RESULTS & DISCUSSION

4. RESULTS & DISCUSSION

4.1. Effect of organic manures on wheat plant growth:

4.1.1. Dry matter weight:

Data in Table (3) and Figure (1) show the dry matter weight of wheat plants grown on (sandy, calcareous and clayey soils) as influenced with biofertilizer and different doses of farmyard manure (FYM) and chicken manure (CM) which either each alone applied or mixed together.

Results revealed that inoculation with biofertilizer alone did not significantly affect the dry matter weight of wheat plants in any of the tested soils. However, mixing the biofertilizers with both organic manures increased significantly the dry matter of wheat plants grown in the studied soils as compared with those of the control treatment. The highest mean values of dry matter weight averaged over all the studied soils (17.18 g pot^{-1}) were obtained when the soils were treated with FYM 25% + CM 75%.

Concerning effect of the organic manure, it was obvious that the addition of either farmyard, chicken manure or a mixture of both together to any of the tested soils increased significantly the dry matter weight of wheat plants in comparison with the control treatment. The highest mean of dry matter weight (19.75 g pot^{-1}) was that of the clayey soil followed by 12.96 and 12.10 g pot^{-1} for the calcareous and sandy soils, respectively.

In sandy soil, the use of FYM or CM each alone or mixed together combined with or without biofertilizers significantly increased the dry matter of wheat plants in comparison with those of the control treatment mainly without organic manure or biofertilizers. Apart from the control treatments, the highest dry matter weight (15.90 g pot^{-1}) and the lowest one (12.27 g pot^{-1}) were achieved by the treatments received FYM 75% + CM 25% + BF and FYM 75% + CM 25%, respectively.

Table (3) Dry matter weight of wheat plants (g pot^{-1}) as affected by different type of manures and soil samples.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	2.70	5.38	15.30	7.79
Control + BF	4.65	7.61	13.64	8.63
FYM 100%	13.44	13.70	22.96	16.70
FYM 100%+ BF	14.66	13.88	19.28	15.94
CM 100%	12.88	14.38	22.08	16.45
CM 100% +BF	13.60	15.66	16.40	15.22
FYM 25% + CM 75%	12.45	14.05	25.04	17.18
FYM 25% +CM 75% + BF	14.47	15.39	17.52	15.79
FYM 50% + CM 50%	13.39	14.07	22.37	16.61
FYM 50% + CM 50% + BF	14.84	15.01	19.65	16.50
FYM 75% + CM 25%	12.27	12.86	23.84	16.32
FYM 75% + CM 25% + BF	15.90	13.55	18.96	16.14
Mean	12.10	12.96	19.75	14.94

L.S.D. (P 0.05)

Soil (s)	0.44
Treatment (T)	0.87
S * T	1.51

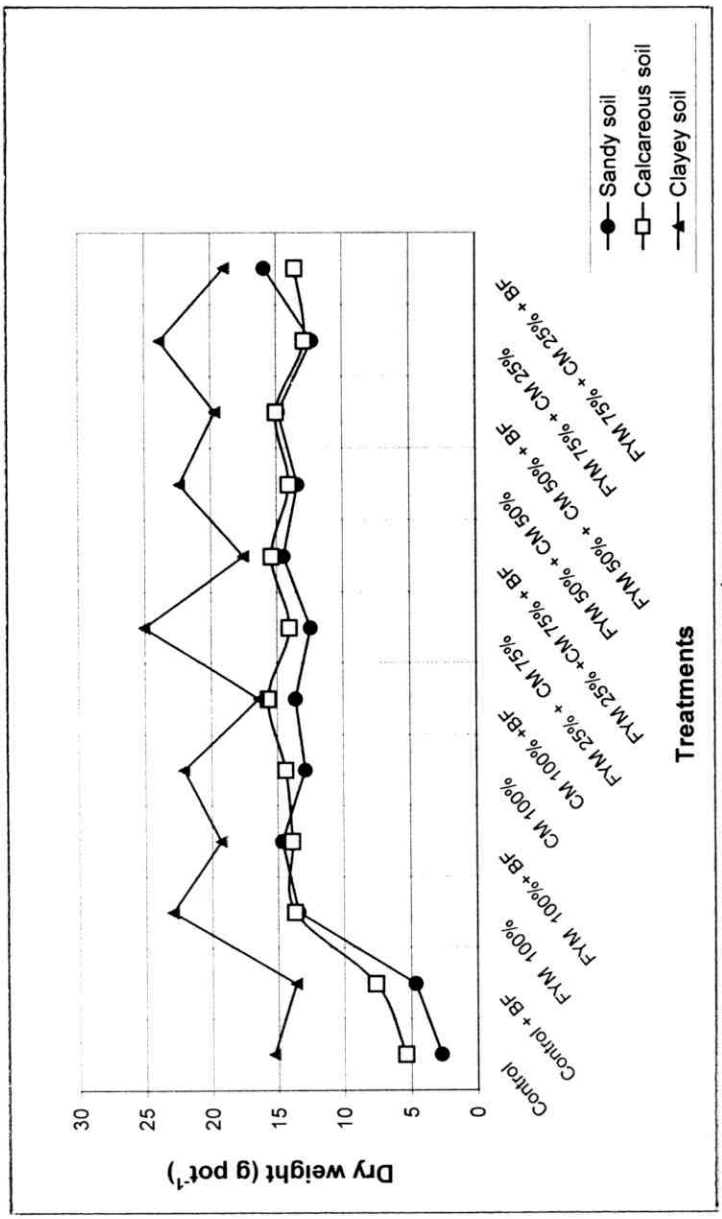

Fig. (1) Dry matter weight of wheat plants (g pot^{-1}) as affected by different type of manures and soil samples.

Moreover, the highest dry matter of wheat plants (15.9 g pot^{-1}) achieved due to the use of FYM 75% + CM 25% + BF was significantly higher than those achieved due to the other treatments except for that of the treatment of FYM 50% + CM 50% + BF.

In calcareous soil, the use of different organic manures each alone or mixed together with biofertilizers significantly increased the dry matter weight of wheat plants. The highest dry matter of plant (15.66 g pot^{-1}) was achieved with the use of CM 100 % + BF treatment. The values obtained were significantly higher than those obtained from the other treatments except for the treatments that received FYM 25% + 75 % CM + BF (15.39 g pot^{-1}) and the one received FYM 50% + CM 50 % + BF (15.01 g pot^{-1}).

It is important to point out that the treatment received FYM 100% gave 13.70 g pot^{-1} dry matter weight against 13.88 g pot^{-1} dry matter for the treatment received FYM 100 % + BF. The differences between values of the dry matter weight of these two treatments were not significant. However, this trend was not true in relative to the treatments of CM 100 % and CM 100 % + BF which were significantly different from each other. These results indicate that the use of biofertilizers (BF) along with CM 100 % resulted in significant positive effect on dry matter weight, while such effect was not attained in FYM 100 % treatment. Meanwhile, it could be concluded that the use of organic manure along with or without biofertilizers increased significantly the dry matter yield of wheat plants grown on the calcareous soil when compared with either the control treatment or the control treatment + BF. The lowest dry matter weight (12.86 g pot^{-1}) was obtained with FYM 75% + CM 25% treatment.

In clayey soil, the wheat plant dry weights were influenced positively by the addition of either biofertilizers or organic manure each alone or in combination when compared to the control treatment or to the control + BF treatment.

The highest dry matter yield of wheat plant were 25.04, 23.84, 22.96, 22.37 and 22.08 g pot^{-1} corresponding to the treatments of FYM 25% + CM 75%, FYM 75% + CM 25%, FYM 100 %, FYM 50% + CM 50% and CM 100 %.

It is obvious that the highest value of dry matter weight (25.04 g pot^{-1}) was achieved by the use of FYM 25% + CM 75%. The lowest dry matter yield 16.4 g pot^{-1} was obtained along with the use of organic manure (CM 100 % + BF).

However, it is of great importance to notice that the inoculation of wheat seeds in the control treatment significantly decreased the dry matter weight of wheat plant. This trend had been exhibited only in the clayey soil. This result could be elucidated due to high contents of both available and total nitrogen, which inhibit the activity of the microorganisms.

Generally, the highest value of the dry matter yield of wheat plants was (25.04 g pot^{-1}) in the clayey soil, (15.90 g pot^{-1}) in the sandy soil and (15.66 g pot-1) in the calcareous soil. The corresponding treatments for these values in each soil were FYM 25% + CM 75% (clayey soil), FYM 75% + CM 25% + BF (sandy soil) and CM 100 % + BF (calcareous soil).

4.1.2. Plant height:

Table (4) and Figure (2) show the effect of organic manures alone or combined with biofertilizer inoculation on height of wheat plants grown on the studied soils. Data reveal that application of both FYM and CM each alone or mixtured together without or in combination with biofertilizer increased significantly the wheat plants height in all tested soils.

The highest mean plant height as average over all the studied soils was 91.61cm with the treatment of FYM 50% + CM 50% +BF. The lowest mean value of plant height (73.32 cm) was that of the control treatment.

In view of effect of the used treatments on the wheat plants grown on the different soils it was found that the highest mean of plant height (91.11 cm) averaged over all treatments was recorded by the clayey soil. This mean value

Table (4) Wheat plant heights (cm) as affected by different manure type and soil samples.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	57.30	72.33	90.33	73.32
Control + BF	72.00	72.33	87.00	77.11
FYM 100%	82.00	79.33	90.33	83.89
FYM 100%+ BF	86.00	85.67	92.67	88.11
CM 100%	79.67	81.00	91.00	83.89
CM 100% +BF	85.67	88.67	91.00	88.45
FYM 25% + CM 75%	78.67	83.33	88.00	83.33
FYM 25% +CM 75% + BF	88.00	86.00	98.33	90.78
FYM 50% + CM 50%	80.67	81.67	89.00	83.78
FYM 50% + CM 50% + BF	90.00	88.33	96.67	91.67
FYM 75% + CM 25%	80.33	79.67	83.33	81.11
FYM 75% + CM 25% + BF	82.00	87.67	95.67	88.45
Mean	80.19	82.17	91.11	84.49

L.S.D. (P 0.05)

Soil (s)	1.73
Treatment (T)	3.46
S * T	5.99

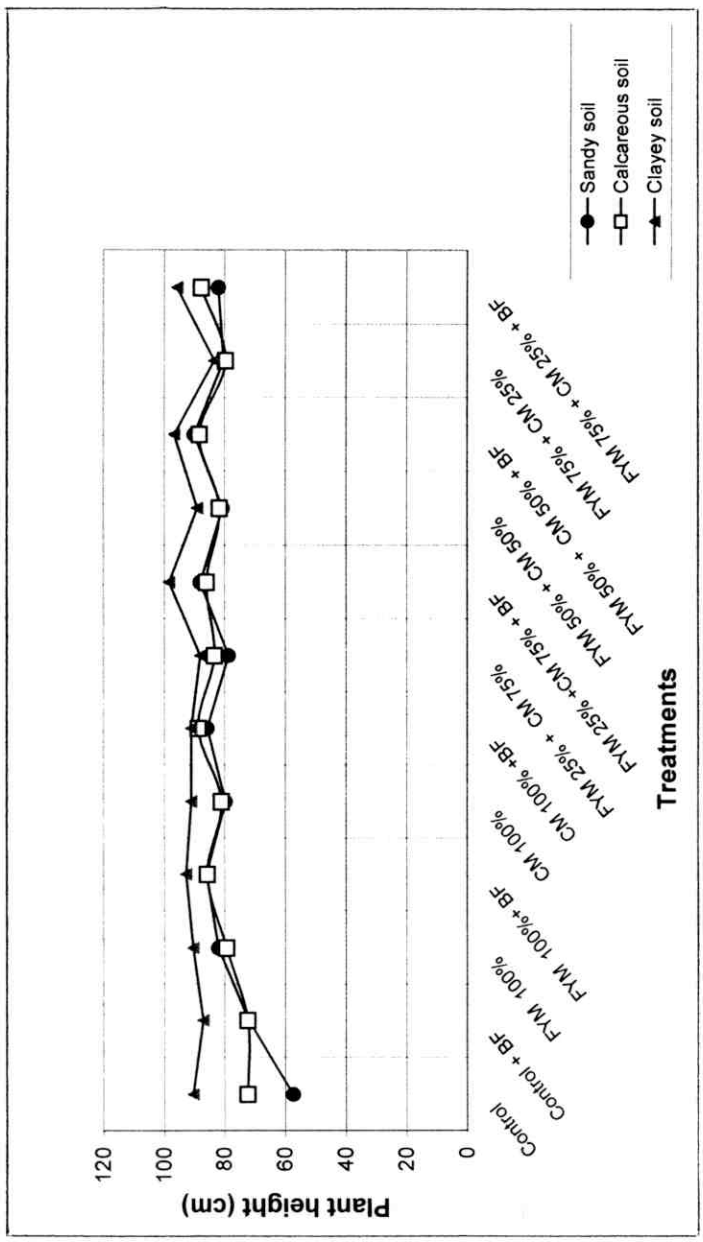

Fig. (2) Wheat plant height as affected by different type of manures and soil samples.

was higher and significantly increased than those obtained with the sandy (80.19cm) and calcareous (82.17 cm) soils.

Coming to argue the effect of the manure treatments on the height of wheat plants grown on the sandy soil; all the tested treatments either organic manures or organic manures plus biofertilizers significantly increased the wheat plant height in comparison with that of the control treatment. The highest value of plant height (90.00cm) was obtained with the treatment of FYM 50% + CM 50% +BF. This value was significantly higher than those recorded by the other treatments except for those of 88.00,86.00 and 85.67 cm which were recorded for the treatments of FYM 25% + CM 75% +BF, FYM 100 % + BF and CM 100 % + BF, respectively (Table 4).

In the calcareous soil, inoculation with only biofertilizers did not affect the plant height compared with the control treatment. Both control and control + BF had scored same plant height (72.33 cm).

However, the use of organic manures either alone or with biofertilizer significantly increased the height of the wheat plants compared with those of the control or control + BF treatment. The highest plant height (88.67 cm) was achieved by the use of CM 100 % + BF. This value was not significantly higher than those of FYM 50% + CM 50% +BF, FYM 75% + CM 25% +BF, FYM 25% + CM 75% +BF, FYM 100 % +BF and FYM 25% + CM 75% treatments whose corresponding values were 88.33, 87.67, 86.00, 85.67 and 83.33 cm, respectively (Table 4).

In the clayey soil, the control treatment gave a plant height of 90.33 cm which was slightly higher than those attained due to the treatments FYM 50% + CM 50%, FYM 25% + CM 75%, control + BF and FYM 75% + CM 25% corresponding to 89.00, 88.00, 87.00 and 83.33 cm were recorded, respectively.

However, the plant height recorded by the control treatment (90.33 cm) was not significantly different from all the manure treatments except for FYM

25% + CM 75% + BF (98.33 cm) and FYM 50% + CM 50% + BF (96.67 cm) treatments. The highest plant height value (98.33 cm) was significantly higher than the other treatments except for that of 96.67 cm which was recorded due to the treatment of FYM 50% + CM 50% +BF.

4.1.3. Number of tillers pot^{-1}:

Table (5) and Figure (3) show the effect of the organic manures and biofertilizers on number of tillers of wheat plant.

Generally, the incorporation of organic manures into soil increased significantly the number of wheat tillers pot^{-1} over both control and \ or control + BF treatments. The highest mean value of 19 tillers pot^{-1} was recorded by both CM 100 % and FYM 25% + CM 75% treatments. The addition of biofertilizer did not increase the number of tillers pot^{-1}but on the other hand, decreased it to an average of 9.33 tillers pot^{-1}, which characterized the control +BF treatment.

The influence of the treatments on the number of tillers pot^{-1}was more obvious in the clayey soil than the other two ones. The highest mean value 20.67 tillers pot^{-1} that detected in the clayey soil was significantly higher than those of 15.58 and 13.83 tillers pot^{-1}, which were detected for sandy and calcareous soils, respectively.

In the sandy soil, all numbers of tiller recorded by the manure treatments were significantly higher than the control treatment. The CM 100 % treatment gave the highest number of tiller pot^{-1} (21 tillers) which exceeded significantly the other treatments except for FYM 50% + CM 50% + BF, FYM 75% +CM 25% and FYM 75% +CM 25% +BF.

It is important to point out that the addition of biofertilizers to all the treatments, did not enhance the number of tillers pot^{-1}, while in the other hand the biofertilizers decreased significantly the number of tillers for CM 100% treatment from 21.00 to 17.00 tillers pot^{-1}.

In the calcareous soil, all the treatments had affected positively the numbers of tillers pot^{-1} as compared with control or control + BF treatment. The

Table (5) No. of tillers of wheat plants(pot^{-1}) as affected by different manure type and soil samples.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	7.00	8.00	19.00	11.33
Control + BF	7.00	7.00	14.00	9.33
FYM 100%	15.00	14.00	23.00	17.33
FYM 100%+ BF	15.00	12.00	24.00	17.00
CM 100%	21.00	16.00	20.00	19.00
CM 100% +BF	17.00	16.00	19.00	17.33
FYM 25% + CM 75%	16.00	17.00	24.00	19.00
FYM 25% +CM 75% + BF	17.00	15.00	22.00	18.00
FYM 50% + CM 50%	17.00	16.00	21.00	18.00
FYM 50% + CM 50% + BF	18.00	15.00	19.00	17.33
FYM 75% + CM 25%	18.00	15.00	22.00	18.33
FYM 75% + CM 25% + BF	19.00	15.00	21.00	18.33
Mean	15.58	13.83	20.67	16.69

L.S.D. (P 0.05)

Soil (s)	0.92
Treatment (T)	1.83
S * T	3.17

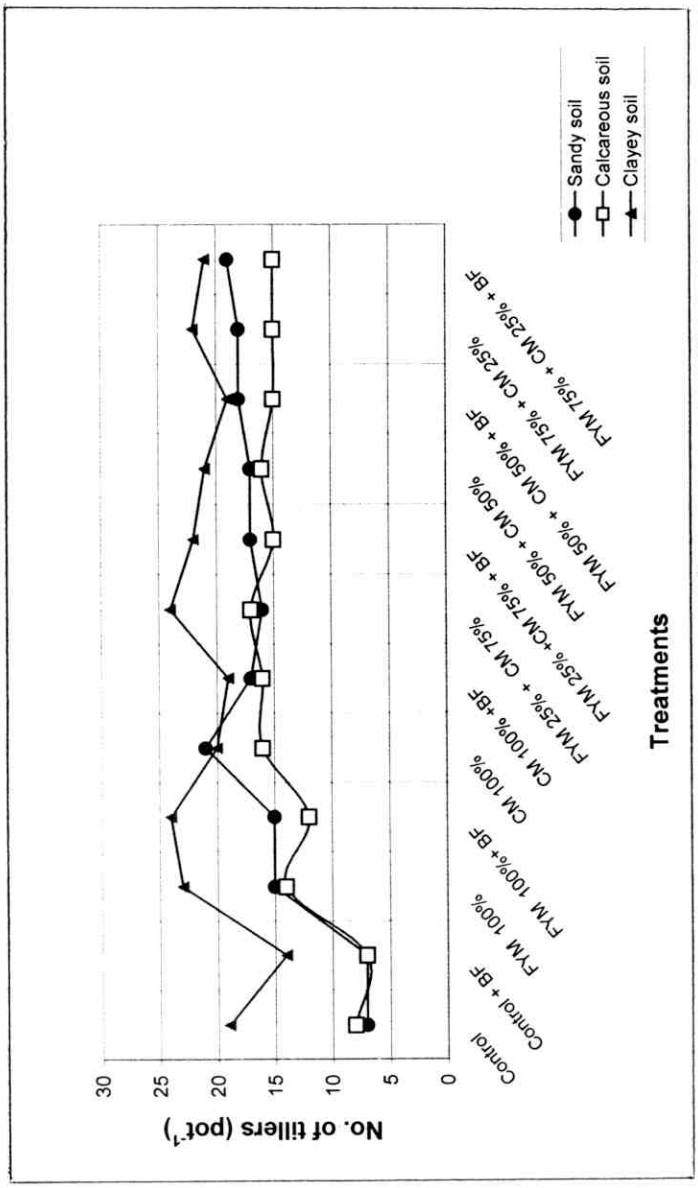

Fig. (3) Number of tillers of wheat plants (g pot^{-1}) as affected by different type of manures and soil samples.

highest number of tillers pot^{-1} (17) was achieved due to the treatment FYM 25% +CM 75% (Table 5).

Application of biofertilizers with manures led to slight insignificant decrease in the number of tiller pot^{-1} compared to the manure treatments only.

In the clayey soil, both FYM 100 % + BF and FYM 25% +CM 75% treatments gave the highest number of tillers pot^{-1} (24) which was not significantly different from all the manure treatments except for CM 100%, CM 100% + BF and FYM 50% +CM 50% + BF treatments.

As a final conclusion of this part of study which concerned the effect of the organic manures and biofertilizers on the wheat plant growth in terms of plant dry matter, plant height and number of tillers pot^{-1}, it could be pointed out that use of organic manures almost enhanced the growth of wheat plants especially in clayey soil followed by the calcareous one and then the sandy soil. Also, it was clear that chicken manure either alone or mixed with FYM 25 % acted on wheat plant growth better than farmyard manure only.

These results are in accordance with those obtained by many authors, such as **Sakr *et al.*, (1992)** who found that the dry matter of what and maize showed positively pronounced increases in response to organic manure application. They added that such increases were higher for plants grown on calcareous soil than alluvial one. Results of **Abdel Sabour *et al.*, (1999)** revealed that the dry matter yield of sunflower leaves, stems and flowers at either vegetative or flowering growth stage were significantly increased by previous single compost manure. **Awad *et al.*, (2000)** stated that the addition of farmyard manure led to the maximum increase in plant growth and consequently wheat yield productivity.

4.2. Effect of organic manures on nitrogen, phosphorus and potassium uptake by wheat plant:

Results in Tables (6, 7 & 8) and Figures (4,5 & 6) represent the values of N, P and K uptake by wheat plant as influenced by organic manures either alone or in combination with biofertilizer inoculation.

4.2.1. Nitrogen uptake:

Soils received organic manures either alone or combined with biofertilizers had achieved higher significant N-uptake mean values than either the control or the control + BF (Table 6 and Fig. 4).

The highest mean value of N-uptake (462.08 mg N pot^{-1}) was attained due to the treatment FYM 25% + CM 75%. This treatment was significantly higher than the other treatments except for that of CM 100 % (452 mg $Npot^{-1}$). The lowest N-uptake (193.71 mg N pot^{-1}) was corresponding to the control + BF treatment.

The plants grown on the clayey soil showed the highest mean value of N-uptake (490.51 mg N pot^{-1}). This mean of N-uptake was statistically higher than those of the calcareous soil (322.81 mg N pot^{-1}) and the sandy soil (292.34 mg N pot^{-1}).

Regarding the effect of organic manures on N-uptake by wheat plant grown on the different soils, results in the sandy soil indicate that all the treatments showed significantly higher N-uptake than the control or the control + BF treatment.

The highest N-uptake value (373.85 mg N pot^{-1}) was recorded by CM 100 % + BF treatment followed with 364.65, 364.60, 343.51, 341.38, 333.93, 328.77, 305.46, 300.49 and 289.46 mg N pot^{-1} for the treatments of FYM 50% + CM 50%, CM 100%, FYM 75% + CM 25%, FYM 25% + CM 75%, FYM 50% + CM 50%+ BF, FYM 25% + CM 75%+ BF, FYM 75% + CM 25% + BF, FYM 100 %, and FYM 100 % + BF treatment, respectively.

However, the highest N-uptake value (373.85 mg N pot^{-1}) achieved due to the treatment of CM 100 % + BF was not significantly higher than all the manure treatments except for FYM 100% + BF treatment.

It is worthy to state that the application of biofertilizers in combination with organic manures decreased insignificantly the nitrogen uptake by wheat

Table (6) Nitrogen uptake by wheat plants (mg pot^{-1}) as affected by different manure type and soil samples.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	75.42	166.26	417.46	219.71
Control + BF	86.55	131.99	362.59	193.71
FYM 100%	300.49	360.44	582.29	414.41
FYM 100%+ BF	289.46	388.63	474.52	384.20
CM 100%	364.60	457.76	535.45	452.60
CM 100% +BF	373.85	370.61	355.70	366.72
FYM 25% + CM 75%	341.38	358.11	686.74	462.08
FYM 25% +CM 75% + BF	328.77	315.34	455.65	366.59
FYM 50% + CM 50%	364.65	396.61	551.79	437.68
FYM 50% + CM 50% + BF	333.93	257.62	523.97	371.84
FYM 75% + CM 25%	343.51	336.95	493.66	391.37
FYM 75% + CM 25% + BF	305.46	333.43	446.35	361.75
Mean	292.34	322.81	490.51	368.56

L.S.D. (P 0.05)

Soil (s)	22.57
Treatment (T)	45.15
S * T	78.19

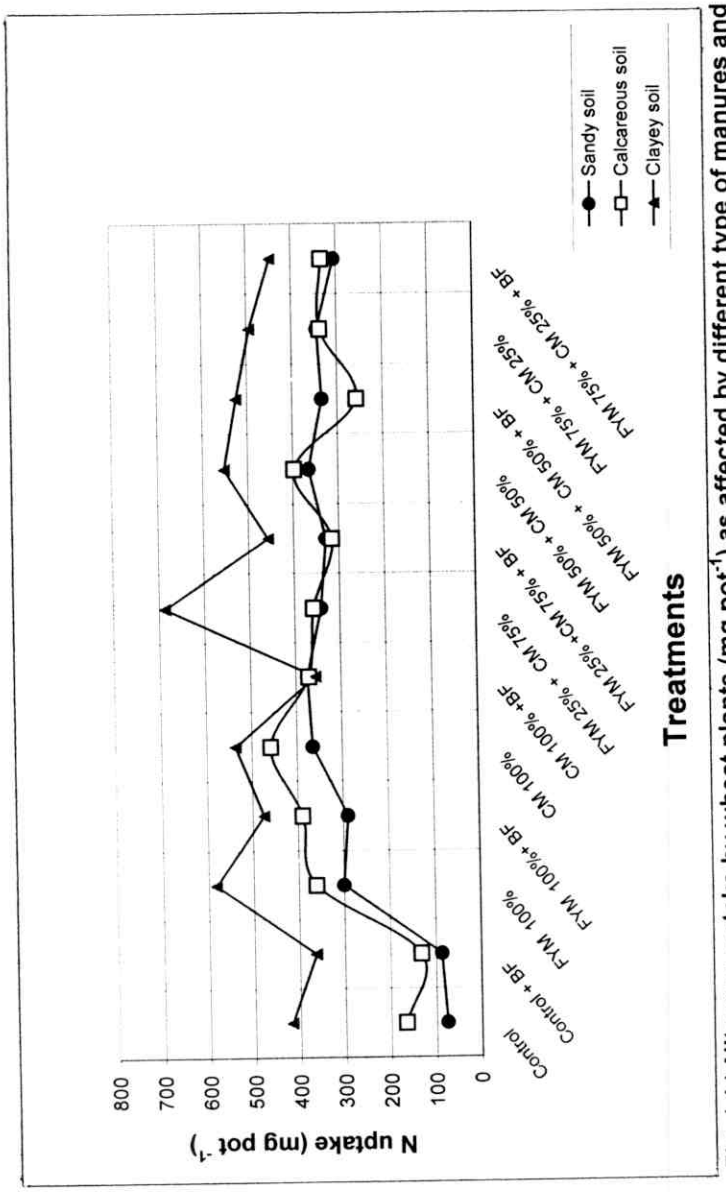

Fig. (4) Nitrogen uptake by wheat plants (mg pot^{-1}) as affected by different type of manures and soil samples.

plants grown on sandy soil except for those of control and CM100% treatments, which increased insignificantly. .

In calcareous soil, all the studied treatments exerted positively significant effect on nitrogen uptake by wheat plants and gave significantly higher N-uptake than those of the control or control + BF treatments.

However, the highest N-uptake value (457.76mg N pot^{-1}) was obtained due to the treatment of CM 100 %. This N-uptake value was significantly higher than the other treatments. The lowest N-uptake value among the manure treatments (257.62 mg N pot^{-1}) was for the plants treated with FYM 50% +CM 50% + BF treatment.

It is also important to note that application of organic manures with biofertilizers inoculation to wheat seeds did not lead to any significant increases in N-uptake amounts relative to the organic manure only, but on the other hand, increased significantly N-uptake to values higher than the control treatment.

In the clayey soil, the addition of organic manure increased significantly the N-uptake over the control treatment or the control + BF treatment. The highest nitrogen uptake (686.74) mg N pot^{-1} was observed with the treatment of FYM 25 % +CM 75 %. This N-uptake value was significantly higher than that uptake by the plants received either organic manure alone or in combination with biofertilizers inoculation. The lowest N-uptake (446.35 mg N pot^{-1}) was achieved by the use of FYM 75 % + CM 25 % + BF treatment.

Inoculation of wheat seeds with biofertilizers in relative to the control treatment without manure application led to insignificant slight decrease in N-uptake.

4.2.2. Phosphorus uptake:

Values of phosphorus uptake by wheat plants grown on different soils and treated with organic manures either alone or combined with biofertilizer are shown in Table (7) and Figure (5).

Table (7) Phosphorus uptake by wheat plants (mg pot^{-1}) as affected by different manure type and soil samples.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	2.60	7.48	17.58	9.22
Control + BF	4.19	6.09	18.16	9.48
FYM 100%	11.66	14.36	27.43	17.82
FYM 100%+ BF	11.70	13.20	26.96	17.29
CM 100%	19.32	27.80	30.16	25.76
CM 100% +BF	22.21	21.93	30.77	24.97
FYM 25% + CM 75%	16.19	22.95	41.87	27.00
FYM 25% +CM 75% + BF	25.58	23.53	27.79	25.63
FYM 50% + CM 50%	23.15	21.04	24.44	22.88
FYM 50% + CM 50% + BF	25.23	19.46	30.75	25.15
FYM 75% + CM 25%	23.31	17.14	23.84	21.43
FYM 75% + CM 25% + BF	21.17	17.62	26.54	21.78
Mean	17.19	17.72	27.19	20.70

L.S.D. (P 0.05)

Soil (s)	**1.00**
Treatment (T)	**2.00**
S * T	**3.46**

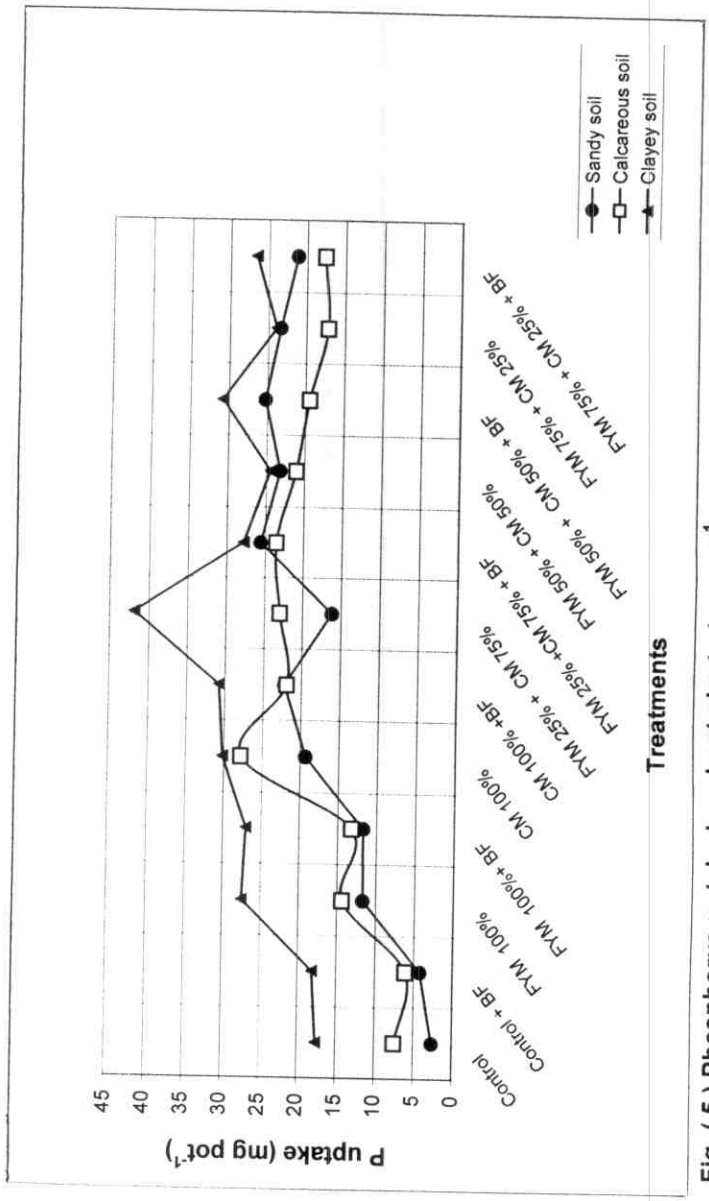

Fig. (5) Phosphorus uptake by wheat plants (mg pot^{-1}) as affected by different type of manures and soil samples.

The highest mean value of P-uptake in all soils by wheat plants (27.00 mg P pot^{-1}) was attained by the treatment FYM 25 % + CM 75 %. This highest value was significantly different from the other means of P-uptake recorded with the other treatments. The mean P-uptake of wheat plants for the control treatment was not differing significantly from that received biofertilizer only (i.e. control +BF). It is also noticed that away from the control treatments the use of FYM 100 % or FYM 100 % + BF gave the lowest mean values of P-uptake as compared with the other treatments. The corresponding mean values were 17.82 and 17.29 mg P pot^{-1}. Those two means were not significantly different from each other.

Comparisons between P-uptake by the plants grown on different investigated soils reveal the highest mean P-uptake (27.19 mg P pot^{-1}) was attained due to the plants grown on the clayey soil followed by 17.72 and then 17.19 mg P pot^{-1} by the plants grown on the calcareous and sandy soils, respectively.

However, the mean P-uptake values attained by the plants grown on the clayey soil were significantly higher than ones which uptake by the plants grown on the calcareous and sandy soils. Also, values of P-uptake recorded for the plants grown on the calcareous and sandy soils did not differ statistically from each other.

Regarding the effect of organic manure treatments on phosphorus uptake by wheat plants grown on the sandy soil, application of organic manures (FYM or CM), both together and combined with or without BF) caused the P-uptake to increase significantly over both control or control + BF treatments.

The highest significant P-uptake (25.58 mg P pot^{-1}) was recorded by the treatment of FYM 25 % + CM 75 % + BF. This value was significantly higher than those recorded by the treatments of FYM or CM each alone or together mixed, combined with or without biofertilizer inoculation. However, some treatments FYM 50 % + CM 50 %, FYM 50 % + CM 50% + BF and

FYM 75 % + CM 25 % had scored values of P-uptake did not significantly differ from the highest one.

Due to biofertilizer inoculation to wheat seeds, it was noticeable that this operation generally increased P-uptake. This trend was true with all treatments except for the treatment of FYM 25 % + CM 75 % which tended to decrease from 23.31 to 21.17 mg P pot^{-1} when received biofertilizers.

In the calcareous soil, P-uptake by manured wheat plants could be described as significantly higher than those of the control or control + BF treatment.

The highest value of P-uptake by wheat plants (27.8 mg P pot^{-1}) was attained due to the use of CM 100 % treatment. Biofertilizers application along with organic manure treatments did not achieve any significant increase more than the P-uptake by plants received organic manure only.

The lowest value of P-uptake among the treatments received organic manure was recorded by the use of FYM 100 % + BF (13.2 mg P pot^{-1}). However, it should point out that the organic manure treatments when received biofertilizer inoculation, no further increase could occur in P-uptake, by contrary to that a decrease in P-uptake occurred when the organic manure plots received biofertilizer. Such decreases in P-uptake were significant in some treatments and were not so in the other. For example, a significant decrease in P-uptake was achieved when the treatment of CM 100 % received BF inoculation, that decrease was from 27.8 to 21.93 mg P pot^{-1}.

Regarding the clayey soil, it is worthy to indicate that all treatments received organic manures tended to increase significantly the P-uptake by wheat plants over the control and \ or control + BF treatments. It could also be noticed that the addition of BF to the treatments received organic manure had exhibited different effects on P-uptake by wheat plants. A significant sharp decrease in P-uptake from 41.87 mg P pot^{-1} to 27.79 mg P pot^{-1} occurred when the treatment of FYM 25 % + CM 75 % was combined with BF. While a significant increase

from 24.44 to 30.75 mg P pot^{-1} occurred when the treatment of was associated with BF. The highest value of P-uptake 41.87 mg P pot^{-1} was attained due to treating soil with FYM 25 % + CM 75 % significantly higher and different from the other treatments received organic manure only or accompanied with biofertilizers. Also the lowest value of P-uptake among the treatments received organic manure (23.84 mg P pot^{-1}) was achieved due to FYM 75 % + CM 25 % treatment.

4.2. 3. Potassium uptake:

Values of potassium uptake by wheat plants treated with organic manures (FYM and CM) each separately or in mixture with or without biofertilizer inoculation are presented in Table 8 and Figure 6.

General effect of the treatments on potassium uptake revealed that the highest value was recorded for the soil treatment of FYM 25 % + CM 75 %. The corresponding mean value was (468.29 mg K $pot^{-1)}$. This mean value had significantly exceeded the other treatments except for CM 100 % treatment. The mean K-uptake value of this treatment was 451.19 mg K pot^{-1}.

On the other hand, all the mean values of K-uptake achieved due to application of organic manure alone or mixed with biofertilizer were significantly higher than the control treatment either alone or with biofertilizers.

Data indicated, that in clayey soil, the mean K-uptake values were in positive significance levels in comparison to those of calcareous and sandy soils. The respective mean K-uptake treatments values were 568.82 > 308.20 > 237.00 mg K pot^{-1}.

In sandy soil all treatments received organic manures only or mixed with biofertilizer were in significance level and higher than those of the control or control + BF treatments. On the contrary, inoculation with biofertilizer alone did not significantly affect K-uptake by plants.

The superior value of K uptake of 319.15 mg K pot^{-1} was recorded by the application of CM 100 % treatment. This higher K-uptake amount was

Table (8) Potassium uptake by wheat plants (mg pot^{-1}) as affected by different manure type and soil samples.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	74.39	133.90	395.67	201.32
Control + BF	83.32	155.29	404.50	214.37
FYM 100%	232.02	334.05	691.92	419.33
FYM 100%+ BF	237.99	319.11	576.41	377.84
CM 100%	329.15	384.98	639.43	451.19
CM 100% +BF	311.22	350.39	466.66	376.09
FYM 25% + CM 75%	252.46	352.16	800.26	468.29
FYM 25% +CM 75% + BF	259.44	328.58	543.90	377.31
FYM 50% + CM 50%	281.11	363.44	579.23	407.93
FYM 50% + CM 50% + BF	257.79	302.10	627.38	395.76
FYM 75% + CM 25%	269.01	327.08	550.89	382.33
FYM 75% + CM 25% + BF	256.05	347.34	549.55	384.31
Mean	237.00	308.20	568.82	371.34

L.S.D. (P 0.05)

Soil (s)	21.49
Treatment (T)	42.97
S * T	74.43

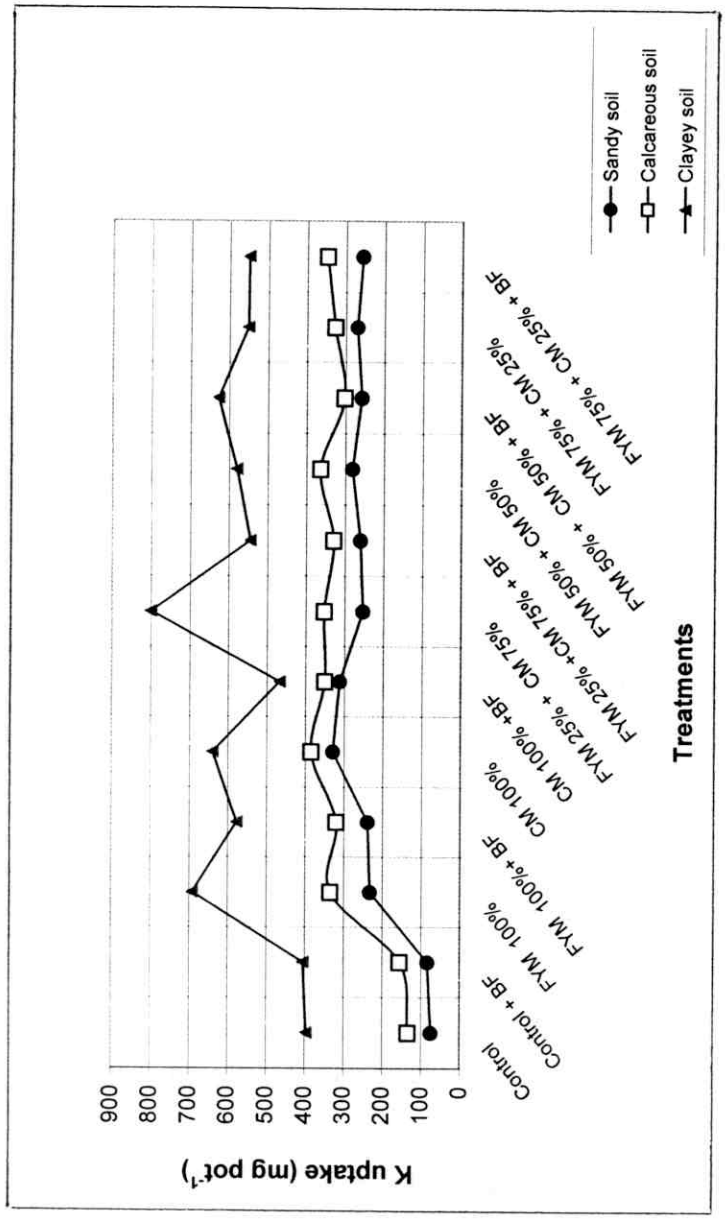

Fig. (6) Potassium uptake by wheat plants (mg pot^{-1}) as affected by different type of manures and soil samples.

significantly different from those other treatment fertilized with organic manure with or without biofertilizer application except for insignificant one that received CM 100 % + BF treatment. Its corresponding K-uptake value was 311.22 mg K pot^{-1}. This trend indicated that biofertilizers when added to CM 100 % treatment showed an adverse influence that cause a slight decrease on K-plant uptake without reaching the level of significance.

It is also clear that once the organic manures added even each alone to the control treatment, the level of positive significance had started to appear. For instance, the application of either FYM 100 % or CM 100% treatments had recorded K-plant uptake amounts of 232.02 and 329.15 mg K pot^{-1}, respectively against 74.39 and 83.32 mg K pot^{-1}, in relative to control and control + BF treatments.

In turn to calcareous soils, same trend observed in sandy soil towards K-plant uptake was frequent in calcareous soil. All plants received organic manures with or without biofertilizer inoculation had achieved higher significant K-uptake values than that of the control treatment. The highest K-uptake amount (384.98 mg K pot^{-1}) was recorded by CM 100 % treatment.

Inoculation of wheat seeds with biofertilizers insignificantly increased the value of K-uptake more than that of the control treatment. The corresponding K-uptake amounts were 155.29 and 133.90 mg K pot^{-1} for control + BF and control, respectively.

Looking at the clayey soil, it was concluded that the amounts of K-plant uptake were higher and far from those recorded by the other two mentioned soils even when compared with their control treatments.

Results indicated that, the application of FYM or CM each alone or mixed together with or without BF significantly increased the K-uptake values than those of the control or control + BF treatments. The highest K-uptake value of 800.26 mg K pot^{-1} had recorded by the treatment FYM 25 % + CM 75 %. But again this higher K-uptake amount was statistically in a positive significant level

when compared with the other manure treatments with or without biofertilizers inoculation. Using biofertilizer alone slightly increased the K-plant uptake amounts than that of the control treatment. The relative values were 395.67 mg $Kpot^{-1}$ (control) and 404.5 mg K pot^{-1} (control + BF). Also same as in the other two tested soils, as soon as organic manures applied for different manure treatments, the significancies of K-uptake amounts were fluctuated between increasing and decreasing. For instance, applying biofertilizers to FYM 100 % and FYM 50 % + CM 50 % had decreased significantly K-uptake from 691.92 to 576.41 mg $Kpot^{-1}$ for the former and had increased the latter insignificantly from 597.23 to 627.38 mg K pot^{-1}.

However, NPK uptake by wheat plants due to organic manures alone or with co-operation with biofertilizers could be argued as in N-uptake when it recorded its highest amounts (Table 6) with the treatments of CM 100 % + BF (373.85 mg N pot^{-1}), CM 100 % (457.76 mg N pot^{-1}) and FYM 25 % + CM 75 % (686.74 mg $Npot^{-1}$) for sandy, calcareous and clayey soils, respectively.

Phosphorus uptake by wheat plants had exhibited its favorite results with the use of organic manures as FYM 25 % + CM 75 % + BF (25.58 mg P pot^{-1}), CM 100 % (27.8 mg P pot^{-1}) and FYM 25 % + CM 75 % (41.87 mg P pot^{-1}) which corresponding to sandy, calcareous and clayey soils (Table 7).

Potassium plant uptake showed same trend recorded previously for both N and P, that also it gave the highest amounts of K-uptake with the use of CM 100 % (sandy soil), CM 100 % (calcareous soil) and FYM 25 % + CM 75 % (clayey soil) for relative K-uptake values of 329.15, 384.98 and 800.26 mg K pot^{-1}, respectively (Table 8).

The aforementioned results indicate some obvious nutrients uptake features by wheat plants under the effect of organic manures utilized in different soil samples (sandy, calcareous and clayey soils). First of all that the use of organic manure to all soil had enhanced the NPK uptake within different degrees. This

enhancement was almost in equal degree in sandy and calcareous soils. However, the NPK- uptake enhancement was higher in clayey soil than those of sandy and calcareous soils may be due to its higher inherited fertility.

Generally it was noticed that wheat plants treated with CM 100 % and FYM 25 % + CM 75 % had ensured better N, P and K-uptake. This better effect was achieved when chicken manure represents the major manure content either 100 % or 75 % of the manure amount fertilized to soil.

However, this attitude might due to that the applied chicken manure is characterized with its high content of organic matter (Table 2) that acts as sustained release source of NPK more and rapid than FYM manure and this to a great extent contribute to NPK availability in soil which in turn do induce the nutrient uptake by plants.

These results agree with those obtained by **EL-Sirafy *et al.*, (1989)** who found that addition of compost to sandy soils increased N, P and concentration in all plant organs, as most of them reached the level of significance.

Eissa (1996) concluded that cucumber plants grown in chicken manure and cattle manure had higher N, P and K than those grown in sandy soil free from manuring. **Alphonse and Saad (2000)** pointed out that farmyard manure and \ or chicken manure and their mixture had significantly increased N, P and K contents in cucumber leaves and They also added that cucumber plants steams at flowering stage and also in the end grown in a mixture of FYM + CM (1:1 v/v) had exhibited a positive enhancement effect on N, P and K contents of plant leaves, They declared that these results might be attribute to the positive effect of the organic manures on the availability of nutrients for plant uptake. In addition **Eneji *et al.*, (2001)** stated that organic manures (chicken manure, cattle manure and swine manure or their mixture) significantly increased the N, P and K contents of rice plants. They added that the general increases in rice nutrient uptake in manured pots suggested that manure mineralization soon after application resulted in greater pool of plant available nutrients.

4.3. Residual effect of organic manures on soil chemical properties:

4.3.1. Available N, P and K:

4. 3.1.1. Available nitrogen:

Data in Table 9 & Fig 7 explain the effect of organic manures (FYM and CM) fertilization alone or in adjacent with biofertilizers on residual available nitrogen amounts in soils (sandy, calcareous and clayey). Results indicate that the influence of organic manure treatments on the soil available-N had achieved the highest mean value (22.67 mg N kg^{-1}) with the use of CM 100% treatment. This high mean available – N value was significantly higher than and different from the mean values recorded by all treatments including the control treatment except for the value of 20 mg N kg^{-1} which was obtained by FYM 25 % + CM 75 % treatment.

However, the lowest mean available N values (15.00 and 14.67 mg N kg^{-1}) were obtained by the control and control + BF treatments, respectively. Also, all the mean available-N values of the manured treatments were significantly higher than those of either control or control + BF treatments.

Inoculation of biofertilizers to the manure treatments led to decrease and \ or increased insignificantly the mean available N amounts. For instance FYM 75 % + CM 25 % treatment had decreased insignificantly the soil available-N from 18.67 to 17.33 mg N kg^{-1} when received biofertilizers. Meanwhile, the treatment of FYM 50% + CM 50 % increased insignificantly the mean available N value from 17.33 to 19.00 mg kg^{-1} when received biofertilizers.

Consequently, the main soil influence on the mean available N values within different tested soil types had indicated that the mean value recorded by clayey soil of 27.25 mg kg^{-1} was significantly higher than and different from those of 13.00 and 14.33 mg N kg^{-1} for sandy and calcareous soils, respectively. On the other hand, as sandy, calcareous and clayey soils exposed to organic manures (FYM and CM) alone or in combination with biofertilizers during

Table (9) Effect of organic manures on soil available-N (mg kg^{-1}) after wheat harvesting.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	10.00	11.00	24.00	15.00
Control + BF	10.00	11.00	23.00	14.67
FYM 100%	14.00	15.00	26.00	18.33
FYM 100%+ BF	12.00	13.00	28.00	17.67
CM 100%	13.00	15.00	40.00	22.67
CM 100% +BF	12.00	17.00	29.00	19.33
FYM 25% + CM 75%	15.00	16.00	29.00	20.00
FYM 25% +CM 75% + BF	12.00	15.00	28.00	18.33
FYM 50% + CM 50%	13.00	14.00	25.00	17.33
FYM 50% + CM 50% + BF	14.00	18.00	25.00	19.00
FYM 75% + CM 25%	16.00	14.00	26.00	18.67
FYM 75% + CM 25% + BF	15.00	13.00	24.00	17.33
Mean	13.00	14.33	27.25	18.19

L.S.D. (P 0.05)

Soil (s)	1.58
Treatment (T)	3.15
S * T	5.46

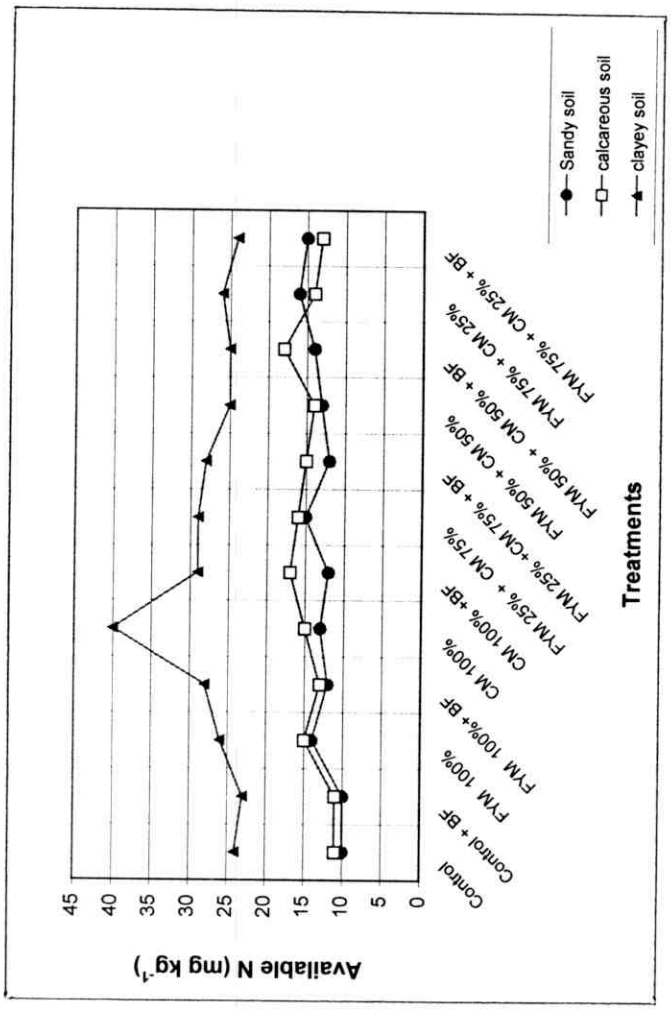

Fig. (7) Effect of organic manures on soil available-N (mg kg^{-1}) after wheat harvesting.

wheat cultivation, each of them did liberate some residual available N amounts that remain in the soil for the following crop.

In sandy soil, the highest available-N amount of 16.00 mg N kg^{-1} was gained by FYM 75 % + CM 25 % treatment. This high available-N amount was not significantly different from those recorded by all the manured treatments. On other respect, all the manured and \ or the manured + BF treatments had achieved significant soil available-N amounts which were statistically different from that of the control treatment. The use of organic fertilizers along with biofertilizers did not affect the soil available-N remained in the soil after wheat harvesting.

In calcareous soil, the use of organic manures either alone or accompanied with biofertilizers did not affect significantly the soil available-N amount when compared with the control or control + BF treatment except for both CM 100 % + BF and FYM 50 % + CM 50 % +BF treatments. The highest soil available-N amount of 18.00 mg N kg^{-1} was not significantly different from all the manure treatments.

In clayey soil, the highest soil available N amounts of 40.00 mg N kg^{-1} (CM 100% treatment) seemed to be significantly different from those of the control and\ or all the manured treatments.

Meanwhile, it is worthy to state that the residual available N amounts scored by the clayey soil after wheat harvesting were more pronounced and higher than those of either sandy or clayey soil.

The favorite residual available N amounts of 40.00, 18.00 and 16.00 mg N kg^{-1} were attained due to the treatments of CM 100 % (clayey soil), FYM 50 % + CM 50 % + BF (calcareous soil) and FYM 75 % + CM 25 % (sandy soil), respectively.

4.3.1.2. <u>Available phosphorus</u>:

Table 10 and Figure 8 exhibit the effect of organic manures on residual available phosphorus remained in the different soils after wheat harvesting.

Table (10) Effect of organic manures on soil available-P (mg kg^{-1}) after wheat harvesting.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	2.00	7.00	7.00	5.33
Control + BF	1.00	6.00	7.00	4.67
FYM 100%	7.00	17.00	9.00	11.00
FYM 100%+ BF	6.00	17.00	9.00	10.67
CM 100%	24.00	67.00	28.00	39.67
CM 100% +BF	27.00	62.00	24.00	37.67
FYM 25% + CM 75%	21.00	57.00	20.00	32.67
FYM 25% +CM 75% + BF	23.00	52.00	19.00	31.33
FYM 50% + CM 50%	20.00	35.00	16.00	23.67
FYM 50% + CM 50% + BF	18.00	34.00	21.00	24.33
FYM 75% + CM 25%	20.00	25.00	15.00	20.00
FYM 75% + CM 25% + BF	16.00	26.00	16.00	19.33
Mean	15.42	33.75	15.92	21.69

L.S.D. (P 0.05)

Soil (s)	0.79
Treatment (T)	1.59
S * T	2.75

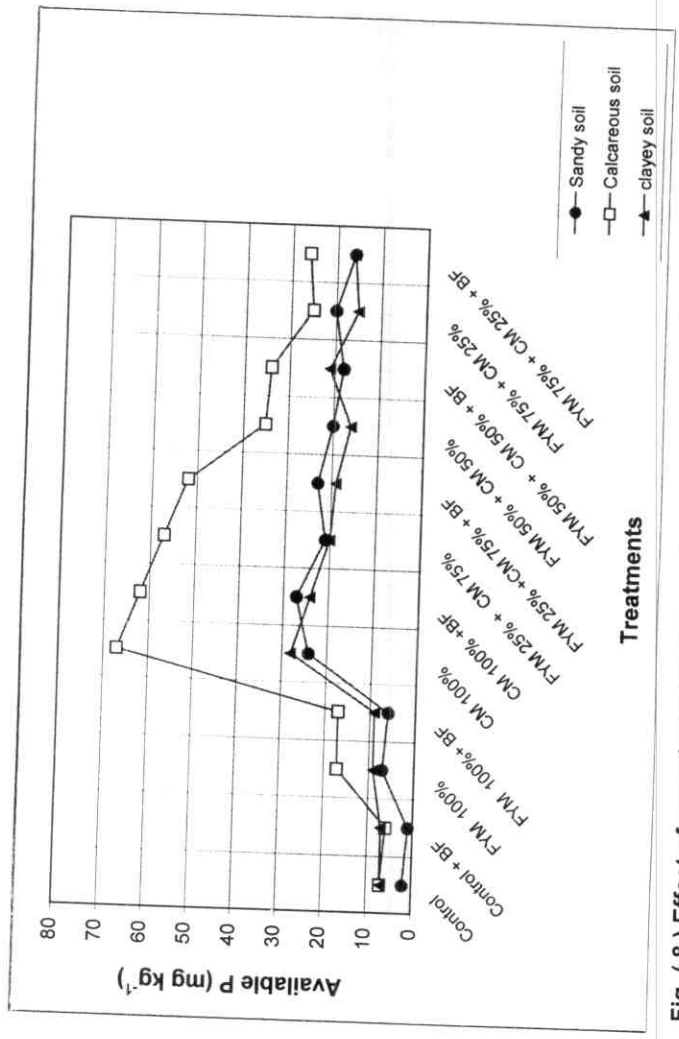

Fig. (8) Effect of organic manures on soil available-P (mg kg^{-1}) after wheat harvesting.

The highest mean value of residual available P of 39.67 mg P kg^{-1} was observed in response to CM 100 % treatment.

This highest mean value of residual available-P was higher than and significantly different from those recorded in response to other manured treatments.

All the manured treatments either alone or accompanied with biofertilizers had achieved higher significant mean residual available P means values than those of the control treatment.

Inoculation of biofertilizers to organic manure treatments led to decrease insignificantly the recorded mean values of residual available P except for the treatment of FYM 50 % + CM 50 % + BF. For instance, the recorded mean residual available P value of had insignificantly increased from 23.67 by FYM 50 % + CM 50 % to 24.33 mg P kg^{-1} when received biofertilizers.

The highest mean residual available P value averaged over all treatments 33.75 mg P kg^{-1} was recorded in the calcareous soil followed by 15.92 and 15.42 mg P kg^{-1} for both clayey and calcareous soils, respectively.

Considering biofertilizers inoculation into the manured treatments, it was found that in sandy soils, biofertilizer showed different influences on the residual available-P amounts. The treatments of FYM 100% and FYM 50 % + CM 50 % decreased insignificantly in the values of available-P from 7.00 and 20 mg to 6.00 and 18.oo mg P kg^{-1}, respectively when both received biofertilizers.

Also the treatment of FYM 75% + CM25% had decreased significantly the value of available-P from 20 to 16 mg P kg^{-1} when received biofertilizers.

However, the treatment of CM 100 % increased significantly in the residual available-P from 24.00 to 27.00 mg P kg^{-1} when treated with biofertilizers.

In calcareous soil, inoculation with biofertilizers to the manure treatments decreased the residual available-P values significantly from 67.00 to 62.00 (CM 100%) and from 57.00 to 52.00 mg P kg^{-1} (FYM 25 % + CM 75 %) when both

treatments were combined with biofertilizers, respectively. Meanwhile, the residual available P amount for the treatments FYM 50 % + CM 50 % decreased insignificantly from 35.00 to 34.00 mg P kg^{-1} when treated with biofertilizers. It was also observed the addition of biofertilizers to the treatment of CM 100 % did not affect the amount of the residual available P (17.00 mg P kg^{-1}).

In clayey soil, the biofertilizers utilization along with organic manures caused manures caused the residual P amounts to increase significantly in the treatment of FYM 50 % + CM 50 % which increased from 16.00 to 21.00 mg P kg^{-1} as receiving biofertilizers. While an insignificant increase from 15.00 to 16.00 mg P pot^{-1} was recorded when the treatment of FYM 75 % + CM 25% was supplied with biofertilizers. On the other hand, the treatment of FYM 25 % + CM 75 % had decreased insignificantly from 20.00 to 19.00 mg P kg^{-1} and the treatment of CM 100 % decreased significantly from 28.00 to 24.00 mg P kg^{-1} when both received biofertilizer respectively.

Generally, in concern to the residual available phosphorus remained in soil it could be to point out that the phosphorus amounts remained in soil were more pronounced in calcareous soil than those remained in both clayey and sandy soil in decreasing order.

Also, it is of importance to note that the treatment of CM 100 % had recorded the superior and higher residual P amounts soil as indicated in calcareous soil (67.00 mg P kg^{-1}), clayey soil (28.00 mg P kg^{-1}), while in sandy soil this trend was true with the value of 27.00 mg P kg^{-1} which recorded as the treatment CM 100 % had received biofertilizers.

4.3.1.3. <u>Available potassium</u>:

Table 11 & figure 9 reveal the amounts of available-K remained in the tested soils after the manured wheat being harvested.

Data indicate the different treatments caused mean values of residual available-P to be significantly higher than and different from those recorded by the control or control + BF treatments.

Table (11) Effect of organic manures on soil available-K (mg kg^{-1}) after wheat harvesting.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	78.00	246.00	850.00	391.33
Control + BF	58.00	212.00	897.00	389.00
FYM 100%	228.00	423.00	947.00	532.67
FYM 100%+ BF	225.00	432.00	1033.00	563.33
CM 100%	160.00	360.00	940.00	486.67
CM 100% +BF	172.00	363.00	1013.00	516.00
FYM 25% + CM 75%	158.00	383.00	940.00	493.67
FYM 25% +CM 75% + BF	173.00	358.00	1020.00	517.00
FYM 50% + CM 50%	185.00	397.00	940.00	507.33
FYM 50% + CM 50% + BF	167.00	405.00	1100.00	557.33
FYM 75% + CM 25%	173.00	410.00	960.00	514.33
FYM 75% + CM 25% + BF	188.00	403.00	1020.00	537.00
Mean	163.75	366.00	971.67	500.47

L.S.D. (P 0.05)

Soil (s)	13.59
Treatment (T)	27.19
S * T	47.09

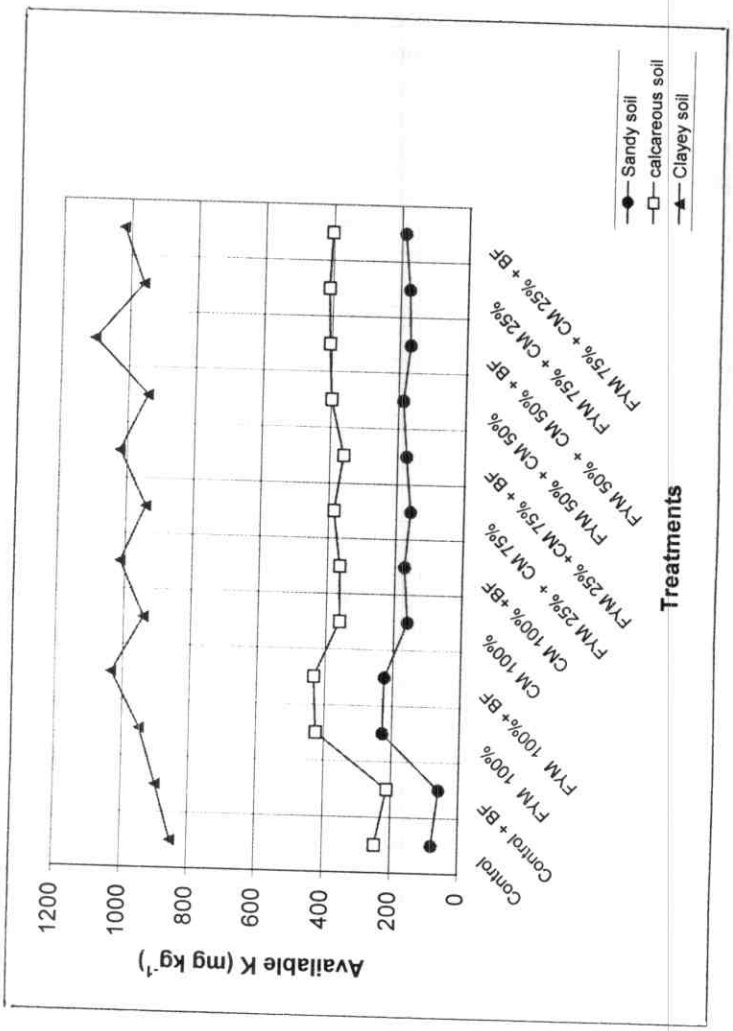

Fig. (9) Effect of organic manures on soil available-K (mg kg^{-1}) after wheat harvesting.

The highest mean value of the residual available- K (563.33 mg K kg^{-1}) was obtained with the use of FYM 100 % + BF treatment. This value was significantly different from those recorded by all the other manure treatments whether they were with or without biofertilizers.

Incorporation of biofertilizers along with organic manures previously applied during wheat cultivation caused the mean values of the residual available-K to exhibit different responses. For instance CM 100 % treatment when accompanied with biofertilizers increased significantly the mean value of residual available-K from 486.67 to 516.00 mg K kg^{-1}.

The highest mean value of the residual available-K (971.67-mg K kg^{-1}) was detected in the clayey soil followed by 366.00 and 163.75 mg K kg^{-1} for calcareous and sandy soils, respectively.

Regarding the effect of organic manure fertilization on the sandy, calcareous and clayey soils, data reveal that the highest residual available-K values i.e. of 432.00 and 1100.00 mg K kg^{-1} were attained in response to the treatments of FYM 100% + BF FYM and 50 % + CM 50 %+ BF for the calcareous and clayey soils, respectively.

In the sandy soil, the highest value of residual available-K achieved due to FYM 100% was significantly higher than those achieved by all the other manure treatments except for the FYM 100% + BF and FYM 50 % + CM 50 % treatments.

In the calcareous soil, the highest residual available-K value attained due to FYM 100% + BF was insignificantly or significantly different from those attained due to the other manure treatments. For instance, it was significantly different from CM 100 % treatment and insignificantly different from FYM 100 % treatment (Table 11).

In the clayey soil, the highest residual available-K value achieved due to FYM 50 % + CM 50 % differed significantly from all the manure treatments even when they accompanied with biofertilizers.

Regarding the effect of biofertilizers application along with the organic manure treatments, in sandy the soil, results manifested that biofertilizers had caused the residual available-K values to increase insignificantly due to some treatments and to decrease in the others. For instance, value of residual available-K increased slightly when the treatment CM 100 % was accompanied with biofertiliztion. Whereas, when FYM 100% was accompanied with biofertiliztion, the residual available-K value decreased from 222.00 to 225.00 mg K kg^{-1}

In the calcareous soils, the increase or decrease in values of the residual available-K when organic manures were accompanied with biofertilizers appeared to be insignificant except for the control treatment when it was accompanied biofertilizers. For instance the value of residual available-K attained due to CM 100 % treatment (360.00 mg K kg^{-1}) increased insignificantly to be 363.00 mg K kg^{-1} as the treatment was accompanied with biofertilizers. Meanwhile, mixing biofertilizers with the treatment FYM 75% + CM 25% had insignificantly reduced value of the residual K from 410.00 to 403.00 mg K kg^{-1}.

Values of residual available potassium remained in the clayey soil was higher than those of the sandy or calcareous soils, although the response to organic manures application was more obvious in both sandy and calcareous soil than in the clayey soil. This finding could be recognized when values of the residual available-K attained due to the different treatments were compared with the corresponding ones of the control treatments.

4.3.2. Organic matter content:

Table 12 & Figure 10 reveal values of the residual organic matter percent in response to organic manures (FYM and CM) previously applied to wheat harvesting.

Results revealed that all mean values of organic matter content achieved due to the biofertilizer treatments were significantly higher than and different

Table (12) Effect of organic manures on soil organic matter percentage after wheat harvesting.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	0.13	0.87	2.46	1.15
Control + BF	0.11	0.85	2.60	1.19
FYM 100%	0.42	1.75	2.87	1.68
FYM 100%+ BF	0.43	1.84	2.89	1.72
CM 100%	0.39	1.48	2.91	1.59
CM 100% +BF	0.37	1.49	2.89	1.58
FYM 25% + CM 75%	0.38	1.49	2.96	1.61
FYM 25% +CM 75% + BF	0.38	1.57	2.88	1.61
FYM 50% + CM 50%	0.38	1.61	2.96	1.65
FYM 50% + CM 50% + BF	0.38	1.63	2.88	1.63
FYM 75% + CM 25%	0.38	1.63	2.94	1.65
FYM 75% + CM 25% + BF	0.36	1.59	2.89	1.61
Mean	0.34	1.48	2.84	1.56

L.S.D. (P 0.05)

Soil (s)	0.02
Treatment (T)	0.05
S * T	0.08

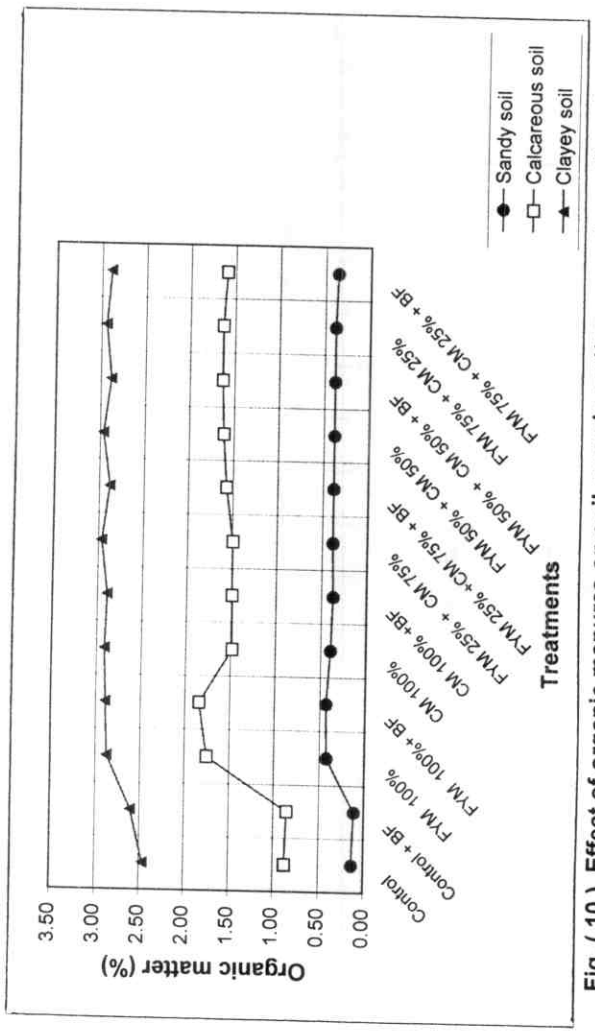

Fig. (10) Effect of organic manures on soil organic matter percentage after wheat harvesting.

from that recorded by the control treatment whether accompanied with biofertilizer or not.

However, the highest mean value of the residual soil organic matter content (1.72 %) was obtained with the use of FYM 100 % + BF treatment. This mean value was significantly different from those achieved due to the other manure treatments whether accompanied with biofertilizers or not.

Inoculation with biofertilizers along with organic manure application seemed to be of no pronounced effect on mean values of the residual organic matter content.

Results revealed also that the mean organic matter content of the clayey soil (2.84 %) was significantly higher than those of the calcareous and sandy soils (1.48 and 0.34), respectively.

Regarding the effect of organic manures application along with or without biofertilizers on the residual organic matter content of the tested soils, results exhibited that the highest values of the residual organic matter contents (2.96, 1.84 and 0.43 %) were recorded for both the treatments of FYM 25 % + CM 75 % and FYM 50 % + CM 50 % in the clayey soil, FYM 100 % + BF in the calcareous soil and FYM 100 % + BF in the sandy soil, respectively.

4.3.3. Soil reaction and electrical conductivity:

Data in Tables 13 & 14 and illustrated by Figures 11& 12 show effect of the organic manures combined with or without biofertilizers on the pH and EC values after wheat harvesting from the tested soils.

Results indicate a slight fluctuation in values of these two parameters (pH & EC) in the three tested soil types in response to the use of organic manures with or without biofertilizers.

However, pH values of the tested soils after wheat harvesting seemed to be slightly lower than those of the control treatments.

Table (13) Effect of organic manures on soil pH after wheat harvesting.

Treatments	Soil samples		
	Sandy	Calcareous	Clayey
Control	8.57	8.18	7.98
Control + BF	8.65	8.20	7.97
FYM 100%	8.47	8.02	7.88
FYM 100%+ BF	8.42	8.05	7.81
CM 100%	8.53	8.11	7.77
CM 100% +BF	8.39	8.15	7.88
FYM 25% + CM 75%	8.40	8.18	7.90
FYM 25% +CM 75% + BF	8.37	8.17	7.90
FYM 50% + CM 50%	8.49	8.11	7.86
FYM 50% + CM 50% + BF	8.38	8.15	7.91
FYM 75% + CM 25%	8.43	8.15	7.92
FYM 75% + CM 25% + BF	8.42	8.20	7.96

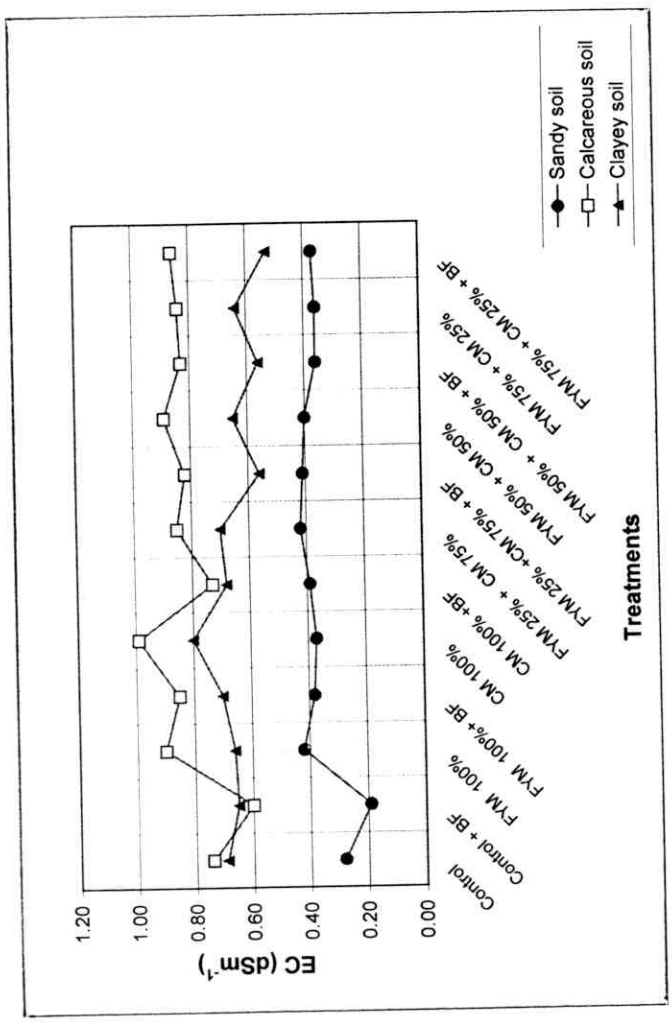

Fig. (12) Effect of organic manures on soil EC (dSm^{-1}) after wheat harvesting.

Generally, organic manuring whether combined with or without biofertilizers increased slightly values of EC of the sandy and calcareous soils but on the other hand decreased very slightly those of the clayey ones.

However these results might indicate that the organic manures and biofertilization are of no pronounced effect on EC values of the soils.

The above mentioned results that describe the effect of organic manures application in soil chemical properties are in agreement with those promoted by many authors.

Giusquiani *et al.* (1988) obtained increases in organic carbon content of 100 and 34 % for sandy loam and clayey loam soil, respectively, when soils amended with carbon wastes.

Fresquez *et al.*, (1990) found that organic manures added to soil caused the soil nutrients including available NPK to be increased linearly with increasing the added amounts of organic manures.

Abou EL. Fadl *et al.*, (1990) reported that the use of chicken manure and \ or tomato and peas compost resulted in an improvement in soil chemical properties. They added that organic matter in the soil was raised from 1.19 to 3.4 % and the lowest pH value of the soil had relatively decreased at the end of the experiment compared with initial pH value.

Geneviri *et al.*, (1991) declared that application of organic manure to a sandy soil increased the percentage of organic matter and total nitrogen and decreased that of available phosphorus. They added that soil pH was increased slightly by compost and the organic fertilizers increased the soluble salt content of soil i.e. EC value.

Luo and Sun (1994) found that organic manure applied to soil had increased available phosphorus in soil due to that organic manure had increased significantly total number of fungi, action mycetes, bacteria, phosphate dissolving bacteria, organic phosphorus mineralizing bacteria, phosphorus

solubilizing rate, and organic mineralizing rate, soil respiration rate and enzyme selected activities.

Pearson *et al.*, (1998) found that applying organic manures to silt loam soil had increased soil organic carbon content from 2.79, to 3.6 %.

Awad (1998) postulated that farmyard manure added to soil had generally decreased EC, pH, SSP and ESP and bulk density values with increasing FYM.

EL.Kholy *et al.*, (1999) stated that applying FYM either alone or in combination with biofertilizers showed a beneficial effect on soil fertility, as the soil available phosphorus and organic matter increased.

4.4. Residual effect of organic manures on rocket plant growth:

After harvesting of wheat plants from the tested that previously treated with organic manures or organic manures combined with biofertilizers, rocket crop was seeded on the remained soil to follow up the residual effect of organic manure on the growth parameters of rocket plants i.e. plant dry matter weight and plant height as well as uptake of NPK by rocket plant (Tables 15,16,17&18 and Figures 13, 14, 15 & 16).

4.4.1. Dry matter weight:

Data presented in Table 15 and illustrated in Fig.13 reveal values of the dry matter weights of rocket plant as influenced by the organic manures in soil after wheat harvesting.

Mean values of dry weight in response to the different treatments revealed that CM 100% treatment was superior over the other ones where it gave the highest dry matter mean value (8.99 g pot^{-1}). This value was significantly higher than mean values attained due to the other treatments except for FYM 25 % + CM 75 % which resulted in dry matter yield about 8.92 g pot^{-1}.

Moreover, mean values of dry matter attained due to the residual effect of all the manure treatments were significantly higher than the corresponding of the control or control + BF treatments.

Table (15) Dry matter weight of rocket plants (g pot^{-1}) as affected by different type of manures and soil samples.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	2.41	3.18	10.59	5.39
Control + BF	1.03	3.12	11.43	5.19
FYM 100%	5.51	4.17	13.06	7.58
FYM 100%+ BF	3.67	4.60	13.07	7.11
CM 100%	6.13	4.91	15.92	8.99
CM 100% +BF	5.17	5.96	12.17	7.77
FYM 25% + CM 75%	6.44	6.02	12.42	8.29
FYM 25% +CM 75% + BF	4.63	4.66	12.68	7.32
FYM 50% + CM 50%	6.16	4.61	12.40	7.72
FYM 50% + CM 50% + BF	4.34	4.52	13.71	7.52
FYM 75% + CM 25%	5.34	4.56	13.21	7.70
FYM 75% + CM 25% + BF	5.05	4.35	13.66	7.69
Mean	4.66	4.56	12.86	7.36

L.S.D. (P 0.05)

Soil (s)	0.45
Treatment (T)	0.89
S * T	1.55

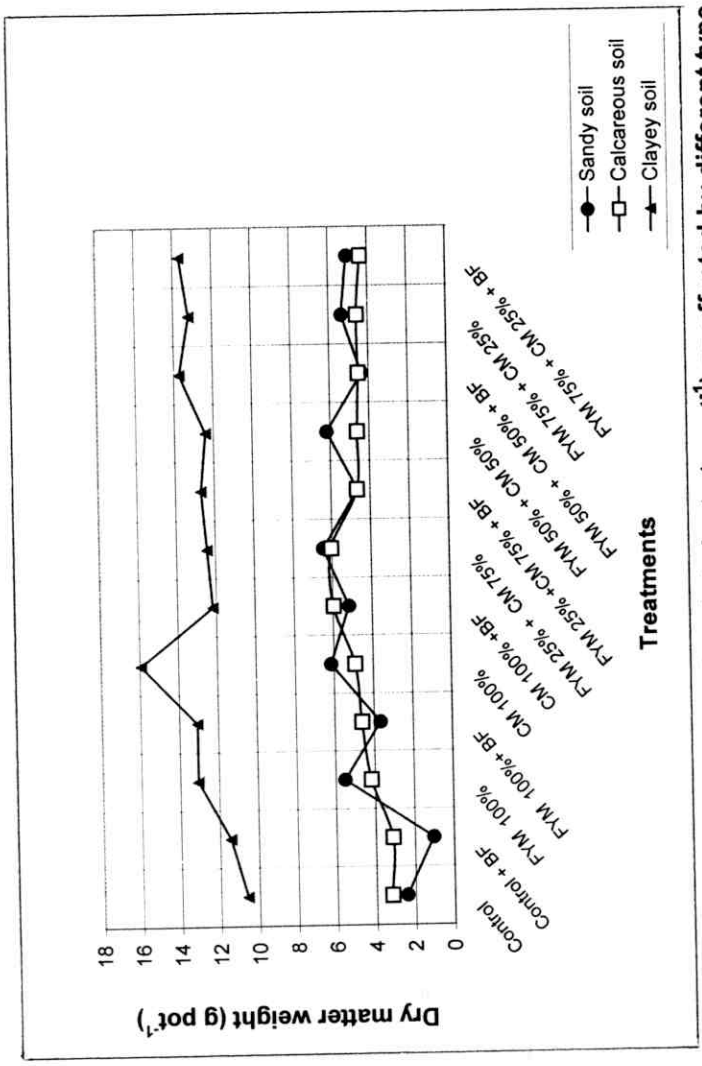

Fig. (13)Dry matter weight of rocket plants (g pot^{-1}) as affected by different type of manures and soil samples.

effect of association of biofertilizers with the treatment CM 100 % had decreased insignificantly the dry matter weight from 6.13 to 5.17 g pot^{-1}.

On the other hand, the residual effect of FYM 50 % + CM 50 % + BF treatment decreased significantly the dry matter weight of rocket plant from 6.16 to 4.34 g pot^{-1} (Table 15).

Regarding the residual effect of organic manures treatments on dry matter weights of the plants grown in calcareous soil, showed that organic manure treatments except for the treatments of CM 100 %, CM 100 % + BF and FYM 25 % + CM 75 % whose corresponding dry matter weight values were 4.91, 5.96 and 6.02 g pot^{-1} caused the dry matter weight to be not significantly different from the control treatment.

Currently, the most obvious residual organic manure effect was achieved due to the treatment of FYM 25 % + CM 75 % which had recorded the highest value of dry matter weight (6.02 g pot^{-1}). This value was significantly different from those attained due to the residual effect of the treatments FYM 100 %, FYM 50 % + CM 50 % +BF and FYM 75 % + CM 25 % whose respective dry matter weight values were 4.17, 4.52 and 4.35 g pot^{-1}. The residual effects of the other treatments did not significantly differ from the highest one.

As biofertilizers were accompanied with the organic manures, the residual effect had insignificantly decreased the rocket plant dry matter weights attained due to most treatments even the control one. Only the residual effect of the biofertilizers combined with FYM 100 % and CM 100 % treatments could result insignificant increase in the plant dry matter weight from 4.17 and 4.91 to 4.60 and 5.96 g pot^{-1}, respectively.

As for the clayey soil, it could be noticed that the residual effect of organic manures on the rocket plant dry matter weights had recorded higher values than the corresponding ones achieved in both sandy and calcareous soils (Table 15). The residual effect of all the manure treatments except for the treatment of CM 100 % + BF which was significantly higher than the control treatment only

In view of the effect of the organic manures + BF treatments, it was remarkable that the residual effect of inoculation with biofertilizers along with organic manures had resulted in a negative effect on the mean values of dry matter weights. For instance, the residual FYM 100 % treatment when combined with biofertilizers had decreased insignificantly the mean values of the dry matter weight from 7.58 to 7.11 g pot^{-1}, while the treatment of CM 100 % when combined with biofertilization caused the mean plant dry matter weight to be reduced significantly from 8.99 to 7.77 g pot^{-1}.

Concerning effect soil type on dry matter the rocket plant, it was detected that the clayey soil had given the highest mean dry matter weight (12.86 g pot^{-1}) in comparison with the sandy and calcareous soils that gave 4.66 and 4.56 g pot^{-1} for, respectively. The differences between the mean value of dry matter weight achieved in the clayey soil and the corresponding ones achieved in the sandy and calcareous soils were significant. On the other hand no significant difference could be detected between the mean value of dry matter weight achieved in the sandy soil and that attained in the calcareous one.

With respect to the residual effect of the organic manure treatments combined with or without biofertilization on dry matter weight of the rocket plants grown in each tested soil individually, it could be indicated that the residual organic manure treatments had significantly increased values of plant dry matter weight of the plans grown on the sandy soil over that of the control or control + BF treatments. The highest residual effect d on the dry matter weight (6.44 g pot^{-1}) has been achieved due to FYM 25 % + CM 75 % treatment. The dry matter value attained due to this treatment was significantly higher than those recorded due to the other manure treatments except the CM 100 % and FYM 50 % + CM 50 % treatments (Table 15).

However, the residual organic manures accompanied with biofertilizers they had decreased the rocket plant dry matter weights. These decreases were significant in some treatments but not so in the others. For example the residual

had given rocket dry matter weights significantly higher than those of both the control and control + BF treatments. The treatment of CM 100% had exhibited superior residual manure effect on the rocket dry matter weight and recorded 15.92 g pot^{-1}. This residual effect was significantly higher than those resulted due to the other residual manure treatments.

The use of biofertilizers in conjunction with organic manures had, generally caused slight increases in the plant dry matter weights. These slight increases did not come to the level of significance compared to the values of the dry matter weight achieved due to the same treatments without biofertilizers except for the treatment of CM 100 % which when received biofertilizer had decreased significantly dry matter weight from 15.92 to 12.17 g pot^{-1}.

4.4.2. Plant height:

Table 16 & figure 14 indicate the rocket plant heights under the influence of organic manures remained in soils after harvesting the wheat plants. The highest mean value of plant height (27.33 cm) was obtained due to the residual effect of the of CM 100 % treatment.

All mean values of plant height recorded under the residual effect of the manure treatment influence were significantly higher than those of the control or control + BF treatments. The residual effect of the used treatments seemed to be highest on the plants grown on the clayey soil whose mean value of the plants grown thereon was 29.00 cm. In this concern, the calcareous soil came second while the sandy soil came third. No significant difference could be detected between the calcareous and sandy soils whereas a significant difference was noticed between each of these soils than the clayey one.

Regarding the residual effect of the organic manure treatments within tested soil on the plant height of rocket plant, it was revealed that all the mean values of plant height attained due to these were significantly higher than those achieved due to the control treatment except for the treatments of FYM 100 % + BF and FYM 50 % + CM 50 % + BF (Table 16).

Table (16)Rocket plant heights (cm) as affected by different type of manures and soil samples.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	15.67	20.67	29.33	21.89
Control + BF	11.67	18.67	25.67	18.67
FYM 100%	19.33	19.67	30.67	23.22
FYM 100%+ BF	16.67	19.67	28.00	21.45
CM 100%	24.00	22.67	35.33	27.33
CM 100% +BF	21.00	23.00	30.00	24.67
FYM 25% + CM 75%	25.67	23.67	30.00	26.45
FYM 25% +CM 75% + BF	20.33	21.00	28.33	23.22
FYM 50% + CM 50%	24.33	20.67	27.33	24.11
FYM 50% + CM 50% + BF	18.00	21.00	26.00	21.67
FYM 75% + CM 25%	22.00	18.00	30.00	23.33
FYM 75% + CM 25% + BF	20.00	17.67	27.33	21.67
Mean	19.89	20.53	29.00	23.14

L.S.D. (P 0.05)

Soil (s)	0.99
Treatment (T)	1.98
S * T	3.42

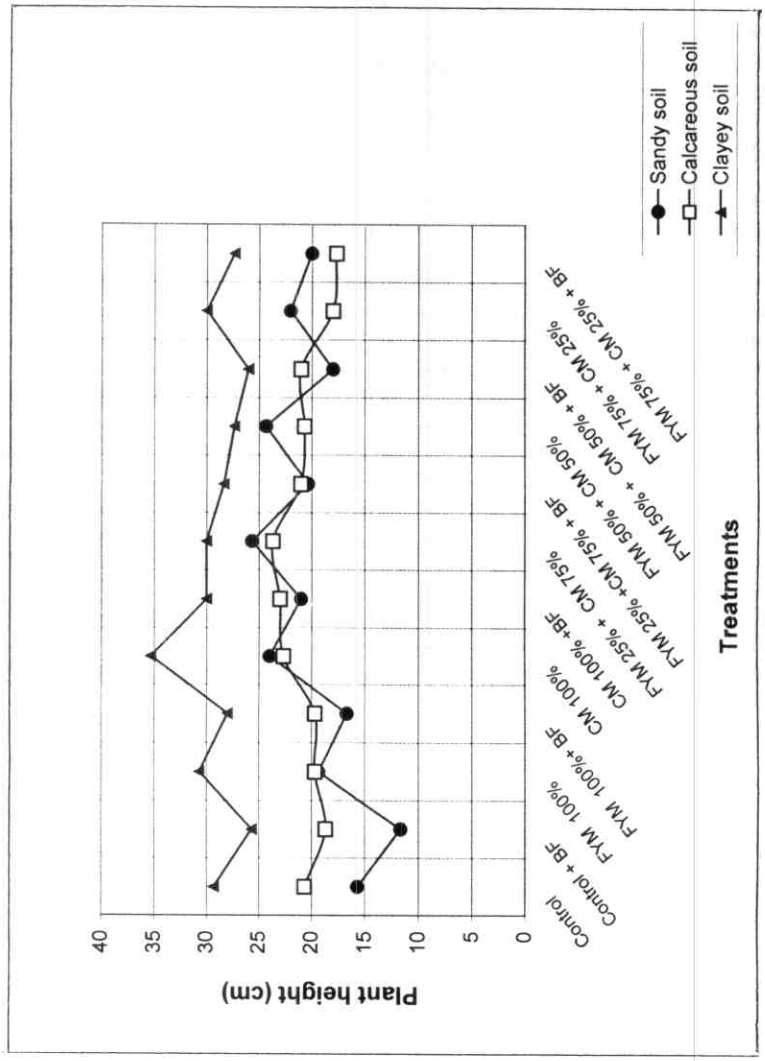

Fig. (14) Rocket plant heights (cm) as affected by different type of manures and soil samples.

The most pronounced residual effect of organic manures on height of the plants grown on the sandy soil was noticed with the use of FYM 25 % + CM 75 % treatment which resulted in a plant height 25.67 cm. This value was higher than and significantly different from all the other treatments received organic manures alone or in conjunction with biofertilizers except for the CM 100% and FYM 50 % + CM 50 % treatments whose relative plant height values were 24.00 and 24.33 cm, respectively.

The residual effect of the treatments inoculated with biofertilizers led to lower values of the plant height than corresponding ones attained due to organic manures only.

The differences due to different treatments except for the treatments CM 100 % and FYM 50 % + CM 50 % + BF were, insignificant. The significant residual effect on plant height was achieved due to the treatment of FYM 25 % + CM 75 % which had decreased plant height from 25.67 to 20.33 cm upon inoculation with biofertilizers.

In the calcareous soil, the plant height values achieved due to the residual effect of the different used organic manures were insignificantly different from that of the control treatment.

The highest plant height produced due to the residual organic manures effect (23.67 cm) was recorded by the treatment of FYM 25 % + CM 75 %. This high value was significantly higher than those recorded by some treatments received organic manures but insignificant with the others.

For instance the highest plant height of 23.67 cm was significantly higher than those of FYM 100 % treatment (19.67 cm) and FYM 75 % + CM 25 % treatments (18.00 cm). Meanwhile it was insignificantly different from the treatments CM 100 % (22.67 cm) and the treatments of FYM 50 % + CM 50 % (20.67 cm).

The inoculation with biofertilizer in adjacent to organic manures did not affect the plant height of rocket plant since the changes occurred in plant height

were more or less not significantly different from those observed with the treatments received organic manures only (Table 16).

In the clayey soil, the residual effect of all organic manure treatments whether alone or in combination with biofertilizer did not affect significantly the plant height of rocket when compared with the control treatment except for the treatment of CM 100 % which resulted in plant height significantly higher than the corresponding ones achieved due to the other treatments.

Combination of the biofertilizers with the organic manures produced an adverse effect on values of the plant height. The decreases occurred in values of plant heights in response to biofertilizers addition were only significant in the control and CM 100 % treatments.

The residual effect of organic manures combined with or without biofertilizers was more obvious on values of the plant height in clayey soil than sandy and calcareous soils. The heights of rocket plants grown on clayey soil were higher and significantly different from those recorded by the sandy or calcareous soils, however difference in plant height between sandy and calcareous soils were insignificant.

The superiority of the clayey soil over the other tow soils is probably attributed to its higher fertility besides of dense of higher population of the microorganisms whose effect is reflected nutrients especially NPK for rocket plants. This pool of available nutrient is consequently positively reflected on plant growth.

Such obtained results, are in accordance with those recorded by many authors.

Dahroug and Gendy (1993) revealed that when soybean cultivated in a sandy clay loam soil previously planted with chickpea fertilized with farmyard manure, gave the highest significant amount of dry matter, pods number and seed yield. They explained that FYM exerted a beneficial residual effect on soybean plants growth. They owed this effect to the organic matter effect on the

retention of soluble nutrients to meet plant growth requirements and consequently lessen their loss by leaching. Moreover, organic matter represents a good source of available nutrients, which increased from its decomposition gradually and slowly. **Ramamurthy and Shivashankar (1996)** declared that the residual effect of 10 tonsha^{-1} organic fertilizer resulted in a significant increase in dry matter and grain yield of maize. **Abdel-Sabour *et al.*, (1999)** found that the residual effect of previous compost application significantly increased heads dry weight as well as seed yield of sunflower. They added that such increases could be attributed to the potential nutrients supplied by previously applied compost, which in turn may support the plant growth requirements.

4.5. Residual effect of organic manures on N, P and K uptake by rocket plant:

Data in Tables 17, 18 & 19 and Figures 15, 16 & 17 reveal values of NPK contents of rocket plants as affected with the residues of the organic manures (FYM and CM manures) whether applied solely or in combination with biofertilizers.

4.5.1. Nitrogen uptake:

Table 17 & Fig. 15 reveal the residual effect of organic manure on rocket plants content of nitrogen.

It could be claimed that the treatments received previously organic manures except for FYM 100 % +BF gave significantly higher mean values of N-uptake than that of the control treatment. The highest mean value of N-uptake (253.29 mg N pot^{-1}) had been achieved by FYM 25 % + CM 75 % treatment, this value was significantly different from the values of N-uptake achieved due to the other manure treatments except for FYM 100 % and CM 100 % treatments. This trend may indicate that the effect of organic manure was still continuous after wheat harvesting.

Table (17) Nitrogen uptake by rocket plants (mg pot)as affected by different type of manures and soil samples.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	57.73	85.30	311.94	151.66
Control + BF	17.31	64.14	302.81	128.09
FYM 100%	157.90	93.47	455.33	235.57
FYM 100%+ BF	86.71	81.79	360.88	176.46
CM 100%	145.71	153.53	366.30	221.85
CM 100% +BF	115.70	166.35	358.93	213.66
FYM 25% + CM 75%	208.98	160.37	390.51	253.29
FYM 25% +CM 75% + BF	104.42	99.72	387.49	197.21
FYM 50% + CM 50%	179.87	117.25	345.50	214.21
FYM 50% + CM 50% + BF	90.27	91.89	374.07	185.41
FYM 75% + CM 25%	138.58	108.97	360.10	202.55
FYM 75% + CM 25% + BF	112.79	108.16	401.22	207.39
Mean	118.00	110.91	367.92	198.94

L.S.D. (P 0.05)

Soil (s)	17.40
Treatment (T)	34.81
S * T	60.29

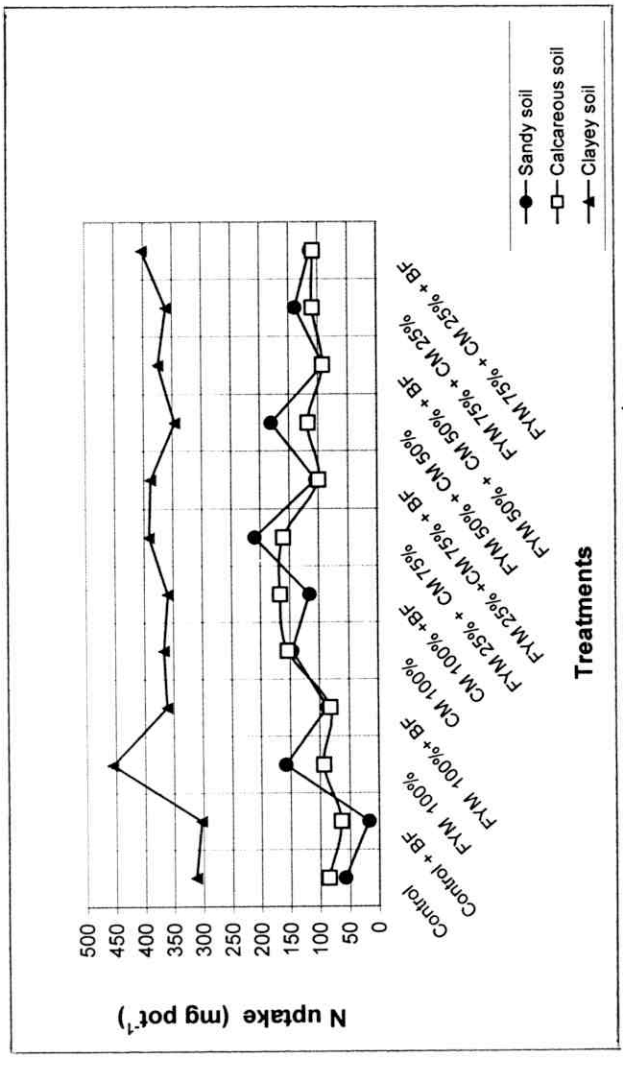

Fig. (15) Nitrogen uptake by rocket plants (mg pot^{-1}) as affected by different type of manures and soil samples.

Regarding differences in N-uptake by the plants grown on the investigated soils, it could be noticed that those grown in the clayey soil were of the highest mean of N-uptake (367.92 mg N pot^{-1}). This value was significantly higher than the corresponding ones achieved by either the sandy or calcareous soil. However no significant difference in N-uptake could be detected between the sandy and calcareous soil.

Within the sandy soil, all treatments received organic manures resulted in N-uptake values significantly higher than that of the control treatment. The highest N-uptake (208.98 mg N pot^{-1}) was recorded due to the residual effect of FYM 25 % + CM 75 % treatment. This value of N-uptake value was also significantly higher than the other treatments received organic manure alone or combined with biofertilizers except for the FYM 100 % and FYM 50% + CM 50 % treatments.

In response to the previous biofertilizer inoculation, the residual effect had produced either significant or insignificant decreases in N-uptake of rocket plant.

As seen in Table 17, the treatment FYM 100 % when combined with biofertilizers resulted in significant decrease in value of the N-uptake from 157.90 to 86.71 mg N pot^{-1}. Meanwhile, when the treatment of CM 100 % was accompanied with biofertilization, N-uptake value decreased insignificantly the from 145.71 to 115.70 mg N pot^{-1}.

The negative effect of biofertilizer inoculation could be explained by that bacteria inoculated to plants during wheat cultivation increased in population and consequently increased utilization and \or immobilization of the previously mineralized nutrients. Thus the bacteria were able to compete with the plant nutrition preventing and consequently decreased the available amounts of the nutritive elements that rocket plants could uptake.

In the calcareous soil, the residual effect of organic manures application appeared to exhibit different responses towards N-uptake by rocket plants. i.e.

not all the organic manure treatments resulted in N-uptake values significantly different from that of the control one. However, the highest N-uptake (166.35 mg N pot^{-1}) was achieved due to the residual effect of CM 100 % + BF treatment. This value of N-uptake differed significantly from some treatments and insignificantly from some others.

When the organic manures were combined with biofertilization their residual effect resulted in lower N-uptake by the rocket plants. Except for the treatment FYM 25% +CM75 % which when accompanied with biofertilization decreased significantly the N-uptake t from 160.37 to 99.72 mg N pot^{-1} .

Form these results it could be concluded the best residual effect of the organic manures on N-uptake was that of CM 100 % + BF whereas the worst one was that of the FYM 100 % + BF.

In clayey soil, the residual effect of organic manure application on N-uptake by the rocket plants was more obvious than the corresponding ones of the sandy and calcareous soils. The residual effect of some of the organic manures treatments gave significantly N-uptake values higher than that of the control treatment.

The highest N-uptake (455.33 mg N pot^{-1}) was obtained due to the residual effect of FYM 100% treatment. This N-uptake value was significantly different from the other manure treatments except for FYM 75% + CM 25% treatment.

When biofertilizers were mixed with organic manures, their residual effect showed different responses towards N-uptake content of rocket plants.

From the above mentioned results, it could be claimed that the best residual effect of organic manures applied during wheat cultivation on N-uptake by rocket plants was obtained due to the treatments FYM 25% +CM 75 % (208.98 mg N pot^{-1}) in the sandy soil, CM 100 % +BF (166.35 mg N pot^{-1}) in the calcareous soil and FYM 100 % (455.33 mg N pot^{-1}) in the clayey soil. Also, the organic manures residual effect on N-uptake of rocket plant was more pronounced in the clayey soil than those of the sandy or of the calcareous soil.

4.5.2. Phosphorus uptake:

Data in Table 18 and Figure 16 explain the residual effect of organic manures after the harvest of wheat plants on the phosphorus uptake rocket plants.

The residual effect of organic manures used previously for fertilizing a wheat plants resulted in P-uptake values higher than and significantly different from those of both control and control + BF treatments.

The highest mean value of P-uptake (21.52 mg P pot^{-1}) was obtained due to the extended effect of the treatment CM 100 %.

This value was significantly higher than the corresponding value of P-uptake values due to the extended effect of the other organic manure treatments combined with or without biofertilizers except for the mean value of CM 100% + BF treatment.

The residual effect of biofertilizers inoculation along with organic manure application had caused the mean values of P-uptake to increase in some treatments and to decrease in the others.

However, these increases or decreases in P-uptake means values did not reach the level of significance.

For example, the p-uptake mean value achieved due to the residual effect of FYM 100 % treatment had insignificantly increased from 10.89 mg P pot^{-1} to 11.19 mg P pot^{-1}, while that attained due to FYM 25% +CM 75 % treatment had insignificantly decreased from 17.62 to 16.79 mg P pot^{-1} when these treatments were combined with biofertilizers.

The clayey soil had achieved the highest mean of P-uptake (22.51 mg P pot^{-1}) followed by 9.92 and 10.83 mg P pot^{-1} for the sandy and calcareous soil, respectively. The differences between the clayey soil and each of the sand and calcareous soil ones were significant while the differences between the sandy and calcareous were significant.

Table (18) Phosphorus uptake by rocket plants (mg pot^{-1}) as affected by different type of manures and soil samples.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	2.63	3.82	12.72	6.39
Control + BF	1.45	3.84	13.72	6.34
FYM 100%	9.09	7.91	15.68	10.89
FYM 100%+ BF	7.38	7.63	18.56	11.19
CM 100%	13.88	13.38	37.31	21.52
CM 100% +BF	13.11	17.29	28.47	19.62
FYM 25% + CM 75%	13.14	16.49	23.22	17.62
FYM 25% +CM 75% + BF	12.26	11.79	26.33	16.79
FYM 50% + CM 50%	13.14	12.64	21.47	15.75
FYM 50% + CM 50% + BF	10.78	12.38	24.22	15.79
FYM 75% + CM 25%	12.12	11.59	22.32	15.34
FYM 75% + CM 25% + BF	10.10	11.17	26.07	15.78
Mean	9.92	10.83	22.51	14.42

L.S.D. (P 0.05)

Soil (s)	1.11
Treatment (T)	2.22
S * T	3.84

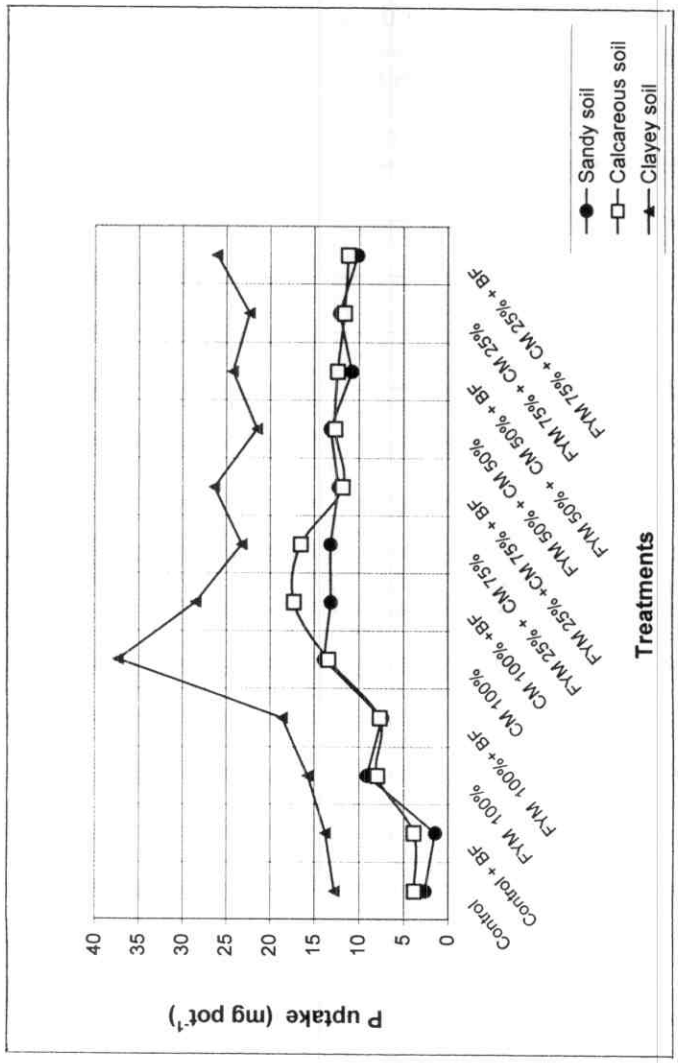

Fig. (16) Phosphorus uptake by rocket plants (mg pot^{-1}) as affected by different type of manures and soil samples.

In sandy the soils, the residual effect of all the manure treatments with or without biofertilizers had given higher significant P-uptake by rocket than those achieved by the control and the control + BF treatments.

However, the highest P-uptake content of rocket plant (13.14 mg P pot^{-1}) was recorded due to the residual effect of FYM 25% + CM 75% and FYM 50 % + CM 50 % treatments. This value of P-uptake was insignificantly different from the values obtained in response to the residual effect of the other manure treatments except for those achieved due to FYM 100 % (7.38 mg P pot^{-1}) and FYM 100% + BF (7.38 mg P pot^{-1}) treatments.

Result of the sandy soil also indicate that inoculation with biofertilizers besides organic manure fertilization had resulted in adverse residual effects on the P-uptake by rocket plants, since its values had decreased insignificantly when the manure treatments received biofertilizers.

For instance the P-uptake recorded in response to the residual effect of CM 100 % treatment decreased insignificantly from 13.88 to 13.11 mg P pot^{-1} to 13.11 mg P pot^{-1} when CM 100 % was combined with biofertilizers. However, it could be claimed that CM 100 % treatment was of superior on its residual effect on P-uptake by rocket plant over the corresponding ones attained due to mixing CM with FYM.

In the calcareous soil, concerning the residual effect of organic manures on P-uptake by rocket plant results revealed that residual effect of all manure treatments seemed to result in values of P-uptake significantly different from those recorded by the residues of control or control + BF treatment.

However, the highest P-uptake content (17.29 mg P pot^{-1}) was obtained due to the residual effect of CM 100 % + BF treatment. This value was significantly higher than and different from those produced due to the other manure treatments except for FYM 25 % + CM 75% (16.49 mg P pot^{-1}).

Biofertilizer inoculation along with organic manure addition had insignificantly decreased P-uptake values due to all manure treatments except

for the CM 100 % treatment whose residual effect resulted in significant increase in P-uptake from 13.38 mg P pot^{-1} to 17.29 mg P pot^{-1} when received biofertilizers.

Regarding the residual effect of the organic manures on P-uptake by the plants grown on the clayey soil, all the manure treatments resulted in significantly higher P-uptake values than those achieved by the control or control + BF treatment except for the FYM 100 % treatment.

However, it was observed that P-uptake values recorded in the clayey soil were generally, higher than the corresponding ones achieved in the sandy or calcareous soil.

The highest P-uptake value (37.31 mg P pot^{-1}) was achieved due to the residual effect of CM 100 % treatment. Such P-uptake value was significantly different from all other manure treatments whether those which received biofertilizers or those which did not (Table 18 and Figure 16).

Owing the residual effect of the biofertilizers when associated with organic manure fertilization, the P-uptake by rocket plants increased insignificantly. This was true for the residual effect of biofertilizer combined with all organic manures except for CM 100 % where a significant decrease in P-uptake value from 37.31 mg P pot^{-1} to 28.47 mg P pot^{-1} P-uptake occurred when it was with biofertiliztion.

4.5.3. <u>Potassium uptake</u>:

Results in Table 19 and Figure 17 reveal the residual effects of organic manures on plant K-uptake of rocket plants seeded after harvesting of wheat previously manured.

Data show that the highest K-uptake mean value (421.17 K mg $pot^{-1)}$ was attained the residual effect of CM 100 % treatment. This high mean value of K-uptake was significantly different from those produced due to the residual effect of the other manure treatments except for FYM 25 % + CM 75 % treatment.

Table (19) Potassium uptake by rocket plants (mg pot^{-1}) as affected by different type of manures and soil samples.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	79.87	115.26	404.31	199.81
Control + BF	19.82	88.87	405.21	171.30
FYM 100%	160.22	155.17	629.75	315.05
FYM 100%+ BF	88.80	120.60	511.97	240.46
CM 100%	230.80	222.04	810.68	421.17
CM 100% +BF	180.80	211.31	543.46	311.86
FYM 25% + CM 75%	325.28	220.16	592.19	379.21
FYM 25% +CM 75% + BF	160.88	139.50	518.11	272.83
FYM 50% + CM 50%	293.80	176.16	505.58	325.18
FYM 50% + CM 50% + BF	123.82	134.49	564.23	274.18
FYM 75% + CM 25%	244.78	160.06	535.30	313.38
FYM 75% + CM 25% + BF	165.77	143.66	531.58	280.34
Mean	172.89	157.27	546.03	292.06

L.S.D. (P 0.05)

Soil (s)	25.96
Treatment (T)	51.92
S * T	89.93

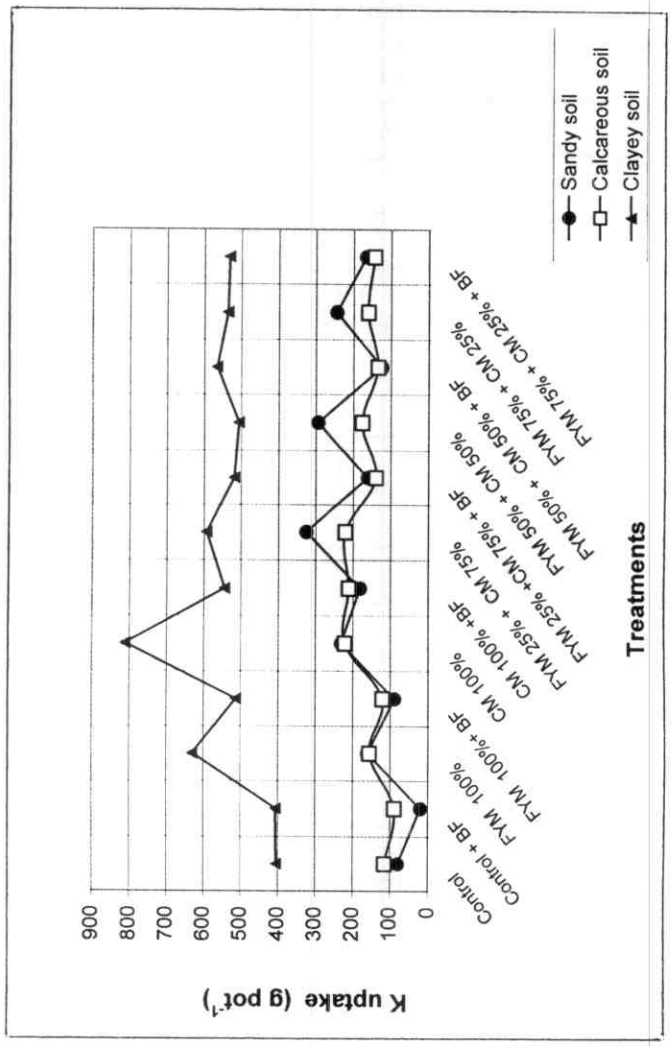

Fig. (17) Potassium uptake by rocket plants (mg pot^{-1}) as affected by different manure types and soils.

On the other respect, the mean values of K-uptake recorded in response to on the residual effect of all manure treatments except for the FYM 100 % + BF treatment were significantly different from that obtained by the control treatment (Table 19).

The biofertilizers when were combined with organic manures led to produce residual adverse effect on mean values of K-uptake by rocket plant.

The decreases in K-uptake mean values were significant when the biofertilizers where combined with FYM 100 %, CM 100 % and FYM 25% + CM 75 % and previously added to wheat plant. The mean values of K-uptake were 315.05, 421.17 and 379.21 mg K pot^{-1} compared with 240.46, 311.86 and 279.83 mg K pot^{-1} for the same treatments, respectively when received biofertilizer.

On the other hand, the mean values of K-uptake were insignificantly decreased from 325.18 and 313.38 to 274.18 and 280.34 mg K pot^{-1} when treatments of FYM 50 % + CM 50 % and FYM 75 %+CM 25%, as they when received biofertilizers, respectively.

It was found that the mean value of K-uptake by rocket plants grown in the clayey soil was higher than and significantly different from those recorded by the sandy or calcareous soil. Their corresponding K-uptake mean values were 546.03, 172.89 and 157.27 mg K pot^{-1}.

Regarding the residual effect of organic manures on K-uptake by rocket plants grown on the sandy soil, the results had proved different responses due to the residual effect of the different treatments, values of K-uptake attained due to some previous treatments were significantly different from that of the control treatment, while the others were not. For instance, the K-uptake value of 160.22 mg $Kpot^{-1}$ (FYM 100 %) was insignificantly different from that of the control treatment (79.87 mg K pot^{-1}), while K-uptake value of 230.80 mg K pot^{-1} (CM 100%) was significantly different from that of the control treatment.

However, the highest K-uptake value (325.28 mg K pot^{-1}) was achieved in response to the residual effect of FYM 25% + CM 75 % treatment. This value was significantly different from K-uptake values attained due to all the manure treatments except for those attained due to both of FYM 50% + CM 50 % and FYM 75% + CM 25 % treatments. Their respective k-uptake values were 293.80 and 244.78 mg K pot^{-1}.

Inoculation with biofertilizers in the sandy soils along with organic manure had reduced the K-uptake values either significantly or insignificantly. For instance, the K-uptake value achieved by the rocket plants due to the residual effect of FYM 100 % had insignificantly decreased from 160.22 to 88.80 mg K pot^{-1}, while the K-uptake value attained due to the residual effect of FYM 25% + CM 75% had significantly decreased from 325.28 to 160.88 mg K pot^{-1}, when both were accompanied with biofertilizers.

In the calcareous soil, the organic manure treatments residues except for those of CM 100 %, CM 100 % + BF and FYM 25% + CM 75% treatments had increased insignificantly the K-uptake by rocket plant in comparison with that of the control treatment. For instance, K-uptake attained due to the residues of the treatment FYM 100 % (155.17 mg K pot^{-1}) was insignificantly higher than that attained due to the control treatment (115.26 mg K pot^{-1}), while the K-uptake attained due to the residues of the treatment CM 100 % (222.04 mg K pot^{-1}) was significantly higher than that of the control treatment (115.26 mg K pot^{-1}).

However, the highest K-uptake content of rocket plant (222.04 mg K pot^{-1}) was recorded by the residual effect resulted from CM 100 % treatment. This K-uptake value was insignificantly higher than the corresponding ones attained due to all the manure treatments except for that attained due to FYM 100 % + BF treatment (120.60 mg K pot^{-1}) which was significantly lower than the highest K-uptake value.

Inoculation with biofertilizers along with organic manure fertilizers led to insignificant decreases in K-uptake values attained due to the residues of all manure treatments (Table 19).

The K-uptake achieved duo to the residues of FYM 100 % and CM 100 % decreased insignificantly when these manures were combined with biofertilizers from 155.17 and 222.04 mg K pot^{-1} to 120.60 and 211.13 mg K pot^{-1}, respectively.

In the clayey soil, all manure treatments had produced significant residual effects on K-uptake content of rocket plants compared to that produced from the control treatment.

The highest K-uptake by of rocket plant (810.68 mg K pot^{-1}) was obtained as a result of the residual influence of CM 100 % treatment.

Biofertilization along with organic manures application resulted in a residual effect led K-uptake content to decrease. When CM 100 % was combined with biofertiliztion, their residues had decreased significantly the K-uptake content from 810.68 to 543.46 mg K pot^{-1}, while when FYM 25% + CM 75% treatment was combined with biofertilizers their residue had decreased insignificantly K-uptake content from 592.19 to 518.11 mg K pot^{-1}. Consequently, it could be detected that the organic manures residual effect on K-uptake by rocket plant was more pronounced in the clayey soil than in the sandy or calcareous soil since mean value of the K-uptake recorded in the clayey soil appeared to be significantly higher than those recorded by the plants grown in the sandy and calcareous soils (Table 19).

Such results are in accordance with those obtained by **Sharma and Mittra (1991), Ramamurthy and Shivashankar (1996) Abdel –Sabour et al., (1999)** who found that chicken manure application to wheat had significantly increased the potassium content of peanut plants when followed wheat cultivation due to the increase in the dry matter production caused by residual influence of organic manure.

4.6. Residual effect of organic manures on soil chemical properties after rocket harvesting:

4.6.1. Available N, P and K in soils:

Tables 20, 21 & 22 and Figures 18, 19 & 20 illustrate the residual effect of organic manures (FYM and CM) either with or without biofertilizers on available-N, P and K contents of the tested soil types (sandy, calcareous and clayey soils)

4. 6.1.1. Available nitrogen:

In sandy soil Table (20) and Figure (18) reveal that the highest content of available- N in the sandy soil (11 mg N kg^{-1}) was recorded in response to the residual effect of CM 100 % + BF treatment. This high available- N value was not significantly different from those attained by the other manure treatments whether those combined with biofertilizers or did not.

Moreover, all the available- N values achieved due to the different manure treatments did not significantly differ from those detected by the control and control + BF treatments.

The residual effect biofertilizers applied with the organic manures CM 100 %, FYM 25% + CM 75%, FYM 50% + CM 50% and FYM 75% + CM 25% (Table 20) had insignificantly increased the sandy soil content of available –N.

Meanwhile the biofertilizers inoculated with the organic manure FYM 100 % caused the soil available-N value to be diminished insignificantly from 8.00 to 7.00 mg N kg^{-1}.

In the calcareous soil, the values of soil available-N recorded in response to the residual effect of organic manure treatments did not significantly differ from those resulted due to the control and control + BF treatments.

However, the highest soil available-N value (16.00 mg N kg^{-1}) was achieved due to the residual effect of each of CM 100 % + BF, FYM 50% + CM 50%+ BF and FYM 75% + CM 25%+ BF treatments. This

Table (20) Effect of organic manures on soil available-N (mg kg^{-1}) after rocket harvesting.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	7.00	12.00	13.00	10.67
Control + BF	8.00	11.00	12.00	10.33
FYM 100%	8.00	15.00	18.00	13.67
FYM 100%+ BF	7.00	13.00	19.00	13.00
CM 100%	9.00	15.00	16.00	13.33
CM 100% +BF	11.00	16.00	16.00	14.33
FYM 25% + CM 75%	8.00	15.00	17.00	13.33
FYM 25% +CM 75% + BF	9.00	14.00	16.00	13.00
FYM 50% + CM 50%	8.00	14.00	16.00	12.67
FYM 50% + CM 50% + BF	9.00	16.00	15.00	13.33
FYM 75% + CM 25%	9.00	15.00	19.00	14.33
FYM 75% + CM 25% + BF	10.00	16.00	18.00	14.67
Mean	8.58	14.33	16.25	13.06

L.S.D. (P 0.05)

Soil (s)	1.58
Treatment (T)	3.15
S * T	5.46

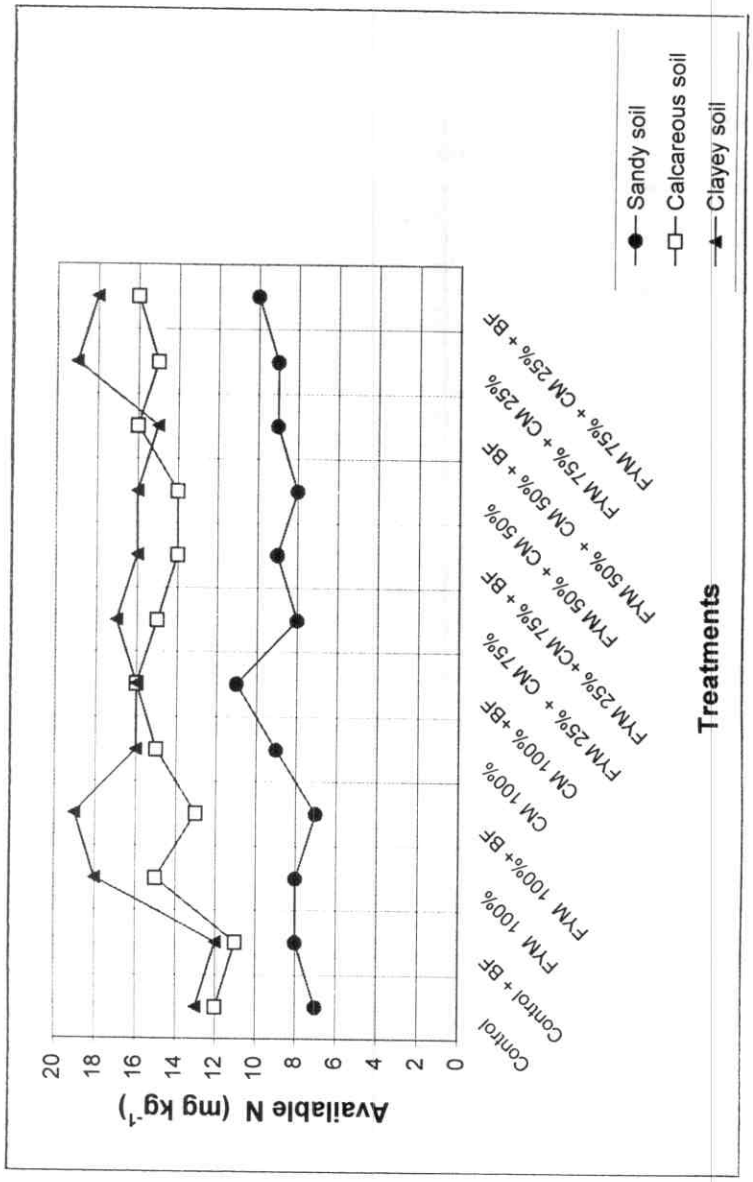

Fig. (18) Effect of organic manures on soil available-N (mg kg^{-1}) after rocket harvesting.

value did not significantly differ from those recorded due to the residual effect of other manure treatments whether they were inoculated with biofertilizers or not.

The residual effect of combining the biofertilizers with the manure treatments (CM 100 %, FYM 50% + CM 50% and FYM 75% + CM 25%) led to insignificant increases in the soil content available–N. These treatments had increased from 15.00, 14.00 and 15.00 mg N kg^{-1} to 16.00, 16.00 and 16.00 mg kg^{-1} soil, respectively.

In the clayey soil, except for residual effect of FYM 100% +BF and FYM 75% + CM 25% treatments none of the other manure treatments resulted in significantly higher than or different from those of the control and control + BF treatments.

The highest soil available – N value (19.00 mg N kg^{-1}) was achieved due to residues FYM 100 % and FYM 75% + CM 25% treatments. This high available–N value did not differ significantly from those achieved due to the other manure treatments combined with or without biofertilizers (Table 20).

Residues of combining biofertilizers with the manure treatments had resulted in different influences on the soil content of available-N after rocket harvesting. The soil content of available–N resulted due to the residues of the treatments FYM 25% + CM 75 %, FYM 50% + CM 50 % and FYM 75% + CM 25 % had decreased insignificantly from 17.00, 16.00 and 19.00 mg kg^{-1} to 16.00, 15.00 and 18.00 mg N kg^{-1}, when those treatment were combined with biofertilizers.

While the soil content of available–N resulted due to FYM 100 % residues (18.00 mg N kg^{-1}) increased insignificantly when this treatment was accompanied with biofertilizers.

On the other hand, biofertilizers inoculation did not change the soil content of available-N resulted due to CM 100 % treatments.

Generally, it could be noticed that the soil content of available-N the in calcareous and clayey soils was more higher than that of the sandy soil after rocket harvesting in response to organic manures applied previously upon wheat cultivation. This is probably because the organic matter content of both the calcareous and clayey soils is initially far higher than that of the sandy soil (Table 2).

4. 6.1.2. Available phosphorus:

Results exhibited in Table (21) and Figure (19) reveal the influence of the organic manures combined with or without biofertilizers, previously applied during wheat cultivation, on concentration of available-P in the tested soils after rocket harvesting.

In the sandy soil, data revealed that all values of soil available-P attained due to the previous manure treatments except for FYM 100 % and FYM 100 % + BF (Table 21) whether solely added or combined with biofertiliztion were significantly higher than and different from those obtained due to the control treatment

However, the highest soil available-P concentration (26.00 mg P kg^{-1}) was resulted in response to previous application of CM 100 % treatment. This content of available- P was significantly higher than and different from the corresponding ones recorded due to the other manure treatments except for that attained due to the CM 100 % + BF treatment (Table 21).

The previous treatments of CM 100 % and FYM 75% + CM 25% treatments had reduced soil content of available P from 26.00 and 18.00 to 23.00 and 12.00 mg P kg^{-1} when these treatments received biofertilizers, with reaching the level of insignificance for the former treatment and significance for the latter one.

On the other hand, the application of biofertilizers did not change the values of available-P resulted due to previous application of FYM 100 %, FYM 25% + CM 75% and FYM 50% + CM 50% treatments.

Table (21) Effect of organic manures on soil available-P (mg kg) after rocket harvesting.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	2.00	7.00	6.00	5.00
Control + BF	1.00	6.00	5.00	4.00
FYM 100%	5.00	13.00	6.00	8.00
FYM 100%+ BF	5.00	15.00	6.00	8.67
CM 100%	26.00	49.00	12.00	29.00
CM 100% +BF	23.00	54.00	13.00	30.00
FYM 25% + CM 75%	17.00	41.00	8.00	22.00
FYM 25% +CM 75% + BF	17.00	40.00	9.00	22.00
FYM 50% + CM 50%	13.00	30.00	8.00	17.00
FYM 50% + CM 50% + BF	13.00	29.00	8.00	16.67
FYM 75% + CM 25%	18.00	23.00	9.00	16.67
FYM 75% + CM 25% + BF	12.00	18.00	8.00	12.67
Mean	12.67	27.08	8.17	15.97

L.S.D. (P 0.05)

Soil (s)	1.48
Treatment (T)	2.96
S * T	5.13

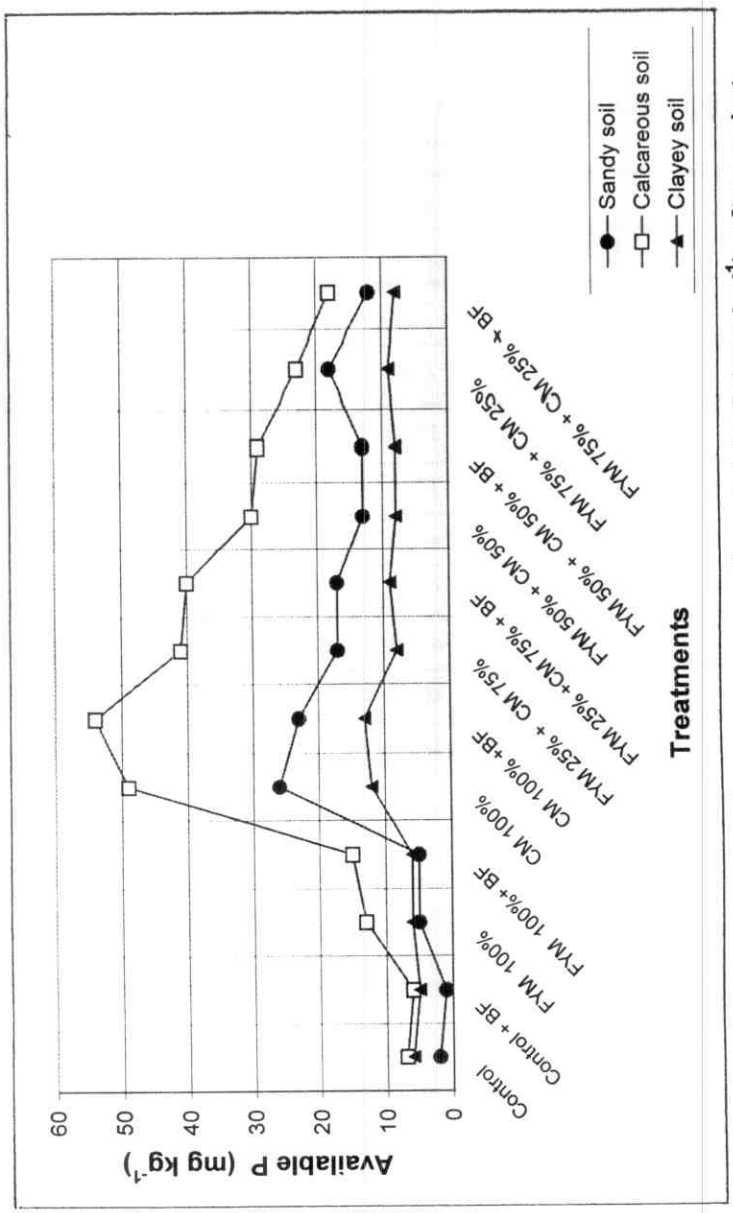

Fig. (19) Effect of organic manures on soil available-P (mg kg^{-1}) after rocket harvesting.

In the calcareous soil, the values of soil available-P recorded due to the previous manure treatments combined with or without biofertilizers were significantly higher than and different from those obtained due to the control or control + BF treatments (Table 21).

The highest value of soil available-P content (54.00 mg P kg^{-1}) was achieved due to the previous CM 100 % + BF treatment. This value was significantly higher than those scored due to the other previous manure treatments except for CM 100 % treatment (49.00 mg P kg^{-1}).

Biofertilizers utilization in parallel with organic manures did not significantly increase the soil content available-P.

In the clayey soil, values of the soil available-P content attained due to the residual effect of organic manures were significantly less than the corresponding ones attained in the sandy or calcareous soil.

However, the values of soil available-P content which were attained in response to organic manure or organic manures + BF treatment, except for both CM 100 % and CM 100 % + BF treatments were not significantly different from those obtained due to control and control + BF treatments.

The highest available-P content (13.00 mg P kg^{-1}) was recorded in response to previously added CM 100 % + BF treatment. This value was not significantly different from those achieved due to the other manure treatments except FYM 100 % and FYM 100 % + BF treatments.

Biofertilizers accompanied with organic manures residues had exhibited different influences on soil content of available-P. Since both CM 100 % and FYM 25% + CM 75% were previously added combined with biofertilizers, their residues treatments had showed insignificant elevations in soil content of available P content from 12.00 and 8.00 mg P kg^{-1} to 13.00 and 9.00 mg P kg^{-1}, respectively. On the other hand upon addition of biofertilizers to both the of FYM 100 % and FYM 50% + CM 50% treatments, their residues did not affect soil content of available-P.

Moreover, residues of biofertilizers inclusion with FYM 75% + CM 25% treatment had reduced insignificantly soil content of available-P from 9.00 to 8.00 mg kg^{-1}.

Commonly, the soil contents of available-P after rocket harvesting were found to be more in remarkable values in the calcareous soil than those of sandy or clayey soil. The increases in soil available-P content values noticed in calcareous soil were significantly different from those observed with similar treatments in both sandy and clayey soils.

This phenomenon might be attributed to the higher increase in microorganism's population in both the sandy and clayey soils, which led to immobilization of the previously mineralized phosphorus in soil. The high concentration of initially existed in chloride the calcareous soil (25.22 meq L^{-1}) might prevent the soil microorganisms to proliferate, thus soil could keep its mineralized available–P against immobilization. The high PH of the calcareous soil, which is a direct result of Ca CO_3 hydrolysis in such soil, causes $CaCO_3$ to be almost inert and thus more soluble P is released into soil solution.

4. 6.1.3. <u>Available potassium</u>:

Table 22 & Figure 20 show the effect of previously applied organic manures combined with or without biofertilizers on the soil content of available-K values in the tested soils after rocket harvesting.

In the sandy soil, all the recorded values soil available-K attained due to residues of organic manures combined with or without biofertilizers application were significantly different from and higher than those obtained due to the residues of the control or control + BF treatment.

The highest value of soil available-K (188.00 mg K kg^{-1}) was achieved due to the residues of FYM 100 % treatment. This value did significantly differ from those attained due to the residues of the other manure treatments except for FYM 100%, FYM 50% + CM 50% and FYM 75% + CM 25% treatments.

Table (22) Effect of organic manures on soil available-K (mg kg^{-1}) after rocket harvesting.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	70.00	247.00	773.00	363.33
Control + BF	58.00	225.00	810.00	364.33
FYM 100%	168.00	385.00	830.00	461.00
FYM 100%+ BF	188.00	383.00	930.00	500.33
CM 100%	103.00	338.00	787.00	409.33
CM 100% +BF	145.00	352.00	870.00	455.67
FYM 25% + CM 75%	132.00	325.00	853.00	436.67
FYM 25% +CM 75% + BF	153.00	340.00	860.00	451.00
FYM 50% + CM 50%	145.00	347.00	845.00	445.67
FYM 50% + CM 50% + BF	157.00	370.00	900.00	475.67
FYM 75% + CM 25%	115.00	367.00	870.00	450.67
FYM 75% + CM 25% + BF	167.00	372.00	893.00	477.33
Mean	133.42	337.58	851.75	440.92

L.S.D. (P 0.05)

Soil (s)	10.05
Treatment (T)	20.10
S * T	34.81

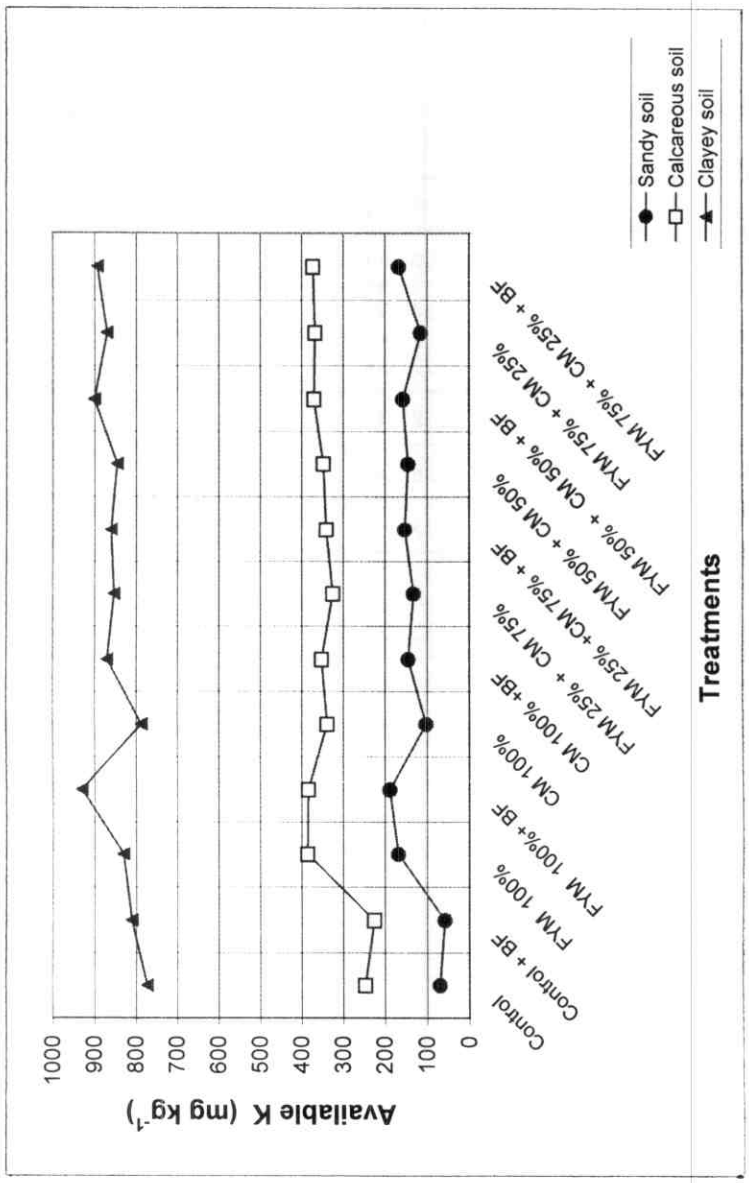

Fig. (20) Effect of organic manures on soil available-K (mg kg^{-1}) after rocket harvesting.

The residues of biofertilizers besides the organic manures in the sandy soil had showed different responses towards the soil available-K (Table 22).

In calcareous soil, the residues of biofertilizers along with organic manures had significantly increased the soil content of available-K in comparison to those achieved due to the control or control + BF treatment.

However, the highest soil content of available-K (385.00 mg K kg^{-1}) was obtained due to the residues of the treatment FYM 100 %. This value was higher and significantly different from those gained due to the residues of CM 100 %, FYM 75% + CM 25% +BF, FYM 25% + CM 75% + BF and FYM 50% + CM 50% treatments. This highest value of soil available-K (385.00 mg K kg^{-1}) on the other hand, insignificantly differed from those recorded due to the residual effect of FYM 100 % + BF (383.00 mg K kg^{-1}) CM 100 % + BF (325.00 mg K kg^{-1}), FYM 50% + CM 50% + BF (370.00 mg K kg^{-1}) , FYM 50% + CM 50% + BF (367.00 mg kg^{-1}) and FYM 75% + CM 25% +BF (372.00 mg K kg^{-1}).

The residual effect of biofertilizers application along with organic manures except for the treatment of FYM 100 % to soil had caused the values of available-K to be insignificantly increased.

In the clayey soil, the recorded values of available-K achieved due to the residues of all the manure treatments were significantly different from and far higher than those obtained due to the corresponding treatments in both the sandy and calcareous soils.

The clayey soil content available-K achieved in response to the residues of all manure treatments combined with or without biofertilizers were significantly higher than those attained due to the residues of the control or control + BF treatment.

However, the highest value of soil available-K, 930.00 mg K kg^{-1} was scored due to the residual effect of FYM 100 % + BF treatment. This value was higher than and significantly different from those detected due to the residues of

the other manure treatments except for FYM 50% + CM 50% + BF treatment which gave an available-K value of 9.00 mg K kg^{-1}.

Association of biofertilizers with the manure treatments was of significant or insignificant residual effect on the soil content of available-K.

4.6.2. Organic matter content:

Data in Table 23 and illustrated in Figure 21 indicate the organic matter percentage remained in the tested soil types after rocket harvesting, in response to the application of organic manures combined with or without biofertilizers and applied previously during wheat cultivation.

In the sandy soil, residues of all the organic manures gave significantly higher soil organic matter percentages compared to those attained due to the control and control + BF treatments.

Also, all the manure treatments had recorded values of soil organic matter percentage significantly less than the highest one (0.40 %) recorded due to residues of both FYM 100 % + BF and CM 100 % treatments.

The residues of manure treatments combined with biofertilizers led to increase the soil organic matter percentages insignificantly from 0.35, 0.30 and 0.32 to 0.40, 0.34 and 0.34 for FYM 100 %, FYM 25% + CM 75% and FYM 50% + CM 50% treatments, respectively.

On the contrary, biofertilizers inoculation had significantly decreased the soil organic matter percentage from 0.40 to 0.31 for the treatment of CM 100 %. Insignificant decrease in organic matter percentage from 0.37 to 0. 32 % occurred due to the residues of the biofertilizers accompanied the organic manure in the treatment FYM 75% + CM 25%.

In the calcareous soil, the soil organic matter percentage recorded due to the residues of manure treatments were significantly higher than those obtained due to the control or control + BF treatment.

The highest content of soil organic matter percentage (1.14) was achieved due to the residual effect of FYM 100 % treatment. This soil organic matter

Table (23) Effect of organic manures on soil organic matter percentage after rocket harvesting.

Treatments	Soil samples			Mean
	Sandy	Calcareous	Clayey	
Control	0.12	0.62	2.39	1.04
Control + BF	0.11	0.67	2.40	1.06
FYM 100%	0.35	1.14	2.72	1.40
FYM 100%+ BF	0.40	1.00	2.74	1.38
CM 100%	0.40	0.90	2.70	1.33
CM 100% +BF	0.31	0.97	2.78	1.35
FYM 25% + CM 75%	0.30	0.99	2.75	1.35
FYM 25% +CM 75% + BF	0.34	0.98	2.74	1.35
FYM 50% + CM 50%	0.32	1.04	2.75	1.37
FYM 50% + CM 50% + BF	0.34	1.01	2.73	1.36
FYM 75% + CM 25%	0.37	1.07	2.74	1.39
FYM 75% + CM 25% + BF	0.32	1.01	2.74	1.36
Mean	0.31	0.95	2.68	1.31

L.S.D. (P 0.05)

Soil (s)	0.02
Treatment (T)	0.05
S * T	0.08

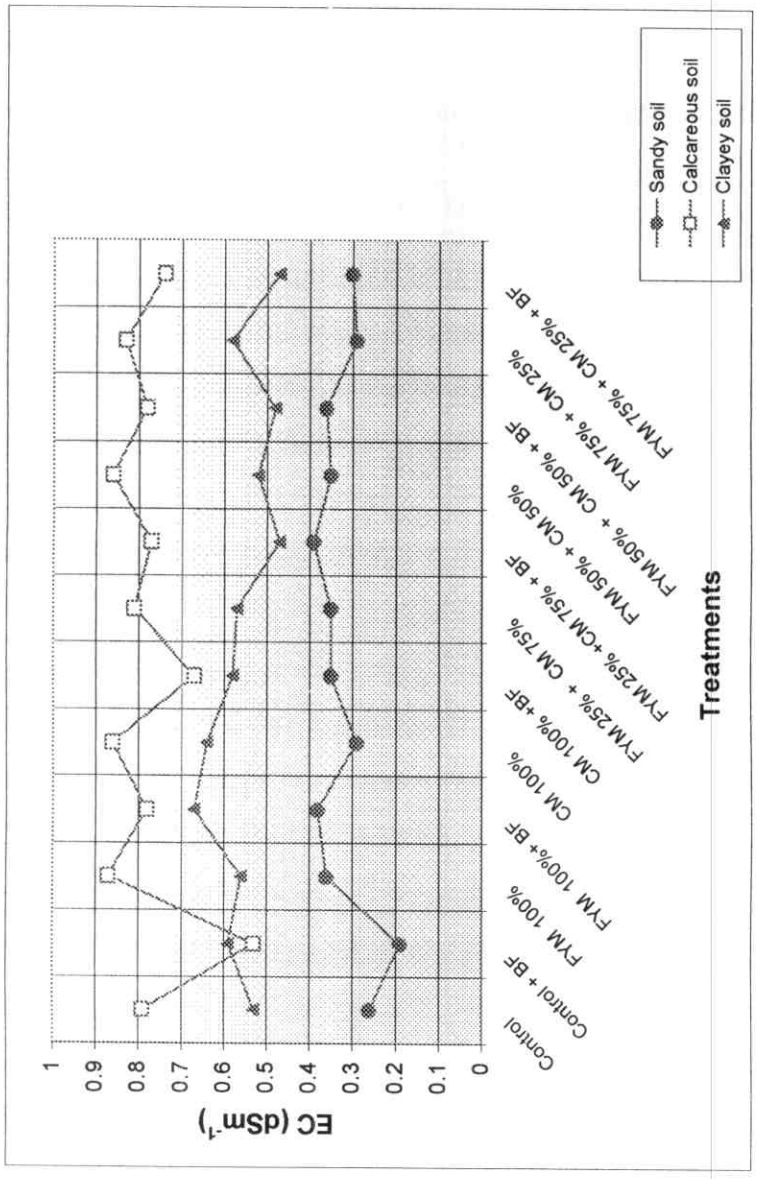

Fig. (23) Effect of organic manures on soil EC (dSm^{-1}) after rocket harvesting.

percentage significantly exceeded those recorded due to the other manure treatments except for FYM 75% + CM 25% (1.07%) treatment.

The previous biofertilizers inoculation had decreased insignificantly the residual effect of the manure treatments except for FYM 100% treatment on organic matter percentage.

However, the organic matter percentage (0.90) that was recorded due to the residual effect of the treatment of CM 100 % was raised insignificantly to 0.97 % when this treatment was associated with biofertilizers.

In the clayey soil, residues of all the manure treatments had given soil organic matter percentage after rocket harvesting higher than and different from those recorded due to the similar treatments by either the sandy or calcareous soil.

However, the soil organic matter percentages resulted due to all the manure treatments previously added had insignificantly exceeded those obtained due to either the control or the control + BF treatment (Table 23).

Generally, the organic matter percentage of the clayey soil is far higher and significantly different from those of the sandy and calcareous soils. This might be due to the higher initial organic matter content of the clayey soil than the corresponding ones of the sandy and calcareous soils.

Yet, it is of importance to indicate that the use of the organic manures combined with or without biofertilizers increased apparently the organic matter percentages to values higher than the initial ones (Table 2).

4.6.3. Soil reaction and electrical conductivity:

It seems from Tables 25 and 26 illustrated in Figures 22 and 23 that no obvious effect could be detected due to residues of the organic manures combined with or without biofertilizers on values of pH or EC of the studied soils. On the other hand, significant differences could be detected among the studied soils probably due to differences initially present among the soils.

Table (24) Effect of organic manures on soil pH after rocket harvesting.

Treatments	Soil samples		
	Sandy	Calcareous	Clayey
Control	8.45	8.08	8.07
Control + BF	8.53	8.08	7.99
FYM 100%	8.28	8.06	8.03
FYM 100%+ BF	8.32	8.08	7.93
CM 100%	8.26	8.09	7.96
CM 100% +BF	8.30	8.15	7.95
FYM 25% + CM 75%	8.26	8.18	8.01
FYM 25% +CM 75% + BF	8.28	8.19	8.06
FYM 50% + CM 50%	8.29	8.17	8.03
FYM 50% + CM 50% + BF	8.31	8.17	8.04
FYM 75% + CM 25%	8.29	8.19	8.02
FYM 75% + CM 25% + BF	8.27	8.24	8.04
Mean	8.32	8.14	8.01

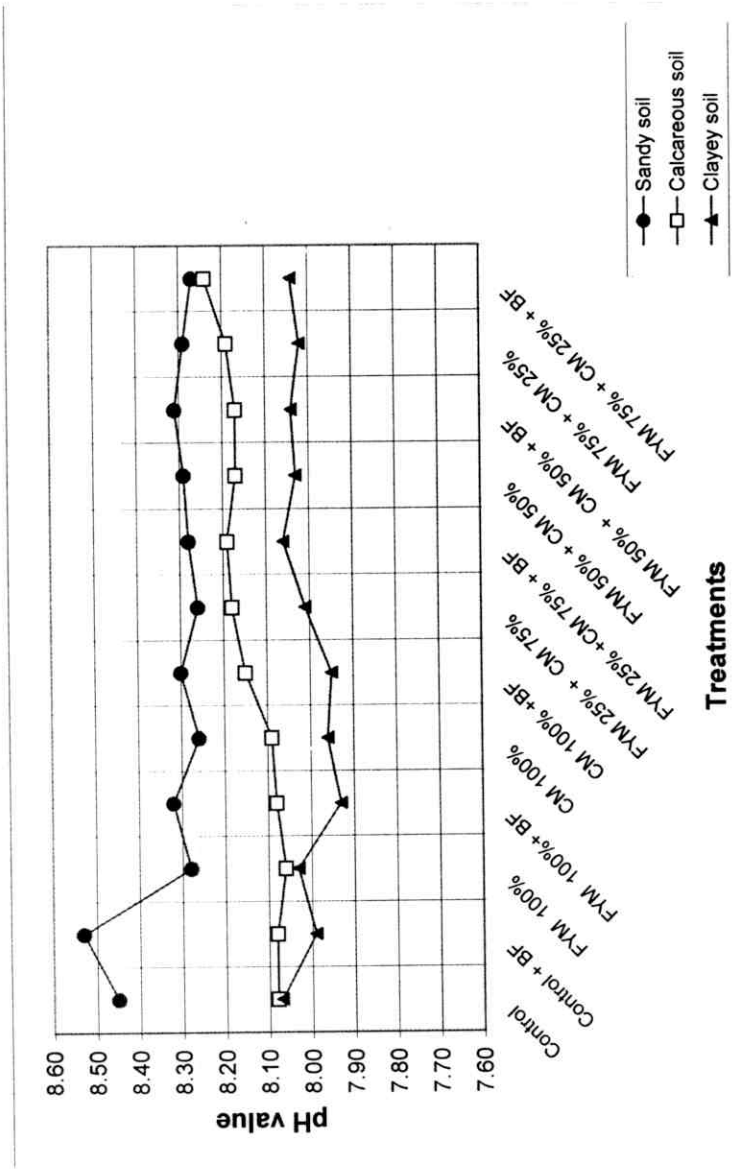

Fig. (22) Effect of organic manures on soil pH after rocket harvesting.

Table (25) Effect of organic manures on soil EC (dS m^{-1}) after rocket harvesting.

Treatments	Soil samples		
	Sandy	Calcareous	Clayey
Control	0.26	0.79	0.53
Control + BF	0.19	0.53	0.59
FYM 100%	0.36	0.87	0.56
FYM 100%+ BF	0.38	0.78	0.67
CM 100%	0.29	0.86	0.64
CM 100% +BF	0.35	0.67	0.58
FYM 25% + CM 75%	0.35	0.81	0.57
FYM 25% +CM 75% + BF	0.39	0.77	0.47
FYM 50% + CM 50%	0.35	0.86	0.52
FYM 50% + CM 50% + BF	0.36	0.78	0.48
FYM 75% + CM 25%	0.29	0.83	0.58
FYM 75% + CM 25% + BF	0.30	0.74	0.47
Mean	0.32	0.77	0.56

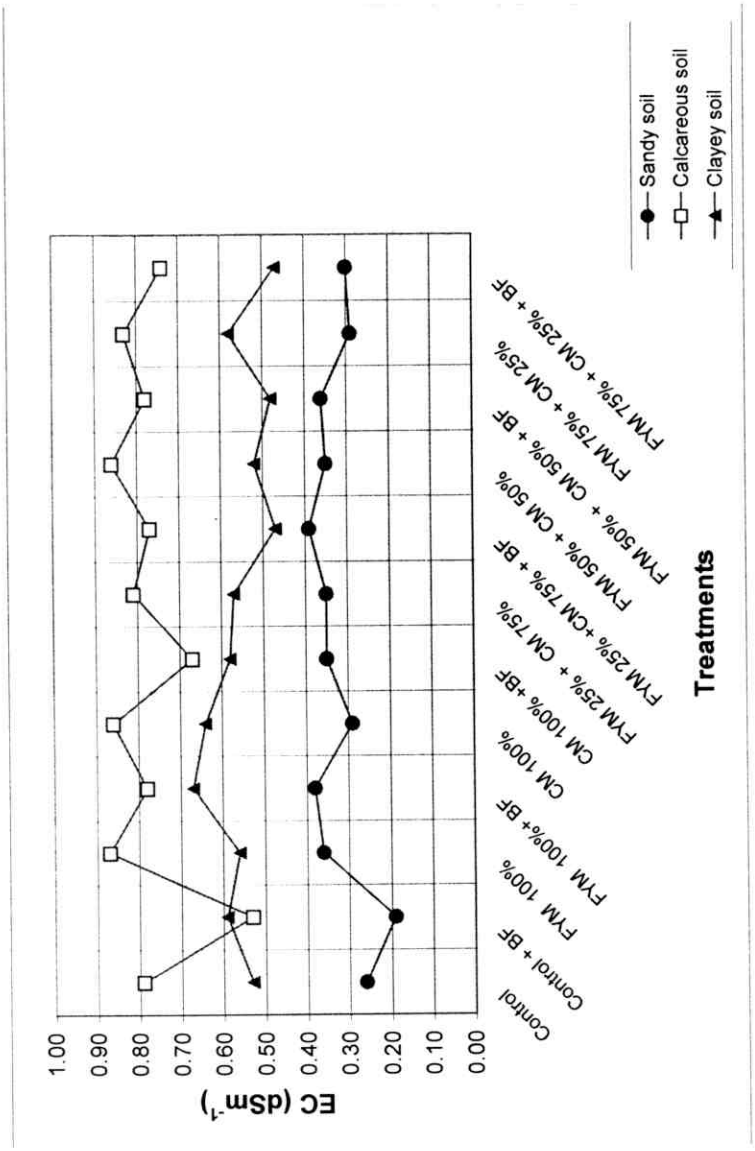

Fig. (23) Effect of organic manures on soil EC (dSm^{-1}) after rocket harvesting.