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ENVIRONMENTAL IMPACT TO UTILIZING SOME FOOD INDUSTRIES WASTE AS A LIQUID ORGANIC FERTILIZER AND THEIR EFFECTS ON PLANTS UNDER SALINE CALCAREOUS SOIL

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ABSTRACT

The objective of this work is to assess the suitability of utilizing food industries waste (molasses and orange waste) to produce natural liquid organic fertilizer and evaluation their effects on plant and soil. A preliminary experiment was conducted at the greenhouse of Agricultureal Research Centre (ARC) at Giza Governorate, Egypt to test the effect of molasses or orange waste extract on the growth of maize (*zea maize*) during the summer seasons of 2011 followed with barley (*Hordeum vulgare*) during the winter seasons of 2011/2012. The field experiment was carried out to verifying the effect of molasses or orange waste extract on maize plants. Maize grains were planted in the experimental farm of Nubareia Research Station (El-Behira Governorate), Egypt. Grains of maize were sown in summer growing season of 2012. The obtained results showed that applying both aqueous extracts to soil increases the amount of soil organic matter and decreases the ECe of the soil. Avery slightly differences were observed in pH and $CaCO_3$% of soil. There is positive effect of both P1 and P2 (molasses or orange waste) on the growth of field crops. The application of these extracts significantly, increased grain and straw yield as well as improved nutritional values of grain, i-e., total carbohydrates, crude protein, oil, total amino acids, organic acids, and hormones. The efficiencies of either extracts as a fertilizer or as amendments compared to control treatment are very different. There was excellent potential to obtain a natural fertilizer and an amendment using molasses. On the other hand, the best results of orange waste extract were obtained as an amendment rather than a fertilizer.

Keywords: Industries wastes, plant extract, liquid organic fertilizer, soil amendment. Calcareous soil

INTRODUCTION

In Egypt, most of the newly reclaimed soils are calcareous, the newly reclaimed land at Nubaria region reach about 900.000 feddan 290.000 feddan from its are calcareous (El-Zaher *et al*., 2001). These soils are generally characterized by low fertility levels and easily ammonia volatilization due to their high content of calcium carbonate and alkaline pH. In addition, the availability of most nutritional elements is considerably low especially phosphorus and micronutrients (Shata *et al.,* 2007).The disposal of large volumes of waste materials can be an expensive and environmentally threatening operation. However, if alternative uses can be found, disposal costs can be avoided and added economic value can be obtained from the usage of waste materials (Inckel *et al*., 1996; Sim and Wu, 2010). Heightened environmental awareness has led to an organic revolution, with scientists turning to organic materials in search of a comprehensive strategy to save soils from further degradation and utilize organic wastes in an environmentally safe manner. Regular additions of organic materials such as sugar industry wastes, municipal biosolids, animal manures and crop residues are of utmost importance in maintaining the tilth, fertility and productivity of agricultural soils (Solaimalai *et al*., 2001). Liquid organic fertilizers are natural materials of either plant or animal origin. They include crop residues, livestock manure, household waste, and food industrial waste. Liquid fertilizers are more uniform in mixture of nutrients compared to a solid form. Since there is a good relationship between water content and nutrient availability, the use of liquid organic fertilizer may be an efficient way of enhancing nutrient uptake. Continued use of liquid organic fertilizers results in increased soil organic matter, reduced erosion, better water infiltration and aeration, and higher soil biological activity, as the materials decompose in soil, and increased yields are obtained after one year of application (Riddech *et al*. 2009). Food industries waste is harmful, which seriously affected the urban environment and human health, but because of its rich organic matter and fat content, therefore, it has a greater utilization value. In this way, not only have a small impact on the environment, but also can recover energy and produce the secondary product which is friendly to environment and applied to the cultivation can improve soil structure, increase soil fertility and promote crop growth. Not only reduce the burden of urban waste, but also promote the mass production of organic fertilizer, reducing fertilizer use, thereby reducing the pollution of soil and water by chemical fertilizer (Lan *et al.* 2012). Dried citrus peel is rich in carbohydrates, proteins and pectin; pectin acts as the inducer for production of pectinolytic enzymes by microbial systems (Bhardwaj and Neelam, 2011). Among the well-known citrus bioactive compounds, flavonoids, especially, the citrus unique polymethoxy flavones and flavanone glycosides, attract considerable attention for their significant biological activities (Tripoli *et al.*, 2007 and kumar *et al*., 2011). Lohrasbi *et al*., (2010) stated that orange peel waste, composing of peel, seed, membrane residue which is required to be processed further to avoid environmental problems. Currently, the main part of this waste is used for cattle feed production and the rest is burnt. Thus, more effective and sustainable alternatives for using orange peel are highly desirable. A high percentage of orange production (70%) is used to manufacture derivative products and approximately 50–60% of the processed fruit is transformed into citrus peel waste (peel, seeds and membrane residues). According to Rivas *et al*. (2008), the orange peel is in fact constituted by soluble sugars, 16.9 % wt; starch, 3.75 % wt; fiber (cellulose, 9.21 % wt; hemicelluloses, 10.5 % wt; lignin 0.84 % wt; and pectins, 42.5 % wt), ashes, 3.50 % wt; fats, 1.95 % wt; and proteins, 6.50 % wt. Insoluble polysaccharides in orange peel are composed of pectin, cellulose and hemicelluloses. Sugar industry wastes can be used as soil amendments to improve crop yield, soil physicochemical characteristics and provide a reasonable economic means to recycle these wastes in an environmentally friendly manner (Jamil and Qasim, 2008). Molasses is used in the baker's yeast production, in the fermentation technology for ethanol, citric, lactic and gluconic acids production, as well as glycerol, butanol and acetone production, as an ingredient of mixed feeds or in the production of amino acids (Belitz *et al*., 2009, Satyanarayana and Kunze, 2009). Molasses could cause environmental pollution through aesthetic degradation if spills are not properly cleaned. It can also cause water pollution if major spills or factory effluents enter river streams. It is therefore important to consider critically the handling and disposal of molasses particularly in situations where supply exceeds demand. This can arise especially where industrial use of molasses is not diversified. During sugar processing, some materials are added into the process as clarification agents and evaporator decadents. These materials include lime and sulphur dioxide among others. During crystallization of the sugar juice, those elements remain in molasses and are then included in the natural molasses ingredients. Those elements plus others imbibed from the soil by the sugar cane as nutrients to support growth are the ones, which probably interacted with expansive soil to change its characteristics during stabilization. However, the exact composition of molasses is difficult to predict. The reason is that molasses composition is influenced by the soil where the cane is grown, climatic conditions, variety and maturity of the cane and the processing conditions at the factory. It is for that reason only ranges with indicative averages of the composition are usually given (Julius and Ndegwa., 2011). Molasses is used primarily as a source of potassium but it has other significant advantages such as increasing organic matter in the soil and microbial activity associated with nitrification. Molasses also contains secondary elements in small quantities such as phosphorus, sulphur, calcium and magnesium, as well numerous trace elements. Application of molasses also improves soil aggregation and reduces surface crusting in hard-setting soils (Wynne and Meyer, 2002). Calcareous soils exist in large areas particularly in semi-arid regions. The aim of the study intended to: Focus on waste minimization in food industry that circumvents the environmental problems caused by this waste. Assess the suitability of utilizing food industries wastes to produce liquid organic fertilizer, to decrease the use of chemical fertilizers and help lower production costs and environmental hazards on a long-term basis. Evaluation the effects of liquid organic fertilizer on the plant and studied soil.

MATERIALS AND METHODS

Preparation of natural liquid organic fertilizer from food industries waste or by-product

Sugar cane molasses was obtained from sugar factory; El-hawamdia; Giza Governorate and orange waste was obtained from Gohina factory; 6 October; Giza Governorate and then prepared as shown in Figure (1). These aqueous extracts were used as a natural organic liquid fertilizer for maize and barley plants under saline calcareous soil. The final chemical analysis of molasses and orange waste is shown in Table 1.

Greenhouse experiment

A preliminary experiment was conducted at the greenhouse of Agriculture Research Centre (ARC) at Giza Governorate, Egypt to test the effect of P1

(molasses) or P2 (orange waste) extracts on the growth of maize (*zea maize*) during the summer seasons of 2011 followed by barley (*Hordeum vulgare*) during the winter seasons of 2011/2012, in the same pots after maize harvesting. Ten maize or twenty barley grain were planted in every pot (20 cm diameter) with three replicates, each pot containing 15 kg soil
obtained from Nubareia Research Station (El-Behira Governorate). The experiment was designed in a complete randomized design.

Molasses
↓
+ hot water (1:10 v/v)
↓
Mixing well
↓
The solution stand for 4 hours under room temperature
↓
Finally the natural solution is kept in plastic bottle
↓
Determination of chemical composition

Fig. 1a: Aqueous solution (P1)

1 kg of orange waste (peel, pulp, & seeds)
↓
Cutting them into small pieces and were air-dried
The dried samples were grinded properly using a mortar and pestle and prepared as a tea bag form
↓
The bag soaked in 10 liter of hot tap water
↓
Soaked for 24 h at room temperature
↓
Aqueous extract transferred into sterile bottles and refrigerated until use
↓
Chemical composition was determined

Fig. 1b: Aqueous solution (P2)

Table 1. Chemical composition of molasses and orange waste aqueous extracts

Chemical composition	Molasses solution (1:10)	Orange waste extract
Organic acids (%)	1.5	1.0
Gibrilic acid (mg/L)	106.3	92.7
Indole acetic acid (mg/l)	113.7	107.7
Cytokinine (mg/L)	1.8	2.2
Oil%	0.21	1.5
Crude protein%	2.4	1.5
Free amino acid %	2.2	2.2
Total soluble sugars%	39.1	19.7
pH(1:5)	5.0	3.8
N%	0.39	0.42
K%	0.32	0.2
P%	0.03	0.01

Field experiment

The field experiment was carried out to verifying the effect of P1 or P2 extract on maize plants. Maize (*zea maize*) grains were planted in the experimental farm of Nubareia Research Station (El-Behira Governorate), Egypt. Field experimental plot area was 10.5 m^2 (3 x 3.5m) with three replicates for each extract (P1 or P2) treatment and control treatment. Experiment was designed in a complete randomized block design. Grains of maize were sown in summer growing season of 2012. Some Physical and chemical characteristics of the studied soil before planting are presented in Table (2).The final plant sampling was taken at plant harvest. Collected samples were dried at 60 °C then kept for some analysis. It is worth mentioning, in both experiments: P1 or P2 extract as a natural fertilizer was added based on available N of each extract and requirements of N fertilizer for plant. P1 or P2 extracts as a soil amendment was added at a rate of 2.5 L/plot from 1:10 extract Sherif *et al*. (2012).

Treatments:

T1. Mineral fertilize (recommended dose)

T2. P1 or P2 as a fertilizer (recommended dose of N-mineral fertilizer)

T3. P1 or P2 as an amendment (2.5 L/polt) + Mineral fertilizer (recommended dose)

T4. P1 or P2 as an amendment (2.5 L/polt) + Compost (recommended dose)

T5. P1 or P2 as a fertilizer (recommended dose of mineral N-fertilizer) + some micronutrient (Fe, Mn, Zn and Cu)

T6. P1 or P2 as an amendment (2.5 L/polt) + Mineral fertilizer (recommended dose) + some micronutrient (Fe, Mn, Zn and Cu)

T7. Compost as a recommended dose of mineral N- fertilizer

Analytical methods:

Some Physical and chemical characteristics of the studied soil was determined according to Page *et al*. (1982). In digested plant sample and P1 or P2 extract; phosphorus content was determined by vanadomolybdate yellow method spectrophotometrically and K by flame photometer **(**Jackson, 1973). Total nitrogen was determined by micro-Kjeldahl method according to (AOAC., 1970). Crude protein was calculated by multiplying the values of total nitrogen by 6.25**.** Total free amino acids concentration was determined using ninhydrin reagent (Moore and Stein, 1954). Free proline was extracted and determined according to the method described by Bates *et al*. (1973). Indole-3-acetic acid was determined according to the method described by Mahadevan and Chandramohan (1966). Gibberellic acid was extracted and determined in plant tissue according to the method described by Cho, *et al*. (1979). Cytokinin was extracted and determined according to the methods of Unyayar *et al*. (1996). Crude oil was determined according AOAC. (1980). Total carbohydrate was extracted according to Smith, *et al*. (1964) and determined using spectrophotometer according to Murphy, (1958). All determinations were performed in triplicate and data represented on dry weight basis as mean values ± standard deviations.

At the end of season, all plants were harvested and collected per plot and yield per feddan were then calculated. All data were statistically analyzed using Costat computer program according to procedures outlined by Snedecor and Cochran (1980).

Table 2: Some physical and chemical properties of the tested soil under different experiments

Physical properties	Value
Sand%	8.00
Silt%	40.00
Clay%	52.00
Texture soil	Silty clay
$CaCO_3$%	22.6
Chemical properties	
pH (1: 2.5, soil water suspension)	7.85
Organic matter (%)	0.7
ECe dS m^{-1}, soil paste	8.18
Soluble cations (me/L)	
Ca^{++}	27.38
Mg^{++}	15.80
Na^{+}	37.70
K^{+}	0.93
Soluble anions (me/L)	
$CO3^{=}$	-
HCO_3^{-}	1.65
Cl^{-}	43.50
$SO_4^{=}$	36.66

RESULTS AND DISCUSSION

Effect of food industries waste extracts on organic matter, pH, calcium carbonate and soil salinity

Applying aqueous solutions, molasses (P1) or orange waste extract (P2) to soil increases the amount of soil organic matter in all treatments relative to mineral fertilizer and compost treatments (Fig. 2). A slightly differences were observed in soil pH and $CaCO_3$ between most of treatments and mineral fertilizer or compost as shown in Fig. (3). Regarding the soil ECe, applying natural extracts (P1 or P2) led to decreases the ECe in all treatments relative to mineral fertilizer and compost treatments (Fig. 4). The lowest value of ECe was recorded in P1 with compost treatment; the decrease percentage reached 74% relative to mineral fertilizer as a control. Concerning the P2 extract, data showed the lowest value was recorded at P2 treatment only; the decrease percentage reached 78% relative to mineral fertilizer as a control. Decreasing soil pH and soil salinity led to improving the availability of macro and microelements in the soil (Hetter, 1985) as well as yield productivity and its related characteristics (Kineber *et al*., 2004).

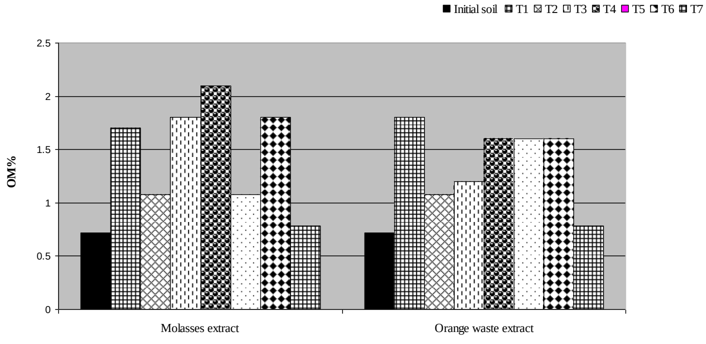

Figure 2: Effect of food industries wastes extracts on soil organic matter%

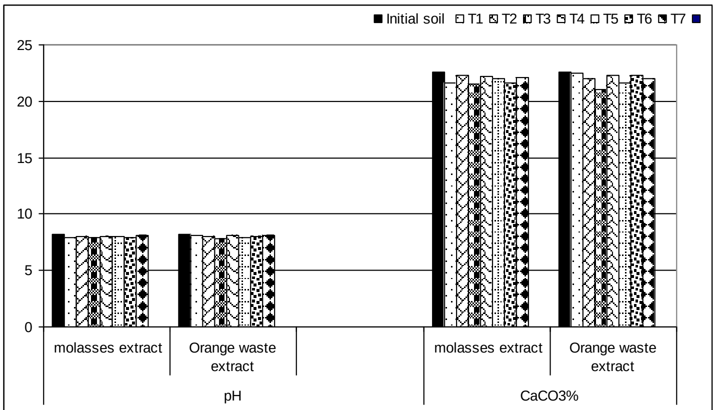

Figure 3: Effect of food industries wastes extracts on soil pH and CaCO3%

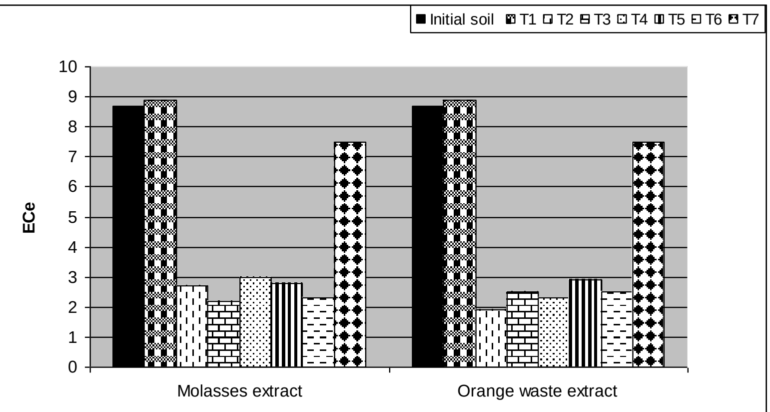

Figure 4: Effect of food industries wastes extracts on soil ECe (ds/m)

Greenhouse experiment

Grain and straw yield of maize plant:

Data of the effect of some food industries wastes extracts on grain and straw yield of maize plant under greenhouse experiment are presented in Table 3. Data revealed that addition of molasses (p1) or orange waste extract (p2) significantly increased grain and straw yield of maize relative to mineral fertilizer or compost treatments. The results showed progressive increases in maize yield (grain or straw) as a result of addition molasses extract (P1) compared with mineral fertilizer. Yield (grain or straw) reached 2.0 and 1.7-fold that of mineral fertilizer and compost, respectively. The grain or straw yield can be arranged in the following order: T3>T6>T5>T4>T2. Regarding to the orange waste extract (P2), the results showed pronounced increases in maize yield (grain or straw) at T6 treatment. Grain yield reached 1.9 and 1.6-fold that of mineral fertilizer and compost, respectively. Straw yield reached 2.1 and 1.7-fold that of mineral fertilizer and compost, respectively. The grain or straw yield can be arranged in the following order: T6>T3>T4>T5>T2. These results (increases in grain and straw yield) may be attributed to the presence of some growth regulator such as indole acetic acid, giberllic acid, organic acid, and amino acids in food industries wastes extracts (P1 or P2) as shown in Table (1) and also to the combination effect of the extracts with mineral fertilizer and micronutrient.

Grain and straw yield of barley plant:

Data of the effect of some food industries wastes extracts on grain and straw yield of barley plant are presented in Table 4. Data showed that addition of molasses (P1) or orange waste (P2) extract significantly increased grain and straw yield of barley relative to mineral fertilizer or compost treatments. The results showed pronounced increases in barley yield (grain or straw) at T3 treatment as a result of addition of P1 extract with mineral fertilizer. Regarding to the orange waste extract (P2), the results showed progressive increases in barley yield (grain or straw) at T6 .Grain yield reached 1.8 and 1.6-fold that of mineral fertilizer and compost, respectively.

Straw yield reached 1.3 and 1.3-fold that of mineral fertilizer and compost, respectively. It is worth mentioning, the minimum yield was found in P2 as fertilizer treatment (T2).

Table 3: Effect of some food industry wastes extracts on grain and straw yield (g/pot) of maize plant under greenhouse experiment

Treatment	Grain yield	Straw yield
	Molasses (P1)	
T1	70.5 ^{g}	211.7 ^{f}
T2	107.1 ^{e}	321.2 ^{d}
T3	142.6 ^{a}	426.2 ^{a}
T4	107.7 ^{d}	321.2 ^{d}
T5	120.6 ^{c}	362.2 ^{c}
T6	130.2 ^{b}	390.2 ^{b}
T7	84.5 ^{f}	254.9 ^{e}
LSD	0.4057	2.597
	Orange waste extract (P2)	
T1	70.5 ^{g}	211.7 ^{g}
T2	92.47 ^{e}	307.3 ^{e}
T3	128.0 ^{b}	397.8 ^{b}
T4	118.1^{c}	363.2 ^{c}
T5	99.2 ^{d}	338.2 ^{d}
T6	136.3 ^{a}	438.3 ^{a}
T7	84.5 ^{f}	254.9 ^{f}
LSD	0.9711	2.580

Table 4. Effect of some food industry wastes extracts on grain and straw yield (g/pot) of barley plant under greenhouse experiment

Treatment	Grain yield	Straw yield
	Molasses (P1)	
T1	15.40 ^{d}	73.03 ^{d}
T2	19.33 ^{b}	79.07 ^{c}
T3	21.10 ^{a}	92.77 ^{a}
T4	19.43 ^{b}	78.50 ^{c}
T5	19.97 ^{b}	84.30 ^{b}
T6	21.10 ^{a}	90.00 ^{a}
T7	17.07 ^{c}	75.80 ^{cd}
	0.9227	3.703
LSD	Orange waste extract (P2)	
T1	15.40 ^{e}	74.03 ^{d}
T2	16.10 ^{e}	64.90 ^{e}
T3	26.70 ^{b}	97.10 ^{b}
T4	24.87 ^{c}	94.67 ^{c}
T5	25.50 ^{c}	94.63 ^{c}
T6	27.67 ^{a}	101.5 ^{a}
T7	17.07 ^{d}	75.80 ^{d}
LSD	0.7996	2.015

Field experiment

Grain and straw yield of maize plant:

The effect of some food industries waste extracts on yield components of maize plant under field experiment are shown in Table 5. Data explained that addition of molasses (P1) significantly increased grain and straw yield of maize relative to mineral fertilizer or compost treatments as a control. The results showed pronounced increases in maize grain yield at treatments T3 and T6. The biggest values of straw yield were observed at T3. Straw yield at treatments T3and T6 reached 2.4 and 2.1-fold that of mineral fertilizer and 2 and1.7-fold that of compost treatment as a control, respectively. Regarding to the orange waste extract (P2), the results showed progressive increases in maize components yield at T6 treatment. Grain yield reached 2.1 and 2.0-fold that of mineral fertilizer and compost, respectively. The grain yield can be arranged in the following order: T6 >T3 ,T4. No significant effect was found between the other treatments. The biggest value of straw yield was observed at T3 and T6 treatment. Straw yield reached 2.0 and 1.7-fold that of mineral fertilizer and compost, respectively. The straw yield can be arranged in the following order: T6, T3>T4, T5. It worth mention that, the applying molasses as an amendment with compost(T4 treatment) was less affected on yield compared with applying molasses as an amendment with mineral fertilizer(T3 treatment) this result may be due to the interaction between microorganisms in soil. Lucia, *et al*. (2010) stated that the bacteria are inhibited by yeasts as most common interaction. While the opposite results (increasing in the grain and straw yield) may be due to each extract comprise important sources of plant promoters such as suger, lipids, carbohydrates, minerals such as N, P, K, inorganic compounds (Djilas *et al*., 2009).

Table 5. Effect of some food industry wastes extracts on yield components (ton/fed.) of maize plant under field experiment

Treatment	Grain	Straw	Biological
		molasses (P1)	
T1	2.4 ^{b}	2.9 ^{cd}	5.3 ^{d}
T2	2.9 ^{b}	3.8 ^{c}	6.7 ^{c}
T3	4.6 ^{a}	7.0 ^{a}	12.4 ^{a}
T4	2.8 ^{b}	2.9 ^{cd}	5.7 ^{cd}
T5	2.7 ^{b}	2.8 ^{d}	5.5 ^{cd}
T6	4.2 ^{a}	6.1 ^{b}	10.3 ^{b}
T7	2.5 ^{b}	3.5 ^{cd}	6.0 ^{cd}
LSD	0.7421	0.8113	1.243
		Orange waste extract (P2)	
T1	2.4 ^{c}	2.9 ^{c}	5.3 ^{d}
T2	2.4 ^{c}	3.1 ^{c}	5.5 ^{d}
T3	4.4 ^{b}	5.7 ^{a}	10.1 ^{a}
T4	4.2 ^{b}	4.6 ^{b}	8.8 ^{b}
T5	2.5 ^{c}	4.4 ^{b}	6.9 ^{c}
T6	5.0 ^{a}	5.8 ^{a}	10.8 ^{a}
T7	2.5 ^{c}	3.5 ^{c}	6.0 ^{d}
LSD	0.4839	0.5307	0.7335

Generally, applying liquid extracts of food waste industries as a fertilizer or amendment (Figs. 5 and 6) was more effective in stimulation of growth plant (Figs.7 and 8). These results supported by Li *et al*. (2009), they stated that liquid natural fertilizer produced from waste was much cheaper compared to chemical fertilizer. Besides this advantage, liquid organic fertilizers from factory waste are easily available and have almost no adverse effect on the environment.

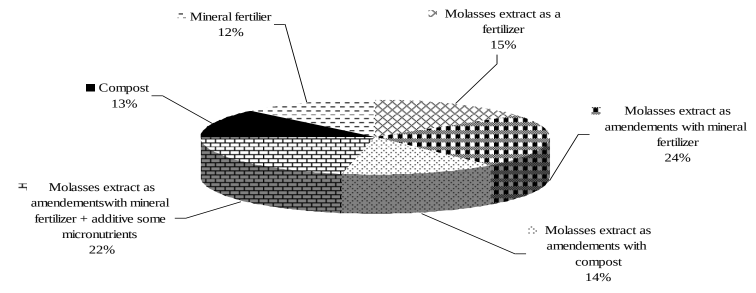

Figure 5 : The effect of molasses extracts as a fertilizer and amendements based on grain yield under field experiment

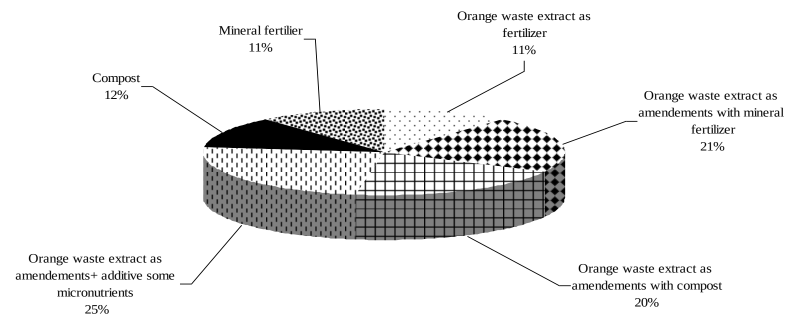

Figure 3 : The effect of orange waste extracts as a fertilizer and amendements

Figure 7. The effect of molasses as a fertilizer and soil amendment

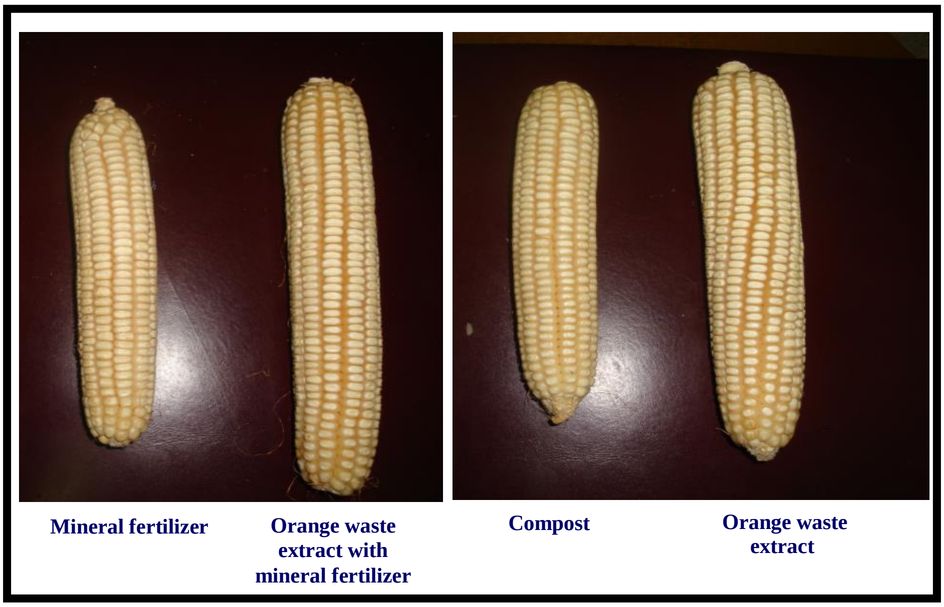

Figure 8. The effect of orange waste extract as a soil amendment

Mineral Contents:

The results of plant minerals content are summarized in Table (6). There was a difference in mineral content as a result of adding molasses (P1) or orange extract (P2) treatments and control. The highest values of nitrogen content were recorded in T3 treatment and T6 treatment. The biggest value of phosphorous content was recorded in T3 and T5 treatments. The highest value of potassium content was recorded in T3 and T6 treatment. Finally, from the previously obtained results, increase in mineral content in plants that treated with both of extract (P1 or P2) compared with mineral fertilizer or compost was observed. Generally, it could be observed that the nutrient contents in maize grains were extending parallel close to the corresponding nutrients contents in both extracts P1 and p2.

Table 6. Effect of some food industry wastes extracts on mineral content (g/100g dry matter) of maize plant under field experiment

Treatment	N	P	K
	Molasses (P1)		
T1	0.81 [d]	0.12 [e]	0.30 [b]
T2	1.04 [c]	0.17 [de]	0.38 [b]
T3	1.32 [a]	0.39 [a]	0.49 [a]
T4	1.11 [bc]	0.23 [cd]	0.33 [b]
T5	1.21 [ab]	0.38 [ab]	0.31 [b]
T6	1.33 [a]	0.39 [a]	0.50 [a]
T7	1.17 [abc]	0.30 [bc]	0.19 [c]
LSD	0.1591	0.07956	0.09744
	Orange waste extract (P2)		
T1	0.81 [c]	0.12 [e]	0.30 [b]
T2	1.04 [bc]	0.17 [de]	0.38 [b]
T3	1.29 [ab]	0.36 [ab]	0.39 [b]
T4	1.29 [ab]	0.34 [b]	0.39 [b]
T5	1.10 [abc]	0.25 [c]	0.30 [b]
T6	1.35 [a]	0.40 [a]	0.55 [a]
T7	1.09 [abc]	0.21 [cd]	0.30 [b]
LSD	0.2756	0.05626	0.1125

Chemical and biochemical parameters of plants:

Total carbohydrates, crude protein and oil

The responses of maize plant to different treatments were obvious from the variations among the total carbohydrates, protein and oil (Table 7). For molasses (P1) treatments, the highest value of total carbohydrate was observed in treatment in T3 treatment, which reached 1.21 and 1.11-fold that of mineral fertilizer or compost as a control followed by T5, which reached 1.18 and 1.08 then 1.13 and 1.03-fold that of mineral fertilizer or compost as a control, respectively. The lowest value was observed in treatment of mineral fertilizer. The highest value of crude protein was observed in T3 and T6 treatments, compared to control. No significant effect was observed in T2, T5, T4 and T7.While the lowest value was recoded in treatment of mineral fertilizer also. Concerning the oil content, the highest value was observed in treatments of T3, T6 and T2. While, the values of oil contents were in the same value in the T1, T4, T5 andT7. Regarding the orange waste extract (P2) treatments, the highest value of total carbohydrate was observed in treatment of T6 treatment, which reached 1.23 and 1.07-fold that of mineral fertilizer or compost followed by T3 then T2, which reached 1.19 and 1.04

then 1.14 and 1.0- fold that of mineral fertilizer or compost as a control, respectively. The value of crude protein was arranged in the following order: T6 > T3, T4 > T2, T7 treatment, while the lowest value was observed in treatment of mineral fertilizer treatment. The highest value of oil content was observed in T3 and T4 compared to control. On the other hand, the lowest value of oil contents was observed in T1. These results may be attributed to that the P1 or P2 extract contains organic materials and minerals such as N, P, K, as shown in Table (1). Carbohydrates and other components that found in extracts can mobilized and translocated very easily from soil to plants. Fathy *et al.* (2009) found that increasing N and K rates significantly increased roots and sugar yield in sandy calcareous soil. Nelson (1978) found that potassium has a positive effect in plant growth under saline conditions, because it plays an essential role in stomata movement, photosynthesis and regulation of osmotic pressure for plant.

Table 7. Effect of some food industry wastes extracts on chemical components of maize plant under field experiment

Treatment	Total carbohydrate%	Protein%	Oil %
		Molasses (P1)	
T1	61.43 f	5.06 c	3.27 c
T2	69.27 c	7.33 ab	4.73 ab
T3	74.20 a	8.27 a	5.60 a
T4	66.03 e	6.96 b	3.27 c
T5	72.23 b	7.56 ab	3.50 c
T6	65.37 e	8.33 a	5.87 a
T7	66.97 d	6.48 b	3.80 bc
LSD			
		orange waste extract (P2)	
T1	61.43 f	5.06 c	3.27 c
T2	70.30 c	6.84 abc	4.60 ab
T3	73.17 b	8.10 ab	5.27 a
T4	65.00 e	8.04 ab	5.57 a
T5	65.97 de	6.89 abc	4.97 ab
T6	75.47 a	8.43 a	4.53 ab
T7	70.30 c	6.84 abc	4.60 ab
LSD	66.97 d	6.48 bc	3.80 bc

Total amino acids, organic acids and proline

Experimental results of total amino acids, organic acids and proline content of maize are found in Table 8. Data revealed that total amino acid and organic acid contents increased in all treatment for both two extracts (P1 or P2) relative to mineral fertilizer as a control. Regarding to the proline content, datd showed that the control treatment (mineral fertilizer only) was higher than that of P1 or P2 extracts treatments. This result may be attributed to the high content of P1 and P2 extract in amino acids, organic acids and hormones...etc as shown in Table 1, these constituent are a well known biostimulant which has positive effects on plant growth, yield and significantly mitigates the injuries caused by abiotic stresses such as salinity. The present findings are in agreement with those reported by Kowalczyk and Zielony

(2008). Amino acids as organic nitrogenous compounds stimulated cell growth acting as buffers maintaining favorable pH value within the plant cell as well as synthesizing other organic compounds, such as protein, amines, purines and pyrimidines, alkaloids, vitamins, enzymes, terpenoids and others (Goss, 1973). Bidwell (1980) stated that, the importance of amino acids came from their widely uses for the biosynthesis of a large variety of non-protein nitrogenous materials, i.e. pigment, vitamins, coenzymes, purine and pyrimidine bases. Amino acids could directly or indirectly influence the physiological activities of plant growth and development, through their regulatory effects on production of gibberellins in plant tissues (Waller and Nowaki, 1978).

Indole acetic acid and gibberillic acid

Data presented in Table (9) illustrate the effect of P1 or P2 extract on hormone content in maize grains. For P1 extract, there was progressive increment in indole acetic acid and gibberillic acid averages of grain maize. The highest value of IAA was recorded in treatment T3 and T6 which reached 1.3-fold that of mineral fertilizer as control. The same trend was observed for gibberillic acid. Regarding the P2 extract treatments, the highest value of IAA and Gib. was recorded at T6 treatment. No significant effect was observed in other treatments. These results may be due to the presence of indole acetic acid and giberllic acid in extracts as shown in Table (1). The beneficial effect of food industries waste extracts application is a result of the presence of many components that may effect synergistically. The application of these extracts significantly, increased grain yield as well as improved nutritional values of seeds, i-e., protein, amino acid, carbohydrates, and hormones. The efficiencies of P1 and P2 extract as a fertilizer or amendments are very different.

Table 8. Effect of some food industry wastes extracts on amino and organic acids of maize plant under field experiment

Treatment	**Total amino acids%**	**Organic acid (ppm)**	**Proline %**
		Molasses (P1)	
T1	6.74 [g]	1472 [b]	1.57 [a]
T2	12.41 [d]	1571 [b]	0.93 [d]
T3	15.41 [a]	3291 [a]	1.13 [c]
T4	10.08 [f]	1416 [b]	1.42 [b]
T5	12.75 [c]	1874 [b]	1.43 [ab]
T6	14.36 [b]	2956 [a]	1.07 [cd]
T7	10.66 [e]	1549 [b]	1.47 [ab]
LSD	0.2105	655.2	0.1378
		Orange waste extract (P2)	
T1	6.74 [e]	1472 [b]	1.57 [a]
T2	10.98 [bc]	1479 [b]	0.89 [e]
T3	10.11 [d]	2682 [a]	1.05 [c]
T4	10.20 [d]	2586 [a]	0.96 [d]
T5	11.27 [b]	1924 [ab]	0.92 [e]
T6	13.86 [a]	2841 [a]	1.43 [b]
T7	10.66 [c]	1549 [b]	1.47 [b]
LSD	0.4358	950.2	0.05626

Table 9. Effect of some food industry wastes extracts on hormone content (µg/g) of maize plant under field experiment

Treatment	Indole acetic acid	Gibrellic
	Molasses (P1)	
T1	382.7 [b]	1088 [b]
T2	334.7 [bc]	1005 [b]
T3	492.3 [a]	2416 [a]
T4	258.3 [c]	1112 [b]
T5	249.3 [c]	1051 [b]
T6	479.3 [a]	2056 [a]
T7	390.0 [bc]	1128 [b]
LSD	85.32	541.5
	Orange waste extract (P2)	
T1	382.7 [d]	1088 [c]
T2	208.3 [f]	960.0 [c]
T3	708.3 [b]	2165 [b]
T4	608.3 [c]	2032 [b]
T5	320.0 [e]	1167 [c]
T6	820.0 [a]	2847 [a]
T7	390.0 [d]	1128 [c]
LSD	33.65	195.7

There was an excellent potential to obtain a liquid natural fertilizer and amendment using molasses (P1). The effects of molasses (P1) as a fertilizer and an amendment had summarized in the following order: P1 + mineral Fertilizer (as amendment) > P1 + some micronutrients + mineral fertilizer (as amendment) > P1 only (as a fertilizer) > P1 + compost (as amendment) compared to mineral fertilizer or compost as control. On the other hand, the best results of orange waste extract were obtained as an amendment rather than a fertilizer. The effect of orange waste extract was summarized in the following order: P2 + additive some micronutrients + mineral fertilizer (as amendment) > P2 with mineral Fertilizer (as amendment) > P2 + compost (as amendment) compared to mineral fertilizer or compost as control. Generally, natural extracts from food industries waste constitute a source of many substances, valuable from the point of view of plant physiology, which particularly help plants adapt to stressful conditions such as biologically active alginic acids, polyphenols, free amino acids, and particularly natural plant phytohormones. The increased yield may be due to the presence of some growth promoting substances such as IAA and IBA, gibberellins, cytokinins, micronutrients, vitamins and amino acids **(**Challen and Hemingway, 1966). These compounds were able to stimulate growth as a result of enhancement of protein synthesis and cell division, and mobilization of nutrients needing for growth. The nutritional quality of grain such as carbohydrate, protein and minerals also improved under the influence of treatment Zodapea, *et al* (2009). The increase in protein content in treated plants with residues extracts is in agreement with the results obtained by

(Kannan and TamilSelvan, 1990), they attributed the increase in protein content to the absorption of most of the necessary elements by plant.

CONCLUSION

It could been noticed that there is a positive effect of molasses and orange extract on the growth, development and consequently yields of field crops have been proved so far. There was an excellent potential to obtain a natural liquid organic fertilizer and amendment using molasses (P1). On the other hand, the best results of orange waste extract were obtained as amendment rather than a fertilizer. So, these extracts can be used to focus on waste minimization in food industry that circumvents the environmental problems caused this waste. Also, food industries waste can be used to produce natural liquid organic fertilizer and amendments for soil and plant as this may decrease the use of chemical fertilizers and help lower production environmental hazards on a long-term basis.

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الاثر البيئى لتحويل بعض مخلفات المصانع لانتاج أسمدة عضوية سائلة وتأثير ذلك على النبات تحت ظروف التربه الملحية الجيرية

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**** المركز الاقليمى للاغذية والاعلاف- مركز البحوث الزراعية - الجيزة**

التخلص من كميات كبيرة من المخلفات يمكن أن تكون عملية مكلفة وتهدد البيئة. ومع ذلك، هناك استخدامات بديلة يمكن العثور عليها، تجنبنا تكاليف التخلص منها ، و الحصول على قيمة اقتصادية من استخدام تلك المخلفات. والهدف من هذا العمل هو تقييم مدى ملاءمة مخلفات مصانع الأغذية (المولاس ومخلفات البرتقال) لإنتاج السماد العضوي الطبيعي السائل وتقييم استخدامها على النبات والتربة. أجريت تجربة أولية في الصوبة فى مركز البحوث الزراعية في محافظة الجيزة ، مصر. وقد أجريت هذه التجربة لاختبار المولاس أو مخلفات البرتقال على نمو الذرة خلال مواسم الصيف من عام ٢٠١١ ثم مع الشعير خلال موسم الشتاء من ٢٠١١/٢٠١٢. ثم أجريت تجربة حقلية على نباتات الذرة لتأكيد نتائج التجربة الأولية وقد تم إجراء التجربة في مزرعة محطة بحوث النوبارية التابعة لمركز البحوث الزراعية-البحيرة في موسم صيف عام ٢٠١٢. واتضح من النتائج التى تم الحصول عليها ،أن إضافة كل المستخلصين للتربة أدى الى زيادة كمية المادة العضوية في التربة وخفض من درجه ملوحة التربه. وقد لوحظت اختلافات طفيفة في درجة حموضة التربة. ان هناك تأثير ايجابى للمولاس ومخلفات البرتقال على نمو المحاصيل الحقليه. وأن استخدامها أدى إلى زيادة كبيرة فى محصول الحبوب ومحصول القش وكذلك تحسين القيمة الغذائية للحبوب، حيث ذادت كل من قيم الكربوهيدرات والبروتين الخام والزيت، الأحماض الأمينية، والأحماض العضوية، والهرمونات بالمقارنة بالكونترول. وأظهرت النتائج أيضا إختلاف فى كفاءة كل منهما كسماد أو كمحسنات للتربة و كان هناك كفاءة فائقة لاستخدام المولاس كمحسن للتربة وكذلك كسماد ومن ناحية أخرى، تم الحصول على أفضل النتائج من مستخلص مخلفات البرتقال كمحسن للتربة أكثر من استخدامه كسماد.

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