A Study of some of the Physical and Chemical Properties of the Garbage Compost in Tartous City

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Abstract

The purpose of the research is to reveal the physical and chemical properties of the compost produced by the garbage and the properties of the soil after mixing it. The research is important in providing safety for the human consumption of vegetables grown on the garbage compost. This research was conducted at Tishreen University Laboratories during the period (2/3/2017 - 2/4/2017) Through taking samples of the compost and it,s mixture with soil conducting laboratory tests to know the physical and chemical properties.

The results showed the ability of the compost to improve the physical and chemical properties of the soil and the ratio of the heavy elements within the permissible limits. The study recommended using the compost to safe germination of vegetable seeds because its content of heavy metals is within permissible limits

Keywords: Compost, organic matter, salinity, acidity, medium,.

I INTRODUCTION

After the development in the waste recycling industry, solid waste has been shown to be a significant reserve for the agricultural mediums despite its health problems and contaminants. Municipal Solid Waste (MSW) produced in developing countries is estimated at 0.35-1 kg / person / day [1]. And the most important feature is the containment of a large proportion of organic waste, which may reach 70% of the total size of the total, in addition to a small proportion of non-recyclable materials such as glass and metal. This is primarily due to the preparation of food from fresh vegetables and not from canned food [2].

The high organic content of waste is an important advantage because it is the basic raw material of the composting process, which is rich in humic substances under the influence of living organisms. These products are known as compost. These specifications allow the use of compost in the agricultural field as organic fertilizer mixed in the soil or as a mulch surface layer or as an agricultural substrate for cultivation in nurseries.

Therefore, many researchers recommended the fermentation of organic materials from the remnants of cities and the remnants of organic industry and the remnants of field farming, forests and green areas as a way of economic disposal and as a way to mitigate the negative impact in the environment [3], [4].

Since the high cost sources in the nursery come from the price of the suitable agricultural medium for propagation and production, the cost of service over time, and the addition of fertilizer enhancers, are necessary to research raw materials that are suitable for agriculture, cheap, available appropriate. can be improved, And not chemical source; as the waste of cities that can be improved by fermentation [5].

The characteristics of the garbage compost produced by Tartous City,s waste will be studied to determine the degree of health safety of the product and the consumer by confirming the absence of pathogenic or heavy metals harmful to human health by comparing it with the international and local standards permitted for use in the production of agricultural plants for human nutrition .

II. METHODOLOGY OF RESEARCH

Laboratory experiments were carried out on compost and its mixtures to determine some of its physical and chemical properties.

The importance of the present research is to protect farmers who use compost from it,s environmental, health and economic risks. The research aims to:

1 - Study some of the characteristics of compost produced by the city of Tartous physically and chemically.

2 - Focus on the role of soil mixing in the compost.

3. Disseminate results to help farmers who use compost

III. MATERIALS and METHODS

Three agricultural media were prepared in order to know the effect of mixing compost with soil (Table 1).

Table 1: The three agricultural mediums used

The symbol	Medium
A	%100 compost
B Mixture	75%compost+ %25soil
C	%100soil

A. The source of the agricultural medium and its tests

The targeted agricultural medium is the compost produced by the solid waste recycling Factory in Tartous City.

The compost samples were taken after their maturity (fermentation for two months) from different parts of the compost pile resulting from the fermentation of organic waste. They were placed in small nylon bags and then closed and transferred to the specialized laboratories at Tishreen University for laboratory analysis.

B. Physical properties

To determine the physical characteristics of the studied medium, external specifications were recorded such as color, odor, texture and content of exotic elements. The Moisture of the agricultural medium was also determined according to the following law.

Moisture %= [Wet Weight (g) - Dry Weight (g)] / Dry Weight (g)].

C. Chemical properties

The chemical properties are the basic characteristics of the medium, along with their physical properties, Therefore, pH, salinity, organic matter content, organic carbon ratio, nitrogen content and nutrient content were measured.

a - acidity number (pH)

The pH value was estimated using a pH-meter using a 5: 1 (weight: volume) extract.

b-salinity Electrical Conductivity EC (m mhos)

The salinity of the medium was determined by measuring the electrical conductivity using the measuring electrode of the conveyor device using a 5: 1 (weight: size)

c. Determination of organic matter (OM) and organic carbon (OC)

Organic matter was measured as a percentage in the incineration method for 4 hours at a temperature of 550 m. The weight loss is organic matter [6].

Organic carbon was calculated in organic matter by dividing the weight of organic matter on the constant factor (2) [7].

d - Determination of some major mineral elements (N. P, K) and content of heavy elements

The plant needs major mineral elements as it enters into its structure and contributes to its vital processes. Knowledge of the heavy elements helps to know the safety of using compost as a safe medium for germination of vegetable seeds, The presence of heavy metals in the compost has been tracked to determine their proportions and compare them with the permitted global and local rates. These elements were tracked by performing the necessary analyzes for each element according to the laboratory methods shown in Table (2).

Table 2: Methods Of Measurement Of Metal Elements In Media

Method	Metal element
The Caldahl Method [8]	N %
Extraction of ammonium acetate and reading on flame apparatus Flam photometer ELE- [8]	P % Absorbable
	K% Absorbable
Atomic Spectrophotometer Absorption (Mod. 210 VGP) [9]	Fe , Cu, Mn, Zn ppm
	Pb ppm.
	ppm. Cd
	Cr ppm.
	Ni ppm.

D. Statistical analysis

- The properties of the three media were compared using the Independent Samples T Test
- The coefficient of selection and the linear regression equation of the compost and its mixtures were calculated with soil

IV. RESULTS and DISCUSSION

A). Physical properties

The construction of the compost has been observed with the naked eye and the Sense of touch. that it is disassembled and free from any adhesive. The heterogeneity of its components in size, is referred to by [10].

2. Moisture percentage (%):

After the analysis, the moisture content was determined in the primary material and in the mixtures. The results were presented in table (3).

Table 3: Percentage of moisture in the media used

Moisture percentage (%):	**Medium**
%51	100% Compost Medium (A)
%33	75% Compost nedium (B)
%18	100% Soil medium (C)

A significant difference was found between the compost and the soil. The t-table value was 23.335, the freedom degree 6 and the sig = 0.001 (0.05) P. There was a significant difference between the compost and its mixture with the soil. Freedom 3 and moral sig = 0.001 are smaller than 0.05

However, adding the compost to the soil improves its physical properties, This is in line with Garbella's assertion in his study [11].

B. Chemical properties

1. -pH or pH number

The results of the analysis showed a clear increase in the pH value of the compost (8,20) and they tended to rise in all samples (Table 3), while the soil was close in the acidity of the compost with insignificant differences for pH. The degree of freedom was 3 and the sig = 0.519 (0.05 <P).

The acidity in the mixture was between them. There was a significant difference between the compost and its mixture. The t value was 9.353 and the degree of freedom was 3 and the sig = 0.002 (P <0.05). The differences in values were due to the mixing of the components of the two mediums in the experiment, In the statistical calculation, the link R, which links the high pH values to the mixing process, was shown to show a linear decrease in acidity values at mixing

(R = 97%). This confirms that 97% of the differences in the acidity values of the mixture are due to the compost In the mixture.

The values obtained in Table (4) are in line with what [12] points out that the acceptable minimum tolerances of mature and arable compost as a good medium are acidity (PH 6.3-8.9).

Table 4: Specific acidity in the media used

Ph	Medium
8.2	100% Compost Medium (A)
7.92	75% Compost nedium (B)
7.5	100% Soil medium (C)
0.97	(R^2)

3. Electrical conductivity EC (m mhos / cm)

The value of the electric conductivity was measured for the three transactions. The results showed that the value of the electric conductivity in the compost (Table 4) was higher and therefore the salinity was higher than the soil. There was a significant difference between compost A and soil C. 0.05> P). This corresponds to the results of [13], which showed that the compost is highly saline, but it is still within the permissible limits, especially tolerant plants (tolerant) to the high concentrations of saline, up to a concentration of 3 mmos / cm.

However, the value of EC is indicative of the stability of the compost [14].

And there is no significant difference of the salinity between the compost A and the B. The degree of freedom 3 is the sig = 0.519 (0.05 <P).

Table 5: Electrical conductivity specified in the media used

EC m m/cm	Medium
2.5	100% Compost (Medium) A
2.1	75% Compost Center (B)
1.35	100% Agricultural Soil Center (C)

It is noted that the R2 = 0.98 is high. This means that the simple linear regression of salinity is strongly related to the compost in the soil and that this parameter can confirm that 98% of the variations in the electric conductivity values are due to the compost in the studied mixtures.

4. Organic matter OM and organic carbon OC

A clear increase in organic and organic carbon content was observed in the compost (Table 6). This is normal, because the components of the waste are mostly cellulose plant organic waste [14]. We note the superiority of compost A on soil C significantly in terms of content of organic matter and organic carbon because sig = 0.001 each of which is < of 0.05. The ratio of organic matter and organic carbon in the compost significantly exceeded the mixture B, the value of t tabular 24.495 and the degree of freedom 3 and moral sig = 0.001 (P <0.05)., As for the relation of the simple linear regression that expresses the low value of the organic matter in the mixture, the soil is of low value for organic material (because the R2 = 0.98).

Table 6: Organic matter and organic carbon in in the media used

OM %	C/N	N%	C%	Media
53.1	**14**	**2.22**	**31.23**	100% Compost (A)
35.2	**11.82**	**1.75**	**20.7**	75% Compost (B)
2.05	**6**	**0.2**	**1.2**	100% soil (C)

5. Carbon ratio of nitrogen C / N

The ratio of carbon to nitrogen is an important indicator in estimating and evaluating organic farming media. In normal cases, the ratio of organic matter in mineral soils is low. Therefore, C / N is not taken as a guide and is not meaningful for soil. These percentages were presented to the studied population in Table (6).

The natural C / N ratio of the good growth medium is between 1/20 and 1/30, which expresses a large and sufficient value of the total nitrogen necessary for the feeding and activity of microorganisms in the middle.

Table (6) shows that the C / N ratio at compost is very high (1/14) and good for root growth and spread, and the added nitrogen in quantity is available to the plant at any moment of need; however, this high percentage causes destruction The agricultural medium during one agricultural season mostly.

The ratio of C / N was increased when mixing the soil with compost. The percentage of organic carbon in the mixture decreased by one third (from 30% to 20%) while the ratio of nitrogen to one-sixth decreased from 2.22% to 0.384%. This reduces microbial activity and increases the degree of stability of the compost in the mixture [15], [16].

At the end of the discussion, C / N can be said to be the evidence of compost maturity and stability together [17].

6. The content of the agricultural medium of mineral fertilizers

a. The content of the nitrogen N

Due to the importance of the nitrogen element in vegetative and root growth, the nitrogen content of the compost and the rest of the media was estimated. Table (7) shows the content of the three parameters of this component.

Table 7: Compost content of the compost and the soil (the three parameters) of the mineral minerals

mg/kg P	K mg/kg	N%	Medium
()82.3	11980	2.22	**A(100%com)**
()74.26	5518	0.384	**B(75%com)**
16.34	264.84	0.108	**C(0%com)**

Table (7) shows that the percentage of nitrogen in the compost is high and is higher than 2% by weight, which is required for good growth and development, while the soil was poor (0.1%) and its content improved after mixing with compost.

This is in line with the studies that have shown that compost improves the content of the agricultural medium of nutrients [18], and re.[19] also noted that the good compost content of mineral nutrients, especially nitrogen, is evidence of compost stability.

The Independent Samples T-test showed significant differences between compost A and mixture B. The t value was 10.369 and the freedom degree 3 was the sig = 0.002 (P <0.05). A significant difference was found between Compost A and soil C. The t value was 26.634 and the degree of freedom was 5 and the sig = 0.001.

b. Potassium content K

Potassium has great importance in accelerating erosion, maturity and resistance to

environmental factors. Table (6) shows the content of the compost and the rest of the potassium medium.

It is noted from the previous table that the measured potassium content (11980 ppm) calculated in the compost and equivalent to (1,198%) is well below the minimum required by [12] to the acceptable minimum limits of potassium in the mature compost is 0, 30% Potas, meaning that the measured ratio is insufficient for growth.

While its percentage in the soil is low (264.84 ppm). This complements the results of studies that confirm the soil content of potassium improved after mixing with the compost [3], and resulted from a test Independent Samples T-test showed that there was significant difference between Compost A and mixture B, the t value was 444.857, the freedom degree 3, and the sig = 0.001. There was a significant difference between compost A and soil C. The t value was 859.688, the freedom degree 6, 0.001.

c. Phosphorus content P

Phosphorus improves flowering and holding fruits in plants and therefore must be studied and clarified the content of compost. The results of the analyzes conducted to determine the compost content of phosphorus were presented in Table (7). The compost contains about 80 ppm of phosphorus (0.008%), which is low compared with [20]. The minimum percentage of phosphorus in mature compost is 0.5% phosphorus 5000 (ppm).

The soil has increased its phosphorus content by increasing its compost ratio, which is confirmed by [21]. However, the proportion of phosphorus in all media is low and insufficient for good growth. The results of the Independent Samples T-test showed that there was a significant difference between compost A and mixture B, the t value was 90077.35, the degree of freedom 3 and the organic sig = 0.001 (0.05> P). High between the compost A and the soil C, the t value was 149.004 and the degree of Rayya 6 and moral sig = 0.001 (0.05> P).

4. Compost content of some rare elements

We measured the content of rare metals and the results of the analyzes were included in Table (8).

Table (8) shows a decrease in soil content in medium C of micro-nutrients compared to compost A and its mixture with soil B. The soil content of trace elements has improved after mixing with compost, and this corresponds to the results of [22]. Compost is rich in major and rare nutrients resulting from the decomposition of organic matter through fermentation

Table 8: Media content of rare and minor mineral element

Medium	Average	Mg/kg			
		Fe	**Cu**	**Mn**	**Zn**
A(100%com)	Average	279	89.5	42.1	284
B(75%com)	Average	110.66	37.4	52.03	129.33
C(0%com)	Average	10.1	13.2	12.5	3.1

d- Content of heavy elements

The results for heavy metals (Table 9) showed that the content of these heavy metals was low and within the permissible limits for agricultural use by 3556/2010. This encourages farmers to use compost to germinate vegetable seeds safely The chemical qualities that make the compost mature and safe for use are the ones that secure production and make it economical, provide environmental safety.

Table 9: Compost content and arboretum soil of some heavy elements (ppm)

Cd	pb	Ni	Cr	
0.5	**50**	**2.5**	**50**	The permissible limits for the heavy elements studied according to (No. 3556)
0.04	**0.3**	**0.1**	**0.2**	Elements in Compost
0.0006	**0.0028**	**0.032**	**0.059**	**soil %100**

V. CONCLUSIONS

The garbage compost studied has many advantages like:

- A safe medium for use, transport, agriculture and free of heavy elements
- It is environmentally, economically and agriculturally important to reduce its need for pesticides and chemical fertilizers +

RECOMMENDATIONS

This study recommends the following

- Compost is a cheap fertilizer and available in quantity and quality. So we recommend using it
- Physical properties of the compost should be improved by adding smooth media.
- It can be used as a vegetable medium because its content of heavy metals is within permissible limits

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