparing with hyro-priming and control (un-treatment).

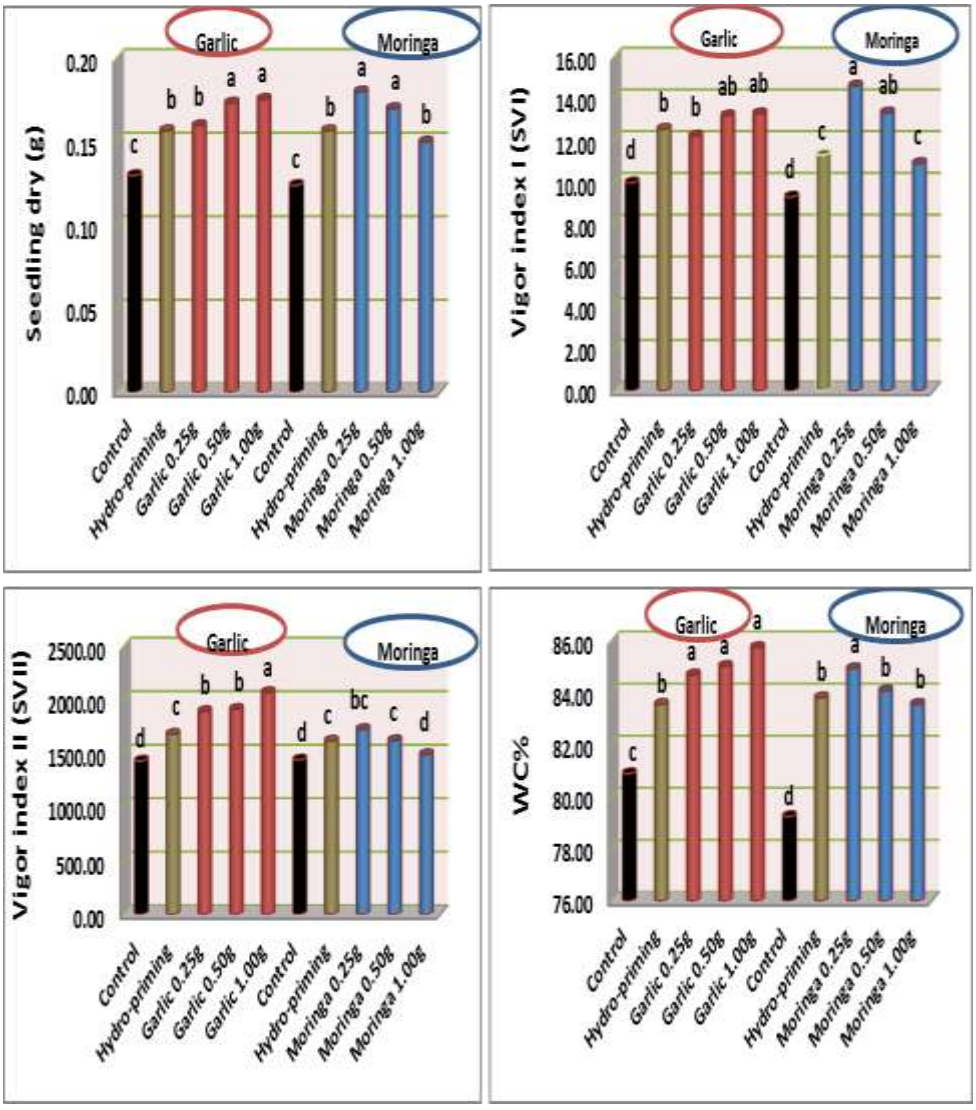

Fig. 3. Seedling parameters of maize seed hybrid SC-168 treated by different concentrations from Garlic and Moringa leaves extracts comparing with Hydro-priming and control (un-treatment).

Seedling dry weight was significantly increased with 1.0g/mm GE extract and 0.25 MLE which was 0.18 g for both of them followed by 0.5 and 0.25 GE concentrations comparing with control which gave the lowest weight. Maximum seedling vigour (SVI) in Fig. (3) was improved with all treated seed, which was 14.61 and 13.32 by 0.25 and 0.50 MLE, respectively followed by 13.28 and 13.18 by 1.0 and 0.50 GE, respectively. Whereas, it was decreased to 9.98 and 10.90 by control. Data indicated a significant interaction between different seed treatments and concentrations of extracts and hydro-priming SVII. The concentration 1.0g then 0.50 and 0.25 GE gave the highest value of SVII (2071.2, 1914.9 and 1894.5, respectively), followed by 0.25 and 0.50g/mm MLE and hydro-priming compared with other treatments and control. Maximum seedling water content was observed in GE for 1.0 and 0.50 (85.7 and 85.0 %, respectively) then 0.25 and 0.25 conc. for MLE and GE, respectively compared with other treatments. The control recorded lower value than other GE and MLE and hydro-priming (Fig. 3).

2- Effect of plant extracts (GE and MLE), hydro-priming and un-treated seed on germination characteristics and seedling growth traits of the hybrid maize (SC-168).

2.1. Germination characteristics

Results presented in Fig. (4) showed a significant effect of GE and MLE as a plant extracts beside to hydro-priming and control on seed germination (%),germination Rate GR (day), germination speed Index (SGI), and mean germination time MGT (day) of maize seeds germinated under different concentrations as compared with hydro-priming and control. The data showed that treated seed by two plant extracts improved the parameters mentioned above compared to un-treated seed under corresponding concentrations. The improvement ranged between 6.9 and 4.5% for G%, 22.7 and 13.6% for GR (day) by MLE and GE, respectively, while, it ranged between 79.9 and 36.9% for SGI, 20.0 and 13.0% for GVI by GE and MLE, respectively. A similar trend was observed in MGT, where it was faster by (-0.13 and -0.16%) by using GE and MLE treatments then hydro-priming which was (-0.55%) compared to un-treated seed.

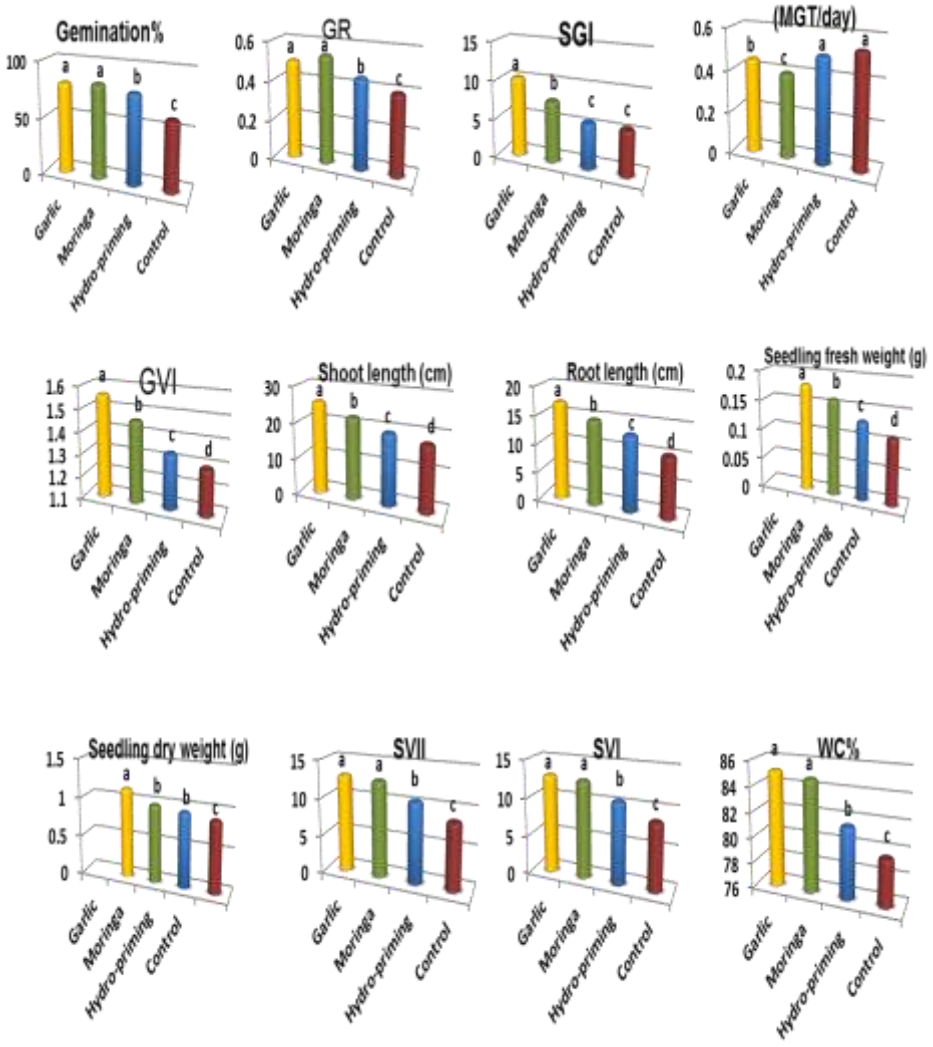

Fig. 4. Germination characteristics and seedling parameters of Maize seed hybrid (SC-168) treated by plants extracts comparing with hydro-priming and control (un-treated seed). Different letters into bars indicate significantly different means according to Duncan test (α = 5%) within the treatment.

2.2 . Seedling parameters

Seedling traits (i.e., seedling length, shoot length and root length, seedling fresh and its dry weight, vigor and seedling water content) were positively and significantly affected by two plant extract seed treatments (GE and MLE) compared with un-treated seed under laboratory conditions (Fig. 4). Treated seed caused an increase of 65.1, 41.6 and 24.6% in Shoot length, 30.3, 18.8 and 2.2% in root length and 43.6, 25.1 and 8.5% for seedling length regarding GE, MLE and hydro-priming, respectively compared with control (un-treated seed).The same trend was observed in seedling fresh and dry weight, which were 28.1, 7.9 and 5.6 in fresh weight and 0.18, 0.16 and 0.13 in dry weight.

The data showed that significant increases were recorded in seedling vigor 1 (SV1) and seedling vigor 2 (SV2) when seeds were treated with two plant extracts and hydro-priming compared to untreated seed. The increase was 49.2, 45.9 and 22.0% for SVI and 58.3, 36.3 and 13.2 for SVII by using GE, MLE and hydro-priming, respectively. A significant difference was observed in seedling water content (WC %) regarding plant extracts and hydro-priming with untreated maize seeds. Treated seed by GE and MLE gave the highest percentage compared with control, which was 6.9 and 6.4%, respectively.

B. Field emergence experiment.

Data on field emergence (Table 1) showed significant differences among GE and MLE. concentrations (g/mm) and its interaction treatments on hybrid SC-168 maize.

Results showed that the MLE concentration had the best values for field emergence % followed by GE compared with hydro-priming and the lowest values were observed by control. Leaf length (cm) was the highest by GE at 1.0 conc. which was 26.1cm, while leaf width and shoot thickness gave the highest values and significant by 0.25 then 0.50 g/mm MLE at the concentrations 1.43, 1.39, 0.30 and 0.28, respectively. While, seedling fresh and dry wt. gave significant increases which were obtained with 1.0 and 0.5 g GE (2.23 and 2.12 for fresh, 0.39 and 0.37 for dry, respectively) and 0.25 g MEL (2.02 for fresh and 0.39g for dry) compared to other treatments and hydro-priming in maize field experiment.

Table 1. Effect of Garlic extract (GE) and *Moringa oleifera* leaf extract (MLE) on field emergence and its parameters of hybrid (SC-168) maize.

Character & Treatment	Conc. (g/mm)	Field emergence%	Leaf length	Leaf width	Shoot thickness	Fresh/ seedling	Dry/ seedling	Seedling Vigor (SVII)
Garlic extract	0.25	80.0c	23.1b	1.28ab	0.23bcd	1.98cd	0.30cd	0.024cd
	0.50	81.5cd	24.4a	1.36ab	0.24abc	2.12b	0.37ab	0.031b
	1.0	83.5bc	26.1a	1.38ab	0.25ab	2.23a	0.39a	0.033b
	Hydro-priming	80.0c	19.8cd	1.25ab	0.18cd	1.92de	0.29de	0.023de
	Control	70.5d	18.7d	1.21b	0.17d	1.84e	0.27de	0.020f
Moringa extract	0.25	100.0a	23.1b	1.43a	0.30a	2.02cd	0.39a	0.039a
	0.50	90.0b	22.6bc	1.39ab	0.28ab	1.99cd	0.35b	0.032b
	1.0	90.0b	22.2bc	1.30ab	0.23bcd	1.90de	0.27de	0.024cd
	Hydro-priming	75.7d	18.8d	1.28ab	0.21cd	1.90de	0.27de	0.020f
	Control	70.3d	17.7d	1.25ab	0.18cd	1.83e	0.26e	0.021ef
F-test		**	***	**	**	**	***	**
CV%		10.54	7.66	4.35	8.69	9.77	12.35	6.22
Plant extracts	Garlic	83.3b	24.5a	1.34b	0.240b	2.11a	0.353a	0.087a
	Moringa	90.3a	22.7b	1.37a	0.270a	1.97bc	0.337b	0.076b
	Hydro-priming	75.7c	19.3c	1.26c	0.195c	1.91cd	0.28c	0.054c
	Control	70.7d	18.2 d	1.23d	0.175d	1.83d	0.265d	0.048d
F-test		*	**	***	**	**	**	***

Different letters into bars (a, b, c, d, e, f) indicate significantly different means according to Duncan test (α = 5%) within the different treatments

Moreover, the best SVII was with soaking in 0.25 g MEL (0.39). Significant differences were recorded on maize traits at field emergence experiment with interaction between plant extracts and concentrations; GE 1.0 then 0.5g and MEL 0.25 then 0.5 g treatments gave the highest values of all recorded parameters, followed by 0.25 GE g and MEL 1.0 and hydro-priming compared with control (Table 1).

Fig. 5. Effect of using different of Moringa leaves extract (MLE) concentrations, hydro-priming and control on Seedling growth after seven days from sowing.

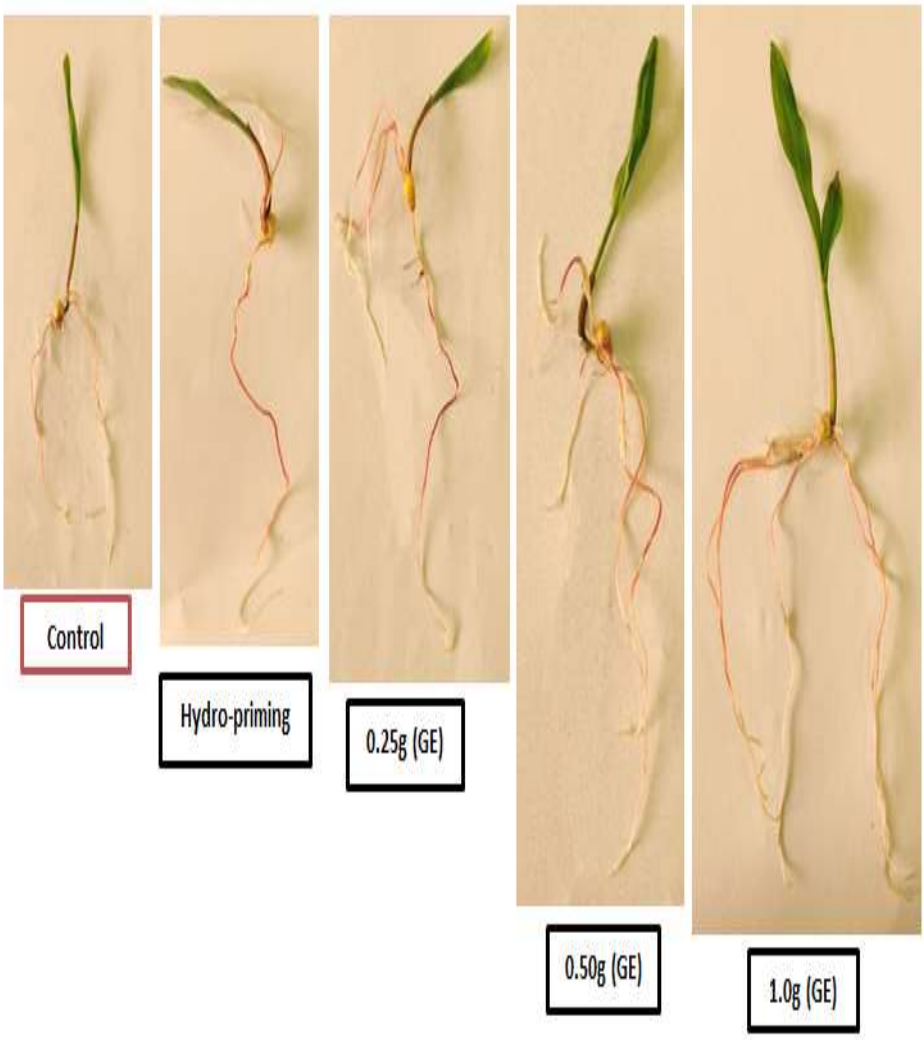

Fig. 6. Effect of using different of Garlic extract (GE) concentrations, hydro-priming and control on Seedling growth after seven days from sowing.

DISCUSSION

Germination and seedling growth development characteristics are very important contributors of final seed yield. Higher emergence rate is the main foundation, which ensures an improvement of overall seedling performance. Our results proved that the optimum concentrations were 1.0 and 0.5g/mm by using Garlic extract and 0.25g/mm concentrate with using *Moringa oleifera* leaves extract through soaking for20 hours in the extract.

Germination of seed is controlled by many of physiological mechanisms. These mechanisms are essential, for the growth of embryo and embryo development. Priming technique is soaking of seeds in a solution, of any priming agent followed by drying of seeds that, starts germination related processes without radical emergence (McDonald, 2000). Hozayn and Ahmed (2019) and Hozayn *et al.* (2019) reported that seed priming significantly increased some activities of enzymes, chitinase, polyphenoloxidase and peroxidase comparing with untreated seed.

Leaves of *Moringa oleifera* are rich source of ascorbate, phenolic compounds, zeatin, potassium and calcium, so being explored as natural crop growth promotor. Antioxidants such as glutathione and ascorbic acid, which are found at high concentrations in Moringa chloroplasts and other cellular components, are crucial for plant defense against oxidative stress (Noctor and Foyer, 1998). During priming with MLE, most of the N and Ca^{2+} appeared to be partitioned to embryo, which promoted seedling emergence and subsequent develpment of maize seedling (Farooq *et al* 2010).

Priming is not only promotes germination percentage and subsequent growth under optimum conditions but also it helps in broadening the range of temperature during germination stage, which finally enhances crop yield (Murray, 1990; Zheng *et al* 1994; and Farooq *et al* 2008). Using *Moringa oleifera* leaves extract was the most effective treatment and extracted method as depicted by higher emergence rate and best early seedling growth as a compared to that of un-treated seed of spring maize (Basra *et al* 2011, Ahmed and El-Mahdy, 2022). They found that the priming with leaf extract from *Moringa oleifera*, having a number of plant growth enhancer, vitamins and mineral nutrients in a naturally balanced

composition, which may enhance the maize plant growth. Moreover, using higher concentrations of MLE as priming agents were not feasible as seed priming with 100% MLE and diluted to 1:10 performed similar to overnight soaking and hydro-priming and failed to improve a number of secondary roots and dry weight of seedling.

Garlic extract treatment led to significantly greater seedling germination, root length, shoot length and vigor index depending on the wheat cultivar and Garlic extract concentration tested, compared with other treatments (Perelló1 *et al* 2013). Kousar *et al* (2023) showed that extract of garlic improved germination% by 10% in maize as compared to untreated seed. The effect was also recorded for growth parameters of maize against the untreated, which included root length, shoot length, fresh weight and dry weight. they suggested that concludes that garlic extract is a good technique for improving germination. Also, It is best for growth optimization if applied in a low concentration. Other studies have shown that Garlic extracts contain a significant stimulatory effect on saline affected plants compared to non-saline. Germination rate was also enhanced by garlic extract (Popescu, 2019).

Seed priming can be a defense line for facing stresses as biotic and abiotic stresses. Afzal *et al* (2005) reported a significant increase in wheat root length and shoot length and fresh weight, dry weight and seed vigor of seedling by seed treatments under normal and stress conditions. Kata *et al.* (2014) reported that priming treatments including hydro-priming resulted in the increased activity of α-amylase which in turn has resulted in better mobilization of stored carbohydrate reserves resulted in improvement of rice germination and its traits under stress conditions.

(Sedghi *et al* 2010) primed seeds of two medicinal possessed more germination rate and plumule length in all of the salinity levels than control. The highest radicle fresh and dry weight in pot marigold was seen at 7.5 ds m^{-1} salinity stress level. Excellent responses occurred with priming at 10°C. Temperature during priming had a little effect on Germination percentage, emergence percentage, or time to 50% germination or emergence. Seeds primed for 16 hours at 23°C or for 60 hours at 10°C initiated seedling emergence at 10°C 4 d earlier than un-primed seeds. Seedling emergence of

primed seeds was 73% compared with 31% for the un-primed seeds (Zheng *et al* 1994). Extracts from different types of plant material contain vitamins or precursors of vitamins, hormones, phenolic compounds, organic acids, which may be responsible for stimulating growth and raising stress tolerance in canola. Popescu (2019) investigated the response of treated seeds with natural extracts under salt stress conditions (100 mM NaCl). Depending on the species and the concentrations of the extracts, the germination and seedling growth parameters of tomato showed significantly improved values, compared to the soaked seeds in the saline solution.

CONCLUSION

Garlic extract (GE) at 1.0 or 0.5 g/mm conc. is the best treatment and *Moringa oleifera* leaves extract (MLE) 0.25g/mm conc. is also the best. They are a good option for increasing germination rate in Maize as priming. Priming of seeds with GE and MLE are a good technique to enhance seedling growth. They stimulate the rapid germination, enhance germination percentage and have positive effect on seedling stage, which produce strong and healthy seedlings. Finally, results recommended that using GR and MLE is a good seed priming before planting for increase germination traits and improve seedling growth of maize.

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كفاءة إستخدام مستخلص الثوم ومستخلص المورينجا على تحسين صفات الإنبات ونمو البادرات فى الذرة الشامية

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تهدف هذه الدراسة الى معرفه تاثير تركيزات مختلفة من مستخلص فصوص الثوم واوراق المورينجا على تحسين الانبات ونمو البادرات فى هجين فردى ١٦٨ من الذرة الشامية وذلك من خلال النقع فى تركيزات مختلفه من مستخلص الثوم و اوراق المورينجا وهى (٠,٢٥، ٠,٥٠، ١,٠ جم/ملليمتر) كل على حده بجانب النقع فى الماء فقط ومعاملة الكنترول (بدون معاملة). وقد تم زراعة البذور بعد النقع فى المستخلصات. اشارت النتائج الى تحسن صفات الانبات للبذور المنقوعة بالمقارنه بعدم النقع تحت ظروف المعمل والحقل. حيث زادت النسبه بواسطه النقع فى تركيز ١ جم/ملليتر من مستخلص الثوم يلية ٠,٥٠ جم/ملليمتر وبالنسبه للمورينجا كان التركيز ٠,٢٥ جم/ملليمتر هو افضل معاملة وذلك لصفات نسبه الانبات و دليل الانبات و دليل سرعه الانبات و معدل الانبات و دليل قوة الانبات و متوسط معدل الانبات و طول الريشه و طول الجذير و طول البادرة و الوزن الغض للبادرة و الوزن الجـ اف للبادرة و حيويه البذور و المحتوى الرطوبى للبادرة على التوالى بينما معاملة النقع فى ١ جرام من مستخلص المورينجا و ٠,٢٥ جـ م/ملليمتر من مستخلص الثوم اعطت نتائج منخفضة بالمقارنة بالمعاملات الاخرى وكانت اقل القيم مع النقع فى الماء يلية معاملة الكنترول. ايضا تم دراسه تأثير هذة المعاملات من خلال تجربة التكشف الحقلى واعطت النتائج زيادة معنوية فى نسبة الإنبات وصفات الأوراق و الوزن الغض و الجاف للبادرات وزيادة قيم صفه قوة البادرات للبذور المعاملة بالمقارنة بالبذور غير المعاملة.

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