5. SUMMARY

5.1. Compost production and characterization of humic acids

5.1.1Compost production

Five piles were prepared using poultry litter, rice straw and banana residues. The amount of each of the previous materials were calculated to give a mixture of C/N ratio about 30: 1 (Table 2). The materials of each pile were thoroughly mixed and stacked in several layers at site area of about 1.25 (W) x 1.5 (L) x 1.75(H). Natural mineral of rock phosphate and feldspar (5Kg for each) were mixed with the materials of compost piles mix 3 and 4 at stacking time. Microbial inoculants were added to compost piles mix 2 and 4 after four weeks of composting. Compost pile mix. 1 was only inoculated with compost tea (20L) directly after waste stacking.

The composting process was continued up to 16 weeks, including the maturation period and stored for another months for studying the characteristics of the extracted humic acids

Temperature degree was recorded every 2 days at three different depths (20, 40 and 60cm). The physical and chemical analyses including bulk density, moisture content, EC, pH, dry matter, organic matter (OM), organic carbon (OC), C/N ratio and contents of ash, total nitrogen (TN), ammonical-nitrogen (NH_4^+-N), nitrate (NO_3^- N), CEC were determined at zero time and at 1, 2, 3, 4, 8, 10,12 and 16 weeks of composting. Mesophilic and thermophilic bacteria and fungi, total and fecal coliforms bacteria and Salmonella & Shigella were also counted at all sampling time.

Contents of protein, hemicellulose, cellulose and lignin and at 0, 4, 8, 12 and 16 weeks of composting. While micronutrients of Fe, Zn, Mn and Cu were also determined at 0 and 16 weeks of composting.

The results obtained from the first experiment could be summarized as follows:

The composting process for the all piles exhibited a classical temperature pattern, where it is possible to distinguish three different phases: mesophilic, thermophilic and cooling down phase, which continues later as compost maturation stage. This temperature feature is observed more clearly for the 40 and 60 cm temperature curves. In the high thermophilic phase, the maximum temperature was 68, 70, 69, 71 and 70 °C for piles mix 1, 2, 3, 4 and 5. The cooling down and maturing phase take place for all tested piles after approximately 50 days from composting process for all piles. From this time on, a slow temperature decrease was noted until the 90th day of composting.

The bulk densities increased from 329.6 to 570.1 kg/m^3, 331.8 to 583.9 kg/m^3, 340.2 to 580.3 kg/m^3, 342.5 to 589.5 kg/m^3 and from 333.5 to 580.1 for piles mix 1, 2 and 3, 4 and 5, respectively.

At the initial time of composting the pH values of all compost piles were ranged between 8.17 and 8.31 units. During the first three weeks of composting, the pH values of all compost piles showed little decreases but still in the alkaline range, then the pH gradually increased towards the last week of the composting process. The pH values for compost piles mix. 1, 2, 3, 4 and 5 were 8.42, 8.39, 8.28, 8.20 and 8.32, respectively.

The initial values of EC for all compost piles were ranged between 2.02 and 2.60 dS/m. The composting material showed gradual increases during the composting period. The composting material's conductivity values at the end of the composting period were 4.32, 4.76 and 4.81 dS/m for piles mix 1, 2 and 5, respectively, while piles mix 3 and 4 showed slightly higher EC values, which they were 5.14 and 5.61 dS/m, respectively.

The decomposition rates of the organic matter were slow during the first week of the composting period, and then rapidly increased to show maximum value at the third week for all piles. Addition of microorganism inoculants, compost tea and natural nutrients such as rock phosphate and feldspar increase the degradation rates of organic materials. the losses in the compost materials in

relation to the initial organic matter and dry solids weights after 16 weeks of composting were calculated to be 61.45 and 48.34 % for pile mix. 1 (control), 70.58 and 55.64 % for pile mix. 2, 66.16 and 49.28 % for pile mix. 3, 71.92 and 53.73 % for pile mix. 4, and 69.41 and 54.56 % for pile mix. 5.

As a result of the high rates of the ammonification process on nitrogenous organic materials during the bio-oxidative phase, ammoniacal-nitrogen showed gradual increases to reached maximal concentrations of 943, 975, 871, 813 and 928 mg/kg fresh weight at the 2nd week of composting for pile mixtures 1, 2, 3, 4 and 5, respectively. Thereafter, the concentration of ammonia decreased rapidly until the end of the composting period to reach minimal values of 55, 48, 44, 39 and 31mg/kg fresh weight for the piles mixtures 1, 2, 3, 4 and 5 respectively. The maximal levels of nitrate were recorded at the last week of composting, where they were 460, 529, 486, 450 and 538 ppm for piles mix 1, 2, 3, 4 and 5, respectively. Nitrogen content showed maximal losses of 34.81 and 39.81 % for piles mix 1 and mix 2 after 16 weeks of composting, while nitrogen losses for piles mix 3 and mix 4 were lesser than those estimated for piles mix 1 and 2, where they were 29.44 % and 31.78 % after 12 and 16weeks of composting, respectively. Nitrogen loss from pile mix 5 was 38.04 % after 12 weeks of composting. Nitrogen contents for piles mix 3 and 5 exhibited little increases towards the end of the composting process, amounted to 0.17 and 0.23 %, respectively. The C/N ratios narrowed from initial values of 29.99; 30.16, 30.04, 29.97 and 29.80 to final values of 17.74, 14.74, 14.37, 12.33 and 14.71 for all compost piles mix 1, 2, 3, 4 and 5, respectively. The values of (Final C/N)/ (Initial C/N ratio) are 0.592, 0.489, 0.478, 0.411 and 0.494 for piles mix 1, 2, 3, 4 and 5, respectively.

The CEC values of piles mix 1, 2, 3, 4 and 5 increased from 37.1, 38.7, 31.3, 33.60 and 36.8meq/100g dry weight at initial time to 69.3, 77.10, 70.90, 78.2 and 75.60meq/100g dry weight, respectively after 16 weeks of the composting process. There is a highly significant

negative correlation between the data of CEC and C/N ratio collected from all piles mixtures during composting

$$\ln CEC = 6.235 - 0.710 \ln C/N, \quad (r = -0.954^{**} \; r^2 = 0.909)$$

The percentages of protein increased from 9.20 to 11.68%, 9.21 to 12.54%, 8.69 to 12.30%, and 8.71 to 12.98% and from 9.28 to 12.68% for compost piles mix 1, 2, 3, 4 and 5, respectively after 16 weeks of composting. Addition of natural nutrients (such as rock phosphate and feldspar to compost piles mix. 3 and 4 decreased the loss percentage of protein throughout the composting course, where the maximum loss % were 28.77 and 31.06 %, respectively at the end of composting period in comparison with loss % of 34.40 for compost pile mix1. In contrary, addition of microbial inoculants and compost tea to compost piles mix 2 and 5 increase the loss percentage of protein throughout the composting course, where the maximum losses % was 39.59 and 37.88 % for compost piles mix 2 and 5, respectively at the end of composting period.

All compost piles exhibited high reduction in hemicellulose dry weight during the first 8 weeks of composting, then little reductions were observed. Addition of natural nutrients, microbial inoculants and compost tea to compost piles mix. increased the loss percentage of hemicellulose throughout the composting course, when values of hemicellulose loss %. compared to the corresponding value of compost pile mix.1 (control treatment). The maximum loss % were 74.18, 70.05, 77.98 and 77.98 %, respectively at the end of composting period in comparison with loss % of 66.16 for compost pile mix1.

Addition of natural nutrients, microbial inoculants and compost tea to compost piles mix. increased the loss percentage of cellulose throughout the composting course, when values of cellulose loss %. compared to the corresponding value of compost pile mix.1. The maximum loss % were, 68.55, 63.67, 71.10 and 65.21 %, respectively

at the end of composting period (16 weeks) in comparison with loss % of 53.99 for compost pile mix1.

Addition of natural nutrients, microbial inoculants and compost tea to compost piles mix. increased the loss percentage of lignin throughout the composting course, when values of lignin loss %. Compared to the corresponding value of compost pile mix.1. The maximum loss % was 45.22, 38.47, 71.10, 47.31 and 42.36 %, respectively at the end of composting period in comparison with loss % of 36.70 for compost pile mix1. The addition of natural nutrients and microbial inoculants together to compost pile mix 4 maximize the loss % of lignin. The loss percentages of lignin are in general lower than those of hemicellulose and cellulose during the composting course for all compost piles. The degradation order of biomacromolecules is protein > hemicellulose > cellulose > lignin.

Concentrations of Iron at initial time of composting were 1690, 1667, 1632, 1625 and 1648mg Fe/Kg dry weight for piles mix 1, 2, 3, 4 and 5, respectively while their levels after 16 weeks composting time were greatly increased (about double values) to be 3171, 3205, 2992, 3085 and 3252 mg Fe/Kg dry finished compost following the same order of the pile mix. Similar results were obtained for Zn, Cu and Mn.

The numbers of mesophilic TVB at initial time for all piles were between $4.9x10^8$ and $6.9x10^8$cfu/g fresh weight (fw). These numbers decreased during the 4 first weeks of composting (thermophilic phase) to be in range from 5.5×10^6 to 9.2×10^6 cfu/g fw. As the temperature decreased during the decline and maturation phase, the mesophilic-TVB proliferated rapidly and their numbers increased to be between 10^7-10^9 cfu/g fw. In contrast, the thermophilic-TVB at initial time was found in numbers lower than those of mesophilic-TVB, where their numbers ranged between $1.95 x10^8$ to 2.6×10^8 cfu/g fw. During the first 4 weeks of composting, the thermophilic-TVB proliferated rapidly and showed maximum peak at the fourth week of composting for all piles under study. These beaks

of thermophilic-TVB were 2.97 x 10^9, 3.05 x 10^9, 3.39 x 10^9, and 6.68 x 10^9 cfu/g fw for piles mix 1, 2, 3, 4 and 5, respectively. Mesophilic and thermophilic numbers of behave similar to those of mesophilic and thermophilic bacteria but numbers of fugi were normally lower.

The numbers of total coliform bacteria rapidly decreased during the composting period and they were detected in numbers ranged between 200 and 300 cfu/g fresh weight after 16 weeks of composting in all composting piles, Similar results were observed for the survival for both fecal coliform bacteria and Salmonella & Shigella but the fecal coliform bacteria were found to be more persistent, it present by numbers ranged from 390 to 600 cfu/g fresh weight at 16^{th} week of composting. Salmonella & Shigella were non-detectable after 12 weeks of composting in all studied piles. The average removal percentages of total and fecal coliforms bacteria were 99.96 and 99.82 % while Salmonella & Shigella were reduced by 100%.

5.1.2 Characterization of humic substances

Total humic substances were extracted from all compost piles at 0, 3, 6, 9, 16 months of composting. The humic substances were fractionated to humic and fulvic acid. Macronutrients of N, P, K and micronutrients of Fe, Mn, Zn and Cu were determined at the same periodical time. The elemental composition as percentage C, N, H, S, O and the total acidity, CEC, the functional groups (carboxyl and phenolic-OH groups) as me/100g acid (COOH and OH) for humic and Fulvic acids 6, 12 months of composting for all compost piles. The results were calculated on dry weight basis

The obtained results could be briefly summarized in the following:

A- Total humus (Hs), humic acid (HA) and fulvic acid (FA) contents and HA/FA ratio.

Percentages of humus, HA and FA acids increased with increasing composting period. Also, data showed that the percentages

of humic acids were lower than the corresponding ones of fulvic acids at all periods of composting.

The data show that the percentage of Humus isolated from the different composted material. These values increased with increasing decomposition period. This was true with all compost types.

The results also show that humus (Hs) as percentages of representing total organic matter after 12 months of composting ranged from 34.24 to 44.70%, the lowest value was recorded for compost mix.No.1 while the highest one was recorded for the compost mix.No.4.

Generally, the percentage of the fulvic acids was higher than that of humic acids throughout the all periods of composting.

B- Total macronutrients in humus, humic and fulvic acids derived from composted organic wastes.

1. Total nitrogen

Data show values of total N in humus (Hs) isolated from the different composted materials. These values increased with increasing decomposition periods. This was true with all compost types. The results also show that values of total N in humus after 12 month of composting ranged from 3.93 to 4.22%. The lowest value was recorded for compost mix No.1 while the highest one was recorded for compost mix No.5.

The corresponding total N values in humic acids after 12 months of composting ranged from 2.18 (for compost mix. No.1) to 2.36% (for compost mix No.5).

The N content of the fulvic acids after 12 months ranged from 1.27 to 1.35%. the lowest value was recorded for compost mix No.1 whereas the highest one was recorded for compost mix No.4.

Generally, it can be seen that the humic acids contained higher percentage of N than fulivic acids. This difference could be related to the nature and composition of the acids.

II- Total phosphorus

Total P content of Hs, HA and FA increased with increasing the decomposition periods.

The results also show that values of total P in Hs, HA and FA after 12 months of composting ranged from 0.381 to 435, 0.141 to 0.172 and 0.201 to o.241%, respectively.

Generally, it can be seen that the fulvic acids contain a higher percentage of P than humic acids. This was true for all the compost mixtures and at all periods of degradation.

III- Total potassium

Data show that the total K content of Hs, HA and FA derived from composted organic wastes followed a pattern differed due to period of composting in a way similar to those followed by P where the K values increased with increasing the decomposition periods of the Hs, HA and FA

From these results, it can be concluded that values of total N, P and K in Hs, HA and FA derived from composted materials, followed the descending order: N> K>P with relatively higher amounts of those elements in fulvic acids than with humic acids.

C- Total micronutrients in humus, humic and fulvic acids isolated from the composted organic wastes.

I. Total iron

Data show values of total iron in humus (Hs) isolated from the different composted materials. These values increased with increasing decomposition periods. This was true with all compost types.

All the studied humic acid contents of total Fe increased with increasing decomposition period. The increase percentages after 12 months of composting were 67.6, 69.1, 96, 96.2 and 84.3% for compost mix. Nos. 1, 2, 3, 4 and 5, respectively as compared with the values of total Fe at Zero times.

The values of total iron content of fulvic acids were higher in the early periods of decomposition of the used composted materials

than tended to decrease gradually with increasing period of decomposition up to 12 months. This was true for all the composted organic wastes.

II- Total manganese

Data show that the amounts of total Mn in the isolated Hs, HA and FA are much lower than the corresponding ones of Fe. Total Mn content of humus and humic acids increased with increasing the decomposition period up to 12 months.

On the other hand, the values of Mn content in fulvic acids increased with increasing period of composting up to 6 months; thereafter they decreased up to the end of the composting period i.e.12 months. The above-mentioned trends were true for all compost mixtures and at all periods of degradation.

III. Total Zinc

Data show that the total Zn contents of humus and HA derived from the used composted organic materials are almost of the same contents as Mn. Likewise, Zn content increased with increasing the composting period.

Total Zn content of fulvic acids derived from the composted organic wastes followed a pattern differed due to period of composting in a way similar to those followed by both Fe and Mn. Zn values associated with FA are relatively higher than those of HA.

VI. Total copper

Values of total Cu content associated with Hs, HA acids and FA acids seemed generally to be lower than the corresponding ones of Fe, Mn and Zn. However, the increase in period of composting resulted in obvious increases in Cu contents of both the humus (Hs) and humic acids. The total Cu content of fulvic acids isolated from the composted materials slightly increased with prolonging period of composting up to 3 or 6 months beyond which they tended to decrease. This occurred with all the studied composted materials.

From these results, it can be concluded that values of total Fe, Mn, Zn and Cu in humus (Hs), HA and FA derived from composted materials,

followed the descending order: Fe>Zn>Mn>Cu with relatively higher amount of those elements in fulvic acids than humic acids.

D- Values of total acidity, functional groups and cation exchange capacity of the humic and fulvic acids isolated from composted organic wastes.

I. Total cidity.

Generally, the values of total acidity of the fulvic acids were higher than the corresponding was of the humic acids.

Data show also that values total acidity of the humic acids after 6 months of composting ranged from 598 to 673 m mol.c /100g. The corresponding total acidity values after 12 months ranged from 675 to 782 m mol c/100 g for compost mix No.3 and the compost No.5.

The values of total acidity of fulvic acids after 6 months ranged from 785(for compost No.3) to 841 m mol c/100g (for compost No.5). The corresponding total acidity values after 12 months ranged from 912 (for compost mix No.1) to 989 m mol c/100g (for compost N0.4).

According to values of total acidity of the humic acids, the different composted materials can be arranged in the following descending order:

Comp mix 5 > Comp. mix.2 > C. mix.4 > C. mix.1 > C. mix. 3.

while in case of the fulvic acid the following descending order was attained :

C. mix 4 > C. mix.2 > C. mix.5 > C. mix.3 > C. mix.1.

II- Values of carboxyl (COOH) and phenolic-OH groups in humic and fulvic acids.

Values of the phenolic-OH groups were higher than those of the COOH groups in both of humic and fulvic acids. This was true for all the studied composted materials.

The results also show that the values of COOH groups in humic acids after 6 months ranged from 286 (for compost mix No.3) to 321 m mol c /100g (for compost mix No.5). The corresponding values after 12 months ranged from 330 to 384 m mol c /100g HA.

Values of COOH groups in fulvic acids after 6 months of composting ranged from 341 to 363 mmalc/100g FA. The corresponding COOH values after 12 months ranged from 404 to 441 m mol c /100g FA.

Values of the phenolic-OH groups in humic acids after 6 months of composting ranged from 312 to 352 m mol c /100g. The corresponding phenolic-oH values after 12 months ranged from 345 to 398 m mol c /100g. Values of phenolic-OH groups in fulvic acids ranged from 444 to 478 m mol c /100g FA after 6 months of composting. The corresponding phenolic-OH groups values after 12 months ranged from 508 to 548 m mol c /100g .

It is worthy to indicate that the COOH and phenolic-OH groups of both the humic and fulvic acids increased with increasing the decomposition period.

III. Cation exchange capacity of humic and fulvic acids.

The results indicate that values of the cation exchange capacity of humic and fulvic acids increased with increasing decomposition period .

Generally, the CEC values of the fulvic acids were higher than the corresponding ones of the humic acids. This was true for all the composted mixtures organic wastes and at all periods of degredation.

Data show that the CEC values of the humic acids after 6 months ranged from 316.9 to 341.18 m mol c /100g HA. The corresponding CEC values after 12 months of decomposition ranged from 380.39 to 416.55 m mol c /100g.

Data show that the CEC values of the fulvic acids after 6 months ranged from 362.24 to 390.10 m mol c/100 g FA. The corresponding CEC values after 12 months of decomposition ranged from 425.20 to 491.18 m mol c/100g F.A.

E- Elementary composition and atomic ratios of the humic and fulvic acids isolated from composted organic wastes:

I. Total carbon percentage

Total carbon of the humic acids ranged from 46.2-48.9% while the corresponding total carbon percentage of the fulvic acids ranged from 37.4 to 39.33% after six months of composting. Meanwhile, total carbon percentage of the humic acids ranged from 40.3-43% while the corresponding values of the fulvic acids ranged from 32.8-35.2% after 12 months of composting.

It is worthy to indicate that compost mix.No.5 resulted in the humic acids of highest carbon percentage as compared with the other studied composts. Likewise, compost mix.No.2 resulted in the fulvic acids of the highest carbon percentages as compared with the other studied composts

II-Total nitrogen percentage

Total N percentage in the humic and fulvic acids, generally, decreased slightly by increasing period of composting from 6 to 12 months.

Nitrogen percentages in the humic acids, however, seemed to be generally higher than the corresponding N percentages of the fulvic acids. This was true for all the studied composted material over both the two periods of composting where N percentage ranged from 2.18 to 2.52 % in the humic acids whereas the corresponding N percentages of the fulvic acids ranged from 1.24 to 1.48% regardless of period of composting of the composted materials.

III- Hydrogen percentage

H percentage in the humic acids seemed to be lower the corresponding in H percentage in the fulvic acids.

This was true for all the studied compostes material over both two periods of composting where H percentage ranged from 4.77 to 5.05 % in the humic acids. Whereas the corresponding H percentages of the fulvic acids ranged from 6.12 to 6.62% regardless of period of composting of the composted materials.

VI- Total sulfur percentage

Sulfur percentage in the humic acids ranged from 2.27 to 4.43% regardless of period of composting of the composted material. The corresponding S percentages in fulvic acid ranged from 1.92 to 3.33%. This means that the S percentages in the humic acids were generally higher than the corresponding values of the fulvic acids

5- Total oxygen percentages

Oxygen percentages of the fulvic acids seemed generally higher than corresponding ones of the humic acids where oxygen percentage values ranged from 41.87 to 50.10% in the humic acids and from 49.94 to 57.42% in the fulvic acids regardless of period of composting.

5.2. Evaluating produced compost mixtures as media for tomato seedlings growth

To evaluate the efficiency of the different types of compost(prepared in Exp.I) to produce tomato (Castal rock cv), this experiment was conducted under green house conditions.

The used growing media included four, out of the five types prepared in Exp.I (i.e. pile mix no 1, 2, 4 and 5) beside the imported peat moss (as a control)

Each type of the tested growth media as well as the control were used directly as they were (A) or mixed with either vermiculite or with sand. Both types of comp. mix i.e. Comp- vermiculite mix or comp-Sand mix were run on a volumetric mixing ratio of 1:1 or (50% + 50%) from the prepared compost or the peat-moss (control) and vermiculite or sand as substituting components in growing media (B)

Compost enrichment treatment was evaluated by subjecting the four compost piles (1, 2, 4,5) processed to fertilization or enrichment

with different essential nutrients (C) or in comparison with those of no enrichment.

Also the effect of compost washing was tested by using compost piles with or without washing as growing media.

The resulted effects due to different treatments were evaluted through some growth parameters namely, greenation % (after 15 and 30 days growth), seedling dimensions (length (cm) and diameter (mm) as well as seedling length (cm) and plant parts (shoot and root weights) nutrients (macro and micro) content (conc.) and uptake (total content)

The obtained could be brief summarized in the following:

1- Results indicate that the germination % as recorded after 15 days from seed sowing were highest (in significantly) reaching 74.65% compared to 73.15 and 73.12 under B and C main factors, respectively. However the germination% after 30 days from sowing were highest germination % (86.07) occurred under vermiculite-peat moss mix growth media (B) whereas the enrichment (C) was in between (84.96%).

2- As for seedling dimensions at 40 days growth it is clear that seedling length that the highest values of seedling length (30.36 cm) and stem ø 3.99(mm) were reached with comp mix no.4 and under the control (peat moss) media, respectively.

3- Results of fresh and dry weights of tomato seedling (40 days growth) showed that both highest fresh and dry weights of seedling shoot (2.37 g & 223.45 mg/S), whereas the corresponding figures of seedling root (0.3 g/S and 151.48 mg/S) were recorded under growing media of control (peat moss) and comp pile no. 4, respectively.

4- Note worthy referring that the different types of comp mix. used could be arranged descending according to the dry weight of seedling in the order: Comp mix no.5 > comp mix.no.4> com

no.1> comp no.2. The corresponding values of tomato seedling dry weight produced were mg/S, respectively.

5- Results indicate that all the growth media containing vermiculite whatever the other components were, favored all the corresponding media free of vermiculite I,e peat moss or compost-sand mix. This was true for all the evaluated the growth parameters and either the pile compost was enriched (fertilized) or washed or neither fertilized nor washed.

6- In conclusion all the used mixed growing media could be arranged descending, according to their inducing effect on tomato seedling dry weight in order: **Peatmoss-vermiculite mix> peatmoss-sand mix> peatmoss 100%(control) comp-sand mix** With corresponding values of dry matter weights of tomato seedling of about, respectively.

7- Results revealed that compost-nutrients enrichment fertilization significantly retarded all the tested growth parameters, except the shoot of tomato seedling, where both treatments (+enrichment an without enrichment) were comparable in their effect.

8- Results reveal that in general compost pile washing increased soundly both fresh (1.96 g/S) up to (2.41 g) and dry weight of tomato seedling shoots from (172.32g) up to (214.66 mg) on average aside from the effects of all the tested parameters. The same trend was obvious with weight of seedling root, but to a clear lower extent

5.2.2. Nutrients uptake by tomato seedlings (shoots and roots):

Results reveal that:

1- The highest uptake values of all the tested nutrients with tomato seedling shoots occurred with compost mix. No.5 i.e. 6.75, 1.23 and 5.09 mg/s for N, P and K as well as 84.06, 27.84, 48.57 and 10.15 ug/s for Fe, Mn, Zn and Cu, respectively. On contrary with seedling roots the highest uptake figures of all nutrients (except Cu) occurred under the control growth media of vermiculite and copm.1, the recorded figures were about 2.3, 0.98, 1.29 mg/s for N,P,K and 67.37, 22.00, 33.68 and 7.88 ug/S for Fe, Mn, Zn and Cu, respectively.

Taking into consideration the dry weights of shoots and roots dry weight and nutrients concentration, data may suggest a clear tendency for nutrients, particularly the micronutrients ones, to accumulate in root tissues of tomato seedlings.

2- The growth media consisted of vermiculite-compost mixture (1:1 V.) was the most efficient either with seedling shoot or root as well as with all the tested nutrients. Again the micronutrients accumulation tendency in tomato roots was obvious.

The obtained values for nutrients uptake in tomato seedling shoots were 7.48, 1.52, 5.64 mg/s and 106.85, 33.89, 60.17 and 12.58ug/s, corresponding to 2.35, 1.01, 1.29 mg and 83.82, 28.20, 36.48 and 0.52 for N, P, K, Fe, Mn, Zn and Cu, in seedling roots respectively.

3- In absence of compost pile enrichment the nutrients uptake by tomato shoots surpassed those observed with the fertilized ones with respect to all the tested nutrients except Cu.

However with respect to seedling roots the unfertilized treatments favored the fertilized ones with respect to all the tested nutrients including Cu.