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# Seed Treatments to Improve Field Emergence of Soybean Seed.

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## ABISTRACT

This study was conducted at Seed Technology Research Unit in Mansoura, Seed Technology Research Department and Tag El-Eiz Experiment Station, ARC, Egypt during 2014 and 2015 yearsto improve seed quality and field emergence of soybean (c.v Giza 111) lots (new and old) through some seed treatment methods i.e.magnetic field(0, 30, 60 and 90 mT), seed priming in ascorbic acid (0, 50, 100 and 150 ppm) and magnetic-priming (magnetic field + seed priming). The main results could be summarized as follows that expose soybean seed to magnetic field up to 90 mT increased seed vigor (normal seedling, germination rate and field emergence), seedling vigor (shoot and radical lengths and seedlings dry weight), enzyme activity (ascorbateperoxidase and catalase) and reversed abnormal seedling andungerminated seed. Seed priming with ascorbic acid significantly increased all studied traits, except abnormal seedlings and radical length. Seed priming in ascorbic acid (150ppm) recorded the highest means of germination % under laboratory and field emergence, shoot length and catalase activity comparing dry seed. Treating soybean seed by magnetic-priming method significantly affected all studied traits. Magnetic-priming treatments (60mT+150ppm ascorbic acid) and (90mT+150ppmascorbic acid) recorded the highest means of seed germination, seedling vigor and field emergence for new and old seed respectively. Generally, it could be improve of seed quality under laboratory and field emergence of soybean (c.v Giza 111) of old seed(one year stored) and get germination % under laboratory and field conditions above the level of acceptance certified seed (75%) by treating seed with magnetic-priming treatment (magnetic field 90mT+ priming inascorbic acidat the rate of 150ppm).

## INTRODUCTION

Soybean *(Glycine max, L.)* is an important oil crop in the world. In Egypt, the soybean area has drastically declined so considerable efforts should be paid to increase the productivity for minimizing the gab between production and consumption of edible vegetable oils.This can be achieved through using high quality seed. Among many factors affecting seed quality are storage period and storage condition especially in short live species as soybean seed. Many studies recorded the negative effects of prolong the storage period on soybean seed quality where El-borai*et al.* (1993), found that the germination percentage and emergence decreased from 85% to 10%, and also seedling lengths and dry weight were decreased during storageincreasing storage period from 6 to 30 months. Sowing low seed quality leading to poor germination, inadequate plant population in the field, subsequently limiting the field productivity. So it's essential to minimize the harmful effects of prolong the storage period on seed quality, presowing seed treatments may alleviate deterioration of seed quality during storage. To enhance crope yield and its quality several chemical and non-chemical methods have been tried, one of them is magnetic field (Jinapang *et al*., 2010). Also Pietruszewski and Kania, (2010) reported that the amelioration in seed germination have been achieved by different pre-sowing treatments such as the electric and magnetic field. Aladjadjiyan (2002) and Florez *et al.* (2007), noticed faster germination of maize seeds when exposed to magnetic field of 125 or 250 mT for different periods meanwhile, Alexander and Doijode (1995) noticed that aged onion and rice seeds exposed to a weak electromagnetic field for 12 h increased germination, shoot and root length of seedlings.Growth of the germinated *Viciafaba* seedlings was enhanced by the application of power frequency magnetic fields 100 mT (Rajendra *et al*., 2005). In broad bean (*Phaseoluslunatus L.*) and pea (*Pisumsativum L.)* cultivars the magnetic field stimulation of seeds improved the growth and appearance of seeds (Podlesny *et al.*, 2005). Nawroz and Hero (2010), concluded that magnetic field pre-treatment for 50 or 70 min enhanced root length, shoot length, root dry weight and shoot dry weight of five chickpea varieties, compared with the control. Majd*et al*. (2009) recorded that the magnetic field pre-treatment improve seed germination rate and seedling emergence percentage of canola also stimulate seedling growth and development. Kubisz *et al.* (2012), soaked commercial seed lots of onion (*Allium cepa L.*) for 12 h in water of the temperature 20°C, then they were exposed to low frequency magnetic field (20 mT) for 10, 30, and 60 min. They noticed that increasing energy of germination. Physiological mechanisms of magnetic field on germination and seedling growth are not completely understood. It has been reported that magnetic field affects plant growth and development processes such as seed germination and seedling growth (Aladjadjiyan, 2002). Furthermore, magnetic field may alter the characteristics of cell membrane and cell reproduction and may cause some changes in cell metabolism and various cellular functions including gene expression, protein biosynthesis and enzyme (Atak*et al.,* 2003).The differs effects of magnetic fields on seed germination and growth of plant rely on a complex way of magnetic flux densities, frequencies, pre-treatment of plant material and treatment duration (Yinam *et al.* 2005).

Seed priming is a presowing, controlled-hydration treatment in which seeds are exposed to an external water potential sufficiently low to prevent radicle protrusion but stimulate physiological and biochemical activities (Bradford 1986, Khan 1992). Ascorbic acid is relatively small molecule in plants and plays multiple roles in plant growth, such as functioning in cell division, cell wall amplification, and other growth operations (Asada, 1999; Conklin, 2001 and Pignocchi and Foyer, 2003). Miladinov *et al*. (2016) investigated the influence of diverse primer concentrations ascorbic acid (AsA) at the rates of 100, 250 and 500 mg/l on germination energy of aged soybean seed. They reported that immersing the seed in solutions with the lowest concentrations led to the improvement of germination energy regardless of seed age. They added that the application of 100 mg/l (AsA) increased seed quality by an average of 7% compared to the control. The best effects were accomplished at two-year-old, fresh and three-year-old seed (6%, 7%, and 9%, respectively) and the little improvement in seed quality occurred in one-year-old soybean seed.

The previous studies on seed treatments did not cleared the influence and mechanism of treating seed with both of magnetic field and seed priming as a combinationtreatment (magnetic field+ seed priming) on seed quality and field emergence so, the aim was to study the effect of magnetic field, seed priming with ascorbic acid and combinationtreatment (magnetic field+ seed priming) on soybean seed quality as measured by seed viability, seedlings vigor, enzyme activity andfield emergence.

## MATERIALS AND METHODS

This experiment was conducted at Seed Technology Research Unit, Mansoura, Seed Technology Research Department, ARC, Egypt during 2014 and 2015 years to improve old (storage one-year) soybean (c.v. Giza 111) seed quality and field emergence using some presowing seed treatments i.e. magnetic field, seed priming and combination of magnetic field and seed priming. Old seed produced from 2014 season were stored in laboratory under open air conditions and new seed (fresh seed) produced from 2015 season. New and old seed were subjected to the following treatments:

1- Magnetic field:

Seed sample were immersed in 5% Sodium hypochloride for 5 minutes to avoid fungal invasion. Seed were exposed to magnetic field through rimming it in static device with ( 0, 30, 60 and 90 mT ) for 1 hour before sowing.

2- Seed priming:

Seeds were placed in beakers contains 200 ml of ascorbic acid concentrations ( 0, 50, 100 and 150 ppm) for 1 h. at $20^{o}C$ and aeration was provided by the use of aquarium air pumps. The beakers were covered with aluminum foil to avoid evaporation that would lead to increased concentration and reduced water potential of ascorbic acid. After soaking, seeds were back dried to the original weight with forced air under shade (Villella and Beckert,2001).

3-Combination of magnetic field and seed priming:

Soybean seed lots (old and new) were treated with a combination of magnetic field (0, 30, 60 and 90 mT ) before priming treatment with ascorbic acid (0, 50, 100 and 150 ppm). The combination treatments were:(30mT+50ppm, 30mT+100ppm, 30mT+150ppm, 60mT+50ppm, 60mT+100ppm, 60mT+150ppm, 90mT+50ppm, 90mT+100ppm and 90mT+150ppm in addition to dry seed (control)). The experiment was arranged in a completely randomized design with four replicates. Seed samples were subjected to the following laboratory tests.

**A-Standard germination test:**

Eight replications of 50 seeds of each treatment were planted in plastic boxes of 40X20X20 cm dimensions and contained sterilized sand. The boxes were watered and kept at $25^{o}$ c in an incubated chamber for 8 days.Normal seedlings, abnormal seedlings and ungerminatedseed were counted at 8 days (final account) according to the international rules of ISTA (1999).

1-Germination percentage (G %):Germination percentage was calculated the formula outlined by ISTA rules (1999).

**G%=(Number of normal seedling/number of seed tested)X 100**

2- Germination rate (GR):It was calculatedaccording to the equation outlined by Bartlett (1937) as follows:

$$\text{Germination rate} = \frac{a + (a + b) + (a + b + c) + \ldots\ldots + (a + b + c + m)}{(a + b + c + \ldots\ldots\ldots\ldots + m)}$$

**Where (a,b,c and m) = number of seeds emerged at the first count, second and final account and n is the number of counts.**

**Figure 1. Magnetic devices used to treat soybean seeds.**

**B-Seedling vigor traits:**

At the final count, ten normal seedlings from each replicate were randomly taken to measure seedling traits:

1- Seedling length (shoot and root length cm): It was measured of ten normal seedlings at8 days after planting.

2- Seedling dry weight (g): Ten normal seedlings were dried in hot-air oven at 85 $^{0}C$ for 12 hours according to Krishnasamy and Seshu (1990) to obtain the seedling dry weight (gm).

C- Enzymes activity:

1- Catalase activity

The catalase activity was assayed by the method of (Sadasivam and Manickan 1996). This method is based on the decomposition of H2O2 that directly decrease in absorbance at 240 nm.A volume of 0.1 ml of plant tissue extract was added to 3 ml of reaction mixture ( 0.16 ml of 10% H2O2 in 100 ml 0.067 phosphate buffer.

**2- Ascorbate peroxidase activity**

Determination of ascorbate peroxidase activity is carried out according to the method of Nakano and Asada (1981). The activity of this enzyme was estimated based on the decrease in absorbance at 290 nm, as ascorbate was oxidized. A known weight of tissue (0.5 gm) was homogenized in 30 ml buffer which consisted of (50 mM phosphate buffer PH 7.8, 1mM EDTA, 5% polyvinylpyrrolidone) then centrifuged at 12000 rpm for 20 min. The specific activity of this enzyme is expressed as(µ mol $g^{-1}$ $min^{-1}$)

**D- Field emergence**:Four replications of 100 seeds from new and old seed of each treatmentswere sown in a randomized block design at Tag El-EizAgricultural Research station.All cultural practices concerning land preparation irrigation were done as recommended. Field emergence was recorded at time 20 days from seed sowing.

All obtained data of characters were subjected to the statistical analysis according to the technique of analysis of variance (ANOVA) of completely randomized design, as described by Gomez and Gomez(1984). The treated averages were compared using the least significant Difference (LSD) method.

## RESULTS AND DISCUSSOIN

Data in Table 1 cleared that the effect of magnetic field treatment on new and old lots seed germination test, germination rate and field emergence %.Magnetic field treatment had significant effects on these traits with increasingmagnetic field dose from(0-90 mT), the normal seedling percentage increased from 77 to 81% and 58 to 72% for new and old lots, respectively.Germination rate increased from 0.517 to 0.633 and from 0.410 to 0.507 in new and old seed lots, respectively. Meanwhile, abnormal seedlings percentage for old seed decreased from 16 to 10%, also ungerminated seed of old lots decreased from 26 to 18%. Magnetic treatments enhanced germination percentage by decreased abnormal seedlings. Thehigher rate of seed germination and seed vigorof exposed seed to magnetic field may be influence the biochemical processes that involve free radicals formation and stimulate the activity of proteins and enzymes (Vashisth and Nagarajan 2010).Such conclusion is in conformity with the findings of Kubisz *et. al.* (2012) they observed that the improved germination of onion seeds hesitated from 4.6 to 22% and abnormal seedling of seeds hesitated from 84 to 80.2%. Also,Hozayn*et. al.* (2015) noticed that exposed fresh and carry over seeds to 0.06 T with 30 mint recorded the highest values of germination percentage and rate, they added that exposing seeds to 0.03Tgave the highest values of germination traits with 30 mint on new seeds and with 60 mint on carry over seeds.

**Table 1. Effect of magnetic field treatment on germination test % traits, germination rate and field emergence of soybean seed lots (new and old).**

| Magnetic field treatment | Germination test traits (%) Normal seedlings % | | Abnormal seedlings % | | Ingeminated seed % | | Germination rate | | Field emergence % | |
|---|---|---|---|---|---|---|---|---|---|---|
| | New | Old | New | Old | New | Old | New | Old | New | Old |
| Dry seed | 77 | 58 | 11 | 16 | 12 | 26 | 0.517 | 0.410 | 66 | 47 |
| 30 mT | 80 | 68 | 8 | 14 | 12 | 18 | 0.573 | 0.473 | 71 | 58 |
| 60 mT | 81 | 72 | 7 | 10 | 12 | 18 | 0.657 | 0.500 | 72 | 62 |
| 90 mT | 81 | 72 | 8 | 10 | 11 | 18 | 0.663 | 0.507 | 75 | 62 |
| L S D at 5% | 3 | | 2 | | 1 | | 0.015 | | 5 | |

Table 2 shows that magnetic field treatment had significant effects on seedling vigor traits, ascorbat e peroxidase enzyme activity and catalase enzyme activity. Exposed seeds (new and old) to magnetic field ranged from 0 to 90 mT increased shoot length (8.2 to 12.7 cm and 7.5 to 12.1 cm), root length 5.9 to 8.4 and 3.1 to 5.8 cm) and seedling dry weight (0.943 to 1.370 and 0.790 to 1.323 gm.)of new and old seed respectively compared with dry seed. Increase seedling growth traits by magnetic field may refer to its effect on growth characteristic and various cellular functions like mRNA quantity, gene expression, protein biosynthesis and enzyme activities and caused the changes concerning the various functions at the organ and tissue levels.

Ta**ble 2. Effect of magnetic field treatment on seedling growth traits, peroxidases enzyme activity and catalase enzyme activity of soybean seed lots (new and old).**

| Magnetic field treatment | Seedling vigor traits Shoot length (cm) | | Root length (cm) | | Seedling dry weight (g) | | Ascobateperoxidase activity (µ mol $g^{-1}$ $min^{-1}$) | | Catalase enzyme activity (µ mol $g^{-1}$ $min^{-1}$) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | New | Old | New | Old | New | Old | New | Old | New | Old |
| Dry seed | 8.2 | 7.5 | 5.9 | 3.1 | 0.943 | 0.790 | 21.00 | 20.67 | 11.20 | 11.43 |
| 30 mT | 10.3 | 10.5 | 6.6 | 4.8 | 1.227 | 1.197 | 21.20 | 22.90 | 12.00 | 12.00 |
| 60 mT | 12.4 | 11.4 | 8.3 | 5.4 | 1.297 | 1.253 | 21.60 | 23.47 | 12.20 | 12.50 |
| 90 mT | 12.7 | 12.1 | 8.4 | 5.8 | 1.370 | 1.323 | 21,67 | 26.10 | 12.43 | 13.57 |
| LSD at 5% | 0.6 | | 0.4 | | 0.017 | | 0.50 | | 0.48 | |

These results are supported by (Stein and Lian., 1992, Goodman *et al*., 1995 and Atac, *et al*., 2007) they shown that magnetic field affected the various characteristics of the plants like germination of seeds, root growth rate and seedling growth, Hozayn *et. al.* (2015) showed that exposed fresh and old seeds to 0.06 T with 30 minute recorded the highest values of seedling parameters (shoot and root length and seedling dry weight) and exposing seeds to 0.03 T gave the highest values of seedling growth with 30 minute on new seeds and with 60 mint on carry over seeds. Also the data showed that magnetic field treatment 90 mTgave the highest values of ascorbate peroxidase (21.67 and 26.10µ mol $g^{-1}$ $min^{-1}$) and catalase (12.43 and 13.57µ mol$g^{-1}min^{-1}$) enzyme activity compared with control. These results are in agreement with Celik*et. al.* (2009), found that treated soybean seeds by various magnetic field and time periods significantly increased the activities of superoxide dismutase and catalase during germination.Data in Table 3 show that seed priming in ascorbic acid had significant effects on the studied traits namely normal seedling percentage, ungerminated seedling, germination rate and field emergence and it had insignificant effect on abnormal seedling. The lowest means of the studied traits were recorded from dry seed. Whereas, the highest means of normal seedling percentage (81 and 70%), ungerminated seed (10 and 16%), germination rate (0.553 and 0.498) and field emergence (75 and 62%) were recorded fromthe seed primingin ascorbic acid at 150 ppm as compared with control (dry seed). The improvement seed quality by seed priming in solution of ascorbic acid may refer to the ascorbic acid,where plays multiple roles in plant growth such as functioning in cell division, cell wall expansion, and other developmental processes (Asada, 1999, Conklin, 2001, Pignocchi and Foyer, 2003).Similar observations were reported by Miladinov*et al.* (2016) they reported that the application of 100ml/l AsA increased the quality by an average of 7% compared to the control variant and added that the best effects were accomplished at three-year-old, fresh and two-year-old seed (9%, 7%, and 6%, respectively) and the little improvement in quality occurred in one-year-old soybean seed.

**Table 3. Effect of seed priming ascorbic acid on germination test %, germination rate and field emergence of soybean seed lots (new and old).**

| Seed priming in ascorbic acid | Germination test traits (%) Normal seedlings % | | Abnormal seedlings % | | Ingeminated seed % | | Germination rate | | Field emergence % | |
|---|---|---|---|---|---|---|---|---|---|---|
| | New | Old | New | Old | New | Old | New | Old | New | Old |
| Dry seed | 77 | 58 | 11 | 16 | 12 | 26 | 0.517 | 0.409 | 66 | 47 |
| Water | 79 | 60 | 11 | 15 | 10 | 25 | 0.527 | 0.420 | 70 | 51 |
| 50 ppm | 79 | 65 | 10 | 17 | 11 | 18 | 0.530 | 0.467 | 70 | 55 |
| 100 ppm | 80 | 70 | 9 | 14 | 11 | 16 | 0.547 | 0.471 | 72 | 61 |
| 150 ppm | 81 | 70 | 9 | 14 | 10 | 16 | 0.553 | 0.498 | 75 | 62 |
| L S D at 5% | 4 | | N.S | | 3 | | 0.015 | | 4 | |

Data in Table 4 show the effect of seed priming inascorbic acid on seedling growth traitsas measured by (shoot and root length and seedling dry weight) and enzymes activity as measured by (ascorbateperoxidase and catalase enzymes activity). Seeds priming at 150 ppm had tallest shoot length (13.0 and 12.0 cm), harvest seedling dry weight (1.316 and 1.276 gm), the highest values of ascorbateperoxidase(23.97 and 25.90µ mol $g^{-1}$ $min^{-1}$) and catalase enzyme activity (13.97 and 12.50µ mol $g^{-1}$ $min^{-1}$) as compared with dry seed. Increasing seedling growth and enzymes activity may be refer to ascorbic acid effects on seed aging by reducing free radical production and maintenance of antioxidant activities (Basra *et al.*, 2003). Also, improved the quality of aged seed by increasing enzyme activity, such as antioxidant enzymes and amylases (Ansari *et al.,* 2013).The present results were similar to those previously reported by (Rehab Behairy et al., 2o12) they illustrated that seeds soaked in ascorbic acid at 100 mg/L-1 had increased shoot length, root length, catalase activity and ascorbate oxidase activity as compared with seeds not treated with ascorbic acid.

Data in Table 5 show that the combination of magnetic field and seed priming treatmentshad significant effects on the studied traits i.e. normal seedling %, ungerminated seed, germination rate and field emergence while, abnormal seedlings was insignificantly affected. The lowest means of ungerminated seed (7 and 13%) were recorded from combination treatment(60 mT+150ppm) meanwhile, the highest means of germination %(normal seedling) under optimum conditions (89 and 82%),germination percentage under field conditions (85 and 77%) and germination rate (0.744 and 0.683 %) were recorded from treating soybean seed with (60mT+150ppm ascorbic acid) and (90mT+150ppm ascorbic acid) treatments for new and old seeds, respectively. According to the International Seed testing Association (ISTA), the minimum germination percentage of certified soybean seed should not be less than 75%. Old seeds of (dry seed, priming in water, (30mT+50ppm) ascorbic acid and (30mT+100ppm) ascorbic acid) treatments did not met the minimum seed certification standards while, treated seeds by the other treatments reached above seed certification standards. The best treatment for old seed was (90mT+150ppm) ascorbic acid which gave the highest percentage of germination (82% and 77%) under laboratory and field conditions, respectively. The increase in seed quality by increasing seed germination gradually might be due to the biochemical changes or altered enzyme activity by exposure of seeds to stationary magneticfields Florez*et al.* (2007). Also seed priming leads to regeneration of the nucleic acid production process, increases protein synthesis, repairs mitochondria and activates the mechanism of antioxidants (McDonald, 1999).

**Table 4. Effect of seed priming in ascorbic acid on seedling growth traits, ascorbate enzyme activity and catalase enzyme activity of soybean seed lots (new and old).**

| Seed priming in ascorbic acid | Seedling growth traits | | | | | | Ascorbate peroxidase activity (µ mol g $^{-1}$ min $^{-1}$) | | Catalase enzyme activity (µ mol g $^{-1}$ min $^{-1}$) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Shoot length (cm) | | Root length (cm) | | Seedling dry weight (gm) | | | | | |
| | New | Old | New | Old | New | Old | New | Old | New | Old |
| Dry seed | 8.2 | 7.5 | 5.9 | 3.1 | 0.943 | 0.789 | 21.00 | 20.67 | 11.20 | 11.43 |
| Water | 9.3 | 7.8 | 6.3 | 3.4 | 0.950 | 0.796 | 21.70 | 23.80 | 11.80 | 11.43 |
| 50 ppm | 12.0 | 10.1 | 7.2 | 4.6 | 1.184 | 1.119 | 22.13 | 24.83 | 12.67 | 12.40 |
| 100 ppm | 12.3 | 11.0 | 7.7 | 5.0 | 1.265 | 1.212 | 23.17 | 25.77 | 13.47 | 12.40 |
| 150 ppm | 13.0 | 12.0 | 8.1 | 5.5 | 1.316 | 1.276 | 23.97 | 25.90 | 13.97 | 12.50 |
| LSD at 5% | 0.4 | | N.S | | 0.050 | | 0.45 | | 0.50 | |

**Table 5. Effect ofcombination between magnetic field and seed priming ( magnetic- priming) on germination test traits, germinationrate and field emergence of soybean seed lots (new and old).**

| Magnetic- priming treatment | Germination test traits (%) | | | | | | Germination rate | | Field emergence % | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Normal seedlings % | | Abnormal seedlings % | | Ingeminated seed % | | | | | |
| | New | Old | New | Old | New | Old | New | Old | New | Old |
| Dry seed | 77 | 58 | 11 | 16 | 12 | 26 | 0.516 | 0.409 | 66 | 47 |
| Water | 79 | 60 | 11 | 15 | 10 | 25 | 0.527 | 0.420 | 70 | 51 |
| 30mT+50ppm(ASA) | 83 | 70 | 9 | 12 | 8 | 18 | 0.566 | 0.484 | 75 | 61 |
| 30mT+100ppm (ASA) | 84 | 72 | 8 | 12 | 8 | 16 | 0.584 | 0.504 | 76 | 63 |
| 30mT+150ppm (ASA) | 84 | 75 | 8 | 10 | 8 | 15 | 0.589 | 0.523 | 77 | 67 |
| 60mT+50 ppm (ASA) | 83 | 75 | 6 | 10 | 11 | 15 | 0.653 | 0.504 | 77 | 67 |
| 60mT+100ppm (ASA) | 86 | 77 | 5 | 9 | 9 | 14 | 0.668 | 0.521 | 81 | 70 |
| 60mT+150ppm (ASA) | 89 | 80 | 4 | 7 | 7 | 13 | 0.744 | 0.582 | 85 | 76 |
| 90mT+50 ppm (ASA) | 83 | 77 | 6 | 9 | 11 | 14 | 0.670 | 0.533 | 77 | 70 |
| 90mT+100ppm (ASA) | 84 | 80 | 5 | 7 | 11 | 13 | 0.674 | 0.573 | 79 | 75 |
| 90mT+150ppm (ASA) | 87 | 82 | 3 | 5 | 10 | 13 | 0.682 | 0.683 | 83 | 77 |
| L S D at 5% | 3.54 | | N.S | | 2.46 | | 0.010 | | 3 | |

Data in Table 6 show that the effect ofmagnetic-priming treatments on the studied traits. Significant effects were noticed on shoot length, ascorbate peroxidase enzyme activity and catalase enzyme activity. Shoot length reached its highest means (17.6 and 16.9 cm) with new and old seeds, respectively for treatments (60mT+150ppm ascorbic acid) and (90mT+150ppm ascorbic acid). The same trend was obtained for ascorbate peroxidase and catalase enzyme activities. Magnetic field treatment influences gene expression in plant cells and can alter the electromagnetic properties of biological molecules and membrane which might be a reason for enhancing the plant growth (Galland and Pazur, 2005). On the other hand, priming of old seed reduces the level of lipid peroxidation (Parmoon,et al. 2015), these leading to the increase in seed quality.

**Table 6. Effect of combination between magnetic field and seed priming (magnetic- priming)on seedling growth traits, peroxidase enzyme activity and catalase enzyme activity of soybean seed lots (new and old).**

| Magnetic- priming treatments | Seedling growth traits | | | | | | Ascorbateperoxidase activity (µ mol g $^{-1}$ min $^{-1}$) | | Catalase enzyme activity (µ mol g $^{-1}$ min $^{-1}$) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Shoot length (cm) | | Root length (cm) | | Seedling dry weight (gm) | | | | | |
| | New | Old | New | Old | New | Old | New | Old | New | Old |
| Dry seed | 8.2 | 7.5 | 4.3 | 3.1 | 0.940 | 0.789 | 21.0 | 20.7 | 14.6 | 11.4 |
| Water | 9.3 | 7.8 | 4.5 | 3.4 | 0.940 | 0.796 | 21.7 | 23.8 | 15.1 | 11.4 |
| 30mT+50ppmASA | 13.1 | 12.2 | 8.9 | 5.6 | 1.285 | 1.261 | 21.2 | 23.2 | 11.9 | 13.0 |
| 30mT+100ppmASA | 13.6 | 13.3 | 9.3 | 6.9 | 1.354 | 1.286 | 21.4 | 24.8 | 11.9 | 15.0 |
| 30mT+150 ppm ASA | 14.5 | 14.4 | 10.4 | 8.4 | 1.462 | 1.348 | 22.0 | 26.3 | 11.9 | 17.0 |
| 60mT+30 ppm ASA | 14.5 | 13.5 | 9.5 | 6.3 | 1.376 | 1.353 | 21.7 | 24.1 | 12.3 | 15.8 |
| 60mT+100 ppm ASA | 15.2 | 13.9 | 10.0 | 8.5 | 1.522 | 1.467 | 22.0 | 25.2 | 12.5 | 17.4 |
| 60mT+150 ppm ASA | 17.6 | 16.9 | 12.4 | 11.3 | 1.615 | 1.521 | 22.2 | 26.1 | 12.9 | 19.1 |
| 90mT+50 ppm ASA | 13.1 | 13.0 | 9.4 | 6.7 | 1.384 | 1.330 | 21.6 | 27.1 | 12.2 | 16.1 |
| 90mT+100 ppm ASA | 15.0 | 14.2 | 9.8 | 7.8 | 1.474 | 1.357 | 21.7 | 29.1 | 12.4 | 19.2 |
| 90mT+150 ppm ASA | 16.8 | 16.7 | 11.8 | 10.8 | 1.540 | 1.542 | 23.8 | 31.9 | 12.5 | 20.5 |
| L S D at 5% | 0.53 | | N.S | | N.S | | 0.31 | | 2.90 | |

## CONCLUSION

The magnetic field,priming in ascorbic acid treatments and magnetic-priming treatments considered major factors for enhance seed viability and seedling vigor. Exposed new and old soybean seeds lot to 90mT and priming at 150ppm ascorbic acid recordedthe highest values of germination percentage, germination rate, field emergence, seedling growth parameters and ascorbateperoxidase and catalase enzyme activities.While, abnormal seedling andungerminated seed werelisted little values. Accordingly, the results of this study suggested using magnetic- priming treatments (60mT+150ppm ascorbic acid) and (90mT+150ppm ascorbic acid) for new and old seed of soybean, respectively to get the germination percentage (89 and 82%) and (85 and 77%) under laboratory and field conditions, respectively above minimumstandard of certified soybean seed (75%) and high seed quality.

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## معاملات التقاوي لتحسين الانبثاق الحقلي لفول الصويا

**عبيرالورد أحمد إبراهيم**
**قسم بحوث تكنولوجيا البذور – معهد بحوث المحاصيل الحقلية – مركز البحوث الزراعية.**

أجريت هذه الدراسة بمعامل وحدة بحوث تكنولوجيا البذوربالمنصورة-قسم بحوث تكنولوجيا البذور بمعهد المحاصيل الحقلية ومحطة البحوث الزراعية بتاج العز التابعة – مركز البحوث الزراعية موسمي ٢٠١٤و ٢٠١٥م. بهدف دراسة إمكانية تحسين الإنبات تحت ظروف المعمل والإنبات تحت ظروف الحقل للوطين مختلفين في الحيوية ( حديث – قديم) لتقاوي فول الصويا صنف (جيزة ١١١) وذلك من خلال بعض طرق معاملات التقاوي مثل التعريض للمجال المغناطيسي (٠، ٣٠، ٦٠ و٩٠ مللي تسلا)، (Seed Priming) وتهيئة البذور باستخدام حامض الأسكوربك بتركيز(٠، ٥٠، ١٠٠ و١٥٠ جزء في المليون) وMagnetic-priming. وأوضحت النتائج أن تعريض التقاوي لمجال مغناطيسى حتى ٩٠ مللى تسلا إلى زيادة قوة البذور (نسبة البادرات الطبيعية ومعدل الإنبات) والتكشف الحقلي، قوة البادرات (طول الريشة والجذير والوزن الجاف للبادرات) وزيادة نشاط أنزيمى أسكوربيت أوكسيديز والكتاليز ونقص النسبة المئوية للبادرات الشاذة، البذور الغير منبتة.وأظهرت النتائج أن تهيئة البذور باستخدام حامض الأسكوبيك أدت إلى زيادة معنوية لكل الصفات تحت الدراسة ، ماعدا النسبة المئوية للبادرات الشاذة وطول الجذير.وقد سجلت معاملة (Seed priming) فى ١٥٠جزئ في المليون من حمض الأسكوبيك أعلى القيم لكل الصفات المدروسة(النسبة المئوية للإنبات تحت ظروف المعمل والحقل، طول الريشة ونشاط إنزيم الكتاليز ، والانبثاق الحقلي ) مقارنة بالبذور الجافة (الغير معاملة).أدي معاملة البذور بطريقة Magnetic-priming إلي تأثير معنوي على معظم الصفات المدروسة، وقد لوحظ تأثير جميع المعاملات خاصة على البذور القديمة.وقد سجلت المعاملةبالـ magnetic priming(التعرض لمجال مغناطيسي ٦٠ ملي تسلا ، وتهيئة البذور في حمض الاسكوربيك تركيز ١٥٠ جزئ في المليون) و(التعرض لمجال مغناطيسي ٩٠ ملي تسلا ، وتهيئة البذور في حمض الاسكوربيك تركيز ١٥٠ جزئ في المليون) أعلى المتوسطات للانبات المعملي والانبثاق الحقلي لتقاوي فول الصويا.وتقترح الدراسة بأنه يمكن تحسين جودة التقاوي والانبثاق الحقلي لبذور فول الصويا صنف (جيزة ١١١) القديمة (تخزين لمدة عام ) والحصول على نسبة إنبات تحت ظروف المعمل والحقل أعلى من مستوى قبول التقاوي المعتمدة (٧٥%) وذلك بمعاملة التقاوي بطريقة بالـ Magnetic- priming (التعرض لمجال مغناطيسي ٩٠ ملي تسلا، وتهيئة البذور في حمض الاسكوربيك تركيز ١٥٠ جزئ في المليون).