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# EFFECT OF COMPOST AND SOME STIMULATING SUBSTANCES ON LEAVES AND SOME CHEMICAL COMPOSITION OF JOJOBA PLANT

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**ABSTRACT:** This work was performed in the two experimental seasons of 2020 and 2021 at the farm of the Faculty of Agriculture, Minia University, Egypt to study the effect of compost (0.0, 500, 1000 and 1500 g/container) and some stimulating substances (control, vitamin E at 100 ppm, bread yeast at 10 g/l and garlic extract at 10%) on leaves and some chemical composition of jojoba (*Simmondsia chinensis*, Link) plants. Data showed that all used levels of compost pronounced increased leaves traits (number, leaf area, leaves weights (fresh or dry) in addition to chemical composition (pigments content, NPK percentages and protein) compared with the control. The 1500 g compost/container was more active than other treatments. Also, sprayed plants with vitamin E, active yeast and garlic extract significantly improved all previous parameters compared with the control. In general, the treatment of active yeast was superior, followed by garlic extract than vitamin E treatment. Therefore, the best interaction treatment was recorded with the high level of compost (1500 g/container) plus bread active yeast (10 g/l) or garlic extract (10 %).

**Keywords:** *Simmondsia chinensis,* Link, compost, vitamin E, active yeast, garlic extract, chemical composition.

## INTRODUCTION

Jojoba (*Simmondsia chinensis* belongs to Simmondsiaceae family. It is distributed over many countries including Egypt (Al-Qizwini *et al*., 2014). Jojoba seeds produce liquid wax (45% to 75% by weight). Jojoba foliage is important for forage livestock, big game animals and wildlife, and is appreciated as soil stabilization and landscaping, city parks, highway shoulders and other places that are hard to take care of (Ashour, 2010 and AL-Qizwini *et al*., 2014).

The role of compost in enhancing growth and leaves content was reported by many researchers. Compost is added to the soil to develop its properties. Which reflected the good growth of several plants including jojoba (Abusaief *et al*., 2021 on *Simmondsia chinensis*; Siraj *et al*., 2001 on *Ficus benjamina*; Abass, 2003 on *Rosa hybrid*; AbdEl-Mola, 2014 on *Populus spp*.; Ngwu, 2016 and Silva de Lima *et al.*, 2016 on *Jatropha curcas*; El-Mahrouk *et al*., 2016 on *Adhatoda vasica*; Said, 2016 on *Duranta erecta* and Agbede, 2018 on *Manihot esculenta*).

Alpha tocopherols have a positive effect on all growth parameters (Ayad *et al*., 2009 on geranium; El-Quesni *et al*., 2009 on *Hibiscus rosa sineses*; Abdou *et al*., 2012 on mint; Soltani *et al*., 2012 on *Calendula officinalis*; Abdou *et al*., 2014 on sweet basil and El-Sayed *et al*., 2021) on taxodium.

Active yeast is considered a good raw material for cytokinins, natural elements, vitamins, protein, lipids, carbohydrates and nuclic acid (Ali *et al*., 2020). It has been shown to be well for the growth of leaves as reported by Naguib (2002) on lemongrass

plants, Reda *et al*. (2008) on river red gum, Hassan *et al*. (2015) and Abdou *et al*. (2017a) on basil, and Ali *et al*. (2020) on *Taxodium disticum*. The increase in plant growth due to spraying active yeast was recorded by Mahmoud (2001) on magnolia, Abdel-Wahid *et al*. (2006) on Euonymus, Reda *et al*. (2008) on *Eucalyptus camaldulensis*, Taha *et al*. (2016) on neem plants, and Ali *et al*. (2020) on *Taxodium disticum*.

Garlic extract contains bio-active components, many authors reported that garlic extract is recommended for plant growth and productivity, such as Hanafy *et al*. (2012) *Schefflera arboricola* plants, Ahmad *et al*. (2014) on sweet basil and Abbasifar *et al*. (2020) on some ornamental plants. Where these extracts contain growth materials, phytohormones and vitamins (Safithri *et al*., 2011). The positive effect of garlic extract on enhancing plant growth was interrupted by Hanafy *et al*. (2012) on *Schefflera arboricola* plants and Abbasifar *et al*. (2020) on some ornamental plants such as poplar, sycamore and rose.

Therefore, the target of this experiment was to evaluate the influence of compost and some stimulating substances on leaves and some chemical composition of jojoba (*Simmondsia chinensis*, Link) plants.

## MATERIALS AND METHODS

This research was performed in both the growing seasons of 2020 and 2021 at the farm of the Faculty of Agriculture, Minia University, Egypt to study the effect of compost and some stimulating substances on the leaves and chemical composition of jojoba plant.

Jojoba seeds were sown on February 1st 2020 and 2021 in black polyethene bags (15 × 10 cm), each bag filled with 1.5 kg of sandy soil in the nursery. After two months from sown in both seasons, uniform seedlings (8.0 cm long) were transplanted in the first week of April for both experimental seasons (2020 and 2021) to containers (25 × 25 × 35 cm) each container filled with 20 kg of sandy soil. Soil analysis (according to ICARDA, 2013) was listed in Table (a).

**Experiment treatments:**

Factor (A); compost treatments (control, 500, 1000 and 1500 g/container). Compost (plant residues) was obtained from Egypt Company for Circulate Solid Residues at New El-Minia City and mixed with the soil before transplanting. Compost analysis was recorded in Table (b).

Factor (B); stimulating substances treatments (control, vitamin E at 100 ppm, active yeast at 10 g/l and garlic extract at 10%).

Vitamin E, active yeast and garlic extract were applied as foliar spray monthly, starting in last week of April till the last week of August (five times). All other agricultural practices were done as usual.

Alpha tocopherol (vitamin E) was provided by El-Tayser Company for Chemical and Scientific Instrument, Minia, Egypt.

Active yeast (*Saccharomyces cervisia*), yeast dry matter was 95% and live cells were $11.6 \times 10^9$/g. The active yeast interruption was arranged by melting sugar with dry yeast together (1:1, w/w) in moderately hot water (about 35-37 ℃) and kept at room temperature for 12 hours to activate the yeast according to Skoog and Miller (1957).

Garlic extract was prepared as follows: one kilogram of fresh cloves were merged with distilled water (one kilogram per liter), and after that, frozen for 24 hours and liquefied twice times then clarified. The clarified extract (100%) was used for performing the certain garlic extract concentration (100 ml/l = 10%) according to El-Desouky *et al*. (1998).

**Data recorded:**

Leaves traits (number, leaf area, fresh and dry weights) in addition to chemical composition (pigments content and NPK percentages).

**Table a. Physical and chemical properties of the used soil before planting of bermudagrass during 2020 and 2021 seasons.**

| Soil character | Values | | Soil character | Values | |
|---|---|---|---|---|---|
| | 2020 | 2021 | | 2020 | 2021 |
| **Physical properties** | | | **Nutrients** | | |
| **Sand (%)** | 89.0 | 90.0 | **Total N (%)** | 0.01 | 0.01 |
| **Silt (%)** | 9.30 | 8.40 | **Available P (%)** | 3.49 | 2.57 |
| **Clay (%)** | 1.70 | 1.60 | **$Na^+$ (mg/100 g soil)** | 0.80 | 0.91 |
| **Soil type** | Sandy | Sandy | **$K^+$ (mg/100 g soil)** | | |
| **Chemical properties** | | | **DTPA-extractable nutrients** | | |
| **pH (1:2.5)** | 8.10 | 8.32 | **Fe (ppm)** | 1.02 | 1.09 |
| **E.C. (dS/m)** | 1.08 | 1.10 | **Cu (ppm)** | 0.31 | 0.38 |
| **O.M. (%)** | 0.02 | 0.03 | **Zn (ppm)** | 0.31 | 0.27 |
| **$CaCO_3$ (%)** | 13.86 | 13.75 | **Mn (ppm)** | 0.50 | 0.61 |

**Table b. Compost analysis applied in the present study.**

| Properties | Value | Properties | Value |
|---|---|---|---|
| **Dry weight of 1.0 $m^2$** | 455 kg | **C/N ratio** | 18.5-14.1 |
| **Fresh weight of 1.0 $m^2$** | 655-705 kg | **NaCl (%)** | 1.13-1.78 |
| **Moisture (%)** | 27-32 | **Total P (%)** | 0.52-0.77 |
| **pH (1:2.5)** | 7.2-8.0 | **Total K (%)** | 0.9-1.1 |
| **E.C. (m. mhos/cm)** | 2.2-4.2 | **Fe (ppm)** | 155-205 |
| **Total N (%)** | 0.9-1.4 | **Zn (ppm)** | 153-228 |
| **Organic matter** | 44 | **Mn (ppm)** | 22-58 |
| **Organic carbon (%)** | 18.5-19.7 | **Cu (ppm)** | 76-152 |

Four months after the first spray of biostimulants fertilization treatments (last week of August in both seasons), leaf pigments content was determined according to Fadl and Sari El–Deen (1978) in the fresh leaves samples.

During the termination of the two seasons (last week of December), leaves were picked and washed many times with tap water followed by distilled water. Samples were oven dried at 70 °C then they were ground in a Willy mill to fine powder, then weighted 0.2 g of fine powder and it was digested by a mixture of concentrated sulphuric acid and hydrogen peroxide (10:4). Then the following elements were determined:

Total N was measured using the micro-kjeldahl method (modified) according to ICARDA (2013). P percentage was measured spectrophotometrically according to ICARDA (2013), while, K was estimated using flame-photometry according to ICARDA (2013).

The recorded findings were statistically analyzed according to MSTAT-C (1986), and LSD test at 0.05 to compare treatments means.

## RESULTS AND DISCUSSION

### Leaves characters:

Data listed in Table (1) proved that leaves number, leaf area, and leaves weight either fresh or dry per plant were significantly increased by all used levels of compost (500, 1000 and 1500 g/container) facing the check treatment in the two seasons. Compost at 1500 g/plant recorded the highest values, number of leaves (84.17 and 89.73), leaf area (7.35 and 8.28 $cm^2$), fresh leaves weight (44.67 and 48.01 g) and leaves dry weight (17.87 and 19.20 g) in both seasons respectively. The enhancement influence of compost on leaves production may be due to compost which resulted better growth as well as better photosynthetic, consequently, more carbohydrates and dry matter accumulation.

**Table 1. Influence of compost and some stimulating substances on leaves number, leaf area, and leaves weights (fresh and dry) of jojoba seedlings during the two growing seasons (2020 and 2021).**

| Some stimulators treatments (B) | Compost levels (g/seedling) (A) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 500 | 1000 | 1500 | Mean (B) | 0.0 | 500 | 1000 | 1500 | Mean (B) |
| | The 1st season (2020) | | | | | The 2nd season (2021) | | | | |
| | Leaves number | | | | | | | | | |
| **Control** | 45.83 | 57.17 | 67.42 | 75.83 | 61.56 | 51.08 | 61.92 | 73.58 | 79.42 | 66.50 |
| **Vitamin E (100 ppm)** | 52.08 | 62.58 | 72.58 | 83.67 | 67.73 | 56.33 | 67.67 | 80.25 | 87.92 | 73.04 |
| **Yeast (10 g/l)** | 60.17 | 71.75 | 82.17 | 90.42 | 76.13 | 64.58 | 76.17 | 90.67 | 98.08 | 82.38 |
| **Garlic Extract (10%)** | 55.17 | 65.75 | 75.92 | 86.75 | 70.90 | 60.75 | 71.08 | 86.17 | 93.50 | 77.88 |
| **Mean (A)** | 53.31 | 64.31 | 74.52 | 84.17 | | 58.19 | 69.21 | 82.67 | 89.73 | |
| **L.S.D. at 0.05** | | | | | | | | | | |
| | Leaf area ($cm^2$) | | | | | | | | | |
| **Control** | 3.56 | 4.42 | 5.52 | 6.60 | 5.03 | 4.61 | 5.49 | 6.54 | 7.20 | 5.96 |
| **Vitamin E (100 ppm)** | 4.10 | 5.32 | 6.31 | 7.31 | 5.76 | 5.37 | 6.40 | 7.27 | 8.54 | 6.87 |
| **Yeast (10 g/l)** | 4.59 | 5.78 | 6.76 | 7.83 | 6.24 | 5.87 | 6.84 | 7.71 | 8.83 | 7.31 |
| **Garlic Extract (10%)** | 4.23 | 5.54 | 6.53 | 7.67 | 5.99 | 5.64 | 6.58 | 7.60 | 8.62 | 7.11 |
| **Mean (A)** | 4.12 | 5.27 | 6.28 | 7.35 | | 5.37 | 6.33 | 7.28 | 8.28 | |
| **L.S.D. at 0.05** | A: 0.15 | | B: 0.23 | AB: 0.46 | | A: 0.18 | | B: 0.25 | AB: 0.50 | |
| | Leaves fresh weight/seedling (g) | | | | | | | | | |
| **Control** | 19.71 | 23.73 | 31.28 | 40.61 | 28.83 | 21.69 | 26.23 | 34.28 | 43.47 | 31.42 |
| **Vitamin E (100 ppm)** | 22.62 | 26.33 | 33.43 | 44.54 | 31.73 | 24.27 | 29.67 | 36.71 | 47.81 | 34.62 |
| **Yeast (10 g/l)** | 24.31 | 29.30 | 36.21 | 47.56 | 34.35 | 26.63 | 31.67 | 39.64 | 51.01 | 37.24 |
| **Garlic Extract (10%)** | 23.42 | 28.14 | 34.38 | 45.97 | 32.98 | 25.72 | 30.39 | 38.58 | 49.73 | 36.11 |
| **Mean (A)** | 22.52 | 26.88 | 33.83 | 44.67 | | 24.58 | 29.49 | 37.30 | 48.01 | |
| **L.S.D. at 0.05** | A: 1.84 | | B: 1.35 | AB: 2.70 | | A: 2.50 | | B: 1.12 | AB: 2.24 | |
| | Leaves dry weight/seedling (g) | | | | | | | | | |
| **Control** | 7.88 | 9.49 | 12.51 | 16.24 | 11.53 | 8.68 | 10.49 | 13.71 | 17.39 | 12.57 |
| **Vitamin E (100 ppm)** | 9.05 | 10.53 | 13.37 | 17.81 | 12.69 | 9.71 | 11.87 | 14.68 | 19.12 | 13.85 |
| **Yeast (10 g/l)** | 9.73 | 11.72 | 14.48 | 19.02 | 13.74 | 10.65 | 12.67 | 15.86 | 20.40 | 14.90 |
| **Garlic Extract (10%)** | 9.36 | 11.26 | 13.75 | 18.39 | 13.19 | 10.29 | 12.16 | 15.43 | 19.89 | 14.44 |
| **Mean (A)** | 9.01 | 10.75 | 13.53 | 17.87 | | 9.83 | 11.80 | 14.92 | 19.20 | |
| **L.S.D. at 0.05** | A: 1.10 | | B: 0.54 | AB: 1.08 | | A: 1.20 | | B: 0.45 | AB: 0.90 | |

Similar results were obtained by Bashir *et al*. (2007), Abdou *et al*. (2008), Ashour (2010), Abdou and Ashour (2012), Bala and Laura (2015), Eed (2016) and Abusaief *et al*. (2021) on *Simmondsia chinensis*. And on other plants, Siraj *et al*. (2001) on *Ficus benjamina*, Abass (2003) on *Rosa hybrid*, AbdEl-Mola (2014) on *Populus spp*., Ngwu (2016) and Silva de Lima *et al.* (2016) on *Jatropha curcas*, El-Mahrouk *et al*. (2016) on *Adhatoda vasica*, Said (2016) on *Duranta erecta* and Agbede (2018) on *Manihot esculenta*.

Regarding the effect of stimulating substances, the three used treatments of vitamin E, active yeast and garlic extract significantly increased the four previous traits facing the check treatment in the two seasons. The bread yeast at 10 g/l was more effective than other used treatments as shown in Table (1).

Active yeast is considered a good source of vitamins, cytokinins, macronutrients, which reflected in plant growth. These results are in line with those obtained by Naguib (2002) on lemongrass plants, Abdel-Wahid *et al*. (2006) on *Euonymus japonicas*, Reda (2008) on river red gum, Hassan *et al*. (2015) and Abdou *et al*. (2017a) on sweet basil, Taha *et al*. (2016) on neem plants and Ali *et al*. (2020) on *Taxodium disticum*.

The effect of interaction was significant for leaves number, leaf area, leaves fresh and dry weights/seedling in both seasons. The

beast interaction treatments were resulted from compost at 1500 g/plant plus bread yeast at 10 g/l or garlic extract at 10% (Table, 1).

**Photosynthetic pigments and NPK percentages:**

Data listed in Tables (2 and 3) proved that all used levels of compost led to pronounce enhancement photosynthetic pigments and NPK percentages facing the control in both seasons. Compost at 1500 g/plant was more active than other treatments including the control. The enhancement in pigments and NPK percentages is due to the application of compost treatments, which increase nutrient elements, especially magnesium in the root zone.

Similar results were recorded by Abdou *et al.* (2008) on jojoba, Badawy (1994) on philodendron parts and schefflera plants, Attia *et al.* (2004) and Abdou *et al.* (2007) on *Ficus spp*., El-Sayed and Abdou (2002) on *Khaya senegalensis* seedlings, Mansour (2002) and Sakr (2005) on senna plants, Abdou (2003b) on *Washingtonia filifera* seedlings, Abdou *et al.* (2003a) on *Delonix regia* and Abass (2003) in *Rosa hybrid*.

Regarding the influence of stimulating substances, data in Tables (2 and 3), all used treatments significantly increased photosynthetic pigments and NPK percentages facing the check in the two experimental seasons. The greatest values were produced from active yeast, followed by garlic extract, without significant differences.

The positive effects of active yeast on photosynthetic pigments and NPK (%) were found by Mahmoud (2001) on magnolia, Ismaeil and Bakry (2005) on papaya plants, Abdel-Wahid *et al*. (2006) on *Euonymus japonicas*, Al-Dulaimy and Alrawi (2015) pomegranate, Taha *et al*. (2016) on neem plants and Taha *et al*. (2020) on *Lupinus termis*.

**Table 2. Influence of compost and some stimulating substances on chlorophyll a, b and carotenoids content (mg/g f.w.) of jojoba seedlings during the two growing seasons (2020 and 2021).**

| Some stimulators treatments (B) | Compost levels (g/seedling) (A) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 500 | 1000 | 1500 | Mean (B) | 0.0 | 500 | 1000 | 1500 | Mean (B) |
| | The 1st season (2020) | | | | | The 2nd season (2021) | | | | |
| | Chlorophyll a content (mg/g f.w.) | | | | | | | | | |
| **Control** | 2.004 | 2.216 | 2.425 | 2.623 | 2.317 | 2.226 | 2.449 | 2.641 | 2.817 | 2.533 |
| **Vitamin E (100 ppm)** | 2.034 | 2.259 | 2.445 | 2.638 | 2.344 | 2.257 | 2.492 | 2.689 | 2.876 | 2.579 |
| **Yeast (10 g/l)** | 2.073 | 2.280 | 2.481 | 2.681 | 2.379 | 2.291 | 2.525 | 2.717 | 2.994 | 2.632 |
| **Garlic Extract (10%)** | 2.060 | 2.270 | 2.462 | 2.667 | 2.365 | 2.275 | 2.498 | 2.704 | 2.978 | 2.614 |
| **Mean (A)** | 2.043 | 2.256 | 2.453 | 2.652 | | 2.262 | 2.491 | 2.688 | 2.916 | |
| **L.S.D. at 0.05** | A: 0.111 | | B: 0.020 | AB: 0.040 | | A: 0.113 | | B: 0.018 | AB:0.036 | |
| | Chlorophyll b content (mg/g f.w.) | | | | | | | | | |
| **Control** | 0.664 | 0.749 | 0.859 | 0.947 | 0.805 | 0.755 | 0.846 | 0.967 | 0.993 | 0.890 |
| **Vitamin E (100 ppm)** | 0.677 | 0.766 | 0.878 | 0.956 | 0.819 | 0.777 | 0.863 | 0.974 | 0.999 | 0.903 |
| **Yeast (10 g/l)** | 0.699 | 0.787 | 0.896 | 0.982 | 0.841 | 0.793 | 0.888 | 0.998 | 1.026 | 0.926 |
| **Garlic Extract (10%)** | 0.685 | 0.779 | 0.885 | 0.969 | 0.830 | 0.784 | 0.875 | 0.982 | 1.011 | 0.913 |
| **Mean (A)** | 0.681 | 0.770 | 0.880 | 0.964 | | 0.778 | 0.868 | 0.980 | 1.007 | |
| **L.S.D. at 0.05** | A: 0.069 | | B: 0.012 | AB: 0.024 | | A: 0.079 | | B: 0.013 | AB: 0.026 | |
| | Carotenoids content (mg/g f.w.) | | | | | | | | | |
| **Control** | 0.727 | 0.805 | 0.916 | 0.983 | 0.858 | 0.828 | 0.932 | 0.956 | 0.997 | 0.928 |
| **Vitamin E (100 ppm)** | 0.767 | 0.839 | 0.941 | 0.992 | 0.885 | 0.853 | 0.964 | 0.991 | 1.028 | 0.959 |
| **Yeast (10 g/l)** | 0.785 | 0.865 | 0.975 | 1.029 | 0.914 | 0.875 | 0.982 | 1.038 | 1.056 | 0.988 |
| **Garlic Extract (10%)** | 0.771 | 0.845 | 0.935 | 1.015 | 0.896 | 0.867 | 0.978 | 1.023 | 1.043 | 0.978 |
| **Mean (A)** | 0.761 | 0.839 | 0.946 | 1.006 | | 0.856 | 0.964 | 1.002 | 1.031 | |
| **L.S.D. at 0.05** | A: 0.071 | | B: 0.018 | AB: 0.036 | | A: 0.081 | | B: 0.013 | AB: 0.026 | |

**Table 3. Influence of compost and some stimulating substances on nitrogen, phosphorus and potassium (%) of jojoba seedlings during the two growing seasons (2020 and 2021).**

| Some stimulators treatments (B) | Compost levels (g/seedling) (A) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0.0 | 500 | 1000 | 1500 | Mean (B) | 0.0 | 500 | 1000 | 1500 | Mean (B) |
| | The 1st season (2020) | | | | | The 2nd season (2021) | | | | |
| | Nitrogen (%) | | | | | | | | | |
| **Control** | 1.55 | 2.11 | 2.24 | 2.29 | 2.05 | 1.84 | 2.20 | 2.32 | 2.45 | 2.20 |
| **Vitamin E (100 ppm)** | 1.64 | 2.21 | 2.36 | 2.44 | 2.16 | 1.97 | 2.37 | 2.48 | 2.59 | 2.35 |
| **Yeast (10 g/l)** | 1.88 | 2.36 | 2.47 | 2.57 | 2.32 | 2.12 | 2.48 | 2.57 | 2.74 | 2.48 |
| **Garlic Extract (10%)** | 1.76 | 2.33 | 2.42 | 2.51 | 2.26 | 2.02 | 2.45 | 2.53 | 2.66 | 2.42 |
| **Mean (A)** | 1.71 | 2.25 | 2.37 | 2.45 | | 1.99 | 2.38 | 2.48 | 2.61 | |
| **L.S.D. at 0.05** | A: 0.05 | | B: 0.05 | | AB: 0.10 | A: 0.07 | | B: 0.06 | | AB: 0.12 |
| | Phosphorus (%) | | | | | | | | | |
| **Control** | 0.229 | 0.248 | 0.279 | 0.299 | 0.264 | 0.257 | 0.289 | 0.320 | 0.339 | 0.301 |
| **Vitamin E (100 ppm)** | 0.255 | 0.278 | 0.301 | 0.320 | 0.289 | 0.279 | 0.336 | 0.368 | 0.397 | 0.345 |
| **Yeast (10 g/l)** | 0.281 | 0.297 | 0.335 | 0.378 | 0.323 | 0.314 | 0.385 | 0.425 | 0.462 | 0.397 |
| **Garlic Extract (10%)** | 0.274 | 0.285 | 0.318 | 0.342 | 0.305 | 0.306 | 0.355 | 0.411 | 0.449 | 0.380 |
| **Mean (A)** | 0.260 | 0.277 | 0.308 | 0.335 | | 0.289 | 0.341 | 0.381 | 0.412 | |
| **L.S.D. at 0.05** | A: 0.014 | | B: 0.018 | | AB: 0.036 | A: 0.016 | | B: 0.017 | | AB: 0.034 |
| | Potassium (%) | | | | | | | | | |
| **Control** | 1.19 | 1.28 | 1.38 | 1.48 | 1.33 | 1.21 | 1.32 | 1.40 | 1.46 | 1.35 |
| **Vitamin E (100 ppm)** | 1.24 | 1.35 | 1.46 | 1.56 | 1.40 | 1.26 | 1.38 | 1.50 | 1.57 | 1.43 |
| **Yeast (10 g/l)** | 1.33 | 1.42 | 1.52 | 1.61 | 1.47 | 1.35 | 1.48 | 1.61 | 1.68 | 1.53 |
| **Garlic Extract (10%)** | 1.30 | 1.38 | 1.49 | 1.58 | 1.44 | 1.33 | 1.44 | 1.55 | 1.61 | 1.48 |
| **Mean (A)** | 1.27 | 1.36 | 1.46 | 1.56 | | 1.29 | 1.41 | 1.52 | 1.58 | |
| **L.S.D. at 0.05** | A: 0.08 | | B: 0.03 | | AB: N.S. | A: 0.09 | | B: 0.05 | | AB: N.S. |

The stimulatory effect of garlic extract on photosynthetic pigments and mineral content was stated by Abd El–Hamied and El-Amary (2015) on pear trees, Abdou *et al*., (2017b) on guar plants, El-Salhy *et al*. (2017) and El-Amary and Abd El-Hamied (2018) on grapevines, Dahab *et al*. (2018) on banana tree, Hussein (2018) on *Olinda Valencia* orange trees and El-Rokiek *et al*. (2019) on quinoa plants.

The effect of interaction was significant for photosynthetic pigments and NPK percentages in the two growing seasons, except K (%). The highest values of photosynthetic pigments and NPK percentages were produced by adding compost at 1500 g/plant in combination with active yeast or garlic extract (Tables, 2 and 3).

## REFERENCES

Abass, R.A. (2003). Effect of the natural and synthetic soil conditioners on the growth of *Rosa hybrida* cv. Queen Elizabeth. J. Adv. Agric. Res., 8(4):673-688.

Abbasifar, A.; Valizadehkaji, B.; Karimi, M. and Bagheri, H. (2020). The first report: the effect of garlic extract on rooting of cuttings of some ornamental plants and fruit trees. Adv. Hort. Sci., 34(2):191-204. https://doi.org/10.13128/ahsc7904

Abd El–Hamied, S.A. and El-Amary, E.I. (2015). Improving growth and productivity of pear trees using some natural plants extracts under North Sinai conditions. Journal of Agriculture and veterinary Science, 8(1):1-9. http://10.9790/2380-08110109

Abdel-Mola, M.A.M (2014). Physiological Studies on Poplar Trees. M.Sc. Thesis, Fac. Agric., Minia Univ., Egypt. 167 p.

Abdel-Wahid, S.M.; Labib, N.Y. and Rezk Alla, B.B. (2006). Effect of active dry yeast and chemical fertilization on vegetative growth and the main

constituents of *Euonymus japonicus* Thunb. plant. Fayoum Journal of Agricultural Research and Development, 20(1):136-147.

Abdou, M.A.; El-Sayed, A.A.; Taha, R.A. and Marzok, Z.S. (2017a). Effect of plant density and some vitamins, as well as, active yeast on sweet basil (*Ocimum basilicum*) plant, A- Vegetative growth characters. Scientific Journal of Flowers and Ornamental Plants, 4(1):83-100.

Abdou, M.A.H. (2003b). Physiological studies on *Washingtonia filifera*, wendl. Plants, II- Effect of chemical organic fertilization on vegetative growth and chemical composition of sandy soil-grown seedlings. J. Agric. Sci., Mansoura Univ., 28(5):3845-3855.

Abdou, M.A.H. and Ashour, R.M. (2012). Physiological studies on jojoba plants. Proc. the Minia Inter. Conf. for Agric. and Irrig. In the Nile Basin countries, El-Minia, Egypt.

Abdou, M.A.H.; Ahmed, E.T. and Attia, F.A. (2003a). Response of *Delonix regia*, RAF. transplants to fertilization with sewage sludge and inoculation with phosphorein and VA-mycorrhizal fungi. Proc. 1st Conf. Egypt and Syr. El–Minia, Egypt.

Abdou, M.A.H.; Attia, F.A.; Ahmed, E.T. Ahmed, A.A. and Abd El-Naeem, L. (2012). Physiological studies on mint plants. Proc. 2nd Inter. Conf. of Physio. Microb. and Ecological Sci., Faculty of Science, Minia University, Egypt, p. 207-228.

Abdou, M.A.H.; Badran, F.S.; Aly, M.K. and Ashour, R.M. (2007). Physiological studies on the propagation of *Ficus elastica* var. *decora* by aerial layering. 1st Inter. Conf. Desert Cultivation, Problems and Solutions, Minia Univ., Egypt.

Abdou, M.A.H.; El-Sayed, A.A.; Taha, R.A.; Sayed, A.E.; Mohamed, A. and Botros, W.S. (2017b). Effect of compost and some biostimulant treatments on guar plants, B- Chemical constituents and guaran productivity. Scientific Journal of Flowers and Ornamental Plants, 4 (1): 159-173.

Abdou, M.A.H.; Tantawy, A.A. and Taha, R.A. (2008). Effect of number of irrigations and organic fertilization on jojoba seedlings grown in sandy soils. Proc. the First International Conference On Environmental Studies and Research (Natural Resources and Sustainable Development ), El-Hattab Environmental Studies and Research Institute (ESRI), Minufiya Univ., Sadat Branch, Egypt, p. 84-93.

Abdou, M.H.; El-Sayed, A.A.; Ahmed, E.T. and Abdel Salam, A.A. (2014). Response of sweet basil plants to some agricultural treatments. Minia J. of Agric. Res. and Develop, 34(1):49-67.

Abusaief, H.M.; Abugarsa, S.A.; Al-Naby, M.M. and Abdul-Qader, A.T. (2021). Effect of soil type and organic farming on jojoba growth. Plant Cell Biotechnology and Molecular Biology, 22(63 and 64):73-86.

Agbede, T.M. (2018). Effect of green manure application on cassava (*Manihot esculenta* Crantz) growth, yield quantity and quality in degraded Alfisols. Pertanika Journal of Tropical Agricultural Science, 41(4):1757-1777.

Ahmad, S.K.; Hammam, K.A. and Amer, A.A. (2014). Effect of bio-fertilization and some plant extracts on the growth, yield and chemical constituents of basil plant. Journal of Plant Production, 5(2):193-210.

Al-Dulaimy, A.F.Z. and Alrawi, M.M.O. (2015). Response of pomegranate trees (*Punica granatum* L.) cv. Salimi and Wonderful to organic fertilizers and its interactions with bread yeast *Sacchromyce Cervisiae*. Tikreet University Journal of Agriculture Sciences, 15(4):73-84.

Ali, A.F.; Ahmed, A.A. and El-Raheem, A. (2020). Influence of organic manure, Minia Azotein, mycorrhizae fungi and active yeast application on growth and chemical constituents of *Taxodium distichum* seedlings. Archives of Agriculture Sciences Journal, 3(1):1-23. www.http//:10.21608/AASJ.2020.94022

Al-Qizwini, H.; Ekbal, A.K.; Mhaidat, N.M. and Maraqa, A. (2014). Antioxidant and antimicrobial activities of Jordanian *simmondsia chinensis* (link) C.K. Schneid. European Scientific J., 10(27):229-241.

Ashour (2010). Response of Jojoba Plants to Some Organic and Biofertilization Treatment. Ph.D. Thesis, Fac. Agric., Minia Univ., Egypt, 164 p.

Attia, F.A.; Abdou, M.A. and Mohamed, M.A. (2004). Physiological studies on *Ficus benjamina* plants, 2- Effect of phosphorus fertilization and biofertilizers on seedling growth. J. Agric. Sci., Mansoura Univ., 29(2):787-797.

Ayad, H.S.; El-Din, K.G. and Reda, F. (2009). Efficiency of stigmasterol and α-tocopherol application on vegetative growth, essential oil pattern, protein and lipid peroxidation of geranium (*Pelargonium graveolens* L.). J. Appl. Sci. Res., 5:887-892.

Badawy, O.E.M. (1994). Effect of Growing Media and Location on Propagation and Growth of Some Indoor Plants. M.Sc. Thesis. Fac. Agric., Cairo Univ., Egypt, 195 p.

Bala, R. and Laura, J.S. (2015). Effect of various soil medium on seed germination of *Simmondsia chinensis* (Link) Schneider (jojoba) under in vivo conditions. International Journal of Pharma and Bio Sciences, 6:77-81.

Bashir, M.A.; Ahmad, M. and Anjum, M.A. (2007). Effect of various potting media on growth of rooted jojoba (*Simmondsia chinensis*) cuttings. International Journal of Agriculture and Biology, 9:147-151.

Dahab, A.A.; Nady, H.N. and El-Salam, H.S.A. (2018). The potential of some plants extract as bio-stimulants for enhancing growth and biochemical constituents of banana plantlets. Middle East Journal of Agriculture Research, 7(3):904-914.

Eed, A.M. (2016). Effect of various potting media on percent survival and growth of Jojoba (*Simmondsia chinensis*) rooted cuttings. International Journal of Current Microbiology and Applied Sciences, 5(9):454-461.

El-Amary, E.I. and Abd El-Hameid, A. (2018). A comparative study between garlic extract and hydrogen cyanamide on flowering, fruit set and productivity of grapes. Egyptian Journal of Desert Research, 68(2):199-222.

El-Desouky, S.A.; Waneis, A.L.A. and Khedr, Z.M.A. (1998). Utilization of some natural plant extracts (garlic and yeast) as seed soaked materials to squash (*Cucurbita pepo*, L.), effect on growth, sex expression and fruit yield and quality. Ann. Agric., Sci., Moshtohor, 36(2):839-854.

El-Mahrouk, E.M.; Abd El-Gayed, M.E. and Abou Kamar, A.N. (2016). Response of *Adhatoda vasica*, L. grown in different soils to some fertilization treatments. J. Agric. Res., Kafr El-Sheikh Univ., 42(1):216-239.

El-Quesni, F.E.; Abd EL-Aziz, N. and Maga, M.K. (2009). Some studies on the effect of ascorbic acid and α-tocopherol on the growth and some chemical composition of *Hibiscus rosa-sinensis* L. at Nurbaria. Ozean Journal of Applied Science, 2(2):159-167.

El-Rokiek, K.G.; Dawood, M.G.; Sadak, M.S. and El-Awadi, M.E.S. (2019). The effect of the natural extracts of garlic or Eucalyptus on the growth, yield and some chemical constituents in quinoa plants. Bulletin of the National Research Centre, 43(1):1-7.

https://doi.org/10.1186/s42269-019-0161-3

El-Salhy, A.M.; Ibrahim, R.A.; Mgawer, M.A. and Abd El-Hafiz, G.N. (2017). Effect of some plant extracts spraying on growth and fruiting of Flame seedless grapevines. Assiut J. Agric. Sci., 48(3):188-197.

El-Sayed, A.A. and Abdou, M.A.H. (2002). Response of Khaya transplants to some soil media and biofertilization treatments. Ann. Agric. Sci., Moshtohor, 40(4):2233-2245.

El-Sayed, S.M.; Mazhar, A.A. and Mayada, M. (2021). Response of *Taxodium disticum* L. seedlings to foliar application of folic acid and/or α-tocopherol. Plant Cell Biotechnology and Molecular Biology, 22(71 and 72):346-357.

Fadl, M.S. and Sari El-Deen, S.A. (1978). Effect of N-benzyaladenine on photosynthetic pigments and total soluble sugars of olive seedlings grown under saline conditions. Egypt. J. Hort. 6(2):169-183.

Hanafy, M.S.; Saadawy, F.M.; Milad, S.M.N. and Ali, R.M. (2012). Effect of some natural extracts on growth and chemical constituents of *Schefflera arboricola* plants. J. of Hort. Sci. and Ornamental Plants, 4(1):26-33.

Hassan, M.R.A.; El-Naggar, A.H.M.; Shaban, E.H. and Mohamed, M.E.A. (2015). Effect of NPK and bio-fertilizers rates on the vegetative growth and oil yield of *Ocimum basillicum* L. plants. Alexandria Science exchange journal, 36:58-72.

Hussein, M.A. (2018). Fruiting of *Olinda Valencia orange* trees in relation to spraying some plant extracts. J. Biol. Chem. Environ. Sci., 13(1):375-392.

ICARDA (2013). Methods of Soil, Plant and Water Analysis: A Manual for the West Asia and North Africa Region, Third edition, International Center for Agricultural Research in the Dry Areas, Beirut, Lebanon, 243 p.

Ismaeil, F.H.M. and Bakry, K.H. (2005). Response of papaya plants to some chemical substances and yeast extract treatments. Egypt. J. of Agric. Res., 2(1):119-150.

Mahmoud, T.R. (2001). Botanical Studies on Growth and Germination of Magnolia (*Magnolia grandiflora* L.) Plants. M.Sc. Thesis, Fac. Agric. (Moshtohor), Zagazig University (Benha Branch), Egypt, 111 p.

Mansour, H.A. (2002). Influence of soil amendments and NPK fertilization on the growth and chemical composition of *Senna sulfurea* plants grown in sandy soil. Annals of Agric. Sci., Moshtohor, 40(3):1779-1796.

MSTAT-C (1986). A microcomputer program for the design management and analysis of Agronomic Research Experiments (version 4.0), Michigan State Univ., U.S.A.

Naguib, N.Y. (2002). Yield and quality of lemongrass plants, *Cymbopogon flexuous* Stapf as influenced by farm yard manure and foliar application of bread yeast. Annals of Agricultural Science, Ain-Shams Univ., 47(3):859-873.

Ngwu, O.E. (2016). Effects of organic and inorganic fertilizers on the growth and yield of physic nut (*Jatropha curcas*). Journal of Advances in Agricultural and Environmental Eng., 3(1):131-135.

Reda, F.M. (2008). The influence of spraying with active yeast extract on vegetative growth and volatile oil of river red gum plant (*Eucalyptus camaldulensis* Dehn.). Journal of Plant Production, 33(1):425-436.

Safithri, M.; Bintang, M. and Poeloengan, M. (2011). Antibacterial activity of garlic extract against some pathogenic animal bacteria. Media Peternakan., 43(3):155-158.

Said, R.M. (2016). Response of sky flower (*Duranta erecta*, L. var. *variegata*) transplants as pot-plant to growing media and water amounts. Middle East J. Agric. Res., 5(2):201-207.

Sakr, W.R.A.S. (2005). Effect of Organic and Biofertilization on Growth and Active Constituents Production of Senna Plants. Ph.D. Thesis, Fac. Agric., Cairo Univ., Egypt, 228 p.

Silva de Lima, R.L.; Severino da Silva, S.; Azevedo, C.A.V.; Marcelo, C.P. and Ronaldo do Nascimento, J.D.N. (2016). Response of jatropha to organic and phosphate fertilization under irrigated conditions. Australian Journal of Crop Science, 10(4):452-459.

Siraj, M.S.; El-Garawany, M.N. and Al-Gosaibi, A.M. (2001). Effects of manure extracts on soil mineral content and rooting and shooting of *Ficus benjamina*. Proc. the Fifth Arabian Hort. Conf. Ismailia, Egypt.

Skoog, F. and Miller, C. (1957). Chemical regulation of growth and organ formation on plant tissue cultured in vitro. Symposia of the Society for Experimental Biology, 11:118-131.

Soltani, Y.; Saffari, V.R.; Moud, A.A.M. and Mehrabani, M. (2012). Effect of foliar application of α-tocopherol and pyridoxine on vegetative growth, flowering, and some biochemical constituents of *Calendula officinalis* L. plants. African Journal of Biotechnology, 11(56):11931-11935. https://doi.org/10.5897/AJB11.4273

Taha, L.S.; Ibrahim, S.M. and Aziz, N.G.A. (2016). Vegetative growth, chemical composition, and flavonoids content of *Azadirachta indica* plants as affected by application of yeast natural extract. Journal of Applied Pharmaceutical Science, 6(4):93-97.

Taha, R.S.; Seleiman, M.F.; Alhammad, B.A.; Alkahtani, J.; Alwahibi, M.S. and Mahdi, A.H. (2020). Activated yeast extract enhances growth, anatomical structure, and productivity of *Lupinus termis* L. plants under actual salinity conditions. Agronomy, 11(1):1-13. https://doi.org/10.3390/agronomy11010074

## تأثير الكمبوست و بعض المواد المنشطة علي الأوراق وبعض المكونات الكيميائية لنبات الجوجوبا

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تم إجراء هذه التجربة خلال موسمي النمو ٢٠٢٠ و٢٠٢١ بمشتل نباتات الزينة، قسم البساتين، كلية الزراعة، جامعة المنيا، مصر لدراسة تأثير الكمبوست (صفر، ٥٠٠ ، ١٠٠٠ ، ١٥٠٠ جم/صفيحة) وبعض المواد المنشطة (فيتامين هـ بتركيز ١٠٠ جزء في المليون، الخميرة النشطة بتركيز ١٠ جم/لتر، مستخلص الثوم بتركيز ١٠٪، بالإضافة لمعاملة الكنترول) علي الأوراق (عدد الأوراق، مساحة الورقة، والوزن الطازج والجاف للأوراق) وبعض المكونات الكيميائية (صبغات البناء الضوئي، النسبة المئوية لعناصر ن ، فو ، بو). أوضحت النتائج أن كل المستويات المستخدمة من الكمبوست أدت إلي زيادة معنوية في صفات الأوراق (عدد الأوراق، مساحة الورقة، والوزن الطازج والجاف للأوراق) وكذلك بعض المكونات الكيميائية (صبغات البناء الضوئي، النسبة المئوية لعناصر ن ، فو ، بو) مقارنة بالكنترول. كان المستوي العالي من الكمبوست (١٥٠٠ جم/نبات) أفضل معاملة. كذلك أدى رش المواد المنشطة إلي زيادة معنوية في كل الصفات السابقة مقارنة بالكنترول خلال موسمي النمو. على العموم، كانت معاملة الخميرة النشطة أكثر فاعلية، تلاها مستخلص الثوم ثم فيتامين هـ. ويمكن القول بأن أفضل معاملات التفاعل هي الكمبوست بمعدل ١٥٠٠ جم/للنبات مع رش النباتات بالخميرة النشطة بتركيز ١٠ جم/لتر أو مع مستخلص الثوم بتركيز ١٠٪.