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# PRODUCTIVITY AND SEED QUALITY OF SOME SOYBEAN CULTIVARS AS AFFECTED BY SOME SEED TREATMENTS

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## ABSTRACT

A field trial and a laboratory experiment were conducted during 2011 and 2012 seasons at the Experimental Station Farm, Faculty of Agriculture, Mansoura University and Seed Technology Research Unit at Mansoura, Dakahlia Governorate, Seed Technology Research Department, Field Crops Research Institute, Agricultural Research Center. The main objective of this research was to study the performance of some soybean cultivars as affected by seed treatments and their effect on seed yield and its attributes as well as quality characteristics. Field experiments were laid out in a split- plot design with four replications. The main plots were occupied with three soybean cultivars *i.e.* Giza 21, Giza 35 and Giza 111. The sub-plots were assigned to eight seed treatments as follows; 1) Without seed treatment. 2) Treated seed with ascorbic acid. 3) Treated seed with fungicide Vetavax. 4) Treated seed with yeast extract. 5). Treated seed with ascorbic acid beside fungicide Vetavax. 6) Treated seed with ascorbic acid beside yeast extract. 7) Treated seed with fungicide vetavax beside yeast extract. 8) Treated seed with ascorbic acid beside fungicide vetavax and yeast extract. Laboratory experiments were conducted in factorial completely randomized design with four replications.

Results showed that Giza 21 cultivar surpassed other studied cultivars in all studied characters, followed by Giza 35 then Giza 111 in both seasons. Treated soybean seeds before planting with the combination treatment of Ascorbic + Vetavax + Yeast surpassed other studied seed treatments and resulted in the highest means of all studied characters in both seasons. This treatment followed by treating seeds with Ascorbic + Yeast treatment, then Ascorbic, Ascorbic + Vetavax, Vetavax + Yeast, Yeast and lastly Vetavax treatment in both seasons. On the contrary, the lowest means of all studied characters were produced from control treatment (without seed treatment) in both seasons. According to the obtained results from this study, it can be concluded that, treated seeds of soybean cultivar Giza 21 with the combination treatment of ascorbic acid beside fungicide Vetavax and yeast extract could be recommend to raise soybean productivity and seed quality under the environmental conditions of Dakahlia Governorate.

**Keywords:** Soybean, cultivars, varieties, seed treatments, Ascorbic acid, Vetavax, Yeast extract, seed yield, seed quality.

## INTRODUCTION

Soybean [*Glycine max* (L.) Merr.] is an important source of edible vegetable oil and protein for both humans and animals. Soybean has a composition of protein content of over 40%, edible vegetable oil content of 20%, carbohydrates content of 30%, a total sugar content of 10% and an ash content of 5% (IITA, 1993). In Egypt, soybean is considered one of the relatively new crops introduced into Egyptian agriculture, which contributes to reducing the shortage in oil production and to reduce the gap for the protein and oil. So, all efforts are being exerted to improve and increase its seed yield and quality, among these planting the promising cultivars and seed treatments.

There are wide variations among soybean cultivars in seed yield, yield components and seed quality. Thus, choosing the best soybean cultivar is one of the most critical components of soybean production. In this respect, Mehasen and Saeed (2005) reported that soybean Giza 22 cultivar recorded significantly higher values for pods and seeds weight/plant, 100-seed weight and seed yield/fed compared with Giza 111 cultivar. Lam and Fernandez (2007) found that the Nam-Vang cultivar had smaller seeds, higher seed yield, better seed quality (germination and vigor at harvest and storability) than OMDN111 cultivar. El-Borai *et al.* (2008) studied performance of twelve soybean genotypes. Toano cultivar recorded the highest values of seed germination percentage followed by Giza 111, while Giza 35 was the lowest followed by Giza 83. El-Harty *et al.* (2010) investigated the performance of 11 soybean genotype, *i.e.* Giza22, Giza 83, Giza111, Osaka, H30, H117, H127, H129, H132, H15l5 and Clark. Soybean genotypes showed high differences in seed yield/fed, which Giza 111, Giza 22 and H15l5 gave higher yield and surpassed all other genotypes. Shairef *et al.* (2010) reported that Giza 21 produced the highest number of branches, number of pods/plant, number of seeds/pod, number of seeds/plant, seeds weight/plant, 100-seed weight and seed yield (t/fed). Mostafa, Azhar (2011) showed that Giza 21 cultivar had highest values of number of pods and seeds yield/plant and higher seed yield/fed, than Giza 22 cultivar. While, Giza 22 cultivar gave maximum values of number of branches/plant than Giza 21 cultivar. El-Abady *et al.* (2012) showed that significant differences among studied soybean cultivars in number of branches/plant, number of pods/plant, number of seeds/pod, number of seeds/plant, 100-seed weight, seed yield per plant and feddan as well as, germination percentage, mean germination time, seedling length and seedling dry weight. Giza 21 surpass Giza 35 and Giza 111 cultivars in seed yield and its attributes. Kandil *et al.* (2012) stated that Giza 21 cultivar significantly superior other studied varieties (H30, H32, H2L12, Giza 22 and Giza 111) in seed yield and its components in both seasons. Seadh and Abido (2013) indicated that studied soybean cultivars *i.e.* Giza 21, Giza 22, Giza 111 and Crawford significantly differed in number of branches/plant, number of pods/plant, pod length, number of seeds per pod and plant, 100-seed weight, seed yield per plant and feddan. Giza 22 cultivar significantly surpassed other studied cultivars in most studied traits. Giza 21 cultivar came in the second rank after Giza 22 cultivar followed by Giza 111 then later Crawford cultivar with regard all studied characters.

Seed treatment with insecticides control insects both above and below ground including those that vector bacterial and viral diseases. Muthuraj *et al.* (2002) noticed that soybean seeds treated with thiram (2 g/kg seeds) improved germination (80.75%) and field emergence (70.52%) as compared to control (79.10 and 58.63%, respectively). Gupta and Aneja (2004) found that soybean seeds treated with thiram at 2.5 g/kg seeds significantly maintained higher germination (46.30%) as compared to control (36.90 %) after 15 months of storage. Krohn and Malavasi (2004) studied the effect of fungicide treatment on the quality of soybean cultivar BR-16 evaluated monthly from May to December. In December, these seeds were compared with seeds treated by fungicide but not stored, they found that the standard germination test indicated that the fungicides did not reduce seed quality, but the germination percentage of treated and untreated seeds was lower than 75%. Bradley (2008) evaluated effect of fungicide fludioxonil + mefenoxam, Warden RTA, azoxystrobin + metalaxyl and SoyGard on seed yield of soybean. He found that seed treated with fludioxonil + mefenoxam gave 2.115 tons seed/ha and azoxystrobin + metalaxyl gave 2.015 tons seed/ha as compared with 1.935 tons seed /ha for untreated seed. Thawale *et al.* (2010) studied soaking seeds of soybean in vitavax. They found that seed treated with vitavax recorded maximum germination, speed of germination, seedling length, seeding dry weight, vigour index and lower electrical conductivity. They demonstrated the effect of soaking seed seems to be beneficial for enhancing the seed quality parameter in soybean.

Seed treatments with antioxidant such as ascorbic acid can promotes germination and improves germination characters as well as induces changes in the plant that improve stress tolerance. Sheteawi, Soad (2007) studied effect of ascobin (ascorbic + citric acids, 2:1) on growth and yield of soybean. She found that Ascobin increased chlorophyll a, chlorophyll b, carotenoids, leaf srea/plant, plant height and seed yield per plant and unit area as compared with control (untreated seeds). Yousof *et al.* (2010) studied the influence of soaking rice seed in ascorbic acid solution at 100 ppm. They found that soaking seed in ascorbic or salicylic acid solutions improved seed germination, seed vigor and seedlings vigor as comparing with soaking in distilled water. Singh *et al.* (2011) studied the influence of pre-soaking seeds of wheat in ascorbic acid and gibberellins. They found that pre-soaking seeds in 50 ppm ascorbic acid caused increment in seedlings and vigour characters. Guo *et al.* (2012) stated that the improved role of ascorbic acid was ascribed to enhancing water absorption capacity, soluble solid content and granule swelling capacity of the aged rice, therefore increased field emergence and germination percentage. Malik and Ashraf (2012) indicated that treated seedlings with ascorbic acid maintained higher chlorophyll contents, net photosynthesis and increased growth characters such as leaf area per plant and plant height as compared to the non-treated plants. Sakr *et al.* (2013) studied the influence of ascorbic acid on soybean. They found that applied ascorbic acid at the rate of 250 mg/L recorded the highest values of growth characters and seed yield of soybean.

Yeast extract is water soluble portion of autolyzed yeast with intact B-complex vitamins. Yeast extract is a mixture of amino acids, peptides, water soluble vitamins and carbohydrates and can be used as natural source of cytokinins and has stimulatory effects on seed quality and yields. Al-Tawaha (2011) studied the effect of yeast extract application on soybean seed yield. He found that application yeast at rate 2 mg/ml produced 10.2 g seed/plant as compared with control treatment which gave 8.2 g seed/plant. Abdo, Fatma *et al.* (2012) studied the influence of extract yeast on growth and yield of soybean. They demonstrated that yeast extract recorded significant increment in total leaf area/plant, plant height, number of branches/plant, number of fruiting groups/plant, number of pods/plant, number of seeds per pod and plant, pods weight/plant, 100-seed weight and seed yield per plant and feddan as well as oil and protein percentages. Abou El-Yazied and Mady (2012) studied the effect of yeast extract application on growth, pod setting and both green pod and seed yield of broad bean. They found that yeast extract treatments not only increased auxins and cytokinins but also decreased abscisic acid at 75 days after sowing during second season. Yeast extract increased number of formed flowers, setted pods per plant, green pod and dry seed yields, as well as satisfactory effect upon shedding percentage. Al-Tawaha and Ababneh (2012) indicated that the greatest seed yield of soybean was observed following the foliar application of yeast extract 2 mg/ml at $R_3$ stage, which represented a 25 % increase as compared to an untreated control. Sakr *et al.* (2013) found that applied yeast extract at the rate of 1000 mg/l resulted in enhancement of leaf area per plant, plant height as well as seed yield of soybean.

Therefore, this investigation was established to determine the effect of seed treatments on some soybean cultivars yield and its attributes as well as seed quality characteristics under the environmental conditions of Mansoura district, Dakahlia Governorate.

## MATERIALS AND METHODS

**I- Field studies:**

Two field experiments were conducted at the Experimental Station, Faculty of Agriculture, Mansoura University, Egypt during the two successive summer growing seasons of 2011and 2012. The main objectives of this study were aimed to study the performance of some soybean cultivars as affected by seed treatments and their interaction on seed yield and its attributes as well as quality characteristics.

The experiment was carried out in split- plot design with four replications. The main plots were occupied with three soybean cultivars *i.e.* Giza 21, Giza 35 and Giza 111 and their pedigree are shown in Table 1.

**Table 1: Pedigree, maturity group and days to maturity of studied soybean cultivars.**

| Cultivars | Pedigree | Maturity group | Days to maturity (days) |
|---|---|---|---|
| Giza 21 | Crawford × Celest | IV | 120-125 |
| Giza 35 | Crowford × Mpresto | IV | 120-125 |
| Giza 111 | Crawford × Celest | IV | 120-125 |

The sub-plots were assigned to eight seed treatments as follows:

1. Without seed treatment (control).
2. Treated seed with ascorbic acid (Ascorbic).
3. Treated seed with fungicide vetavax (Vetavax).
4. Treated seed with yeast extract (Yeast).

5. Treated seed with ascorbic acid beside fungicide vetavax (Ascorbic + Vetavax).
6. Treated seed with ascorbic acid beside yeast extract (Ascorbic + Yeast).
7. Treated seed with fungicide vetavax beside yeast extract (Vetavax + Yeast).
8. Treated seed with ascorbic acid beside fungicide vetavax and yeast extract (Ascorbic + Vetavax + Yeast).

Seeds were soaked for 2 hours in ascorbic acid at the rate of 100 ppm as antioxidants. The ratio of seed weight to solution volume was 1 : 5 (g/ml). Soybean seed was treated with fungicide vetavax at the rate of 3 g per 1 kg seeds for 2 minutes. The ratio of seed weight to yeast extract solution volume was 1 : 5 (g/ml) and soaking for 2 hours.

Each experimental basic unit (sub – plot) included five ridges, each of 60 cm width and 3.5 m long, resulted an area of 10.5 m2 (1/400 fed). The preceding summer crop was wheat (*Triticum aestivum* L.) in both seasons.

Soil samples were taken at random from the experimental field area at a depth of 15 and 30 cm from soil surface before seed bed preparation during the growing seasons to measure the physical and chemical soil properties as shown in Table 2

**Table 2: The mechanical and chemical analysis of the experimental soil in both seasons.**

| | Sand % | Silt % | Clay % | Texture | O.M.% | $CaCO_3$ % | Available, ppm | | | E.C $dS.m^{-1}$ | pH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | N | P | K | | |
| **2011** | 22.7 | 30.3 | 47.0 | Clayey | 2.90 | 2.60 | 22 | 7 | 145 | 1.65 | 7.88 |
| **2012** | 23.7 | 27.3 | 49.0 | Clayey | 2.87 | 2.70 | 31 | 9.32 | 175 | 1.71 | 7.50 |

The experimental field was well prepared through two ploughing, leveling, compaction, ridging and then divided into the experimental units (10.5 $m^2$). Calcium superphosphate (15.5 % $P_2O_5$) was applied during soil preparation at the rate of 150 kg/fed.

Soybean seeds were soaked in previously seed treatments for 2 hours before planting then thoroughly mixed with nodulating bacteria (*Bradyrhizobium japonicum*) and directly sown in hills, 20 cm apart on both sides of ridges, 60 cm width, which expressed 140000 plants/fed on May 8$^{th}$ and 5$^{th}$ in the first and second seasons, respectively. After full germination plant density was adjusted by thinning the over plants at 21 days from planting leaving healthy two plants/hill. Hand hoeing was achieved every 21 days to control weeds (before time of irrigations). Nitrogen and potassium fertilizers were applied in the forms of urea (46.0 % N) and potassium sulphate (48 % $K_2O$) at the rate of 60 kg N/fed and 48 kg $K_2O$/fed in two equal doses (after thinning and three weeks later). The normal cultural practices for growing soybean crop were followed.

At harvest time, ten guarded plants were taken from each sub-plot to estimate the following characters; number of branches/plant, number of fruiting groups/plant, number of pods/plant, number of seeds/pod, number of seeds/plant, pods weight/plant (g), 100 – seed weight (g). Seed yield (g/plant) was estimated by weighted all clean seeds per plant as average of ten plants. Whole plants in each sub-plot were harvested and left to dry on air, then they were threshed and the seeds (which were at 13 % moisture) were weighted (kg), then converted to ton per feddan.

All obtained data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the split – plot design as published by Gomez and Gomez (1984) by using means of "MSTAT-C" computer software package. New Least Significant of Difference (NLSD) method was used to test the differences between treatment means at 5 % level of probability as described by Snedecor and Cochran (1980).

**II- Laboratory studies:**

A laboratory experiment was carried out under the laboratory conditions of Seed Technology Research Unit at Mansoura, Dakahlia Governorate, Seed Technology Research Department, Field Crops Research Institute, Agricultural Research Center during 2011and 2012seasons. The purpose of this investigation was to assess seed quality resulted from the field experiments.

Random sample of 400 seeds per each treatment were sown on top filter paper in sterilized Petri-dishes (14-cm diameter). Each Petri-dish contained 25 seeds, and four Petri-dishes kept close together and incubated at 25° C and 100 % relative humidity, then four replications were used to evaluate every seed test done on each treatment as the rules of International Seed Testing Association (ISTA, 1985).

1- Germination percentage: it was expressed by the percentage of seed germinating normally after 8 days as the following:

2-

$$\text{Germination percentage} = \frac{\text{Number of normal seedlings}}{\text{Number of seeds}} \times 100$$

2- Speed of germination: The four replications of germination test were used to evaluate speed of germination according to Agrawal (1986).

3- Seedling length (cm): it was determined from 10 normal seedlings taken by random per each replicate at the end of standard germination test.

4- Seedling dry weight (g): Averages 10 normal seedlings at random per replicate, were dried in a forced air oven at 105 C° for 24 hours and weights thereafter, dry weight recorded and expressed as grams.

Collected data were subjected to the statistical analysis according to the technique of analysis of variance (ANOVA) for the factorial completely randomized design as published by Gomez and Gomez (1984).

## RESULTS AND DISCUSSION

**1. Cultivars performance:**

Significant differences among the three studied cultivars *i.e.* Giza 21, Giza 35 and Giza 111 of soybean were detected in number of branches/plant, number of fruiting groups/plant, number of pods/plant, number of seeds/plant, pods weight/plant, 100 – seed weight, seed yield/plant and seed yield/fed in both seasons (Tables 3 and 4). Giza 21 cultivar significantly surpassed other studied cultivars (Giza 35 and Giza 111) in all studied characters, which recorded the highest values of these characters in the two growing seasons. This cultivar was followed by Giza 35 with concern all studied characters in both seasons without significant differences in some traits. While, Giza 111 cultivar recorded the lowest values of all studied characters in the first and second seasons of this study. The former results might be related to genetic factors make up by the used cultivars. Similar results were obtained by Shairef *et al.* (2010), Mostafa, Azhar (2011), El-Abady *et al.* (2012), Kandil *et al.* (2012) and Seadh and Abido (2013).

The results exhibit significant differences among three studied cultivars in seed quality characters *i.e.* germination percentages, speed of germination, seedlings length and seedling dry weight in both seasons (Table 5). Giza 21 cultivar significantly surpassed other cultivars and produced the highest values of these characters in both seasons. However, Giza 35 cultivar recorded the intermediate values of these characters in the two growing seasons. While, Giza 111 cultivar resulted in the lowest values of all studied quality characters in both seasons. The former results might be related to genetic factors which resulted from genetic makeup relations for the varieties. These results are in good agreement with those stated by El-Borai *et al.* (2008), El-Abady *et al.* (2012) and Kondetti *et al.* (2012).

**Table 3: Means of number of branches, fruiting groups and pods per plant, number of seeds per pod and plant as affected by seed treatments of some soybean cultivars and their interaction during 2011 and 2012 seasons.**

| Characters Seasons Treatments | Number of branches/ plant | | Number of fruiting groups /plant | | Number of pods/ plant | | Number of seeds/ pod | | Number of seeds/ plant | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 |
| **A- Cultivars:** | | | | | | | | | | |
| Giza 21 | 3.13 | 3.59 | 25.21 | 25.52 | 78.68 | 80.15 | 2.70 | 2.80 | 134.8 | 137.0 |
| Giza 35 | 2.94 | 2.94 | 25.14 | 25.35 | 72.27 | 73.23 | 2.51 | 2.71 | 130.1 | 157.6 |
| Giza 111 | 2.79 | 2.73 | 23.15 | 24.67 | 70.25 | 70.45 | 2.44 | 2.63 | 128.8 | 132.7 |
| F. test | * | * | * | * | * | * | NS | NS | * | * |
| NLSD at 5 % | 0.19 | 0.26 | 0.49 | 0.38 | 1.57 | 1.58 | - | - | 2.3 | 2.4 |
| **B- Seed treatments:** | | | | | | | | | | |
| Without (control) | 1.83 | 1.66 | 18.73 | 19.99 | 53.24 | 52.74 | 1.77 | 1.81 | 85.4 | 87.6 |
| Ascorbic | 3.64 | 3.53 | 26.99 | 27.14 | 84.54 | 84.62 | 2.99 | 3.21 | 137.1 | 148.2 |
| Vetavax | 1.81 | 1.88 | 21.17 | 21.58 | 61.07 | 60.27 | 1.95 | 1.95 | 124.9 | 136.6 |
| Yeast | 3.25 | 3.14 | 26.19 | 26.47 | 79.64 | 79.32 | 2.95 | 3.07 | 133.5 | 139.2 |
| Ascorbic + Vetavax | 2.58 | 2.69 | 25.44 | 24.86 | 71.45 | 73.22 | 2.47 | 2.73 | 137.1 | 142.1 |
| Ascorbic + Yeast | 3.75 | 3.59 | 27.20 | 28.34 | 87.01 | 88.89 | 3.03 | 3.35 | 144.5 | 151.4 |
| Vetavax + Yeast | 2.99 | 2.29 | 22.98 | 24.10 | 61.57 | 64.32 | 2.10 | 2.21 | 138.7 | 141.0 |
| Ascorbic + Vetavax + Yeast | 3.77 | 3.90 | 27.29 | 28.96 | 91.35 | 93.52 | 3.12 | 3.37 | 148.7 | 193.3 |
| F. test | * | * | * | * | * | * | * | * | * | * |
| NLSD at 5 % | 0.56 | 0.67 | 1.84 | 1.17 | 3.48 | 3.52 | 0.36 | 0.45 | 2.3 | 2.4 |
| **C- Interaction:** A × B | NS | NS | NS | NS | * | * | NS | NS | * | NS |

**Table 4: Means of pods weight/plant, 100-seed weight, seed yield per plant and per feddan as affected by seed treatments of some soybean cultivars and their interaction during 2011 and 2012 seasons.**

| Characters Seasons Treatments | Pods weight/plant (g) | | 100-seed weight (g) | | Seed yield (g/plant) | | Seed yield (t/fed) | |
|---|---|---|---|---|---|---|---|---|
| | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 |
| **A- Cultivars:** | | | | | | | | |
| Giza 21 | 56.36 | 56.79 | 17.35 | 17.33 | 23.20 | 21.49 | 1.381 | 1.391 |
| Giza 35 | 54.90 | 56.18 | 17.02 | 16.71 | 20.01 | 20.67 | 1.317 | 1.319 |
| Giza 111 | 53.23 | 55.37 | 16.48 | 16.53 | 19.29 | 20.00 | 1.284 | 1.276 |
| F. test | * | * | * | * | * | * | * | * |
| NLSD at 5 % | 0.80 | 0.84 | 0.24 | 0.32 | 0.82 | 0.90 | 0.030 | 0.036 |
| **B- Seed treatments:** | | | | | | | | |
| Without (control) | 39.55 | 41.29 | 14.81 | 14.77 | 19.61 | 16.15 | 1.131 | 1.102 |
| Ascorbic | 63.92 | 64.74 | 18.15 | 18.27 | 22.25 | 21.88 | 1.358 | 1.359 |
| Vetavax | 42.19 | 44.42 | 15.48 | 14.76 | 17.87 | 18.72 | 1.201 | 1.232 |
| Yeast | 60.31 | 62.43 | 17.59 | 17.72 | 19.37 | 20.44 | 1.317 | 1.316 |
| Ascorbic + Vetavax | 51.17 | 51.54 | 16.72 | 16.01 | 21.31 | 21.50 | 1.348 | 1.351 |
| Ascorbic + Yeast | 65.90 | 64.95 | 18.27 | 18.56 | 22.78 | 23.16 | 1.406 | 1.432 |
| Vetavax + Yeast | 49.56 | 50.81 | 15.67 | 15.78 | 20.50 | 20.25 | 1.342 | 1.320 |
| Ascorbic + Vetavax + Yeast | 66.03 | 68.72 | 18.91 | 18.99 | 22.96 | 23.65 | 1.514 | 1.516 |
| F. test | * | * | * | * | * | * | * | * |
| NLSD at 5 % | 3.44 | 4.04 | 0.45 | 0.69 | 0.72 | 0.68 | 0.021 | 0.029 |
| C- Interaction: A × B | NS | NS | * | NS | NS | NS | * | * |

**2. Effect of seed treatments:**

The obtained results clarified that seed treatments *i.e.* Ascorbic, Vetavax, Yeast, Ascorbic + Vetavax, Ascorbic + Yeast, Vetavax + Yeast and Ascorbic + Vetavax + Yeast as compared with control treatment (without seeds treatment) of sown seeds had a significant effects on number of branches/plant, number of fruiting groups/plant, number of pods/plant, number of seeds/pod, number of seeds/plant, pods weight/plant, 100 – seed weight and seed yield per plant and feddan in both seasons (Tables 3 and 4). Treated soybean seeds before planting with the combination treatment of Ascorbic + Vetavax + Yeast surpassed other studied seed treatments and resulted in the highest means of all studied characters in the first and second seasons. This treatment followed by treating seeds with Ascorbic + Yeast treatment, then Ascorbic, Ascorbic + Vetavax, Vetavax + Yeast, Yeast and Vetavax treatment in both seasons. On the contrary, the lowest means of all studied characters were produced from control treatment (without seed treatment) in the two growing seasons. The increase in seed yield and its attributes because of seed treatment can be easily ascribed to its role in improvement early growth, more dry matter accumulation and stimulation the building of metabolic products, consequently enhancement yield components (number of pods/plant, number of seeds/plant and 100-seed weight) and thus increasing seed yield. These findings are supported by Sheteawi, Soad (2007), Al-Tawaha (2011), Abdo, Fatma *et al.* (2012), Al-Tawaha and Ababneh (2012) and Sakr *et al.* (2013).

The effect of seed treatment on seed quality characters *i.e.* germination percentage, speed of germination, seedlings length and seedling dry weight was significant in both seasons (Table 5). The maximum values of germination percentage, speed of germination, seedlings length and seedling dry weight were resulted from soybean seeds that treated with Ascorbic + Vetavax + Yeast treatment in the first and second seasons. However, treated seeds with Ascorbic + Yeast treatment ranked after former treatment concerning these characters in both seasons without significant differences in some traits. On the other direction, the lowest of these characters were obtained from control treatment (without seed treatment). These findings may be due to the role of ascorbic acid in enhancing water absorption capacity, soluble solid content and granule swelling capacity of seed, therefore increased germination characters (Guo et al., 2012). Confirming this conclusion, Muthuraj *et al.* (2002), Gupta and Aneja (2004), Krohn and Malavasi (2004) and Thawale *et al.* (2010) came to similar results and conclusion.

**Table 5: Means of germination percentage, speed of germination, seedlings length and seedlings dry weight as affected by seed treatments of some soybean cultivars and their interaction during 2011 and 2012 seasons.**

| Characters Seasons Treatments | Germination (%) | | Speed of Germination | | Seedlings length (cm) | | Seedlings dry weight (g) | |
|---|---|---|---|---|---|---|---|---|
| | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 | 2011 | 2012 |
| **A- Cultivars:** | | | | | | | | |
| Giza 21 | 91.94 | 93.13 | 42.28 | 41.85 | 24.09 | 24.28 | 0.528 | 0.504 |
| Giza 35 | 90.74 | 92.91 | 42.06 | 41.31 | 23.02 | 24.16 | 0.476 | 0.448 |
| Giza 111 | 85.05 | 86.66 | 36.62 | 34.78 | 22.90 | 23.45 | 0.446 | 0.431 |
| F. test | * | * | * | * | * | * | * | * |
| LSD at 5 % | 1.05 | 1.14 | 1.92 | 1.15 | 0.68 | 0.44 | 0.039 | 0.024 |
| **B- Seed treatments:** | | | | | | | | |
| Without (control) | 82.96 | 83.40 | 33.80 | 32.28 | 16.81 | 17.03 | 0.324 | 0.287 |
| Ascorbic | 90.49 | 92.39 | 41.87 | 38.81 | 25.78 | 26.89 | 0.523 | 0.476 |
| Vetavax | 87.23 | 89.24 | 38.43 | 38.91 | 21.96 | 21.20 | 0.414 | 0.383 |
| Yeast | 88.49 | 89.50 | 39.13 | 37.07 | 24.65 | 25.40 | 0.486 | 0.495 |
| Ascorbic + Vetavax | 89.76 | 91.33 | 40.96 | 40.63 | 23.23 | 23.34 | 0.494 | 0.454 |
| Ascorbic + Yeast | 92.53 | 94.25 | 42.22 | 43.11 | 25.88 | 27.00 | 0.565 | 0.562 |
| Vetavax + Yeast | 89.08 | 91.38 | 40.94 | 39.40 | 21.56 | 23.80 | 0.457 | 0.461 |
| Ascorbic + Vetavax + Yeast | 93.44 | 95.71 | 45.20 | 44.31 | 26.83 | 27.04 | 0.606 | 0.567 |
| F. test | * | * | * | * | * | * | * | * |
| NLSD at 5 % | 1.44 | 1.14 | 1.24 | 0.79 | 1.00 | 1.15 | 0.045 | 0.035 |
| *C- Interaction:* A × B | * | * | NS | * | NS | NS | NS | NS |

**3. Effect of interaction:**

Our results indicated that there was significant effect as a result of the interaction between cultivars and seed treatment on number of pods/plant, seed yield per feddan, germination percentage in laboratory (in both seasons), number of seeds/plant, 100-seed weight (in the first season) and speed of germination (in the second season). As shown from data graphically illustrated in Figs 1 to 9, the maximum values of these characters were obtained as a result of treated seeds of Giza 21 cultivar with the combination treatment of Ascorbic + Vetavax + Yeast. On the other hand, the lowest values of these characters were resulted from untreated seeds of Giza 111 cultivar.

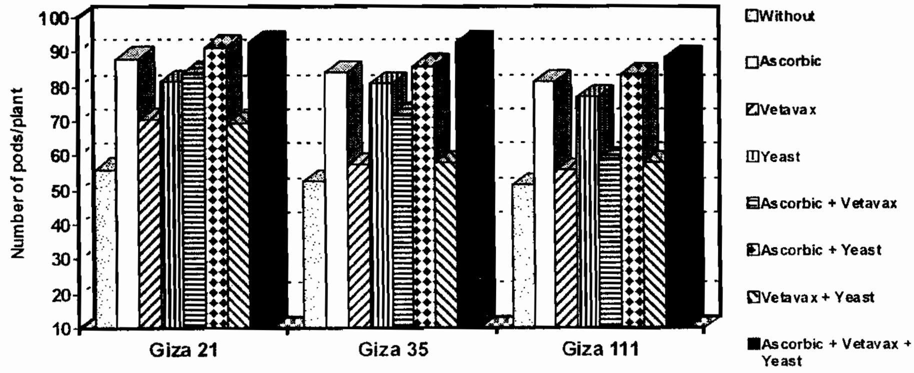


**Fig. 1: Number of pods/plant as affected by the interaction between cultivars and seed treatments during 2011 season.**

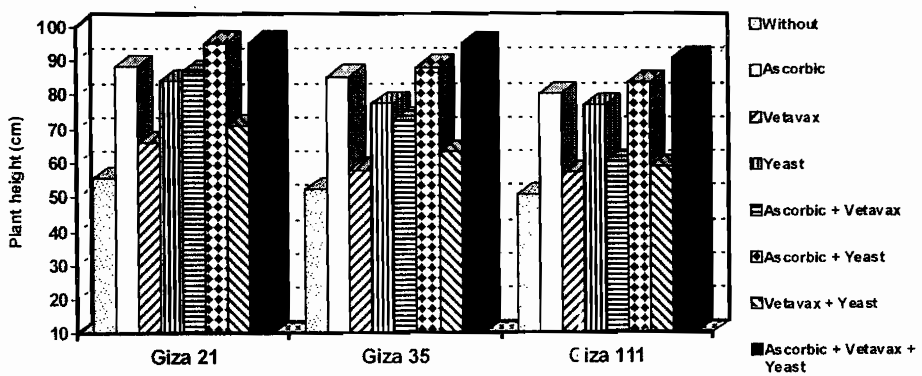


**Fig. 2: Number of pods/plant as affected by the interaction between cultivars and seed treatments during 2012 season.**

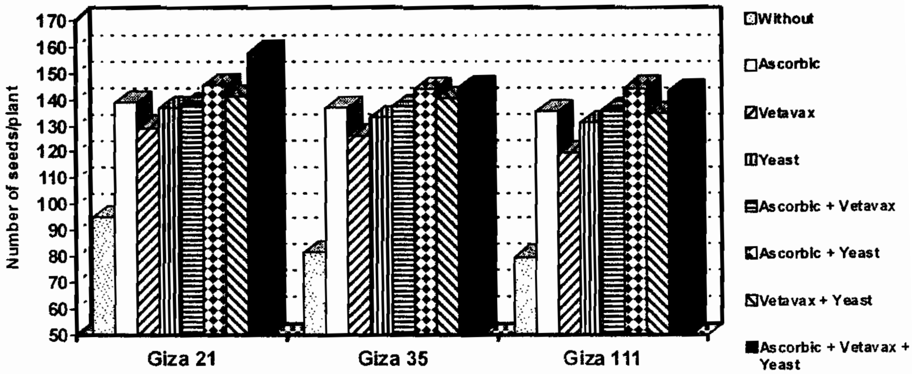


**Fig. 3: Number of seeds/plant as affected by the interaction between cultivars and seed treatments during 2011 season.**

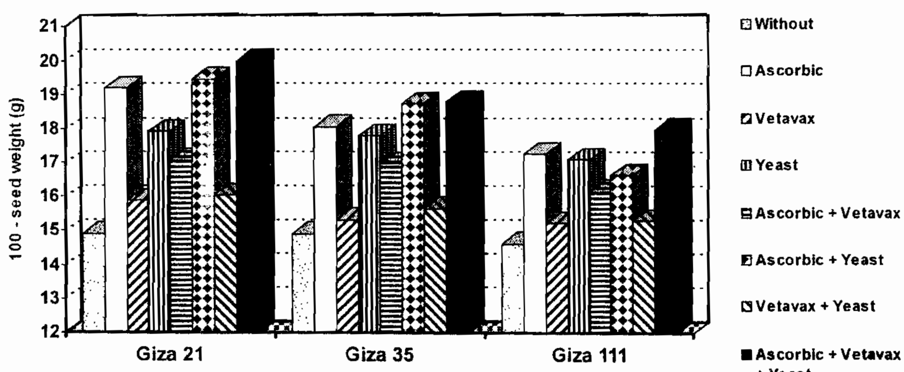


**Fig. 4: 100-seed weight as affected by the interaction between cultivars and seed treatments during 2011 season.**

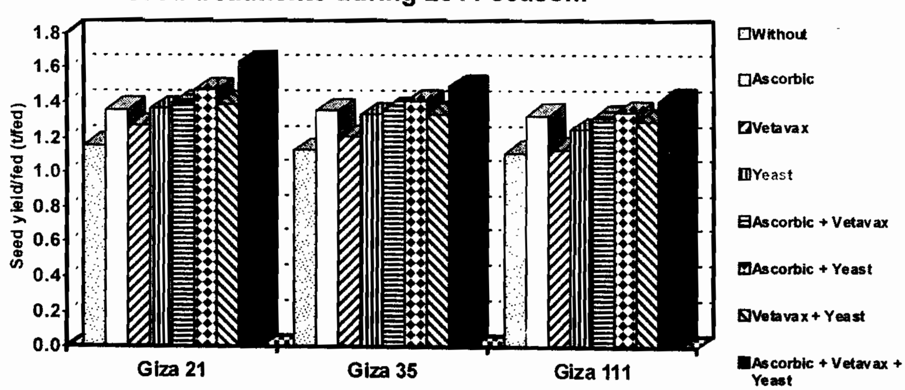


**Fig. 5: Seed yield/fed as affected by the interaction between cultivars and seed treatments during 2011 season.**

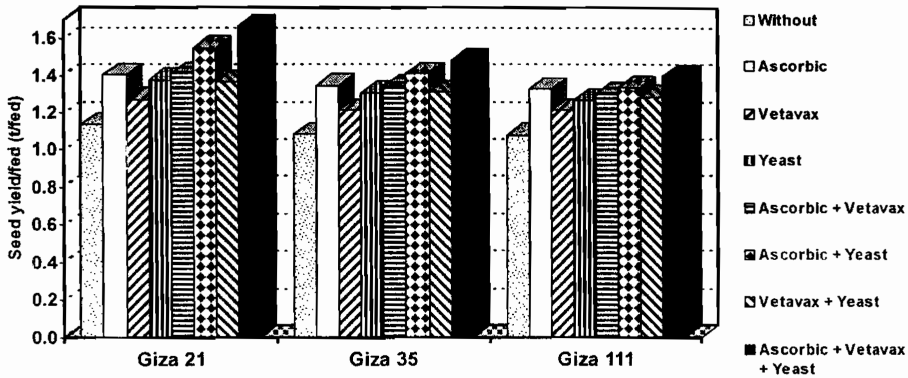


**Fig. 6: Seed yield/fed as affected by the interaction between cultivars and seed treatments during 2012 season.**

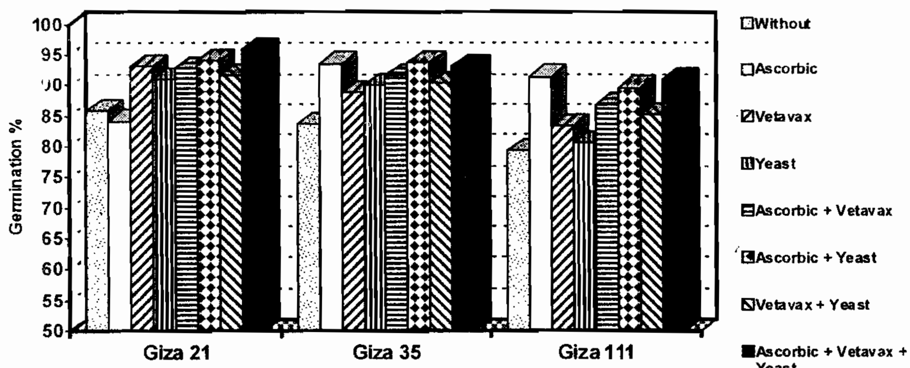


**Fig. 7: Germination percentage as affected by the interaction between cultivars and seed treatments during 2011 season.**

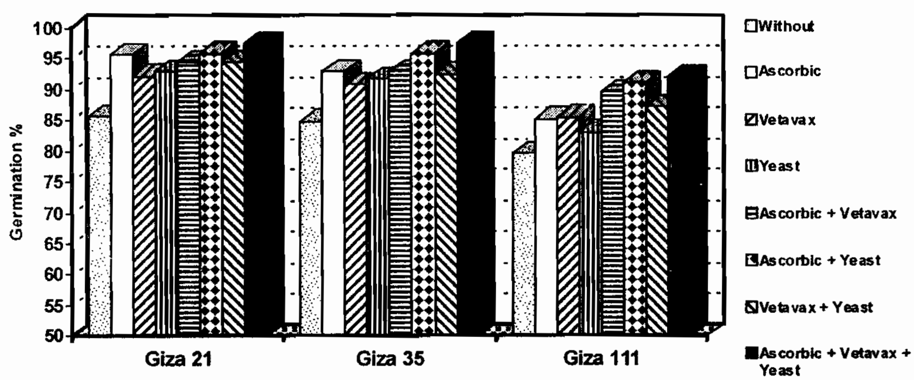


**Fig. 8: Germination percentage as affected by the interaction between cultivars and seed treatments during 2012 season.**

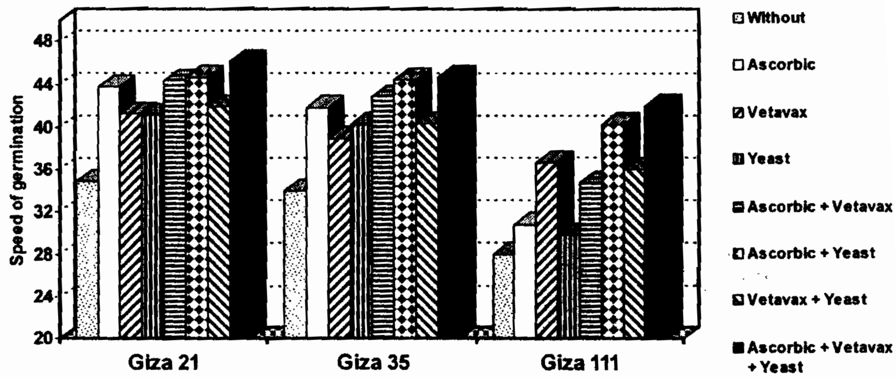


**Fig. 9: Speed of germination as affected by the interaction between cultivars and seed treatments during 2012 season.**

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## تأثر إنتاجية وجودة بذور بعض أصناف فول الصويا ببعض معاملات التقاوى

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أجريت تجربتان حقليتان خلال الموسمين الزراعيين ٢٠١١ و ٢٠١٢ بمحطة التجارب والبحوث الزراعية بكلية الزراعة – جامعة المنصورة لدراسة تأثير معاملات التقاوى لبعض أصناف فول الصويا وكذلك التفاعل بينهم على صفات النمو ومحصول البذور ومكوناته وصفات جودة التقاوى. نفذت كل تجربة فى تصميم القطع المنشقة مرة واحدة فى أربعة مكررات. حيث إشتملت القطع الرئيسية على الأصناف تحت الدراسة وهى؛ جيزة ٢١ ، جيزة ٣٥ وجيزة ١١١. بينما إحتوت القطع الشقية على ثمانية معاملات للتقاوى هى: بدون معاملة للتقاوى (معاملة المقارنة) ، معاملة التقاوى بحمض الأسكوربيك بمعدل ١٠٠ جزء فى المليون لمدة ساعتان ، معاملة للتقاوى بالمبيد الفطرى فيتافاكس بمعدل ٣ جم لكل كجم تقاوى لمدة دقيقتان ، معاملة للتقاوى بمستخلص الخميرة بمعدل ٥ مل لكل جم تقاوى لمدة ساعتان ، معاملة للتقاوى بحمض الأسكوربيك والمبيد الفطرى فيتافاكس ، معاملة للتقاوى بحمض الأسكوربيك و مستخلص الخميرة ، معاملة للتقاوى بالمبيد الفطرى فيتافاكس ومستخلص الخميرة ومعاملة للتقاوى بحمض الأسكوربيك و المبيد الفطرى فيتافاكس ومستخلص الخميرة.

أجريت التجارب المعملية بوحدة بحوث تكنولوجيا البذور بالمنصورة ، قسم بحوث تكنولوجيا البذور ، معهد بحوث المحاصيل الحقلية ، مركز البحوث الزراعية لتقدير جودة التقاوى بإختبارات الإنبات والتوصيل الكهربى للتقاوى الناتجة من التجربة الحقلية بالإضافة على نسبة البروتين والزيت فى البذور.

بينت النتائج أن صنف فول الصويا جيزة ٢١ قد تفوق بشكل كبير على كـلا الـصنفين جيزة ٣٥ وجيزة ١١١ حيث أنتج أعلى القيم لجميع الصفات السابقة فى كلا الموسمين. كما يمكن ملاحظة أن الصنف جيزة ٣٥ سجل أفضل قيم لجميع الصفات المدروسة بعد الصنف جيزة ٢١ في كلا الموسمين وبدون فروق معنوية فى بعض الصفات. في حين أن الصنف جيزة ١١١ سجل أقل القيم لجميع الصفات السابقة فى كلا الموسمين. تفوقت معاملة بذور فول الـصويا قبـل الزراعـة بحمض الأسكوربيك و المبيد الفطرى فيتافاكس ومستخلص الخميرة على معاملات التقاوى الأخرى وأنتجت أعلى القيم لجميع الصفات المدروسة في الموسمين الأول والثاني. تلى هذه المعاملة معاملة التقاوى بحمض الأسكوربيك و مستخلص الخميرة بدون فروق معنوية بينهما فى معظم الصفات في كلا الموسمين. على العكس من ذلك، تم الحصول على أقل القيم لجميع الصفات المدروسـة مـن معاملة المقارنة (بدون معاملة التقاوى) في كلا الموسمين

من النتائج المتحصل عليها فى هذه الدراسة فإنه يمكن التوصية بمعاملـة تقـاوى فـول الصويا صنف جيزة ٢١ قبل الزراعة بحمض الأسكوربيك والمبيد الفطرى فيتافاكس ومـستخلص الخميرة وذلك للحصول على أعلى إنتاجية وجودة للتقاوى تحت ظروف محافظة الدقهلية.

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