Results and Discussion

4- RESULTS AND DISCUSSION

4.1. Effect of the different fertilization treatments on dry matter weight of tomato plant at the first stage of growth:

Data presented in Table (3) reveal that all the studied treatments could result in increases in dry matter weight of roots, stems and fruits as compared with the control treatment.

However, it could be noticed that the treatment T_2 (10 kg composted maize band^{-1}) was the least effect on dry matter weight of all the studied plant organs where it resulted in 18.71, 66.42 and 15.57 kg dry yield of roots, stems and fruits, respectively. However, increasing rate of the applied composted maize up to 20 kg band^{-1} (T_4) almost doubled the dry matter yield of roots and increased the dry matter yield of stems and fruits by about 171% and 502%, respectively. It is worthy to note that although the application of the maize compost at the rate of 10 kg band^{-1} produced dry matter yield less than that attained due to application of the mineral fertilizers N, P and K at the recommended doses, yet raising this rate up to 20 kg band^{-1} resulted in dry matter yield obviously exceeded the dry matter yield attained due to the mineral fertilizers. Such a result might be attributed to the nutritive content of the maize compost which contained some micronutrientive elements such as Fe, Mn, Zn and Cu besides the fertilizer ones i.e. N, P and K. Moreover, the applied maize compost might improve the physical condition of the soil especially the physical properties related to the moisture retention. The organic matter is characterized beside of its effect as a cementing material by its ability to retain moisture and

Table (3): Effect of different composted materials as well as NPK on dry matter weight of *tomato plants* "different organs" (kg/fed.) at the first stage of growth (flowering) 55 days of sowing.

Treatments	Fruits	Stems	Roots
Control	12.57	53.14	10.14
T_1	18.99	160.71	22.29
T_2	15.57	66.42	18.71
T_3	64.71	221.99	36.86
T_4	93.85	180.42	57.43
T_5	295.71	305.42	73.29
T_6	40.29	205.71	35.57
T_7	68.99	308.14	43.29
T_8	142.71	290.14	65.14
T_9	295.71	340.86	73.29
T_{10}	58.29	215.14	36.42
T_{11}	74.57	302.99	56.14
T_{12}	189.00	418.00	72.43
T_{13}	405.86	511.42	185.57

T_1 = NPK
T_2 = 10 kg maize only
T_3 = NPK+10 kg maize
T_4 = 20 kg maize only
T_5 = NPK + 20 kg maize
T_6 = 10 kg f. bean only
T_7 = NPK+10 kg f. bean
T_8 = 20 kg f. bean only
T_9 = NPK + 20 kg f. bean
T_{10} = 10 kg chicken M. only
T_{11} = NPK+10 kg chicken
T_{12} = 20 kg chicken M. only
T_{13} = NPK + 20 kg chicken

consequently reserved or soluble nutrients. against leaching, thus provides more available water and nutrients for plant content.

Fertilization of the tomato plant with the combined NPK and maize compost at a rate of 10 kg band^{-1} (T_3) resulted in higher dry matter yield than that attained due to the lower rate of the applied compost alone (T_1) but lower than that attained due to the highest rate of the applied compost (T_4). This was true for both roots and fruits whereas stems dry yield attained due to the treatment T_3 exceeded the corresponding one attained due to T_4. Application of the highest rate of maize compost (20 kg band^{-1}) together with the mineral fertilizers N, P and K (T_5) had more pronounced effect on increasing dry matter yield of tomato roots, stems and fruits.

The response of plant growth to the highest rate of the compost applied together with the mineral N, P and K suggests that the soil under investigation is still in need for more application of all the nutritive elements. Such an observation is logic and is expected due to the low natural fertility of the sandy soil on one hand, and the low water retentively on the other hand which facilitates loss of the applied nutrients through leaching.

Data in Table (3) illustrate that at the same rates of the applied compost (10 or 20 kg band^{-1}), the broad bean compost resulted in more dry matter yield of roots, stems and fruits than the maize compost. This occurred weather the composts were applied solely or in combination with the mineral fertilizers.

The difference in yield is likely to be due to differences in chemical composition of the used composts. The total N content of the broad bean compost is 1.5 times that of the maize compost whereas the C/N ratio of the broad bean compost is more tight than that of the maize compost. This figure gives an indication to the more ease by which nutrients can be taken up from soil upon application of the broad bean.

The organic fertilizer i.e. the chicken manure, seemed to be the most pronounced effect on dry matter yields of tomato roots, stems and fruits whether it was solely applied or it was combined with the mineral fertilizers regardless to its rate of application. However, the attained dry matter yield increased with increasing rate of the applied manure especial when manuring was accompanied with NPK fertilizers application. Thus, the highest dry matter yields of the different tomato organs i.e. roots, stems and fruits were achieved upon application of the chicken manure combined with NPK (185.57, 511.42 and 405.86 kg $band^{-1}$, respectively).

4.2. Effect of different fertilization treatments on values of total macro and micro-nutrients content in the different organs of

4.2.1. contents of the macro-nutrients N, P and K:

4.2.1.1. Roots content.

Tomato roots content of the macronutrients N, P and K is illustrated in Table (4).

It is obvious that values of N content generally exceeded the corresponding ones of P and K regardless of the fertilization treatments. N, P and K content values were lowest in the control treatment however, application of the mineral fertilizers (T_1) increases these values. Application of the maize compost at a rate of 10 kg band^{-1} (T_2) although resulted in higher values of N, P content than those attained due to the control treatment, yet these values were very slightly below those attained due to the mineral fertilizers (T_1). However, the combined application of the maize compost at a rate of 10 kg band^{-1} together with the mineral fertilizers (T_3) slightly increased the N content but on the other hand caused pronounced increases in values of P and K content. Increasing rate of the applied maize compost up to 20 kg band^{-1} (T_4) seemed to result in further increases in up values of N, P and K content.

Moreover, this rate of the applied maize compost combined with the mineral fertilizers (T_5) was the highest effect on increasing the content values of N, P and K.

The effect of broad bean compost on content values of N, P and K seemed to be higher than that of the maize compost. This finding held true at all rates of the applied compost whether

Table (4) Effect of different composted materials as well as chicken manure on total macronutrients content in tomato plants at the first stage of growth.

Treatments	P (mg kg^{-1})			K (mg kg^{-1})			N (kg)		
	F	S	R	F	S	R	F	S	R
Control	1.12	1.99	2.79	3.12	6.42	10.08	3.13	0.99	0.35
T_1	2.16	2.20	4.55	13.92	6.88	12.10	3.98	1.95	1.13
T_2	1.63	2.03	3.37	5.11	11.28	12.00	3.30	1.59	1.11
T_3	2.44	2.93	4.98	7.92	14.13	14.76	4.34	2.20	1.15
T_4	3.00	4.29	5.28	8.64	15.36	16.56	4.61	2.49	1.21
T_5	3.55	5.72	5.75	14.05	17.89	18.60	4.77	2.63	1.39
T_6	2.21	2.60	4.85	6.69	13.5	14.56	3.98	1.99	1.14
T_7	2.52	2.94	5.11	8.64	15.01	15.80	4.40	2.31	1.17
T_8	3.06	4.77	5.33	13.20	16.10	16.76	4.65	2.55	1.33
T_9	3.94	5.74	5.93	15.97	18.45	18.72	4.83	2.70	1.39
T_{10}	2.32	2.73	4.94	7.20	13.68	14.72	4.32	2.12	1.15
T_{11}	2.79	3.67	5.20	8.48	15.12	16.32	4.53	2.37	1.17
T_{12}	3.12	5.46	5.72	13.32	17.76	18.00	4.69	2.55	1.35
T_{13}	4.35	5.85	6.50	17.24	19.12	19.20	4.96	2.78	1.59

F = Fruits
S = Shoots
R = Roots
T_1 = Mineral fertilizer(MF)
T_2 = 10 kg maize compost (MC) without (MF)
T_3 = 10 kg maize compost with (MF)
T_4 = 20 kg maize compost without (MF)
T_5 = 20 kg maize compost with (MF)
T_6 = 10 kg broad beans compost (BC) without (MF)
T_7 = 10 kg broad beans compost with (MF)
T_8 = 20 kg broad beans compost without (MF)
T_9 = 20 kg broad beans compost with (MF)
T_{10} = 10 kg chicken manure (Ch.M) without (MF)
T_{11} = 10 kg chicken manure with (MF)
T_{12} = 20 kg chicken manure without (MF)
T_{13} = 20 kg chicken manure with (MF)

their application was associated with application of the mineral fertilizers or not. However, it is of interest to indicate that the N, P and K content values became higher when rate of the applied compost was raised from 10 to 20 kg band^{-1} and also when it was also when it associated with application of the mineral fertilizers.

Chicken manure gave a more obvious effect on tomato roots than both the studied composts (i.e. maize compost and broad bean compost). Application of this manure resulted in higher content values of N, P and K. Such a finding was true at all rates of application and also upon association with the mineral fertilizers or not. It is worth to refer also that increasing rate of application of the chicken manure had the highest effect on N, P and K content than that of the lower rate. Also, the combined application of the chicken manure and the mineral fertilizers caused N, P and K values to surpass their corresponding values achieved in absence of the mineral fertilizers. Accordingly, it is of interest to indicate that superiority of T_{13} over the other treatments when it is dealt with roots content of N, P and K.

4.2.1.2. Shoots content:

Table (4) reveals that tomato shoots content of N, P and K under influence of the studied fertilization treatments followed patterns similar to a great extent, to those previously described for roots content of the same macronutrients i.e. N, P and K. Thus it was noticed that application the maize compost at a rate of 10 kg band^{-1} (T_2) increased shoots content of N, P and K as compared with the control treatment however, these values were of content were less, than the corresponding ones achieved due to application of the mineral fertilizers (T_1). On the other hand this rate of the applied maize compost together with the mineral fertilizers (T_3) resulted in higher values content for N, P and K exceeding those attained due to the treatment (T_2).

The effect of broad bean compost on values of N , P and K content by tomato shoots surpassed that of the maize compost but was at the same time less than that of the chicken manure. This occurred at all levels of application of the investigated composts as well as the chicken manure whether in absence or presence of the mineral fertilizers.

4.2.1.3. Fruits content:

Values of N content in tomato plant fruits seemed to be for higher than its corresponding ones attained by shoots or roots. On the other hand, values of P and K content in fruits were obviously lower than the corresponding values attained by roots and shoots.

Regarding effect of the different fertilizer treatments on values of fruits content data presented in Table (4) reveal that the control treatment gave the lowest content values of the three studied macronutrients.

Application of the mineral fertilizers (T_1) slightly increased N content by fruits in N but increased their content of P more than two times and raised contents of K up to more than four times.

The application of the maize compost at its lowest rate (T_2) although it increased values of the three fertilizer elements content by tomato fruits as compared with their corresponding values achieved due to the control treatment, yet these values were almost only half the corresponding content ones attained due to application of the mineral fertilizers in case of P and K but only slightly lower in case of N.

Application of the maize compost together with the mineral fertilizers (T_3), as it was expected, had a more pronounced effect than the solely application of either the mineral fertilizers or the maize compost at a rate of 10 kg band^{-1} (T_2) on values of N, P and K content in tomato fruits.

Raising rate of the applied maize compost to 20 kg band^{-1} (T_4) was associated with further increases in values of N, P and K content in fruits. Such increases become more obvious when this rate of compost was added in combined application with the mineral fertilizers (T_5).

Data in the same aforementioned Table illustrate that the broad bean compost at any of its studied rates whether when applied solely or together with the mineral fertilizers caused higher values of N, P and K content in fruits exceed the corresponding ones attained due to usage of the maize compost. However, it could be observed that, increasing rate of the applied broad bean compost whether upon its solely application or upon its combination with the mineral fertilizers resulted in higher values of N, P and K content in tomato fruits.

Chicken manure had higher effect on values of N, P and K content which surpassed those of either the two studied composts. This occurred at all rates of the applied manures weather their application was associated with the mineral fertilizers or not. Thus it could be easily realized that T_{13} treatment i.e. the application of the chicken manure at its higher rate of application (20 kg band^{-1}) together with the mineral fertilizers was the most effective treatment in increasing values of N, P and K content in tomato fruits.

The obtained results herein agree to some extent with those reported by **Omar et al. (1970), Hargital (1985), Abd El-Moez et al. (1995)** who studied the effect of the different organic and inorganic fertilizers on N concentration and content by different plants. The also stand in well agreement with the results achieved on P and K content reported by **Ashower (1992), Sakr et al. (1992), Faiyed (1994), Abd El-Moez et al. (1995), Mahmoud (1996), El-Ghozoli (1998) and El-Falkhrani (1999).**

4.2.2. Contents of the micro-nutrients Zn, Mn and Fe:

4.2.2.1. Roots content.

Data presented in Table (5) represent the values of Zn, Mn and Fe content by tomato roots. It is obvious from these data that the treatment T_1 (mineral fertilizers) gave higher values of Zn, Mn and Fe content than both the control treatment and the maize compost at a rate of 10 kg band^{-1} treatment (T_2). However, marked increases in values of Zn, Mn and Fe content occurred when the maize compost was added at the previously mentioned rate (10 kg band^{-1}) combined with the mineral fertilizers (T_3). Furthermore, increasing rate of the applied maize compost up to 20 kg band-1 (T_4) was associated with further increase in roots content of Zn, Mn and Fe. The increase became more obvious when application of the mentioned rate of maize compost was associated with application of the mineral fertilizers (T_5). Substituting the maize compost by the broad bean compost

Table (5) Effect of different composting materials on total micronutrients content (mg kg^{-1}) in tomato roots at the first stage.

Treatments	Roots (R)		
	Zn	Mn	Fe
Control	0.24	0.20	2.30
T_1	0.33	0.22	3.00
T_2	0.28	0.19	2.83
T_3	1.53	0.29	3.45
T_4	1.60	0.34	4.05
T_5	2.70	0.38	4.58
T_6	0.93	0.28	3.25
T_7	1.54	0.28	3.50
T_8	2.00	0.31	4.13
T_9	2.75	0.39	5.50
T_{10}	1.1	0.28	3.28
T_{11}	1.47	0.29	3.66
T_{12}	2.35	0.36	4.38
T_{13}	5.13	0.42	5.83

T_1 = Mineral fertilizer (MF)
T_2 = 10 kg maize compost (MC) without (MF)
T_3 = 10 kg maize compost with (MF)
T_4 = 20 kg maize compost without (MF)
T_5 = 20 kg maize compost with (MF)
T_6 =10 kg broad beans compost (BC) without (MF)
T_7 = 10 kg broad beans compost with (MF)
T_8 = 20 kg broad beans compost without (MF)
T_9 = 20 kg broad beans compost with (MF)
T_{10} = 10 kg chicken manure (Ch.M) without (MF)
T_{11} = 10 kg chicken manure with (MF)
T_{12} = 20 kg chicken manure without (MF)
T_{13} = 20 kg chicken manure with (MF)

caused considerable increases in roots content of Zn, Mn and Fe to increase generally. This occurred at all rates of application and whether the mineral fertilizers were applied or not.

Application of chicken manure alone or combined with the mineral fertilizers had more obvious effect on tomato roots content of Zn, Mn and Fe. This was true at all levels of the compost application whether in absence of the mineral fertilizers or upon their application. Thus, it could be deduced that chicken manure at a rate of 20 kg $band^{-1}$ together with the mineral fertilizers (T_{13}) was the treatment of the most pronounced effect on roots content of Zn, Mn and Fe.

4.2.2.2. Shoots content:

Data in Table (6) represent values of tomato shoots content of Zn, Mn and Fe due to the different fertilization treatments of the studied soil. It is clear that values of Zn, Mn and Fe content by the shoots in the control treatment were the least as compared with the other treatments.

Application of the maize compost at a rate of 10 kg $band^{-1}$ (T_2) slightly increased the above mentioned values, however, the mineral fertilization (T_1) seemed to be of more pronounced effect on increasing Zn, Mn and Fe content in shoots. The combined effect of the low rate of maize compost (10 kg $band^{-1}$) together with the mineral fertilizers (T_3) caused Zn and Fe content to increase obviously, whereas the increase in Mn content could be almost negligible.

Increasing rate of the applied maize compost to 20 kg $band^{-1}$ (T_4) increased Zn, Mn and Fe content in tomato shoots to values higher than the corresponding ones attained due to the

Table (6) Effect of different composting materials on total micronutrients content (mg kg^{-1}) in tomato shoots at the first stage.

Treatments	Shoots (S)		
	Zn	Mn	Fe
Control	0.13	0.06	1.25
T_1	0.18	0.13	1.58
T_2	0.13	0.12	1.50
T_3	1.35	0.13	2.08
T_4	1.57	0.15	2.44
T_5	2.47	0.16	2.88
T_6	0.61	0.13	1.75
T_7	1.40	0.14	2.42
T_8	1.95	0.15	2.50
T_9	2.48	0.17	2.88
T_{10}	0.84	0.133	1.78
T_{11}	1.17	0.13	2.44
T_{12}	2.16	0.16	2.63
T_{13}	3.08	0.18	3.78

T_1 = Mineral fertilizer (MF)
T_2 = 10 kg maize compost (MC) without (MF)
T_3 = 10 kg maize compost with (MF)
T_4 = 20 kg maize compost without (MF)
T_5 = 20 kg maize compost with (MF)
T_6 =10 kg broad beans compost (BC) without (MF)
T_7 = 10 kg broad beans compost with (MF)
T_8 = 20 kg broad beans compost without (MF)
T_9 = 20 kg broad beans compost with (MF)
T_{10} = 10 kg chicken manure (Ch.M) without (MF)
T_{11} = 10 kg chicken manure with (MF)
T_{12} = 20 kg chicken manure without (MF)
T_{13} = 20 kg chicken manure with (MF)

aforementioned treatments. Moreover, the association with this rate of maize compost with the mineral fertilizers (T_5) caused values of Zn, Mn and Fe to be obviously higher.

Usage of broad bean compost for manuring the soil caused Zn, Mn and Fe shoots content values to be higher than the corresponding ones achieved due to manuring with the maize compost. This occurred at all rates of application of manures whether the application was associated with the mineral fertilizers or not. However, one should pay attention towards the increase in Zn, Mn and Fe shoots content when rate of the applied compost was raised up to 20 kg $band^{-1}$ and also to the effect of the mineral fertilizers when were applied together with the compost on increasing these values.

Chicken manure seemed to be of the highest effect on content of Zn, Mn and Fe content by tomato shoots. At all rates of application of the manure the values of Zn, Mn and Fe content exceeded the corresponding ones attained due to application of the maize compost or broad bean compost. Such a finding was true also when the chicken manure was applied together with the mineral fertilizers. Thus, it can be concluded that chicken manure (20 kg $band^{-1}$) combined with the mineral fertilizers (T_{13}) was the treatment that caused the highest values of Zn , Mn and Fe content by tomato shoots.

An overview on the aforementioned results may lead to conclude that: values of tomato shoots content of Zn, Mn and Fe are generally lower than the corresponding ones of roots.

The studied organic materials could be arranged according to their effect on increasing values of Zn, Mn and Fe content in the following descending order: Chicken manure > broad bean compost > maize compost.

This order may be a final product of the chemical composition of these materials which indicates that the chicken manure was characterized by the narrowest C/N ratio (7.38:1) followed by the broad bean compost (16.8 :1) whereas the maize compost was of the widest ratio (26.1 :1).

The effect of the studied treatments on values of Zn and Fe content was obvious whereas very minute effect could be noticed due to these treatments on Mn content. This finding means that the soil content of Mn is likely to be sufficient for plant growth but on the other hand the plant might still in need for more Zn and Fe.

4.2.2.3. Fruits content:

Values of Zn, Mn and Fe content by tomato fruits seemed to be the lowest as compared with the corresponding ones of roots and shoots (Table 7).

The control treatment caused the values of Zn, Mn and Fe content to be the lowest as compared with the other treatments.

Treating the plant with the mineral fertilizers only (T_1) slightly increased its fruits content of the studied elements.

Application of the maize compost at a rate of 10 kg band^{-1}. (T_2) although increased very slightly values of Zn, Mn and Fe content as compared with the corresponding values of the control treatment, yet these values were markedly lower than those attained due to the application of the mineral fertilizers. However, the combined application of the maize compost together with the mineral fertilizers caused the tomato fruits

Table (7) Effect of different composting materials on total micronutrients content (mg kg^{-1}) in tomato fruits at the first stage.

Treatments	Fruits (F)		
	Zn	Mn	Fe
Control	0.10	0.03	0.3
T_1	0.16	0.08	0.39
T_2	0.11	0.06	0.31
T_3	0.32	0.13	0.56
T_4	0.39	0.13	0.67
T_5	0.80	0.15	0.75
T_6	0.21	0.11	0.50
T_7	0.32	0.13	0.63
T_8	0.68	0.15	0.67
T_9	0.80	0.16	1.00
T_{10}	0.21	0.12	0.52
T_{11}	0.39	0.15	0.63
T_{12}	0.68	0.15	0.75
T_{13}	1.53	0.16	3.13

T_1 = Mineral fertilizer (MF)
T_2 = 10 kg maize compost (MC) without (MF)
T_3 = 10 kg maize compost with (MF)
T_4 = 20 kg maize compost without (MF)
T_5 = 20 kg maize compost with (MF)
T_6 =10 kg broad beans compost (BC) without (MF)
T_7 = 10 kg broad beans compost with (MF)
T_8 = 20 kg broad beans compost without (MF)
T_9 = 20 kg broad beans compost with (MF)
T_{10} = 10 kg chicken manure (Ch.M) without (MF)
T_{11} = 10 kg chicken manure with (MF)
T_{12} = 20 kg chicken manure without (MF)
T_{13} = 20 kg chicken manure with (MF)

content of Zn, Mn and Fe to be obviously higher than the corresponding values attained due to application of the mineral fertilizers only (T_1) or those attained due to the application of the maize compost at its low rate (10 kg $band^{-1}$).

Increasing rate of the applied maize compost up to 20 kg $band^{-1}$ (T_4) positively affected the values of Zn, Mn and Fe and the effect was more pronounced when the compost application at this rate was associated with the mineral fertilization (T_5) .

Application of the broad bean compost instead of the maize compost was of more marked effect on increasing fruits content of Zn, Mn and Fe. This occurred at all levels of application of the composts whether these composts were applied with or without the mineral fertilizers. In this concern, application of the broad bean at a rate of 20 kg $band^{-1}$ combined with the mineral fertilizers (T_9) caused Zn, Mn and Fe content values to be highest.

The chicken manure effect on values of Zn, Mn and Fe content seemed to be higher than the corresponding ones of both the maize compost and broad bean compost at all rates of application whether when the manure application was associated with or without mineral fertilization. However it is worthy to indicate that combined application of the manure at a rate of 20 kg $band^{-1}$ with the mineral fertilizers (T_{13}) was the most effective treatment followed by (T_{12}) i.e. the application of the manure at a rate of 20 kg $band^{-1}$ then (T_{11}) i.e. the combined application of the manure at a rate of 10 kg $band^{-1}$ with the mineral fertilizers and finally (T_{10}) which is the application of the organic manure at a rate of 10 kg $band^{-1}$ with mineral fertilizers.

Similar findings were reported by **Chen and Stevenson (1986), Faiyed (1994) and Mikhaeel et al. (1997)** upon their studies on effect of different mineral fertilizers and organic manures on values of Fe, Mn and Zn concentration or content.

4.3. Effect of different fertilization treatments on dry matter weight of tomato plant at the second stage of growth:

Data presented in Table (8) reveal that the different studied treatments resulted in pronounced increases in dry matter yields of roots, stems, and fruits as compared with the control treatment. Once again, the lowest rate of the maize compost which is 10 kg band^{-1} (T_2) resulted in the lowest dry matter yield of roots, stems and fruits i.e. 33.06, 537.8 and 548.1 respectively. Such a finding probably indicates that this rate of applied compost was not quite enough for providing the grown plants with their requirements of the nutritive elements.

Increasing rate of the applied maize compost up to 20 kg band^{-1} (T_4) increased obviously the dry matter yields of all tomato plant organs i.e. the roots, stems and fruits. These results assure the aforementioned finding and suggest that the plants are still in need for more applications of the nutritive elements.

The combined application of the NPK mineral fertilizer with 10 kg compost band^{-1} (T_3) increased the dry matter yields of all tomato organs as compared with the corresponding ones achieved due to application of the maize compost at rate of 10 kg band^{-1} but without combination with the mineral fertilizers. This result is expected and could be explained also on the basis that the maize compost at a rate of 10 kg band^{-1} is not sufficient to meet the nutritive demands of tomato plant, hence the plant

Table (8): Effect of different composting materials on dry weights (kg/fed.) of tomato plants at the second stage (three months of sowing) .

Treatments	Fruits	Stems	Roots
Control	438.43	395.40	29.57
T_1	582.43	565.71	35.57
T_2	548.14	53.7.86	33.00
T_3	713.14	677.99	46.02
T_4	1127.71	899.71	166.71
T_5	1510.86	1311.99	204.85
T_6	641.57	602.57	36.86
T_7	746.99	1350.42	45.86
T_8	1376.71	942.14	191.57
T_9	1554.99	1525.86	209.14
T_{10}	708.86	652.71	41.14
T_{11}	1616.85	984.71	142.29
T_{12}	1496.29	1090.00	197.57
T_{13}	1812.14	1784.29	211.71

T_1 = NPK
T_2 = 10 kg maize only
T_3 = NPK+10 kg maize
T_4 = 20 kg maize only
T_5 = NPK + 20 kg maize
T_6 = 10 kg f. bean only
T_7 = NPK+10 kg f. bean
T_8 = 20 kg f. bean only
T_9 = NPK + 20 kg f. bean
T_{10} = 10 kg chicken M. only
T_{11} = NPK+10 kg chicken
T_{12} = 20 kg chicken M. only
T_{13} = NPK + 20 kg chicken

responded well to the added mineral fertilizers. Likewise, the plant responded very obviously to rising the level of the applied maize compost up to 20 kg band^{-1} and the response was more noticeable when this rate of the applied maize compost was associated with the mineral fertilizers N, P and K (T_5).

As compared with the maize compost, application of the broad bean compost was of higher effect on dry matter yield of tomato roots, stems and fruits. This occurred at all levels of the applied composts whether they were applied solely or together with the mineral fertilizers. Yet, it is worthy to indicate that the effect of the applied broad bean compost increased with increasing its rate of application and also with application of the mineral fertilizers. Thus, the treatments that involved the board bean compost could be arranged descendingly due to their effect on dry matter yield of tomato plants as follows:

T_9, (20 kg broad bean compost band^{-1} + NPK) > T_8 (20 kg broad bean compost band^{-1}) > T_7 (10 kg manure band^{-1} + NPK) T_{16} (10 kg broad bean compost band^{-1}).

This trend was true for dry matter yields of both roots and fruits, however in case of dry weight of stems the attained arrangement differed slightly and followed the order: $T_9 > T_7 > T_8 > T_6$.

Values of dry matter yield of tomato roots, stems and fruits attained due to application the chicken manure at its lower rate i.e., 10 kg band^{-1} (T_{10}) seemed to be higher than the corresponding ones achieved due to application of the same rate of maize compost (T_2) or broad bean compost (T_6). Also, the higher rate of applied chicken manure, 20 kg band-1, (T_{12})

caused dry matter yields of tomato plant organs to increase several times as compared with the corresponding dry matter yields attained due to the lower rate of chicken manure. Moreover, chicken manure at either of its rates of application combined with the mineral fertilizers enormoused the corresponding dry matter yields attained due to application of the same rates of manures but in absence of the applied mineral fertilizers. Therefore, it was found that the highest dry matter yields of tomato roots, stems and fruits can be achieved due to the combined application of chicken manure at a rate of 20 kg $band^{-1}$ together with the mineral fertilizers.

4.4. Effect of different fertilization treatments on values of total macro and micro-nutrients content by the different organs of tomato plants at the second stage of growth:

4.4.1. Concentration of the macronutrients N, P and K:

Data presented in Table (9) reveal effects of the different fertilization treatments on values of N, P and K content in roots, shoots and fruits of tomato plants. Generally values of N, P and K content in the different studied tomato plant organs in the second stage exceeded the corresponding ones of the first stage. This was true whether the plants were not fertilized, received mineral fertilizer elements manured or even manured and received the mineral fertilizers.

Application of the mineral fertilizers (T_1) increased values of N, P and K content as compared with the control treatment. Also application of either of the studied organic fertilizers at a rate of 10 kg $band^{-1}$ could result in increases in values of N, P and K content in all the plant organs, though these content values

Table (9) Effect of different composting materials on total macronutrients content in tomato plants at the second stage.

Treatments	P (mg kg^{-1})			K (mg kg^{-1})			N (kg)		
	F	S	R	F	S	R	F	S	R
Control	2.54	0.65	0.52	11.4	4.10	0.64	1.43	1.39	0.55
T_1	2.63	0.97	0.15	12.00	9.60	5.00	1.59	1.55	1.27
T_2	2.63	0.91	0.71	11.28	6.48	4.86	1.59	1.47	1.19
T_3	3.00	1.04	0.98	18.96	15.84	6.72	1.71	1.59	1.55
T_4	3.48	1.56	1.43	23.04	20.40	7.92	2.39	2.31	1.59
T_5	3.49	3.30	1.95	25.44	20.64	11.52	2.66	2.78	1.59
T_6	2.72	0.98	0.72	14.42	14.40	5.04	1.59	1.59	1.43
T_7	3.22	1.24	1.09	19.20	18.24	6.96	1.98	1.83	1.55
T_8	3.21	2.26	1.56	23.28	20.56	8.64	2.39	2.39	1.59
T_9	3.81	3.50	2.60	25.90	20.88	11.56	2.66	2.86	1.59
T_{10}	2.91	0.98	0.19	15.37	15.35	6.48	1.59	1.59	1.51
T_{11}	3.53	1.43	1.36	22.56	16.44	7.68	2.07	1.99	1.55
T_{12}	3.40	3.26	1.65	23.52	20.60	10.56	2.51	2.39	1.59
T_{13}	4.01	3.99	3.12	28.80	22.56	11.76	2.86	3.18	1.59

F = Fruits
S = Shoots
R = Roots
T_1 = Mineral fertilizer(MF)
T_2 = 10 kg maize compost (MC) without (MF)
T_3 = 10 kg maize compost with (MF)
T_4 = 20 kg maize compost without (MF)
T_5 = 20 kg maize compost with (MF)
T_6 = 10 kg broad beans compost (BC) without (MF)
T_7 = 10 kg broad beans compost with (MF)
T_8 = 20 kg broad beans compost without (MF)
T_9 = 20 kg broad beans compost with (MF)
T_{10} = 10 kg chicken manure (Ch.M) without (MF)
T_{11} = 10 kg chicken manure with (MF)
T_{12} = 20 kg chicken manure without (MF)
T_{13} = 20 kg chicken manure with (MF)

were generally rather lower than those achieved due to application of the mineral fertilizers (T_1). The effect of this rate of the applied organic fertilizers became more marked upon their application together with the mineral fertilizers.

Raising rate of the applied fertilizers to 20 kg band^{-1} was associated with further increases in N, P and K content in the different plant organs to values exceeding the corresponding ones achieved due to application of the mineral fertilizers.

The combined application of this rate of the organic fertilizers together with the mineral fertilizers was higher compared with the other fertilization treatments. However at all rates of the applied organic fertilizers (maize compost, broad bean compost and chicken manure) whether in absence or presence of the mineral fertilizers, the effect of these organic manures on values of N, P and K content in the different tomato plant organs followed the descending order: chicken manure > broad bean compost > maize compost.

4.4.2. Contents of the micronutrients Zn, Mn and Fe accumulated by tomato plants:

Data presented in Tables (10, 11 and 12) reveal that Fe was of the highest content values whereas, Mn was of the lowest one among the three studied micronutrients. Also, values of the considered nutrients content in the different organs of tomato plants followed the descending order: fruits > shoots > roots. This order was true whether the plant was fertilized or not and whether the mineral fertilizers were used or the organic ones or a combination of both.

Values of Zn, Mn and Fe content in all studied plant organs seemed to be effected with the different fertilization treatments in a similar way. For all the considered nutrients in all organs of the tomato plants, application of the mineral fertilizers was of a positive effect on their content by in the different plant organs and effect of application of these mineral fertilizers exceeded that of the maize compost at a rate of 10 kg band^{-1} but at the same time was less than that of the broad bean compost and obviously lower than that of the chicken manure.

It is worthwhile to indicate that raising the rate of studied manures was associated with a marked increases in content values of the considered micronutritive elements by all the tomato plant organs. Moreover the association of the mineral fertilizers with the applied organic ones enormoused their effect on increasing values of these micronutritive element content in all the plant organs. A final observation that should be mentioned is the superiority of the treatment (13) (i.e. application of the chicken manure at a rate of 20 kg band^{-1} associated with the mineral fertilizers over the other treatments in increasing Zn, Mn and Fe content in the different organs of the tomato plants.

Table (10) Effect of different composting materials on total micronutrients content (mg kg^{-1}) in tomato roots at the second stage.

Treatments	Roots (R)		
	Zn	Mn	Fe
Control	0.13	0.04	0.30
T_1	0.15	0.05	0.58
T_2	0.10	0.51	0.50
T_3	0.25	0.06	0.75
T_4	0.56	0.06	1.02
T_5	1.20	0.11	1.25
T_6	0.24	0.06	0.63
T_7	0.30	0.06	0.76
T_8	0.65	0.09	1.20
T_9	1.48	0.13	2.25
T_{10}	0.25	0.06	0.75
T_{11}	0.43	0.06	1.00
T_{12}	1.01	0.10	1.50
T_{13}	2.18	0.15	2.50

T_1 = Mineral fertilizer (MF)
T_2 = 10 kg maize compost (MC) without (MF)
T_3 = 10 kg maize compost with (MF)
T_4 = 20 kg maize compost without (MF)
T_5 = 20 kg maize compost with (MF)
T_6 =10 kg broad beans compost (BC) without (MF)
T_7 = 10 kg broad beans compost with (MF)
T_8 = 20 kg broad beans compost without (MF)
T_9 = 20 kg broad beans compost with (MF)
T_{10} = 10 kg chicken manure (Ch.M) without (MF)
T_{11} = 10 kg chicken manure with (MF)
T_{12} = 20 kg chicken manure without (MF)
T_{13} = 20 kg chicken manure with (MF)

Table (11) Effect of different composting materials on total micronutrients content (mg kg^{-1}) in tomato shoots at the second stage.

Treatments	Shoots (S)		
	Zn	Mn	Fe
Control	0.20	0.08	0.75
T_1	0.68	0.13	1.63
T_2	0.45	0.13	1.50
T_3	1.82	0.18	2.26
T_4	1.85	0.25	2.51
T_5	2.31	0.29	2.75
T_6	1.01	0.13	0.23
T_7	1.83	0.20	2.26
T_8	1.90	0.25	2.52
T_9	2.41	0.33	3.00
T_{10}	1.23	0.14	1.53
T_{11}	1.85	0.21	2.5
T_{12}	1.95	0.26	2.63
T_{13}	2.50	0.40	4.13

T_1 = Mineral fertilizer (MF)
T_2 = 10 kg maize compost (MC) without (MF)
T_3 = 10 kg maize compost with (MF)
T_4 = 20 kg maize compost without (MF)
T_5 = 20 kg maize compost with (MF)
T_6 =10 kg broad beans compost (BC) without (MF)
T_7 = 10 kg broad beans compost with (MF)
T_8 = 20 kg broad beans compost without (MF)
T_9 = 20 kg broad beans compost with (MF)
T_{10} = 10 kg chicken manure (Ch.M) without (MF)
T_{11} = 10 kg chicken manure with (MF)
T_{12} = 20 kg chicken manure without (MF)
T_{13} = 20 kg chicken manure with (MF)

Table (13) Effect of different composting materials on total micronutrients content (mg kg^{-1}) in tomato fruits at the second stage.

Treatments	Fruits (F)		
	Zn	Mn	Fe
Control	0.26	0.13	1.50
T_1	1.70	0.16	2.13
T_2	0.53	0.15	2.00
T_3	1.91	0.19	3.75
T_4	3.50	0.23	4.52
T_5	5.35	0.30	7.38
T_6	1.80	0.18	0.23
T_7	1.99	0.22	4.00
T_8	3.56	0.25	6.50
T_9	5.75	0.33	7.75
T_{10}	1.81	0.18	3.63
T_{11}	2.23	0.21	4.50
T_{12}	2.01	0.26	6.51
T_{13}	6.15	0.51	15.5

T_1 = Mineral fertilizer (MF)
T_2 = 10 kg maize compost (MC) without (MF)
T_3 = 10 kg maize compost with (MF)
T_4 = 20 kg maize compost without (MF)
T_5 = 20 kg maize compost with (MF)
T_6 =10 kg broad beans compost (BC) without (MF)
T_7 = 10 kg broad beans compost with (MF)
T_8 = 20 kg broad beans compost without (MF)
T_9 = 20 kg broad beans compost with (MF)
T_{10} = 10 kg chicken manure (Ch.M) without (MF)
T_{11} = 10 kg chicken manure with (MF)
T_{12} = 20 kg chicken manure without (MF)
T_{13} = 20 kg chicken manure with (MF)