



## Response of Jerusalem Artichoke Plants Grown under Saline Calcareous Soil to Application of Different Combined Organic Manures

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**T**WO FIELD experiments were successfully carried out to evaluate the potential influences of three organic manure (farmyard, FYM, poultry, PLM, and pigeon PGM) applied in different combinations on growth and tuber yield, and biochemical constituents of Jerusalem artichoke plants. The results indicated that organic treatments improved all tested parameters, with different degrees, compared to the control. In the first season (2016/2017), the combined PLM + PGM treatment (T<sub>2</sub>) produced the highest values of No. of leaves, leaf and stem fresh and dry weights, tuber fresh and dry weights, and tuber nitrogen content. The combined PGM + ½ FYM + ½ PLM treatment (T<sub>6</sub>) produced the highest values of plant height, No. of lateral shoots, tuber phosphorus, cadmium and nickel content. While combined FYM + PLM treatment (T<sub>1</sub>), produced the highest values of leaf nitrogen content and total yield. While, the combined FYM + ½ PLM + ½ PGM treatment (T<sub>4</sub>) showed the best number of lateral shoots, leaf fresh and dry weights, tuber fresh weight and total tuber yield, leaf phosphorus and tuber nitrogen contents in the second season (2017/2018). However, the combined FYM + PGM treatment (T<sub>3</sub>) produced the highest values of total phenolic compounds, leaf phosphorus and tuber potassium contents, and the combined PGM + ½ FYM + ½ PLM treatment (T<sub>6</sub>) was the best for inulin percentage in both seasons. The results of this study recommend using organic fertilizers, especially the combined T<sub>1</sub> or T<sub>4</sub> for Jerusalem artichoke.

**Keywords:** Jerusalem artichoke, Loamy clay sand soil, Organic manures, Heavy metals, Macronutrients uptake.

### Introduction

The use of mineral fertilizers to increase yield has been found to be effective only within few years, demanding consistent use on long term basis (Ojeniyi et al., 2009). The hazardous environmental consequences and high cost of mineral fertilizers make it undesirable but also uneconomical and out of reach of the poor farmers who still dominate in the Egyptian agriculture sector (Shiyam and Binang, 2011). This is led to increase use of organic manure, a readily available alternative, to be more environmentally friendly. Over-use of chemical fertilizer can be harmful to environment by polluting water and which be

hazardous to human health. In organic farming, the soil becomes rich in nutrients; therefore, crops grow healthy and can be resistant to pests and diseases, making the quality of the products more nutritious, tasty and contain substances that are good for health (Wakui, 2009).

In recent years, attention has been directed toward organic manure because of the rising cost of mineral fertilizers coupled with their inability to give the soil the desired sound health. Poultry manure, sometimes called chicken manure, is an excellent soil amendment that provides nutrients for growing crops when used wisely, because it has high organic matter content combined with

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available nutrients for plant growth (Van Ryssen et al., 1993).

Jerusalem artichoke (*Helianthus tuberosus* L.) is a non-traditional tuberous crop, which is recently introduced to Egypt for its high nutritional and medicinal values. The plant can grow in almost all soils with the exception of clay soil. It contains an important homo-polysaccharide (Inulin) which plays very important roles for nutrition and treatment of diabetic patients and obesity. Recently, Jerusalem artichoke has attracted attention by the bioethanol industry sector because of its high productivity as well as high content of inulin (Puangbut, et al., 2012). The inulin is present as a reserve carbohydrate in its tubers and can be easily hydrolyzed for ethanol production (Maria et al. 2006). In order to improve the yield of Jerusalem artichoke, the soil content of nutrients should be increased to increase the fertility which can be achieved by either using organic fertilizer such as cattle manure, poultry manure, pigeon manure and use of compost (Dauda et al., 2008) or by using chemical fertilizers mainly potassium and nitrogen compounds.

Therefore, the objective of the present work was to study the influence of some different organic manure combinations for good vegetative growth, some chemical constituents and high tuber yield and quality characters of Jerusalem artichoke.

## **Materials and Methods**

### *Experimental site*

This experiment was carried out at the Experimental farm of the Faculty of Agriculture,

Fayoum University, Demo farm station during two successive summer seasons of 2016/2017 and 2017/2018, to investigate the effect of combination of some different fermented organic manures; farmyard manure (FYM); poultry manure (PLM) and pigeon manure (PGM) on Jerusalem artichoke (*Helianthus tuberosus* L. Baladi cv.) plants grown in sandy clay loam soil.

### *Manures and intercultural operations*

Well-decomposed FYM, PLM and PGM were applied before sowing at the rate of 12 tons ha<sup>-1</sup> to the all plots except control treatment. Only 480 kg of ammonium sulfate (20.6% N); 480 kg of triple superphosphate (15.5% P<sub>2</sub>O<sub>5</sub>) and 240 kg ha<sup>-1</sup> of potassium sulfate were added as a source for nitrogen; phosphorus and potassium, respectively. The total amount of triple superphosphate and 50% of total dose of ammonium and potassium sulfate were applied during soil preparation. The rest amounts of ammonium and potassium sulfate were applied after 35 days from sowing. Intercultural operations like thinning, sowing, irrigation, insects and pest management were done to facilitate optimum crop growth. Moreover, Organic fertilizers samples were analyzed to determine the Nitrogen, Phosphorus, Potassium and organic matter content as shown in Table 1.

### *Experimental design*

The single factor randomized complete block design (RCBD) was used with three replications. The plot area was 10.5 m<sup>2</sup> (3.5 m × 3.0 m). The experiment consisted of three organic manures levels as shown in Table 2.

**TABLE 1. Analysis of organic manure used in this study for two seasons**

FYM Farm yard manure    PLM Poultry manure    PGM Pigeon manure



### *Collection and analysis of Soil sample*

Soil samples of each experiment were collected from 25 cm depth and analyzed for some physical and chemical properties according to the methods described by Page et al. (1982) as shown in Table 3.

### *Statistical analysis*

A random sample of five plants from each experimental plot was taken at flowering initiation stage (after 120 days from planting) to calculate plant height (cm), lateral shoots plant<sup>-1</sup>, leaves and stem fresh and dry weights plant<sup>-1</sup> (g). All of these characters were analyzed according to Official Methods of the Association Chemists (AOAC, 1975).

### *Yield and its components*

At harvest time, 290 days after planting, average tuber fresh and dry weight plant<sup>-1</sup> (g), total tuber yield (Mg ha<sup>-1</sup>) were assessed.

### *Chemical constituents*

#### *Leaves*

Random samples from the upper fourth leaf were collected; washed with distilled water to estimate chlorophyll index using SPAD 502 plus chlorophyll meter and then, oven dried at 70° C to determine the nitrogen, phosphorus and potassium contents according to the methods described in AOAC (1992).

One g portions from oven dried leaves of Jerusalem artichoke were digested with H<sub>2</sub>SO<sub>4</sub>-H<sub>2</sub>O<sub>2</sub> method according to Parkinson, Allen (1975) and analyzed, for total nitrogen using the Orange G method according to Hafez and Mikkelsen (1981); phosphorus content was determined using a colorimetric method according to Chen et al. (1956) and potassium content was estimated using a flame photometer, Jenway- PFP7 with acetylene burner as described by Page et al. (1982).

#### *Tubers*

Total nitrogen, phosphorus and potassium were determined by Hafez and Mikkelsen (1981), Chen et al. (1956) and Page et al. (1982), respectively, Inulin content was determined in tubers according to the methods of Winton and Winton (1985), some heavy metals; cadmium, lead and nickel were determined by the inductively coupled plasma– optical emission spectrometry (ICP-OES, Perkin- Elmer OPTIMA-2100 DV, Norwalk, CT) and total Phenolic compounds (TPCs) were extracted from dry sample (1.0 g) by the method described by Taga et al. (1984).

## **Results and Discussion**

### *Vegetative growth*

The results in Table 4 indicate that all organic treatments improved all growth parameters, with different degrees, compared to the control which received inorganic fertilizers only (T<sub>0</sub>). The application of 50% pigeon manure+50% poultry manure (T<sub>2</sub>) and 25% farmyard manure + 25% Poultry manure + 50% pigeon manure (T<sub>6</sub>) recorded the highest values in 2016/2017 for all parameters studied. As the lowest values were obtained by applying 50% farmyard manure + 50% pigeon manure (T<sub>3</sub>) and inorganic NPK (T<sub>0</sub>), respectively in the first season. On the second season, the highest values of all growth parameters were recorded by using (T<sub>3</sub>) and 50% farmyard manure + 25% poultry manure + 25% pigeon manure (T<sub>4</sub>). The lowest values of all growth parameters were recorded by applying the inorganic fertilizers (T<sub>0</sub>). Given the steady increase in population and the urgent need for a food free from contaminants, new sources of food had to be sought with environmentally friend fertilizers. Analysis of variance indicated that all organic combination treatments had significant effects on all growth parameters (plant height, No. of lateral shoots, No. of leaves, leaf area, leaves fresh and dry weights), positively reflecting in yield and its components at P≤0.01 in Table (4). These results are in agreement with those obtained by Ahmed and El-Zaawely (2010) for plant height and number of lateral shoots which may be attributed to the high levels of organic nutrients in the manures that could encourage growth. Ndukwe et al. (2011) indicated that organic manures are a valuable source of crop nutrients and organic matter, which can improve the soil physical, chemical and biological properties. Obtained results are coinciding with those reported by Ng'Etich et al. (2012). These results may be attributed to that soil with high organic content and adequate nutrients are required to favor the growth Chweya and Mnzava (1997). In addition, plants that received little or no nutrients were stunted in growth compared to healthy plants. Results had highly significant effects for leaves fresh weight, dry matter, stem fresh weight and dry matter in both seasons. These results appeared to be in a close agreement with the findings recorded by Abd El-Hak (2005). The results might be due to the efficient absorption and assimilation of nitrogen from manures by the plants which serve as a

TABLE 4. Influence of organic manure combination on some growth characters of Jerusalem artichoke plants in two seasons.

FW	Fresh weight
DW	Dry weight

constituent of chlorophyll which has been reported to be directly proportional to photosynthetic process (Ng'etich et al., 2009). The results agree with those of Sumeet et al. (2009), who reported that chlorophyll is strongly related to nitrogen content in the soil and is constituents of chlorophyll. In addition, the release of nutrients with the decomposition of this organic manures (Wang et al., 2014).

#### Chemical constituents

##### Leaves

##### Chlorophyll index

The effect of mixtures of organic manures on the chlorophyll index of leaves is shown in Fig. 1. The highest value of chlorophyll index (37.82) were recorded by  $T_0$  when inorganic fertilizers added followed by  $T_5$  with value of 37.13 while, the lowest value was recorded by  $T_6$  (34.36) in 2016/2017. On the other hand, the highest values were recorded by  $T_2$  (33.39) followed by  $T_0$  (33.13), the lowest value was recorded by  $T_6$  (29.87) in 2017/2018.

From the obtained data, the rates of increase between the highest and lowest values were 9.14% and 10.54% in 2016/2017 and 2017/2018, respectively. Chlorophyll index of leaves of Jerusalem artichoke plants, significantly and highly

significantly improved in both seasons, respectively. The results of both seasons reflected the effect of organic compound and the organic nitrogen, which was in the following order  $T_0 > T_2 > T_6 \approx T_5 > T_3 \approx T_4 \approx T_1$  with values of about 0.254, 0.182, 0.151, 0.150, 0.119, 0.118 and 0.117 kg N/plot in the same order. However,  $T_0$  applied more nitrogen per plot than any organic treatments, but the presence of organic acids produced by organic matter decomposition was more effective than inorganic nitrogen.

##### Nitrogen, phosphorus and potassium content in leaves

The results in Table 5 indicate that  $T_3$  (50% FYM + 50% PGM) treatment recorded the values (1.5 and 215%, respectively) for phosphorus and potassium, while value for nitrogen (4.49%) was recorded by applying  $T_1$  (100% FYM) treatment in the first season. On the other hand, the highest values (5.56 and 2.11%) were showed by using  $T_3$  for nitrogen and potassium, respectively, and (1.57%) by  $T_4$  treatment for phosphorus in the second season.

The results in Table 5 showed that in the first season, nitrogen in leaves was significantly higher with  $T_1 = T_3 = T_2 = T_6$  than  $T_5$  which was higher the  $T_4 \approx T_0$ , while in the second season all organic mixtures produced higher N-content in leaves than the inorganic ( $T_0$ ) treatment.

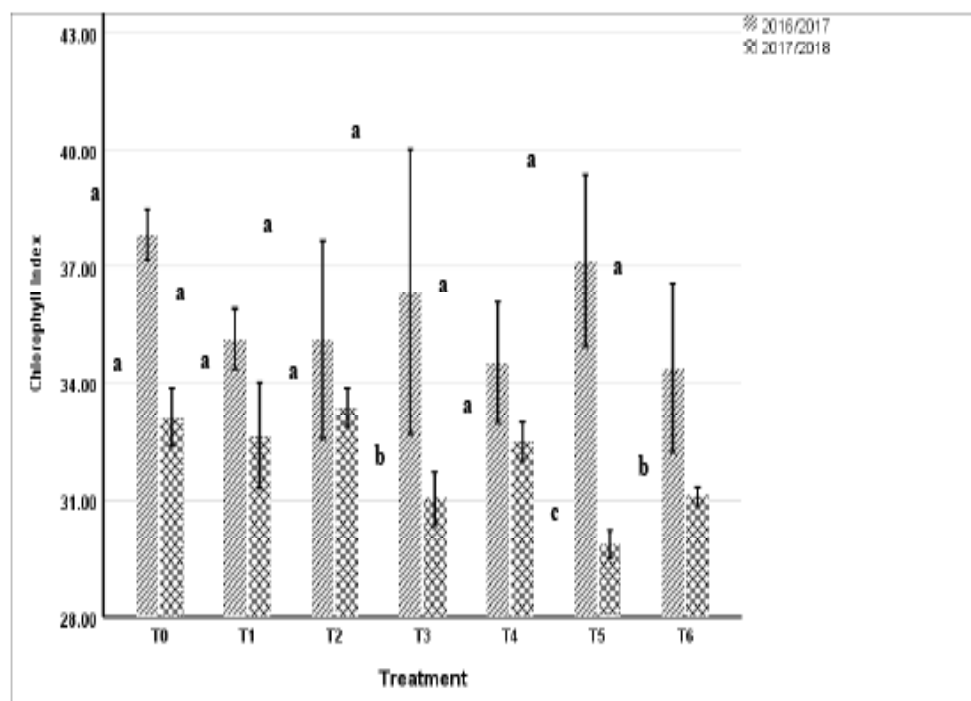


Fig. 1. Influence of organic manure combination on chlorophyll index of Jerusalem artichoke leaves in 2016/17 and 2017/18

**TABLE 5. Influence of organic manure combination on leaf and tuber contents of mineral nutrients of Jerusalem artichoke plants in the two seasons**

According to P-leave content, it was also significantly higher with all organic mixtures than ( $T_0$ ) inorganic treatment in both seasons. Also, K leaves content increased significantly with  $T_3$ ,  $T_1$  and  $T_2$  than control treatment.  $T_3$  (50%PLM + 50% PGM) usually showed the highest trend of NPK in leaves.

The results in Table 5 showed that in the first season, nitrogen in leaves was significantly higher with  $T_1=T_3=T_2=T_6$  than  $T_5$  and  $T_5$  which were higher than the  $T_4$  and  $T_0$ , while in the second season all organic mixtures produced higher N-content in leaves than the inorganic ( $T_0$ ) treatment. According to leaves P content it was also significantly higher with all organic mixtures than ( $T_0$ ) inorganic treatment in both seasons.

Also, leaves K content increased significantly with  $T_3$ ,  $T_1$  and  $T_2$ , than  $T_0$ . Treatment 3 (50% FYM + 50% PGM) usually showed the best trend of NPK in leaves.

With regard to the lowest values, the results were similar, however  $T_0$  (control) treatment recorded (1.13 and 1.74%) for phosphorus and potassium, and (3.99%) for nitrogen in the first season. In the second season, the lowest values (4.71; 1.11 and 1.75%, respectively) were recorded without any organic manure  $T_0$  (control) treatment for nitrogen; phosphorus and potassium, respectively. Such data reveal that there are highly significant differences between treatments for the three studied elements for both growing seasons. Regarding, N, P and K content in Jerusalem artichoke leaves, organic manures not only a source of nutrients available for plants but also as the most important constituent of the soil humus, which provides good substrate to plant growth. This could be attributed to the fact that nutrients in the organic manures were released gradually through the process of mineralization (Mehedi et al. 2012), maintain optimum soil levels over prolonged periods of time. Some of the organic substances released during the mineralization may act as chelates, which help to uptake of essential



ions (Lobo et al., 2012), they added that organic materials could form complex, preventing the fixation of P, reduced the P sorption capacity of the soil, enhanced P availability, improved P recovery or resulted in better utilization by plants. In addition, organic manures added carbon to the soil provides substrate for microbial growth and decomposition of organic materials improves C and N mineralization rate and enzyme activities that affect nutrient cycling and availability to the plants. This effect may be due to the high phosphorus and potassium contents of pigeon and poultry manures as shown in Table 3 in addition to the role of PLM for enhancement of decomposition of the organic materials and mineralization of nutrients especially, N and P in presence of mineral fertilizers (Okunlola et al., 2011).

### *Tubers*

#### *Nitrogen, phosphorus and potassium content in tubers*

As regard to the influence of organic manure mixtures on nitrogen (N); phosphorus (P) and potassium (K) contents in Jerusalem artichoke tuber, Table 5 indicated that the three nutrients content were highly significant enhanced with the application of organic manure mixtures as compared with control. The highest values of 2.00; 0.70 and 1.44%, for N, P and K, respectively were obtained by applying T<sub>2</sub> (50% PLM + 50% PGM) for N; T<sub>4</sub> (50% FYM + 25% PLM + 25% PGM) and T<sub>6</sub> (50% PGM + 25% FYM + 25% PLM) for P and T<sub>3</sub> (50% FYM + 50% PGM) for K in 2016/2017 growing season, but in 2017/2018, the highest value (1.89; 0.70 and 1.35, respectively) were recorded by applying T<sub>4</sub>; T<sub>3</sub> and T<sub>3</sub>, for N; P and K, respectively.

#### *Cadmium, lead and nickel content of tubers*

Cadmium (Cd); Lead (Pb) and nickel (Ni) concentrations in Jerusalem artichoke tuber are shown in figures (4; 5 & 6). The obtained results indicated that the lowest values were recorded with applying T<sub>7</sub> (50% PGM + 25% FYM + 25% PLM) (0.05 and 0.07 for Cd and 2.71 and 2.69 mg kg<sup>-1</sup> for Ni), while the lowest values of Pb (1.67 and 1.64) were recorded with applying T<sub>6</sub> (50% PGM + 25% FYM + 25% PLM) and T<sub>3</sub> (50% FYM + 50% PGM) in 2016/2017 and 2017/2018 growth seasons, respectively. On the other side, the highest values of 0.51 and 0.52 for Cd; 3.67 and 4.23 for Pb and 6.36 and 6.29 for Ni mg kg<sup>-1</sup>, in 2016/2017 and 2017/2018, were recorded with applying T<sub>1</sub> or chemical fertilizers T<sub>0</sub>, respectively.

The ANOVA results showed that the Cd; Pb and Ni concentrations were significantly affected by all combinations of organic manures as compared with control treatment at 1% probability level.

In arid and semi-arid regions including Egypt, irrigation water and soil are characterized by high levels of salinity that may aggravate the problem of heavy metals pollutions (Rady et al. 2016). These results may be due to that soil application of organic manures has been shown to improve soil fertility to reduce salt stress and the bioavailability of heavy metals to plant roots (Ok et al., 2012). In addition, the application of organic manures improved the soil physical, chemical and biological properties and decreased the heavy metals bioactivity to plant roots. Moreover, the application of organic manures reduced the metals toxicity and consequently increased soil microbial activity (Usman et al., 2013). On the other hand, (T<sub>0</sub>) recorded the highest values for Cd; Pb and Ni due to the frequent use of chemical fertilizers such as ammonium sulfate, calcium super phosphate and potassium sulfate as shown in Table 2 which cause an increase in the concentration of heavy metals in soil and irrigation water, consequently, in plants (Hadi et al., 2014). Indeed, the soil heavy metals availability can be decreased by applying the organic manures that causing heavy metals transformation from more readily available forms to less available forms such as fractions, associated with organic materials, carbonates or heavy metals oxides causing reduction in heavy metals uptake by plants (Ok et al., 2011).

#### *Total phenolic compounds and inulin content of tubers*

Presented data in (Fig. 2 and 3) indicate the influence of some organic manure combinations on total phenolic compounds (TPC) and inulin content (IC) of Jerusalem artichoke tubers. The highest values (16.93 and 17.81%, respectively) were showed by T<sub>3</sub> (50% FYM + 50% PGM) and T<sub>2</sub> (50% PLM + 50% PGM) treatments for TPCs, and (13.13 and 12.86%, respectively) by T<sub>6</sub> (50% PGM + 25% FYM + 25% PLM) for IC in 2016/2017 and 2017/2018 growth season, respectively. On the other side, the lowest values (6.20 and 8.05%, respectively for TPCs) were recorded by T<sub>6</sub> and T<sub>5</sub> (50% PLM + 25% FYM + 25% PGM) treatments and (10.38 and 10.9% for IC) by T<sub>0</sub> (control) in both of seasons, respectively. Obtained results are coincided with those reported by Ragab et al. (2008) on Jerusalem artichoke.



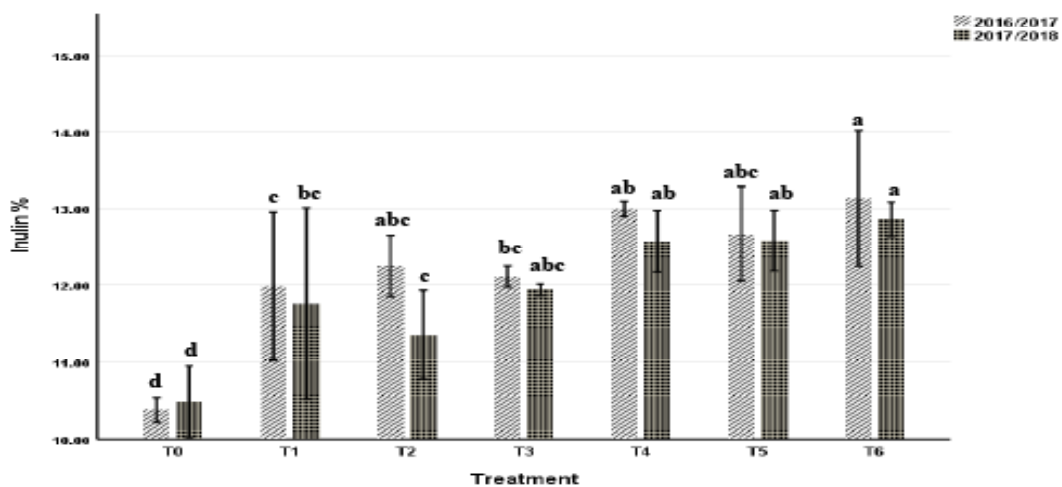


Fig. 2. Influence of organic manure combination on inulin content % of Jerusalem artichoke tubers in 2016/17 and 2017/18

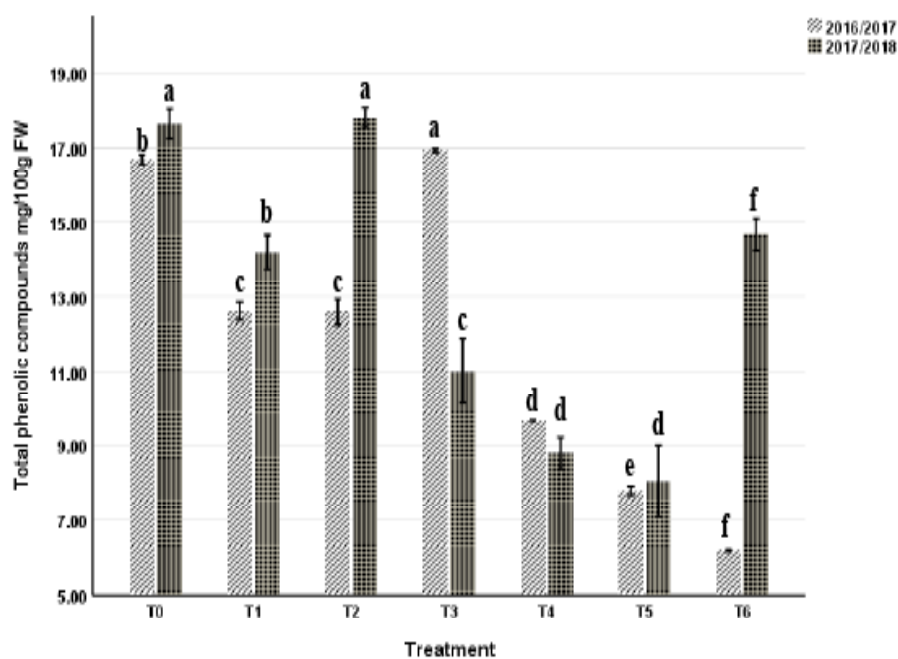


Fig. 3. Influence of organic manure combination on total phenolic compounds of Jerusalem artichoke tubers in 2016/17 and 2017/18

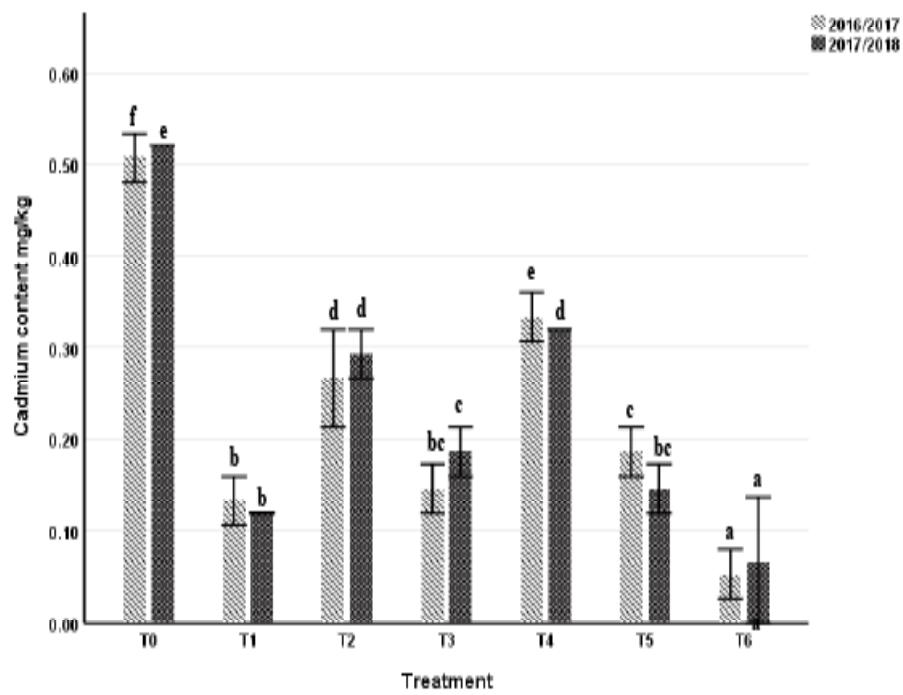


Fig. 4. Influence of organic manure combination on cadmium content of Jerusalem artichoke tubers in 2016/17 and 2017/18

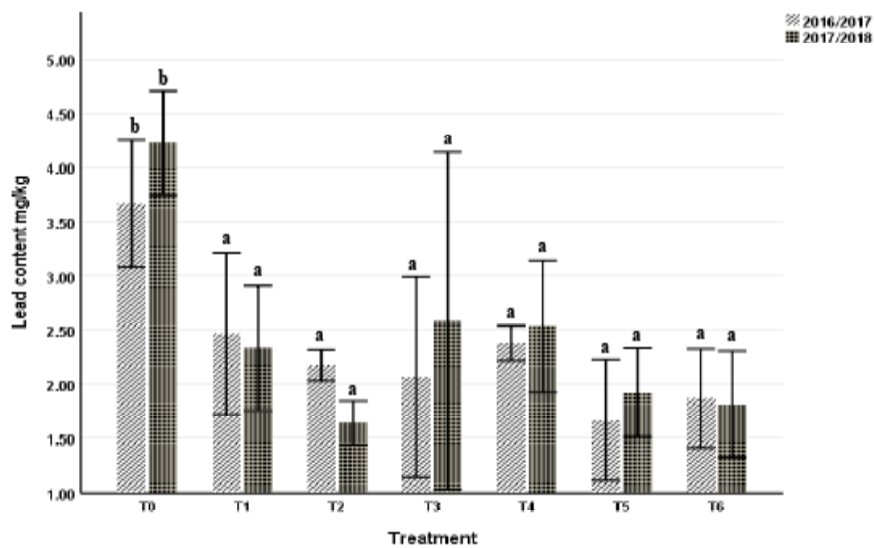


Fig. 5. Influence of organic manure combination on lead content of Jerusalem artichoke tubers in 2016/17 and 2017/18

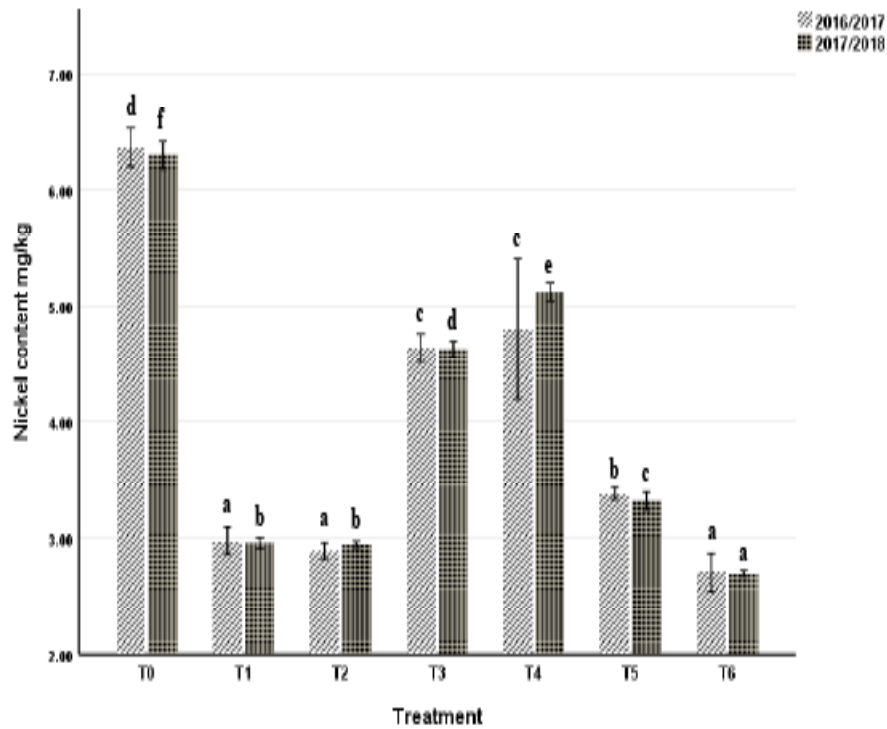


Fig. 6. Influence of organic manure combination on nickel content of Jerusalem artichoke tubers in 2016/17 and 2017/18

TABLE 6. Influence of organic manure combination on tuber yields of Jerusalem artichoke plants in the two seasons

These results could be explained due to that high content of these nutrients of leaves positively reflected in the nutritional status of tubers. It is evident from the results that TPCs and IC were highly significant affected by applying organic manure combinations. As shown from results, might be due to applying organic manures improved the mineral status of JA plants Kolota and Osinska (2006), in addition, total phenolic compounds are synthesized through a secondary metabolism cycle and it could produce some plant hormones Franco et al. (2002).

#### *Yield and its components*

##### *Tuber fresh and dry weights*

Data illustrated in Table 6 show the influence of organic manure combinations on yield components expressed as fresh and dry weights of tubers. The highest values (987.17 and 352.92 g plant<sup>-1</sup>, respectively) were showed by applying T<sub>2</sub> (50% PLM + 50% PGM) treatment, although the highest value (50.16%) of dry weight percent was recorded by using T<sub>0</sub> (control) in 2016/2017, as, the highest values (882.23 and 494.01) were showed by applying T<sub>4</sub> (50% FYM + 50% PLM) and T<sub>3</sub> (50% FYM + 50% PGM). On the other side, the lowest values were showed by applying T<sub>0</sub> (control) for fresh and dry weights in both seasons. The rates of increasing were (76.08 and 66.45%) and (54.76 and 56.76%) for fresh and dry weights in both seasons.

##### *Total tuber yield*

The indicated data in Table 6 indicated that the highest values (50.56 and 42.25 t ha<sup>-1</sup>) were recorded by applying T<sub>1</sub> (50% FYM + 50% PLM) followed by T<sub>3</sub> (50% FYM + 50% PGM) treatments in 2016/2017 growing season, and (24.38 and 20.01 t ha<sup>-1</sup>) by applying T<sub>3</sub> followed by T<sub>4</sub> treatments in 2017/2018 growing season. The lowest values (27.41 and 14.43 t ha<sup>-1</sup>) were recorded by T<sub>0</sub> (Control) and T<sub>2</sub> (100% PLM) treatments, the rates of increasing were 45.79 and 22.87 % in both seasons respectively. This increase in yield components may be attributed to the high levels of nutrients in the manures that could encourage the vegetative growth and accelerate the photosynthetic rate (Ahmed and Elzaawely 2010). In addition, poultry manures contained essential nutrients associated with high photosynthetic activities and thus promotes roots and vegetative growth (Daoula et al. 2008). The increase could be attributed to the ability of poultry manure to promote vigorous growth, increase meristematic and physiological activities in the plants due to supply of plant nutrient and improve in the soil properties. In this respect, similar findings were also found by Osman (2004).

The results of statistical analysis of these data

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indicated that treatments were highly significant increase in 2016/2017 season and no significant in 2017/2018 growth season as compared with control. These results were in line with the results obtained by Dauda et al. (2005b), however poultry manure is good source of nitrogen for sustainable crop production.

The increase in the total yield may due to the effect of organic manures on soil aggregation, soil aeration, increase water holding capacity and offers good environmental conditions for the root system (Ng'etich et al. 2012). In addition, farmyard manures are slow release nutrients all over the growing seasons.

#### **Conclusion**

On the basic of the obtained results it was concluded that the highest total yield were recorded by T<sub>1</sub> (50% FYM + 50% PLM) and T<sub>4</sub> (50% FYM + 25% PLM + 25% PGM) treatments in 2016/2017 and 2017/2018 growth seasons, respectively. T<sub>3</sub> treatment was the highest treatment for total phenolic compounds and T<sub>6</sub> (50% PGM + 25% FYM + 25% PLM) treatment for inulin.

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### إستجابة نباتات الطرطوفة النامية تحت ظروف الاراضى الجيرية الملحية إلى معدلات الاضافة المختلفة من الاسمدة العضوية

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أجريت تجربة على نباتات الطرطوفة المنزرعة بأرض جيرية عالية الملوحة حديثة الاستصلاح خلال الموسم الصيفي ٢٠١٧/٢٠١٦ و ٢٠١٨/٢٠١٧ لتقييم تأثير خلط ثلاثة أنواع مختلفة من الاسمدة العضوية (مخلفات الماشية و مخلفات الدواجن و ذبل الحمام) على بعض صفات النمو الخضري وامتصاص بعض العناصر الكبرى (النيتروجين - الفوسفور - البوتاسيوم) و انعكاس ذلك على محتوى الدرنات من هذه العناصر كأحد صفات الجودة، اضافة الى مدى تأثير نتائج خلط هذه الاسمدة على محتوى الدرنات من بعض العناصر الثقيلة مثل الكاديوم و النيكل و الرصاص.

وقد أشارت النتائج المتحصل عليها بأن خلط هذه الاسمدة قد أدى الى تحسين في كل الصفات المدروسة ولكن بدرجات متفاوتة وذلك عند مقارنتها بنتائج التسميد المعدني الموصى به من قبل وزارة الزراعة المصرية. ففي خلال موسم النمو الأول ٢٠١٧/٢٠١٦ سجلت المعاملة T2 ( ٢١ كجم مخلفات الدواجن + ٢١ كجم ذبل حمام) أعلى القيم لصفة عدد الأوراق و الوزن الطازج و الجاف لكل من الأوراق و السيقان و الدرنات إضافة الى محتوى النيتروجين الكلي بالدرنات، بينما أعطت المعاملة T6 ( ٢١ كجم ذبل حمام + ١٠,٥ كجم مخلفات الماشية + ١٠,٥ كجم مخلفات دواجن) أعلى النتائج لكل من طول النبات و عدد الأفرع الجانبية و محتوى الفوسفور بالدرنات علاوة على أقل تركيز من الكاديوم و النيكل بالدرنات، وكانت المعاملة T1 ( ٢١ كجم مخلفات الماشية + ٢١ كجم مخلفات الدواجن) هي الأفضل على الإطلاق بالنسبة لمحتوى النيتروجين الأوراق و محصول الدرنات الكلي.

في موسم النمو الثاني ٢٠١٧/٢٠١٨، على الجانب الاخر، كانت المعاملة T4 ( ٢١ كجم مخلفات ماشية + ١٠,٥ كجم مخلفات دواجن + ١٠,٥ كجم ذبل حمام) هي الأعلى في تسجيل قيم الصفات التالية: عدد الأفرع الجانبية ووزن الطازج و الجاف للأوراق و ايضا الوزن الطازج للدرنات و محتوى الدرنات من عنصرى النيتروجين و الفوسفور.

في المقابل سجلت المعاملة T3 ( ٢١ كجم مخلفات ماشية + ٢١ كجم ذبل حمام) أعلى النتائج لمحتوى الدرنات من المركبات الفينولية الكلية و ايضا محتوى الأوراق من الفوسفور و البوتاسيوم، بينما سجلت المعاملة T6 أعلى القيم لمحتوى الدرنات من سكر الانبولين و ذلك خلال موسمي الدراسة، توصي نتائج البحث استخدام الاسمدة العضوية و تحديدا كلا من المعاملتين T1 و T4 للحصول على أعلى إنتاج و جودة لمحصول نبات الطرطوفة في الاراضى الجيرية حديثة الاستصلاح العالية الملوحة.