RESULTS & DISCUSSION

4- RESULTS AND DISCUSSION

The availability of phosphorus in two soils, differing in their properties, was investigated with respect to the effects due to nitrogen forms and N-serve (Exp. I), soil moisture content and rate of N fertilization (Exp.II) and Organic residues application(Exp. III).

The indices determined were dry matter yield, plant P concentration and P uptake as well as soil available P.

The results obtained are presented and discussed separately for each experiment.

4.1. Experiment I

This experiment deals with the effects of nitrogen form and nitrification inhibitor (N-serve) on dry matter yield of soybean plants, plant P concentration, P-uptake and soil available phosphorus.

4.1.1. Effect of nitrogen form and nitrification inhibitor (N-serve) on the dry matter yield of soybean plants

The data obtained on dry matter yield of soybean plants yielded from both soil samples, Moshtohor (clay) and Meet-kinana (sandy loam) are presented in table (3) and depicted in Fig. (1).

Moshtohor soil: The application of nitrogen forms as $(NH_4)_2SO_4$, KNO_3 and urea, in absence of N-serve, increased the dry matter yield by 23, 20, and 26% over control treatment (N_oV_o), respectively. In presence of N-serve, these N sources behaved slightly different and increased the yield by 21, 23, and 20%, respectively as compared to N_oV_o treatments. However, variations due to N-serve and nitrogen on the dry matter yield were not significant.

In this respect, noteworthy to mention that, many confirmation results were obtained. Stephan and Waid (1963) found that, urea and NH_4NO_3 at lower rates of application gave similar yields of maize. At higher rates, yields from urea were generally less than NH_4NO_3. Steineck (1967) reported that, dry matter yield was higher with NO_3-N than with NH_4-N. Tsvetkava (1968) stated that, urea dnd NH_4NO_3 were equally effective in increasing yield. On the other hand, Spratt and Gasser (1970) mentioned that, NH_4-N was better than NO_3-N for increasing wheat dry matter as compared to $(NH_4)_2SO_4$ and $Ca(NO_3)_2.4H_2O$.

The results reveal that, the addition of inhibitor (N-serve) in combination with $(NH_4)_2SO_4$ and urea sources resulted

Table (3): Effect of nitrogen form and nitrification inhibitor (N-serve) on dry matter yield of soybean plants (g/pot).

Soil sample	N-serve	Nitrogen form				Mean
		N_0	NH_4	NO_3	Urea	
Moshtohor	V_0	5.825	7.175	7.000	7.350	6.837
	V_1	6.575	7.050	7.150	6.975	6.937
Mean		6.200	7.113	7.075	7.163	6.887
Meet-Kinana	V_0	5.025	5.825	5.375	5.050	5.318
	V_1	5.375	5.275	5.650	5.675	5.493
Mean		5.200	5.550	5.513	5.363	5.406
Mean		5.700	6.331	6.293	6.262	6.147

L.S.D. 5% S 0.343; 1% S 0.499 **N N.S.** **V N.S.** **SXN N.S.** **SXV N.S.** **NXV N.S.**

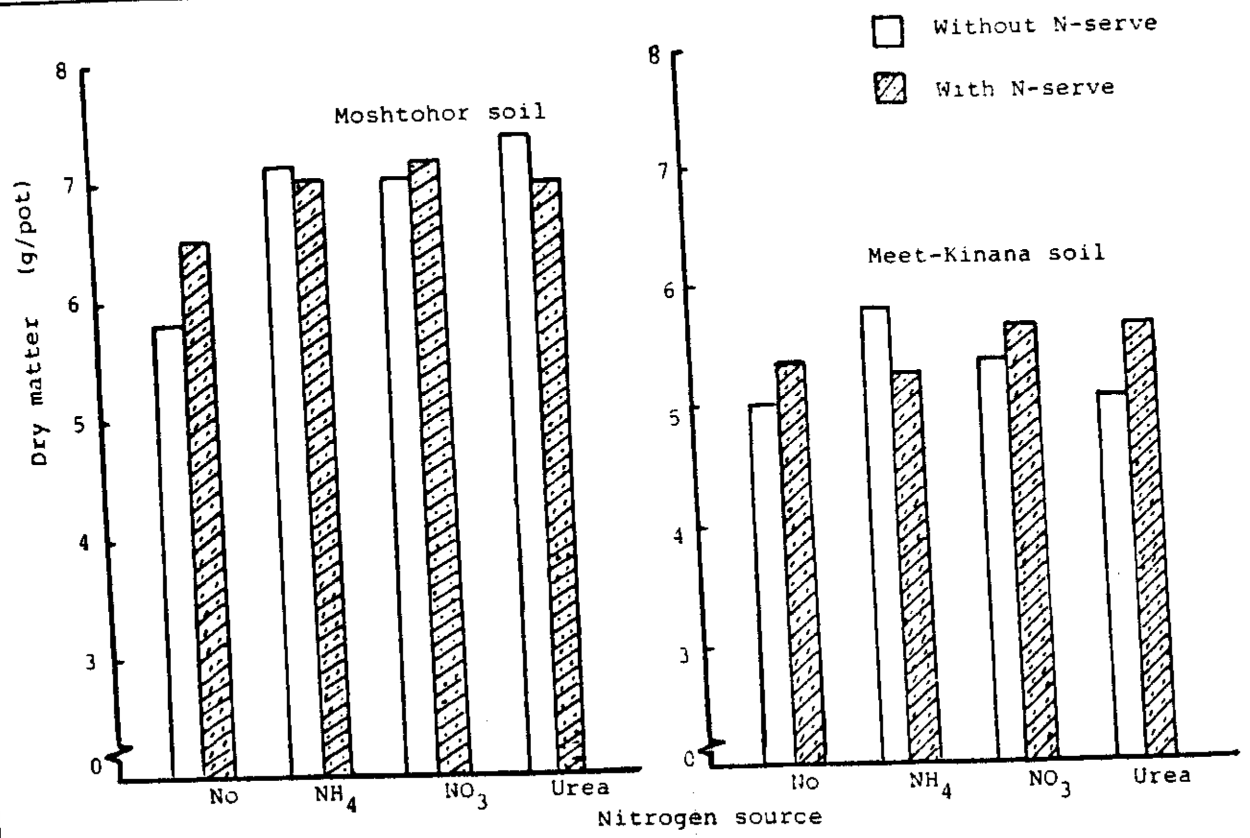

Fig. (1): Effect of nitrogen form and nitrification inhibitor (N-serve) on dry matter yield of soybean plants,(g/pot).

in a decrease in the dry matter yield of soybean plants, whereas, its application in combination with KNO_3 source, slightly increased the yield compared to their corresponding values with absence of N-serve. The single application of N-serve increased the dry matter yield by 13% as compared with control treatment (N_oV_o), but this effect was not significant.

Meet-Kinana soil: Data obtained indicate that, N-sources (ammonium, nitrate and urea) in absence of N-serve, increased the dry matter yield by 16, 6 and 0.5% over control, respectivley. In presence of N-serve, these forms increased the yield by 5, 12, and 13%, respectivley. Compared to these values, addition of N-serve in combination with KNO_3 and urea increased the dry matter yield, but N-serve + $(NH_4)_2SO_4$ decreased the yield. The single application of N-serve increased the dry matter yield by 7% over the control treatment (N_oV_o).

4.1.2. Effect of nitrogen form and nitrification inhibitor (N-serve) on P concentration in soybean plants

Table (4) and Fig. (2) show the effect of nitrogen form in the absence or presence of nitrification inhibitor (N-serve) on P-concentration in soybean plants.

Results obtained revealed that, nitrogen forms and

Table (4) : Effect of nitrogen form and nitrifiation inhibtor (N-serve) on P concentration in soybean plants, (ug P / g plant).

Soil Sample	N-seve	Nitrogen form N_0	NH_4	NO_3	Urea	Mean
Moshtohor	V_0	1103	1527	1463	1565	1396
	V_1	1255	1750	1480	1545	1508
Mean		1179	1639	1472	1555	1452
Meet-Kinana	V_0	540	865	795	873	768
	V_1	965	947	973	1032	912
Mean		753	906	884	953	840
Mean		898	1272	1178	1254	1146
L.S.D. 5%	S 56	N 79	V 56		SXN N.S.	SXV N.S.
L.S.D. 1%	S 75	N 106	V 75			
	NXV N.S.					

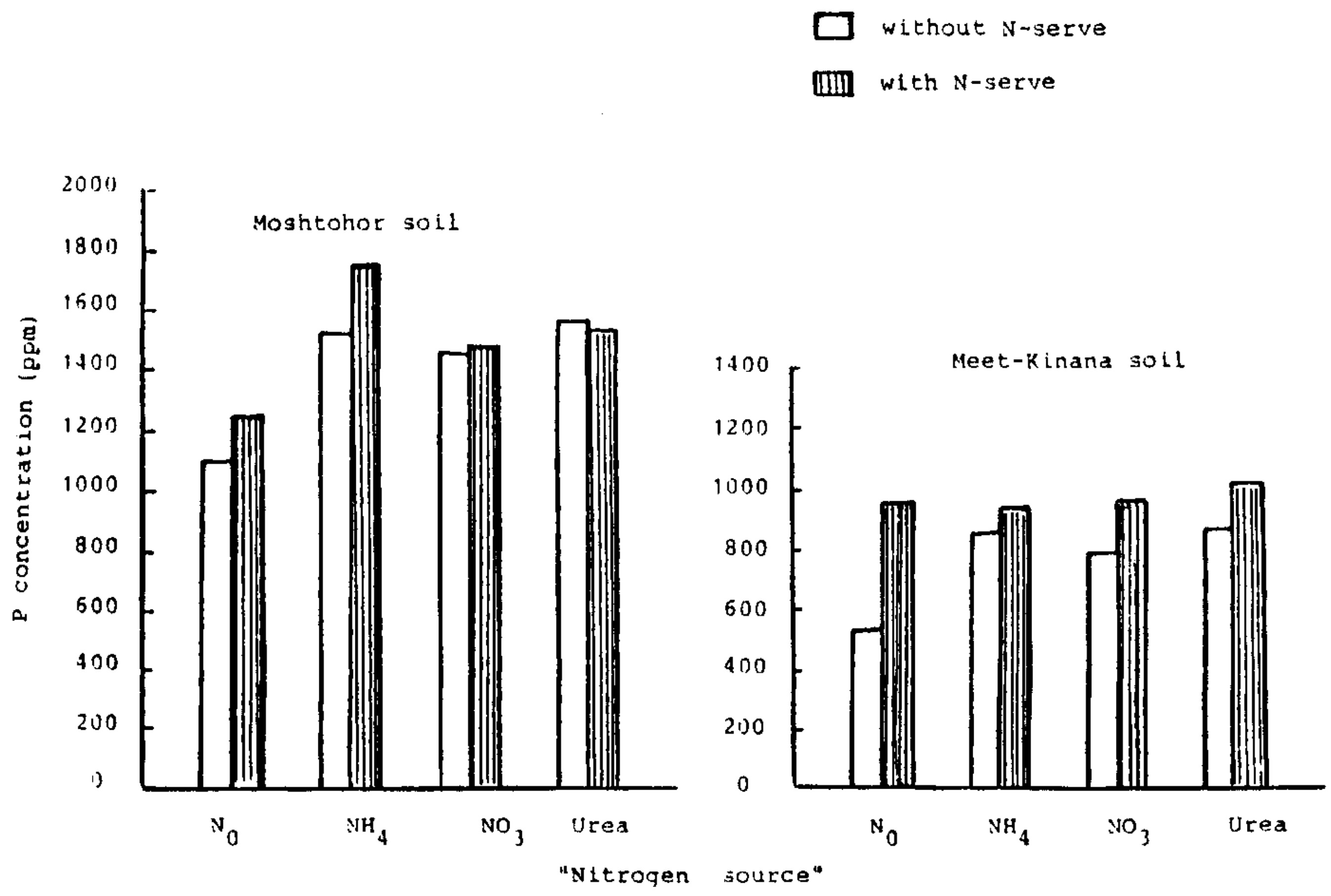

Fig (2): Effect of nitrogen form and nitrification inhibitor (N-serve) on P concentration in soybean plants, ppm.

nitrification inhibitor (N-serve) significantly increased the P concentration in soybean plants.

<u>Moshtohor soil:</u> Addition of N sources (NH_4^+ , NO_3^- and amide-N) in absence of N-serve, significantly increased P concentration in soybean plants by 38, 33 and 42%, respectively. In presence of N-serve, these forms (NH_4^+, NO_3^- and urea) increased P conc. by 59, 34, and 40%, respectively, as compared to the control treatment (N_oV_o).

Generally, data obtained revealed that, P concentration in soybean plants corresponding to different forms can be arranged as follows: Ammonium or urea > nitrate.

These results are in close agreement with those reported by Rennie and Soper (1958) who concluded that NH_4^+ ion appears to be the dominant factor in P utilization by plants as it indirectly influences the plant's ability to take up P, rather than altering in any way the availability of applied P fertilizer. Also, Riley and Barber (1971) showed that, NH_4-fertilized soybean absorbed more P and had a higher P-concentration than NO_3-fertilized soybean. They suggested that, the increased availability of soil P where NH_4^+ was used is mainly due to the effect of the N-source on the pH of the rhizosphere zone in soil. Moreover, Yousef (1972) obtained similar results.

Regarding the effect of nitrification inhibitor (N-serve) on soybean plants, data obtained showed significant increase in P concentration due to the addition of N-serve either solely or in combination with NH_4^+ source. However, insignificant effect was obtained with urea source compared to their corresponding values with absence of N-serve. The single application of N-serve resulted in an increase in P concentration in soybean plant by 14% as compared with control treatment (N_oV_o).

<u>Meet-Kinana soil</u>: Generally, the addition of nitrogen forms (NH_4^+ , NO_3^- and amide-N) yielded increases in P concentration in soybean plants by 60, 47, and 62%, respectively. In presence of N-serve the N-forms used, increased the P concentration in soybean plants by 75, 80, and 91% , respectively, as compared to the control treatment (N_oV_o).

Generally, data indicate that, P concentration in soybean plants was positively affected with the different N forms according to this descending order; urea > ammonium > nitrate.

Addition of nitrification inhibitor (N-serve), either solely or in combination with N forms used (NH_4^+ , NO_3^- and amide-N) significantly increased P concentration in soybean plants. The application of N-serve, alone, increased P concentration in soybean plants by 79%, as compared to control treatment (N_oV_o).

In this regard, with both field and growth chamber tests, Spratt (1973) reported that, the use of nitrapyrin (N-serve) with ammonium and urea phosphate maintained greater levels of NH_4^+ in the soil and increased the percent P and P-uptake of vegetative wheat plants perior to heading, as compared to fertilizers applied in absence of inhibitor. It was referred by Baizhigitov et al. (1980) that the application of N with N-serve at sowing, increased the contents of N and P in plant especially during the early growth.

With respect to interaction of soils with the N-sources or with the N-serve, no significant variations were observed.

Finally, results obtained can be summarized as follows:

(1) Significant increases in P concentration in soybean plants were observed in both soils, Moshtohor and Meet-Kinana, with the use of different N sources $(NH_4)_2SO_4$, KNO_3 and urea) either in presence or absence of N-serve.

(2) Due to the lower fertility level and the limited buffering capacity of Meet-Kinana soil as compared to that of Moshtohor, the former soil showed higher relative response to the different N sources and to the application

of N-serve than did the latter soil with respect to both plant growth and P concentration.

(3) In Moshtohor soil, the ammonium form of N$(NH_4)_2SO_4$ was the most effective, while in Meet-Kinana soil,the amide-N form (urea) was superior.

(4) The highest P concentration in soybean plants (1750 ppm) was recorded in case of Moshtohor soil, with the treatment of $(NH_4)_2SO_4$ in presence of N-serve. However, the lowest P concentration in soybean plants (540 ppm) was observed with the control treatment (N_oV_o) of Meet-Kinana soil.

4.1.3. Effect of nitrogen form and nitrification inhibitor (N-serve) on P-uptake by soybean plants.

Data in Table (5) and Fig. (3) show the effect of N form on P-uptake in presence or absence of nitrification inhibitor (N-serve).

Results obtained indicate that, the effect of nitrogen form on P-uptake was highly significant. Considerable differences in P-uptake by plants between Moshtohor (Clay textured) and Meet-Kinana (sandy loam) soils were observed and might be attributed to the different physical and chemical properties of these two soils.

Table (5) : Effeet of nitrogen form and nitrification inhibitor (N-serve) on P uptake by soybean plants (mg P / pot) .

Soil sample	N-serve	Nitrogen form				Mean
		N_0	NH_4	NO_3	Urea	
Moshtohor	V_0	6.433	10.967	10.248	11.513	9.790
	V_1	8.263	12.348	10.615	10.763	10.497
Mean		7.348	11.658	10.432	11.138	10.144
Meet-Kinana	V_0	2.720	5.075	4.295	4.395	4.121
	V_1	3.740	4.980	5.590	5.908	5.055
Mean		3.230	5.028	4.943	5.152	4.588
Mean		5.289	8.343	7.687	8.145	7.366

L.S.D. 5% / 1%: S 0.667 / 0.891; N 0.943 / 1.260; V 0.667 / 0.891; SXN N.S.; SXV N.S.; NXV N.S.

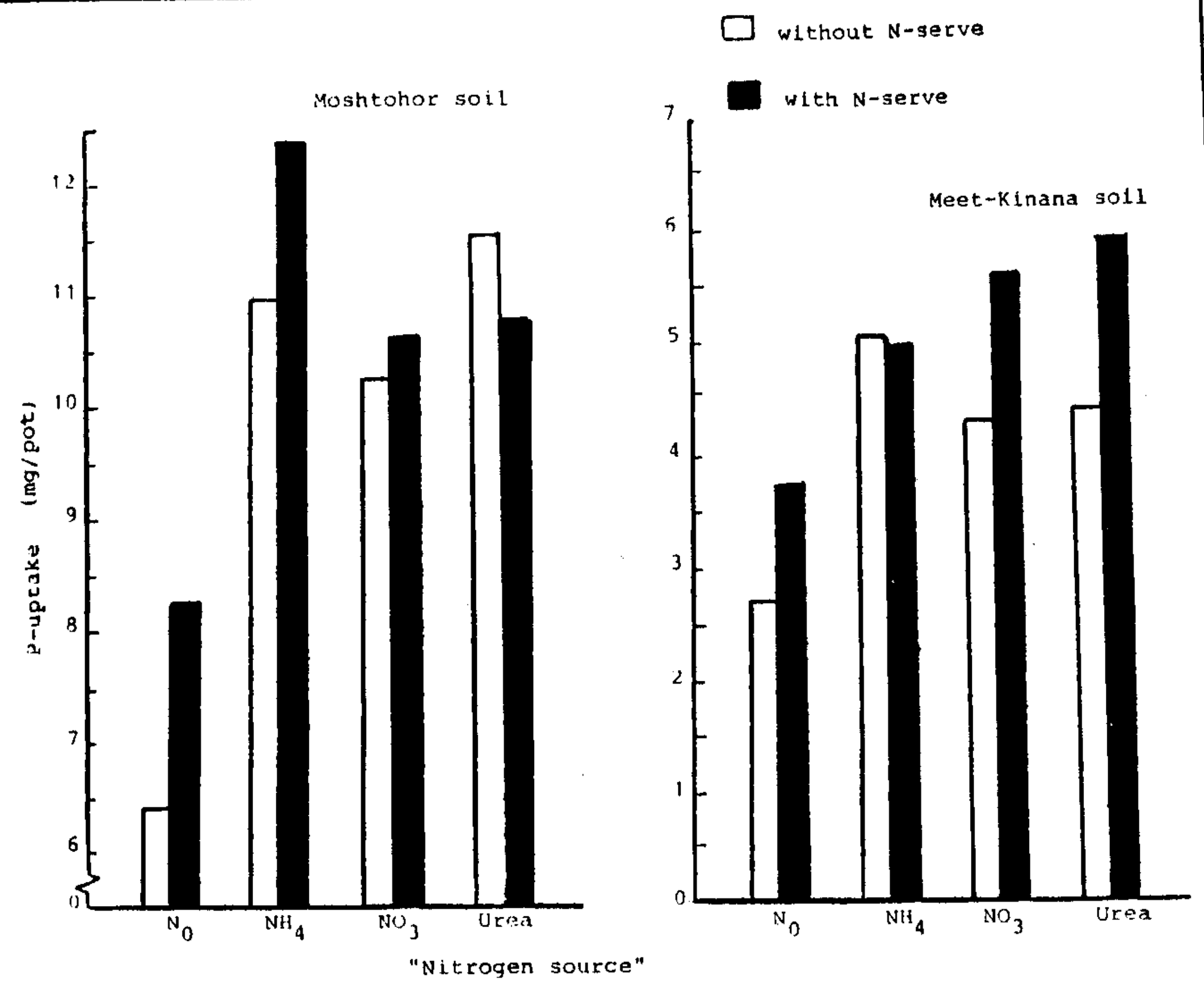

Fig. (3): Effect of nitrogen form and nitrification inhibitor (N-serve) on P uptake by soybean plants,(mg P/pot).

<u>Moshtohor soil:</u> In respect to the effect of N form on total P-uptake, ammonium source was superior to nitrate in stimulating P-uptake.

Addition of N sources $(NH_4)_2SO_4$, KNO_3, and urea), in the absence of N-serve, significantly increased P-uptake by soybean plants by 70, 59 and 79%, respectively. In presence of the nitrification inhibitor (N-serve), the corresponding increases were; 92, 65, and 67%, respectively.

Generally, data obtained show that the values of total P-uptake corresponding to different forms could be arranged as follows: Ammonium or urea > nitrate.

Leonce and Miller (1966) found that, ammonium form had a specific influence on the transfer of P across the root symplast. Also, the latter behaviour, accoring to Riley and Barber (1969), could be attributed to the external effect of the medium that may result in changes in pH around the root surface and adjacent soil. Moreover, Miller <u>et al</u>. (1970) obtained similar results.

Rennie and Soper (1958) obtained a close relationship between the high absorption of NH_4^+ ions and the increased uptake of fertilizer P and concluded that, rapid ammonium-ion absorption appears to be accompanied or followed by enhanced P absorption when both ions are closely associated in the fertilizer band. Grunes *et al*. (1958) and Grunes (1959), attributed such effect of N form on P uptake to the physiological effect of ammonium sulphate that increases the availability of P in both soils and fertilizers.

According to the previous discussion, it may be concluded that, ammonium ion was absorbed easier or faster than nitrate and amide nitrogen . Ammonium may increase the dissociation rate of the P carrier complex at the xylem. The above hypothesis may explain the highest uptake of P in case of association with the ammonium N form as compared with the other N forms.

Concerning, the effect of nitrification inhibitor (N-serve), significant increase in P-uptake was observed due to its application either solely or in combination with NH_4 source. However, no significant effects could be obtained with KNO_3 and urea sources. The single application of N-serve increased P-uptake by 28% as compared with the control treatment (N_oV_o).

Meet-Kinana soil: Addition of N-sources ($(NH_4)_2SO_4$, KNO_3 and urea), significantly increased P-uptake by soybean plants by 87, 58 and 62%, respectively. In presence of N-serve, the corresponding increases were 83,106, and 117%, respectively.

In general, data indicated that the values of P-uptake corresponding to different N forms could be arranged as follows: Urea > Ammonium > nitrate.

Addition of nitrification inhibitor (N-serve) significantly stimulated P-uptake when in combination with NO_3 and urea sources, but it was not effective with the $(NH_4)_2SO_4$ source. The single application of N-serve increased P-uptake by 38% as compared to control treatment (N_oV_o).

With respect to the interaction of the soils with the N sources (S x N) or with the N-serve (S x V) no significant variations were revealed.

According to the aforementioned data, the most important effects on P uptake due to N forms and N-serve could be summarized as follows:

1) The different N sources ($(NH_4)_2SO_4$, KNO_3 and urea) significantly enhanced P-uptake by soybean plants in both Moshtohor and Meet-Kinana soils, either in presence or absence of the nitrification inhibitor (N-serve).

2) The N-serve application significantly affect the P uptake by soybean plants in Moshtohor soil treated with the ammoniacal fertilizer ($(NH_4)_2SO_4$) and Meet-Kinana soil treated with urea and KNO_3.

3) In Moshtohor soil, the ammonium form of $N((NH_4)_2.SO_4$ was

generally superior, while in Meet-Kinana soil, the amide form (urea) was more superior.

4) The highest P uptake (12.35 mg/pot) was yielded from Moshtohor soil with application of $(NH_4)_2SO_4$, in presence of N-serve, while the lowest P uptake (2.72 mg/pot) was yielded from Meet-Kinana soil with unfertilized treatment (N_oV_o) in absence of N-serve.

4.1.4 Effect of nitrogen form and nitrification inhibitor (N-serve) on the availability of soil P.

Data indicating the effect of N form on the availability of soil P, in presence and absence of nitrification inhibitor (N-serve), are presented in table (6) and Fig.(4).

Data reveal that, the availability of soil P was significantly increased by the addition of N forms (NH_4^+ , NO_3^- and amide-N) in presence or absence of N-serve, but in different modes with respect to the two soils investigated.

Moshtohor soil: Application of N forms (NH_4^+, NO_3^- , and amide-N), in absence of N-serve, increased the availability of soil P by 15, 9, and 17%, respectively, whereas in presence of N-serve these N forms increased soil P availability by 29 10, and 31%, respectively, as compared to the control treatment (N_oV_o)

Table (6) : Soil available phosphorus as affected by nitrogen form and nitrification inhibitor (N.serve), (ug P /g soil).

Soil sample	N-serve	No	NH_4	NO_3	Urea	Mean
		Nitrogen form				
Moshtohor	V_0	75.950	87.150	82.740	88.690	83.633
	V	84.350	98.000	83.300	99.750	91.350
Mean		80.150	92.575	83.020	94.220	87.492
Meet-Kinana	V_0	36.750	58.940	49.000	47.600	48.073
	V_1	45.500	60.900	54.740	54.250	53.848
Mean		41.125	59.920	51.870	50.925	50.961
Mean		60.638	76.248	67.445	72.273	69.227

L.S.D. 5% S $^{2.496}_{3.333}$ N $^{3.530}_{4.714}$ V $^{2.496}_{3.333}$ SXN $^{4.992}_{6.667}$

SXV N.S. VXN N.S.

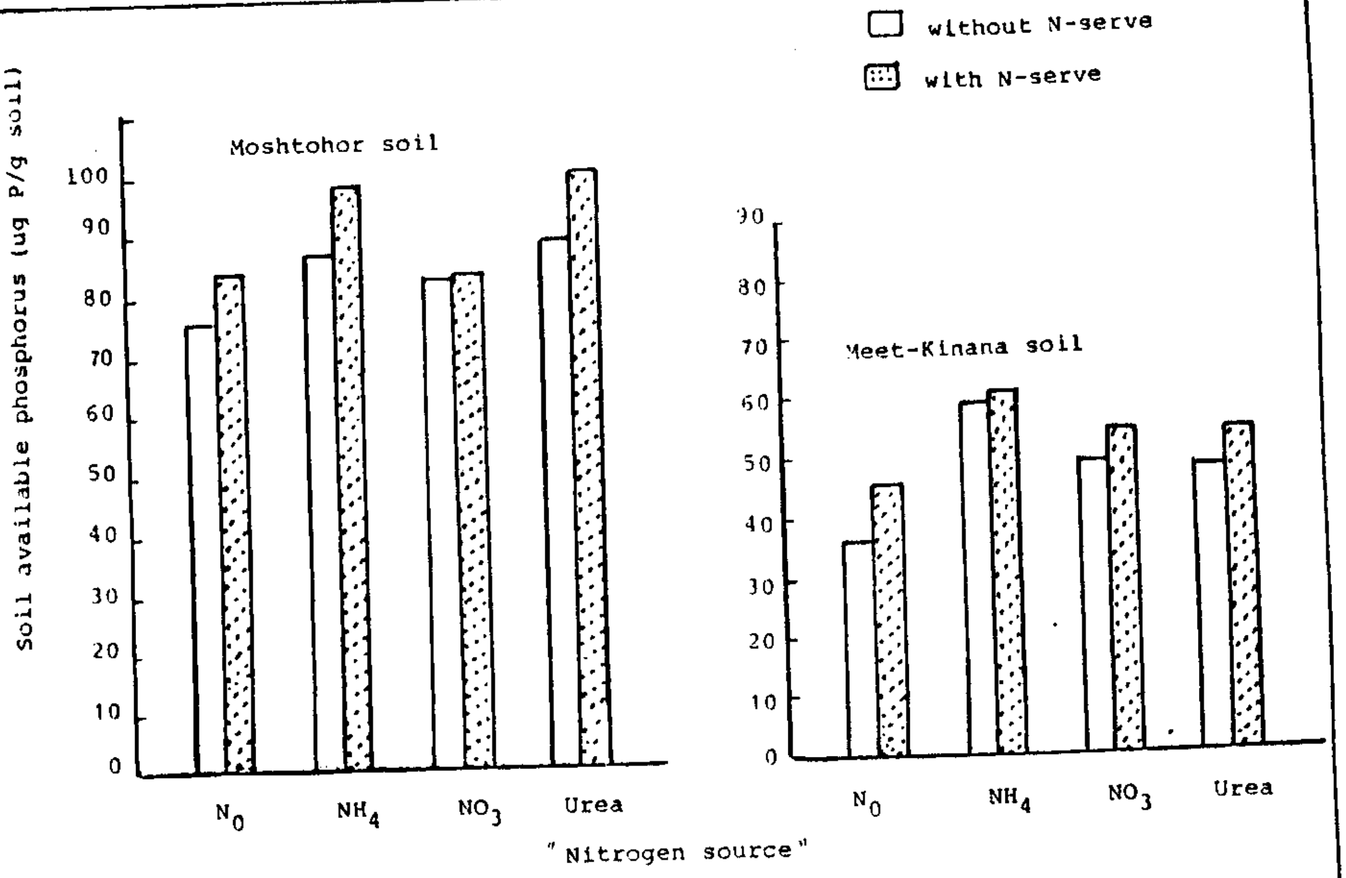

Fig (4) Soil available phosphorus as affected by nitrogen form and nitrification inhibitor (N-serve), (ug P/g soil).

Data obtained indicate that, soil content of available P corresponding to different N forms increased in the descending order; urea > ammonium > nitrate

Regarding the effect of nitrification inhibitor (N-serve) on the availability of soil P, data obtained revealed that, soil P availability was significantly increased by the addition of N-serve solely or in combination with N forms (NH_4^+, and amide-N). The single application of N-serve increased soil P availability by 11% over control.

<u>Meet-Kinana soil</u> : In absence of N-serve, application of N forms (NH_4^+, NO_3^- and amide-N) increased soil P availability by 60, 33, and 30%, respectively. In presence of N-serve, these N forms increased soil P availability by 29, 10, and 31%, respectively as compared to control (N_0V_0).

This ability was found to be as follows: Ammonium > nitrate > urea.

Application of nitrification inhibitor (N-serve)alone or in combination of KNO_3 and urea sources, significantly increased the availability of soil P. The single application of N-serve increased soil P availability by 24%, as compared with control (N_oV_o).

Finally, these results can be summarized as follows:

1) Significant increases in soil available P were observed in both soils under investigation with the use of different

N forms $(NH_4)_2SO_4$ and urea in Moshtohor soil and KNO_3 and urea in Meet-kinana soil either in presence or absence of N-serve.

2) Addition of N-serve solely or in combination with N forms significantly increased the soil P availability except for the NO_3 form (KNO_3) in Moshtohor soil and NH_4 form $(NH_4)_2SO_4$ in Meet-Kinana soil, where these obtained increases were not significant .

3) In Moshtohor soil, the amide form(urea) was most effective while in Meet-Kinana soil, the ammonium form showed more superiority.

4) The highest content of soil available P (99.8 µg P/g soil) was recorded by Moshtohor soil treated with urea in presence of N-serve, whereas the lowest P-concentration in soils (36.8 µg P/g soil) was observed from unfertilized treatment (N_oV_o) of Meet-Kinana soil, in absence of N-serve.

Fig. (5) show highly significant correlation ($r = 0.8610^{**}$) between the soil content of available P and total P uptaken by soybean plants.

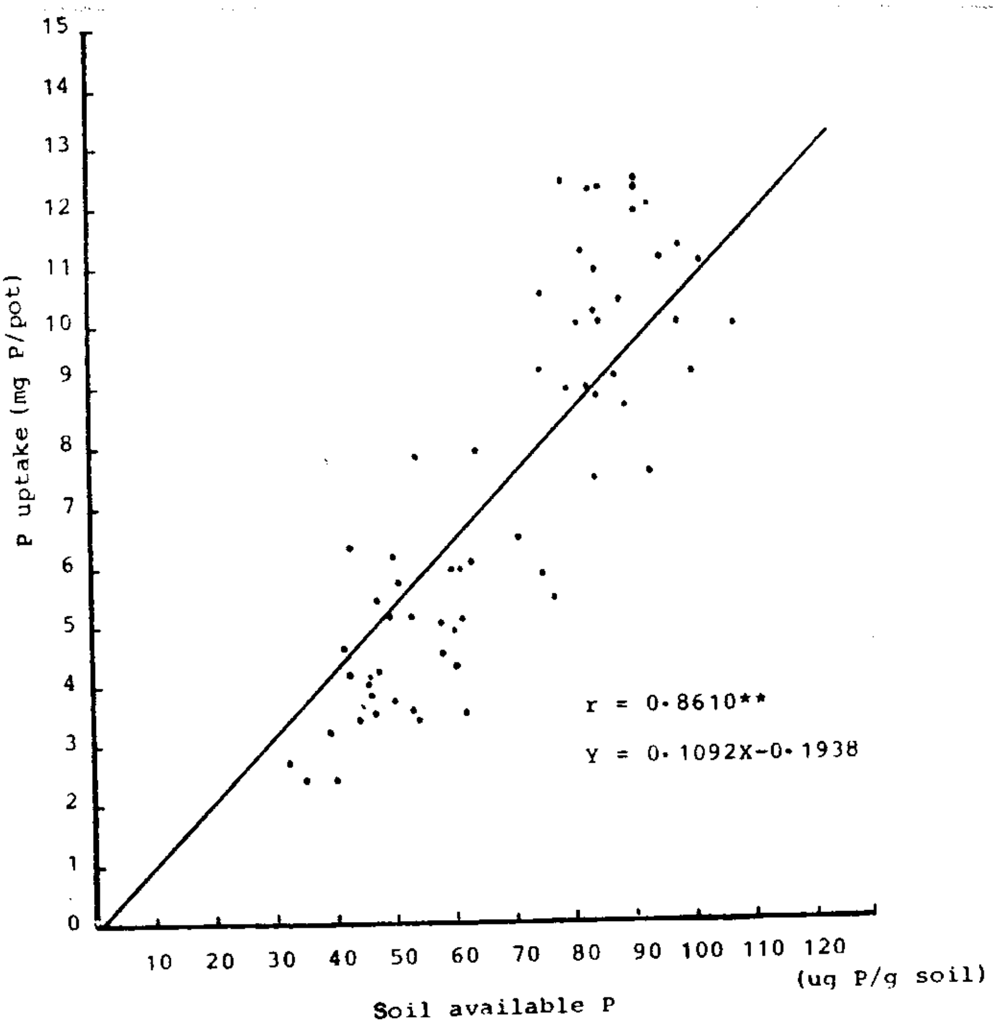

Fig (5): The relationship between soil available P(ug P/g soil) and P-uptake by soybean plant (mg P/pot).

4.2. Experiment II

4.2.1. Effect of soil moisture content and rate of nitrogen fertilization on dry matter yield of barley plants.

The dry matter yield of above ground parts of barley plants as affected by soil moisture content and rate of N fertilization is presented in table (7) and depicted in Fig. (6).

In this experiment, four levels of soil moisture content namely; 55, 70, 85 and 100% of the maximum available moisture (MAM) were studied. It is referred to these levels in the text as M_1, M_2, M_3 and M_4, respectively.

The N fertilizer added as $(NH_4)_2.SO_4$ at four rates namely; $O(N_o)$, $25(N_1)$, $50(N_2)$ and 75 ppm N (N_3) was investigated.

4.2.1.1. Effect of soil moisture content on dry matter yield

Results obtained reveal that, the dry matter yield of barely plants was significantly increased by increasing the soil moisture content in both soils from 55 % up to 100%

Table (7) : Effect of soil moisture content and rate of N-fertilization on dry matter yield of barley plants (g / pot) .

Soil sample	Nitrogen rate	Soil moisture content M_1	M_2	M_3	M_4	Mean
Moshtohor	N_0	5.793	7.753	8.960	8.286	7.698
	N_1	7.010	9.526	10.566	10.880	9.496
	N_2	9.093	10.690	11.356	11.000	10.535
	N_3	10.040	10.993	13.556	11.063	11.413
Mean		7.984	9.741	11.110	10.307	9.786
Meet-Kinana	N_0	3.743	4.203	4.543	5.873	4.591
	N_1	4.550	6.000	6.890	7.460	6.225
	N_2	6.456	7.783	7.893	8.393	7.631
	N_3	7.163	7.706	7.886	9.520	8.069
Mean		5.478	6.423	6.803	7.812	6.629
Mean		6.731	8.082	8.956	9.059	8.208

L.S.D.	M	N	S	SXM	SXN
5%	0.6287	0.6287	0.445	0.889	0.889
1%	0.8360	0.8360	0.591	1.182	1.182

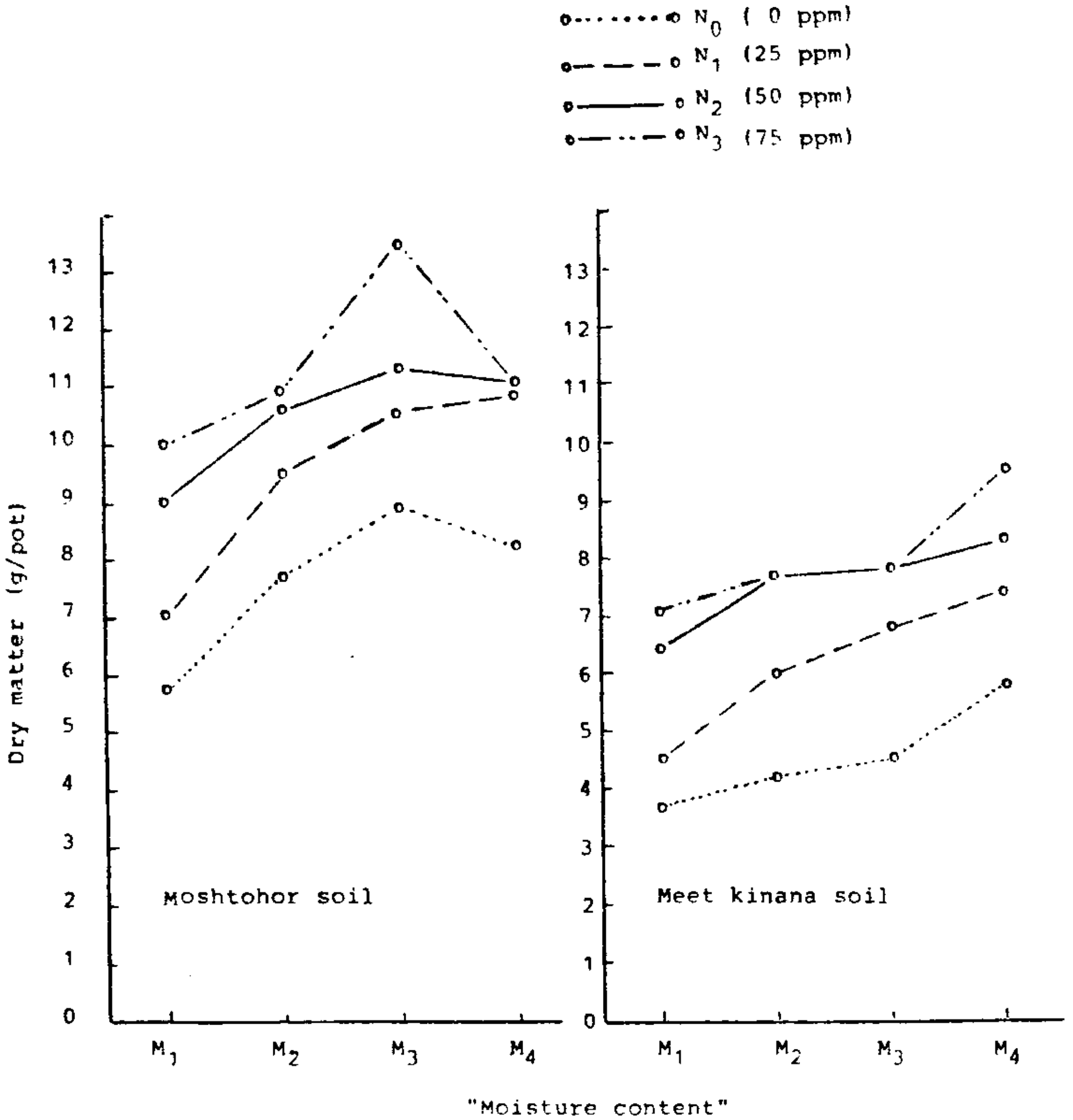

Fig (6) Effect of soil moisture content and rate of N fertilization on dry matter yield of barley.

of maximum available moisture (MAM).

Moshtohor soil: Results indicate that, the dry matter yield of barley plants was significantly and gradually increased by increasing the soil moisture content from 55% up to 85% of the MAM

The increases in the dry matter yield due to progressive increases in soil moisture from M_2 to M_4 as percentage increase over that of M_1 in the presence of the different N levels showed the following pattern:

At N_o ; 33, 54 and 43 %,

At N_1 ; 35, 50 and 55 %,

At N_2 ; 17, 24 and 20 %,

At N_3 , 9, 35 and 10%

Noteworthy to mention that the dry matter yield is affected by soil moisture content in a unique pattern when the soil was fertilized with N_2 or N_3 nitrogen rate.

The increase in the dry matter yield caused by increasing the moisture content from 55 to 70% of the MAM was much greater than that caused by increasing the moisture content from 70 to 85% of the MAM.

The stimulative effect on plant growth, due to increasing the soil moisture content was reported by many investigators such as, Stevenson and Boersma (1964), Abdou _et al_. (1969) and Day and Thompson (1975).

The sharp decrease in the values of dry matter yield observed with increasing the soil moisture content from 85% to 100% of the MAM could be attributed to the permanent unfavorable distribution of air: water balance produced from excess water at 100% of the MAM. Adequate aeration is very essential for the development of healthy roots and vigorous plants of most species, and indequate aeration may limit the growth of adventitous roots. The heavy textured soil of Moshtohor (52.6% clay) gives confirmation to such explanation.

<u>Meet kinana Soil:</u> Data obtained reveal that, the dry matter yield of barley plants was significantly and progressively increased by increasing the soil moisture content within the available moisture range. These results are presented in more details and discussed as follows:

At N_o; 12, 21 and 56%,

At N_1; 31, 51 and 63%,

At N_2; 20, 22 and 30 %,

At N_3; 7, 10 and 32. for M_2, M_3, M_4 as percentage increase over those of the M_1 moisture supply, respectively.

It is quite evident that, soil moisture showed its highest effect on dry matter yield when nitrogen was applied at a rate of 75 ppm N(N_3).

The increase yielded by increasing the soil moisture content from 55 to 70%of the MAM averaged 17% and was higher than that caused by increasing moisture content from 70 to 85% of the MAM (6%) and by increasing the moisture content from 85 to 100 of the MAM (15%).

4.2.1.2. Effect of nitrogen fertilization on dry matter yield:

Data obtained indicate that, the dry matter yield of barley plants was significantly increased by increasing the rate of added N. This result was obvious with both soils.

Moshtohor soil: Results reveal that, the dry matter yield was positively increased by increasing the rate of nitrogen fertilization up to 75 ppm N (N_3), where the increase produced with the first rate of added N (25 ppm) was greater than that caused by the higher levels; N_2 and N_3. The percent increases observed due to increased rates of added N can be listed in the following:

At M_1; 21, 56 and 73%,

At M_2; 22, 37 and 41%,

At M_3; 17, 26 and 51%,

At M_4; 31, 32, and 33%, for N_1, N_2 and N_3 as compared to the control treatment (N_o), respectively.

According to the above results, the different levels of moisture supply could be arranged according to their effect on dry matter yield of barley as follows; $M_3 > M_4 > M_2 > M_1$.

Finally, it could be profitable to refer that, the highest dry matter yield of barley plants (13.56 g/pot) was observed in Moshtohor soil and resulted with the combined treatment of M_3N_3, while the lowest dry matter yield (5.79g/pot) was recorded from M_1 N_o treatment.

<u>Meet-Kinana Soil:</u> Results reveal that, the dry matter yield of barley plants was significantly and consistently increased by increasing the rate of added N up to 75 ppm(N_3) level. The resulted increases due to increasing rates of added N can be summarized as follows:

At M_1; 21, 72, and 91 %,

At M_2; 42, 85 and 83%,

At M_3; 51, 73 and 73%,

At M_4; 27, 42 and 62% for N_1, N_2 and N_3 as percentage increase over that of the control treatment (N_o), respectively.

The increase in the dry matter yield observed by increasing N addition from N_o to N_1 (36%) was much higher than that due to increasing the N rate from N_1 to N_2(23%) or by increasing N rate from N_2 to N_3 (6%).

The levels of soil moisture content could be arranged according to their effect on dry matter yield in the order: $M_4 > M_3 > M_2 > M_1$.

Finally, commenting on the aforementioned presentation, the highest yield of barley plants (9.52 g/pot) was recorded in Meet-Kinana soil from the combined treatment N_4N_3, whereas the lowest yield (3.74 g/pot) was attained from M_1N_o treatment.

4.2.1.3. Dry matter yield as affected by interactions of soils with moisture content and rate of N fertilization:

Data obtained for interactions between different soils and both soil moisture levels and rate of N fertilization is presented in tables (7,8) and illustrated in Fig. (7).

The results show significant interaction between the soil itself(soil type) and the moisture content (SXM).The third level of soil moisture (85% of the MAM) was quite enough in Moshtohor soil; the maximum available moisture level was

Table (8): Effect of interaction between soil moisture content and rate of nitrogen fertilization on dry matter yield of barley plants (g/pot).

Nitrogen rate	Soil moisture content				Mean
	M_1	M_2	M_3	M_4	
N_0	4.768	5.978	6.752	7.079	6.144
N_1	5.780	7.763	8.728	9.170	7.860
N_2	7.775	9.237	9.625	9.697	9.083
N_3	8.602	9.349	10.721	10.292	9.741
Mean	6.731	8.082	8.956	9.059	8.207
L.S.D. 5%		1.258			
L.S.D. 1%		1.673			

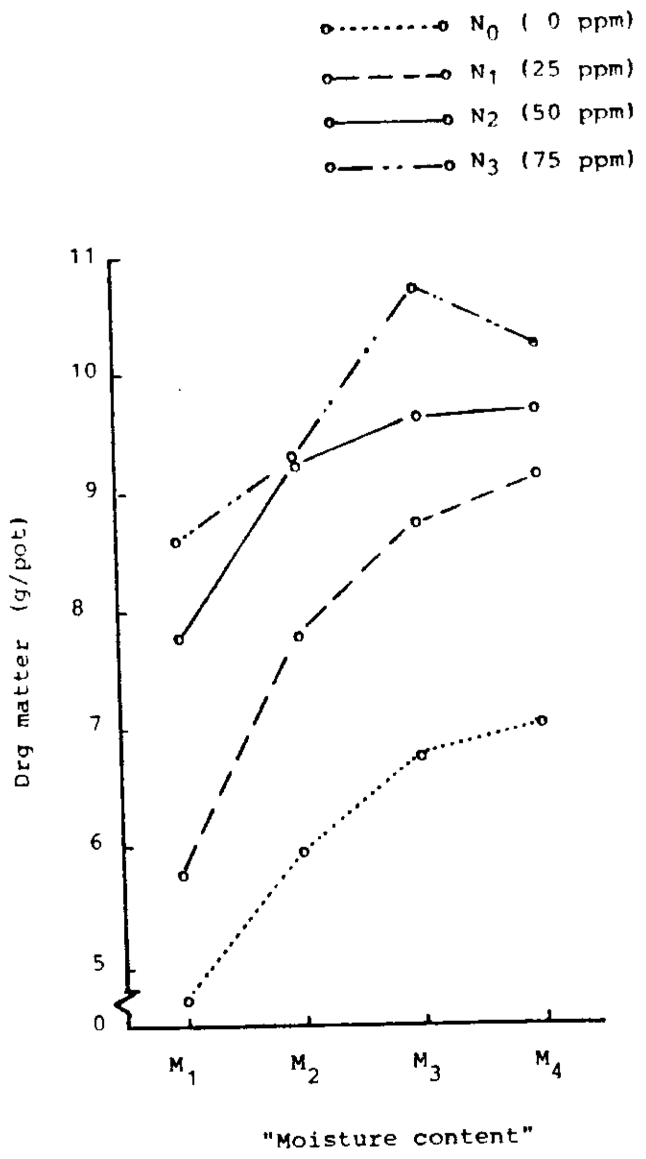

Fig.(7): Effect of interaction between soil moisture content and rate of N fertilization on dry matter yield of barley plants (g/pot).

required in Meet-Kinana soil in order to reach better yield. Noteworthy to refer that, the fine textured soil (like that of Moshtohor) are characterized with relatively higher capacities to retain moisture at higher levels as compared with the light textured soil (like Meet-Kinana).

In respect to the soil interaction with nitrogen rate (SXN), significant effects were also recorded, particularly in Meet-Kinana soil, where higher N supplementals seemed to be essential for obtaining higher dry matter yield of barley.

The interaction of soil moisture content with the N rate (M x N) either significantly, or even high significantly, affected the dry matter yield of barley grown on both soils investigated.

4.2.2. Effect of soil moisture content and rate of nitrogen fertilization on P concentration in barley plants.

The results of P concentration in barley plants as influenced by the soil moisture content and the rate of N fertilization are presented in table (9) and illustrated in Fig. (8).

3.2.2.1. Effect of soil moisture content on P concentration:

In Moshtohor soil; the results showed consistent and gradual increases in P concentration due to increasing content of soil moisture. This increasing trend was obvious in case of N fertilization at all rates but only up to M_3 (85% of MAM) where the yielded increase averaged 9 and 44 % for M_2 (70%) and M_3 (85% of the MAM) as compared to M_1(55% of MAM) moisture level, respectively. Increasing the soil moisture content of M_4 (100% MAM) reduced the P concentration in all the N treatments but did not affect the control treatment.

Such enhancing effect on P concentration could have arised mainly from increasing the rate of P diffusion resulted with the higher moisture content. It is well known that P diffusion, particularly in heavy textured soils, represents an important mechanism responsible for P absorption and utilization by plants, Mahtab et al.,(1972).

In Meet-Kinana soil: It is easy to detect that the values of P concentration were significantly increased with increasing the soil moisture content in both control and all N treatments. The resulted increase averaged 9, 20, and 33% for M_2 (70%) MAM, M_3 (85%) and M_4(100% of the MAM) as compared with M_1 (55%), respectively.

Nuttall (1976) mentioned that, P concentration in alfalfa herbage was significantly higher under low moisture tension (100 millibars) than high soil moisture tension (151 millibars).

4.2.2.2. Effect of nitrogen fertilization on P concentration:

Moshtohor soil: Data in table (9) and Fig. (8) reveal that, N fertilization significantly affected the P concentration in barley plants under all the levels of soil moisture content. The yielded increases averaged 22, 34, and 52% for N_1, N_2 and N_3, respectively as compared to N_o treatments. Grunes and Krantz (1958) mentioned that, the effect of N on increasing the P concentration in oats tops was due in part to increased root growth, especially of fine roots which were probably high in absorbing capacity per unit weight.

It is profitable to mention that, the highest P concentration in barley plants was resulted with the highest rate of applied N (N_3), when it was combined with soil moisture supply at the rate of 85% MAM (M_3) treatment. Noteworthy to remember, however, that this treatment reduced the maximum yield of dry matter that may give further support to consider this treatment as the most suitable one.

Meet-Kinana soil: The data obtained, indicate that, Table (9): Effect of soil moisture content and rate of N-fertilization on P concentration in barley plants (ug P/g)

Soil sample	Nitrogen rate	Soil moisture content M_1	M_2	M_3	M_4	Mean
Moshtohor	N_0	1174	1325	1505	1524	1382
	N_1	1372	1571	2178	1647	1692
	N_2	1581	1599	2196	2017	1848
	N_3	1714	1865	2518	2291	2097
Mean		1460	1589	2099	1869	1755
Meet-kinana	N_0	738	861	956	1031	896
	N_1	1012	1155	1439	1553	1289
	N_2	1420	1373	1581	1761	1533
	N_3	1496	1676	1647	1874	1673
Mean		1166	1266	1405	1554	1348
Mean		1313	1427	1752	1711	1552

L.S.D.	S	M	N	SXM	SXN
5%	72	101	101	143	N.S.
1%	95	135	135	191	

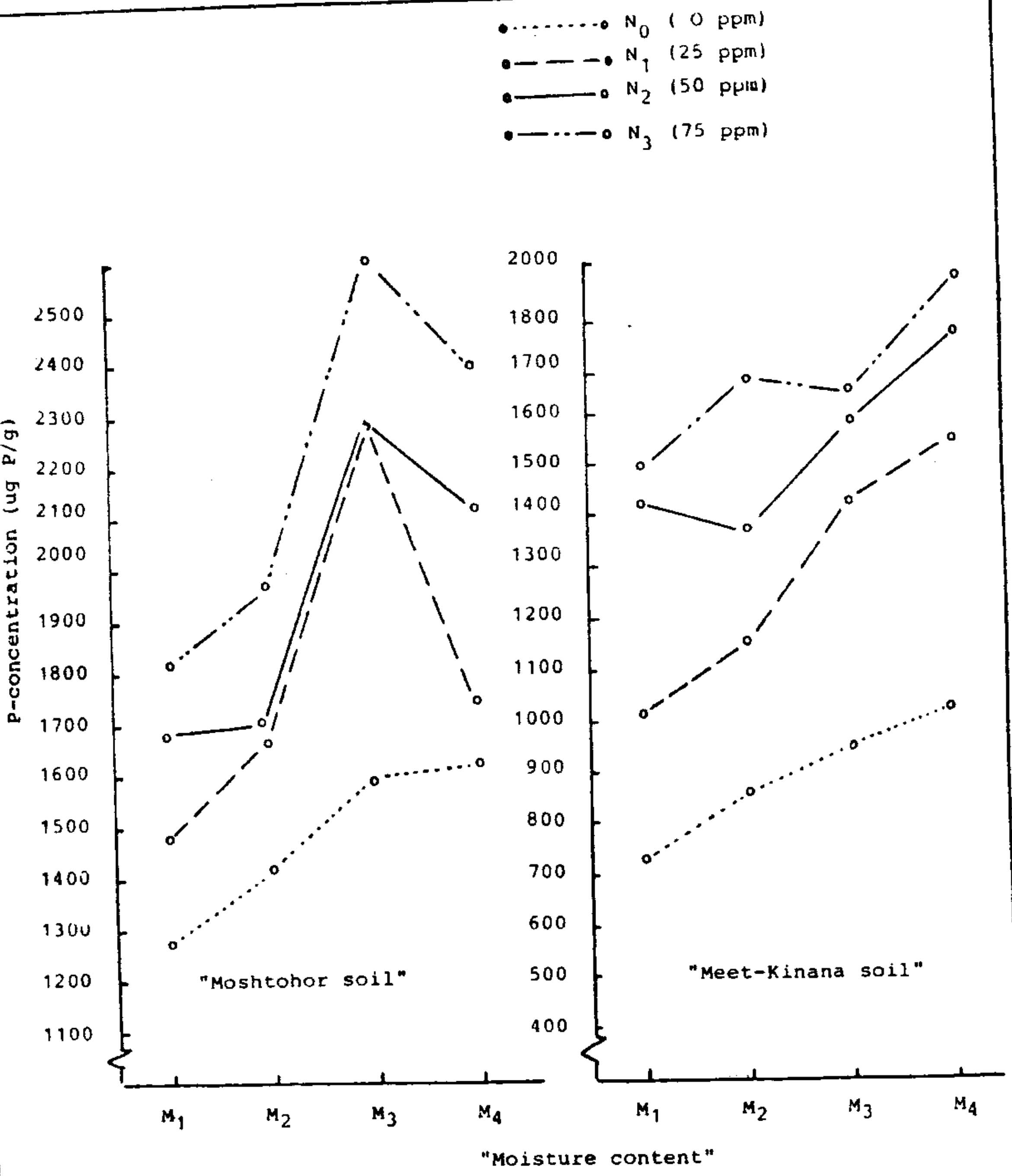

Fig (8) Effect of soil moisture content and rate of N fertilization on P concentration in barley plant.

N fertilization, in general, significantly increased the P concentration in barley plants under the different levels of soil moisture supply. The resulted increases in P concentration due to N fertilization averaged 44, 71 and 87 % for N_1, N_2 and N_3, as compared to N_o treatments, respectively.

Finally, it may be concluded that the M_4N_3 treatment was proved to be the most fruitful treatment either with respect to the highest productivity of dry matter or P concentration in barley plants, to remember that the highest productivity of plants is often combined with a good status or balance of nutrient contents.

4.2.2.3. Phosphorus concentration in baarley plants as affected by interactions of soils with moisture content and rate of N fertilization:

Significant interaction between soils and level of moisture supply (S x M), indicating that the highest effect of soil moisture was fulfilled in the heavy soil of Moshtohor with the third level of moisture content (85% of MAM) while higher moisture supplementals (100% of MAM) were more suitable for the light textured soil of Meet-Kinana, Tables (9 , 10) and Fig. (9).

4.2.3. Effect of soil moisture content and rate of nitrogen fertilization on P uptake by barley plants:

The data obtained for the effect of soil moisture content and rate of nitrogen fertilization on P uptake by

Table (10): Effect of interaction between soil moisture content and rate of nitrogen fertilization on P concentration in barley plants (ug P/g).

Nitrogen rate	Soil moisture content M_1	M_2	M_3	M_4	Mean
N_0	956	1093	1231	1278	1139
N_1	1192	1363	1809	1600	1491
N_2	1500	1486	1889	1889	1691
N_3	1605	1770	2083	2083	1885
Mean	1313	1427	1752	1712	1552
L.S.D. 5% 1%	N.S.				

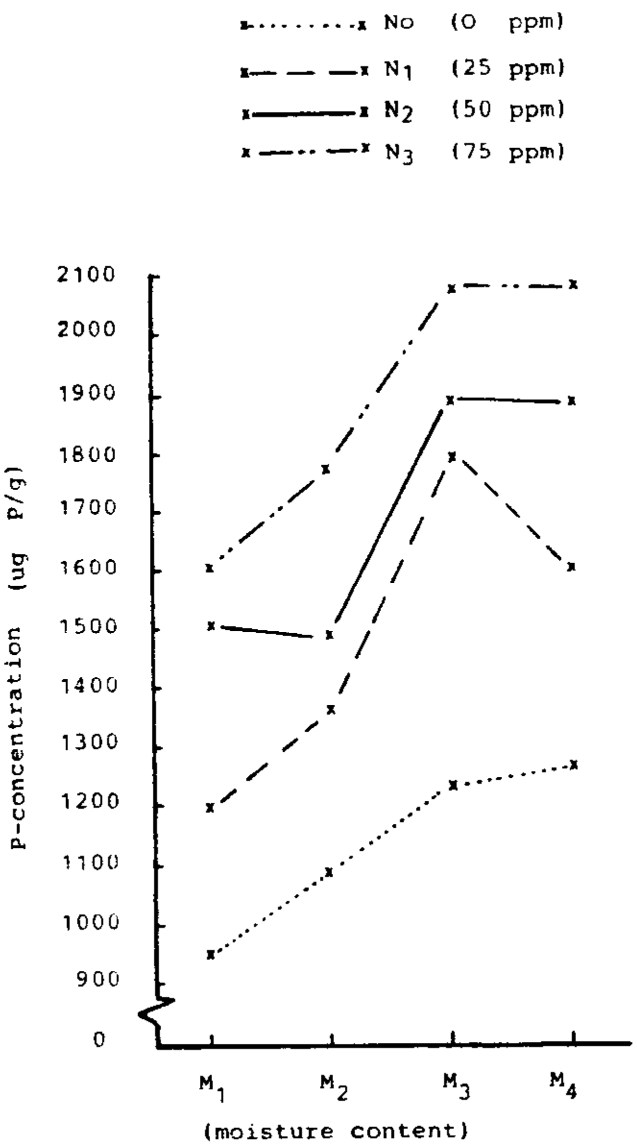

Fig (9) : Effect of interaction between soil moisture content and rate of N. fertilization on P-concentration in barley plant, (ug P/g).

barley plants is presented in table (11) and illustrated in Fig. (10).

4.2.3.1. <u>Effect of soil moisture content on P uptake:</u>

Results indicate that, increasing the soil moisture content significantly increased the P uptake by barley plants in the two soils under investigation.

<u>Moshtohor soil</u>: The increases in P uptake by barley plants due to progressive increases in soil moisture content from M_1 to M_2, M_3 and M_4 could be summarized as follows:

At N_o; 51, 98 and 84%,

At N_1; 57, 138 and 85%,

At N_2; 17, 71 and 53%,

At N_3, 15, 98, and 45%, for M_2, M_3 and M_4 as compared to M_1 moisture content, respectively.

Data obtained reveal that, the increase in P uptake by barley plants due to increasing the soil moisture content from 55 to 70% of the MAM was 29%, whereas increasing moisture content from 70 to 85% of the MAM yielded an increase in P uptake by 52%. A sharp decrease in P uptake was observed by increasing the soil moisture content up to 100% of the MAM, as oxygen diffusion seems to be minimized. These results reveal that the effect of soil moisture content on P uptake depends on the rate of added nitrogen.

In this regard, Metwally and Pollard (1959) found that, Table (11) : Effect of soil moisture content and rate of N-fertilization on P uptake by barley plants (mg P/ pot).

Soil sample	Nitrogen rate	Soil moisture content M_1	M_2	M_3	M_4	Mean
Moshtohor	N_0	6.818	10.311	13.525	12.590	10.811
	N_1	9.573	15.066	22.843	17.742	16.306
	N_2	14.490	17.091	24.867	22.213	19.665
	N_3	17.223	19.880	34.139	25.033	24.068
Mean		12.026	15.587	23.843	19.394	17.713
Meet-Kinana	N_0	2.740	3.593	4.383	6.031	4.186
	N_1	4.564	6.964	9.909	11.595	8.258
	N_2	9.189	10.830	12.323	14.727	11.767
	N_3	10.741	12.999	13.029	17.818	13.646
Mean		6.808	8.596	9.911	12.542	9.464
Mean		9.417	12.091	16.877	15.968	13.588

L.S.D.	S	M	N	SXM	SXN
5%	0.808	1.143	1.143	1.617	1.617
1%	1.075	1.520	1.520	2.150	2.150

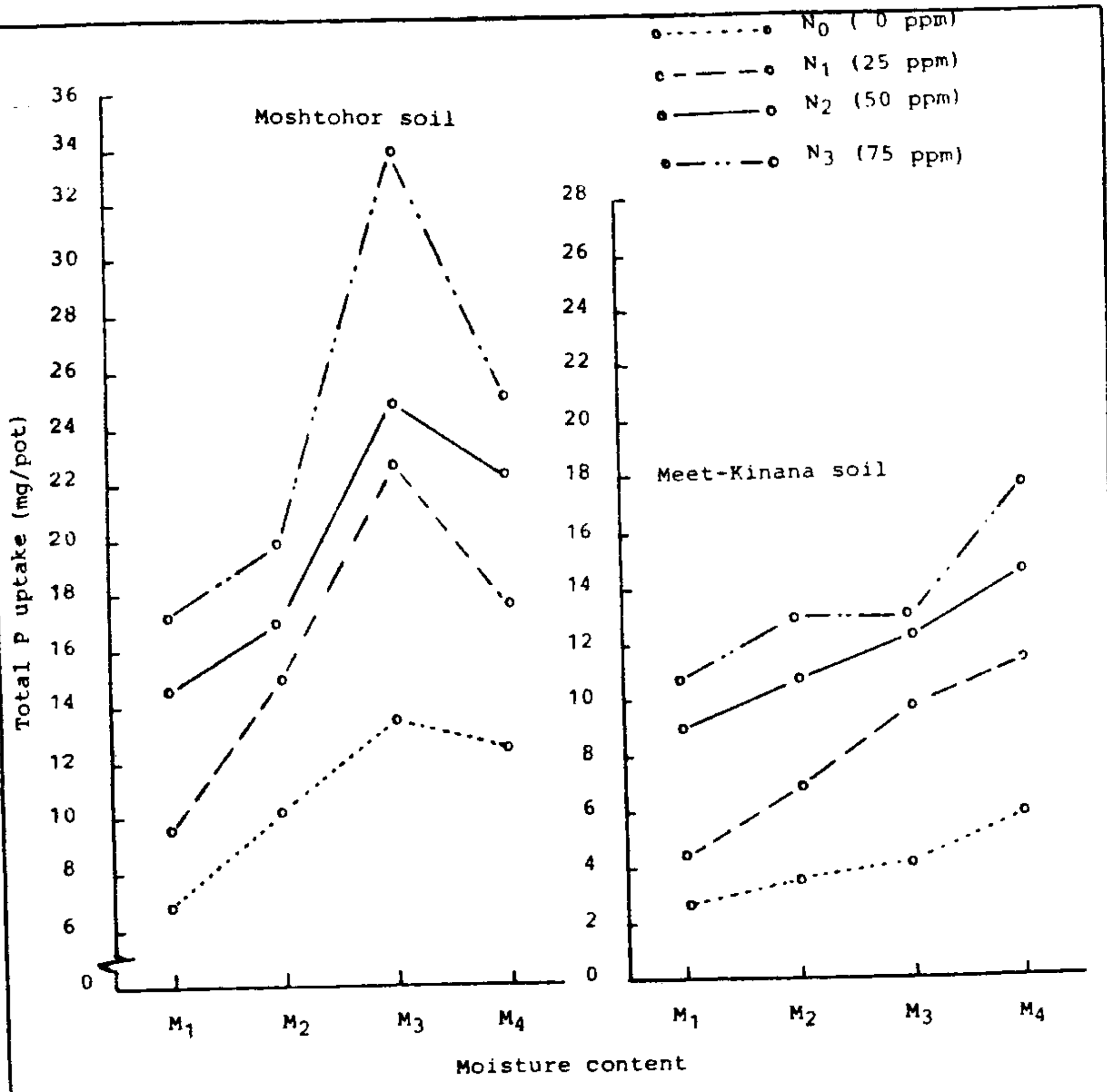

Fig. (10): Effect of soil moisture content and rate of N. fertilization on P uptake by barley.

the P contents of the soil solution were greater when moisture content was held at 50% than 35% of water holding capacity.

Brown et al. (1960) concluded, however, that, increasing soil moisture from the wilting percentage to saturation significantly increased the P uptake by plants. Lutz et al. (1972) found that, soil available moisture < 50% did not affect the leaf P of corn. Abdou et al. (1969), El-Nennah (1972), El-Sherif and El-Sherif (1973), and El-Sweedy (1975) obtained similar results.

Meet-Kinana soil: The increases in P uptake due to gradual increases in soil moisture content from M_1 to M_2, M_3 and M_4 could be presented and discussed as follows:

At N_o; 31, 59 and 120%,

At N_1, 52, 117, and 154%,

At N_3, 17, 34 and 60%,

At N_4, 21, 21 and 65 %, for M_2, M_3 and M_4 as compared to M_1 moisture supply, respectively.

The increase in P uptake by barley plants yielded by increasing the moisture content from M_3 to M_4 (27%) was greater than that caused by increasing moisture content from M_1 to M_2 or M_3 (26 and 15%, respectively.).

The increase in P uptake with increasing soil moisture content could be attributed to the fact that,when the soil moisture is reduced, the P concentration and hence P mobility of P is lowered (dilution effect, Mattson 1966). Therefore, the plants utilization of P could be adversely affected. That is on one hand; on the other hand the absorption of P from the soil depends greatly on root growth and the magnitude of the absorbing surface, which may cease or strongly inhibited under moisture stress conditions.

4.2.3.2. Effect of nitrogen fertilization on P uptake:

Results reveal that, increasing the rate of added nitrogen, significantly increased P uptake by barley plants in the two soils investigated. The results obtained agree well with those obtained by Yousef (1972) and Mansour (1981).

Moshtohor soil: The yielded increases in P uptake due to increasing the rate of added nitrogen from N_o to N_1, N_2 and N_3 can be listed and summarized in the following trend:

At M_1; 40, 112 and 152 %,

At M_2; 46, 65 and 92%,

At M_3; 68, 83 and 152%,

At M_4: 40, 76, and 98% for N_1, N_2 and N_3 as compared to control treatment (N_o), respectively.

The increase in P uptake by barley produced by increasing the rate of nitrogen addition from N_o to N_1(51%) was much greater than that caused by increasing the N rate to N_2 and N_3 (20 and 22%, respectively).

The different levels of moisture supply could be arranged according to their effect on P uptake by barley plants in the following order: $M_3 > M_4 > M_2 > M_1$.

Finally, it is clear that, the highest P uptake by barley plants (34.1 mg/pot) was recorded in Moshtohor soil, with the combined treatment of M_3N_3, whereas the lowest P uptake was yielded with the M_1N_o treatment.

El-Sweedy (1975) found that, the highest P uptake occurred in mature plants grown under the M_1N_1 treatment (75% of available water + 100 Kg N/fed.) whereas, the lowest P uptake observed for those of M_4N_o (10% available water + N_o nitrogen) and M_4N_2 treatment (10% available water + 200 Kg N/fed.).

The enhansing influence of nitrogen addition on P uptake may represent a phenomenon established by many investigators such as Grunes, (1959) who attributed this effect to one or more of the following: (a) increasing plant growth

(b) changes in root morphology and increasing root distribution (c) chemical changes in the soil. (d) changes in the rate of P absorption by the root. El-Sweedy (1975) attributed the favourable effect of N application on P uptake to the fundamental role of N in plant growth and nutrient uptake, partly through increasing growth as well as through phosphoprotein-formation.

Meet Kinana soil: The increases in P uptake due to nitrogen additions showed the following pattern:

At M_1 ; 66, 235 and 292 %,

At M_2 ; 93, 201, and 261%,

At M_3 ; 126, 181, and 197%,

At M_4 ; 92, 144 and 195%, for N_1, N_2 and N_3 as compared to N_o treatment, respectively.

The different moisture treatments affected P uptake by barley plants according to the following order; $M_4 > M_3 > M_2 > M_1$.

The highest P uptake by barley plants (17.8 mg/pot) was recorded in Meet Kinana soil with the combined treatment N_4N_3, while the lowest P uptake (2.74 mg/pot) was attained with the M_1N_o treatment.

Although these data may demonstrate stimulative effect on P absorption due to N fertilization, yet number of authors such as Miller (1965) and Blanchar and Coldwell (1966) reported that, N in association with P in the absorption solutions did not influence the plant ability to absorb P, providing no comon ion effect of the two nutrients external to the cell. This give evidence that N stimulated P uptake through a series of physiological processes which might lead to the conclusion that P absorption is mainly dependent on N preconditioning of the roots rather than on stimulatneous N and P absorption.

4.2.3.3. Phosphorus uptake by barley plants as affected by interactions of soil with moisture content and rate of N fertilization:

Data obtained for different interactions between soils, soil moisture content and rate of nitrogen fertilization is listed in table s (11,12) and depicted in Fig. (11).

The results show significant interactions between soils and level of moisture content (S x M). The third level of soil moisture (85% of the MAM) was most effective in Moshtohor soil, while the fourth level of moisture content (100% of AMA) was the best in Meet-Kinana soil to achieve the maximum uptake of P by barley plants.

Regarding the interactions of soils with N rate

Table (12): Effect of interaction between soil moisture content and nitrogen fertilization on P uptake by barley plants (mg/pot).

Nitrogen rate	Soil moisture content M_1	M_2	M_3	M_4	Mean
N_0	4.779	6.952	8.954	9.310	7.499
N_1	7.068	11.015	16.376	14.668	12.282
N_2	11.839	13.960	18.595	18.470	15.716
N_3	13.982	16.439	23.584	21.425	18.858
Mean	9.417	12.092	16.877	15.968	

L.S.D.	0.05	2.287
	0.01	3.041

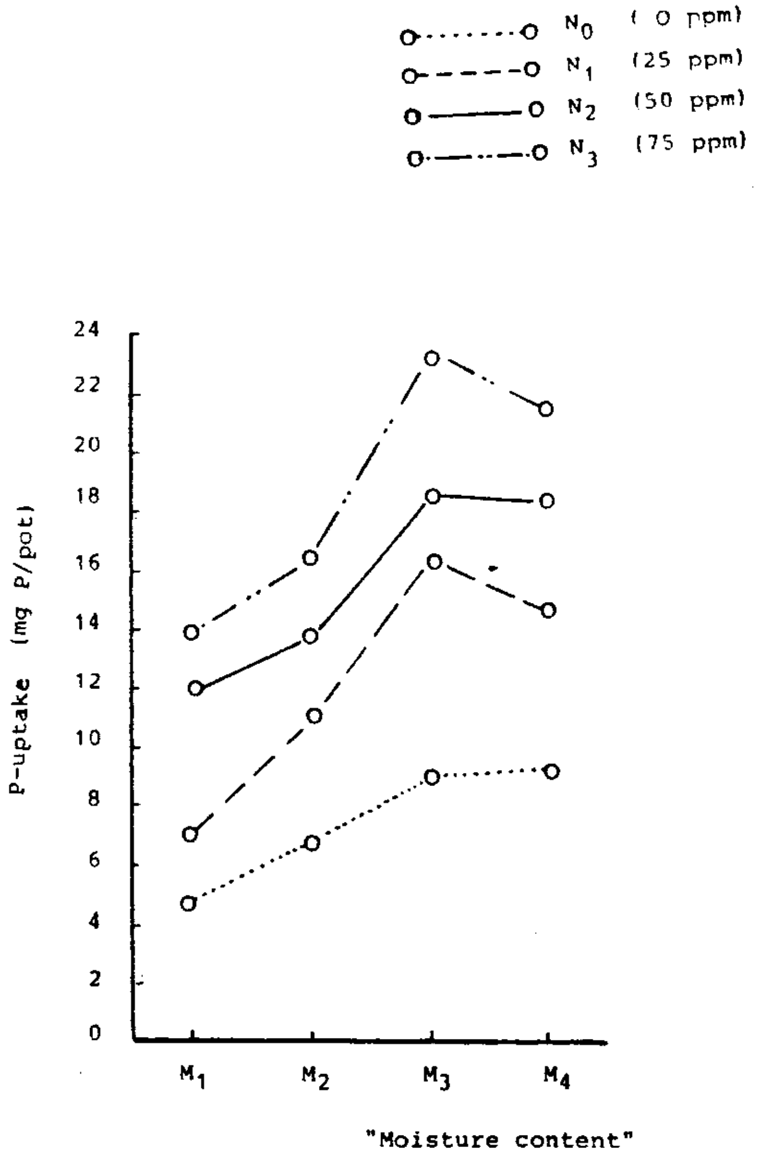

Fig (11): Effect of interaction between soil moisture content and nitrogen fertilization on P-uptake by barley plants, (mg P/pot).

(S x N) significant effects were recorded.

Significant interaction of soil moisture content and the N rate (M x N) was also observed.

4.3. Experiment III

The results of this experiment are discussed with respect to the effect of organic manuring at a rate of 3% on dry matter yield, P concentration in soybean plants, plant P uptake and soil available P.

4.3.1. Effect of organic manuring on dry matter yield of soybean plants:

Comparing the influence of the different treatments with the control, table (13) and Fig. (12) show that,organic manuring with the different types of residues, generally , increased the dry matter yield of soybean plants.

In more details, the results obtained can be presented as follows:

In Moshtohor soil, most of treatments increased the dry matter yield of soybean plants. The resulted increases averaged 49, 4, 20 and 64% for clover, wheat straw, rice straw, and poultry manure, respectively, whereas corn stalks

Table (13): Effect of different organic residues on dry matter yield of soybean plant (g/pot).

Soil	Control t_0	Clover t_1	Corn stalks t_2	Wheat straw t_3	Rice straw t_4	Poultry manure t_5	Mean
Moshtohor	11.24	16.77	10.13	11.73	13.52	18.44	13.64
Meet-Kinana	9.83	11.76	8.28	8.93	11.48	15.23	10.92
Mean	10.53	14.27	9.21	10.33	12.50	16.83	12.28

L.S.D.	S	T	SXT
5%	1.02	1.76	N.S.
1%	1.36	2.36	

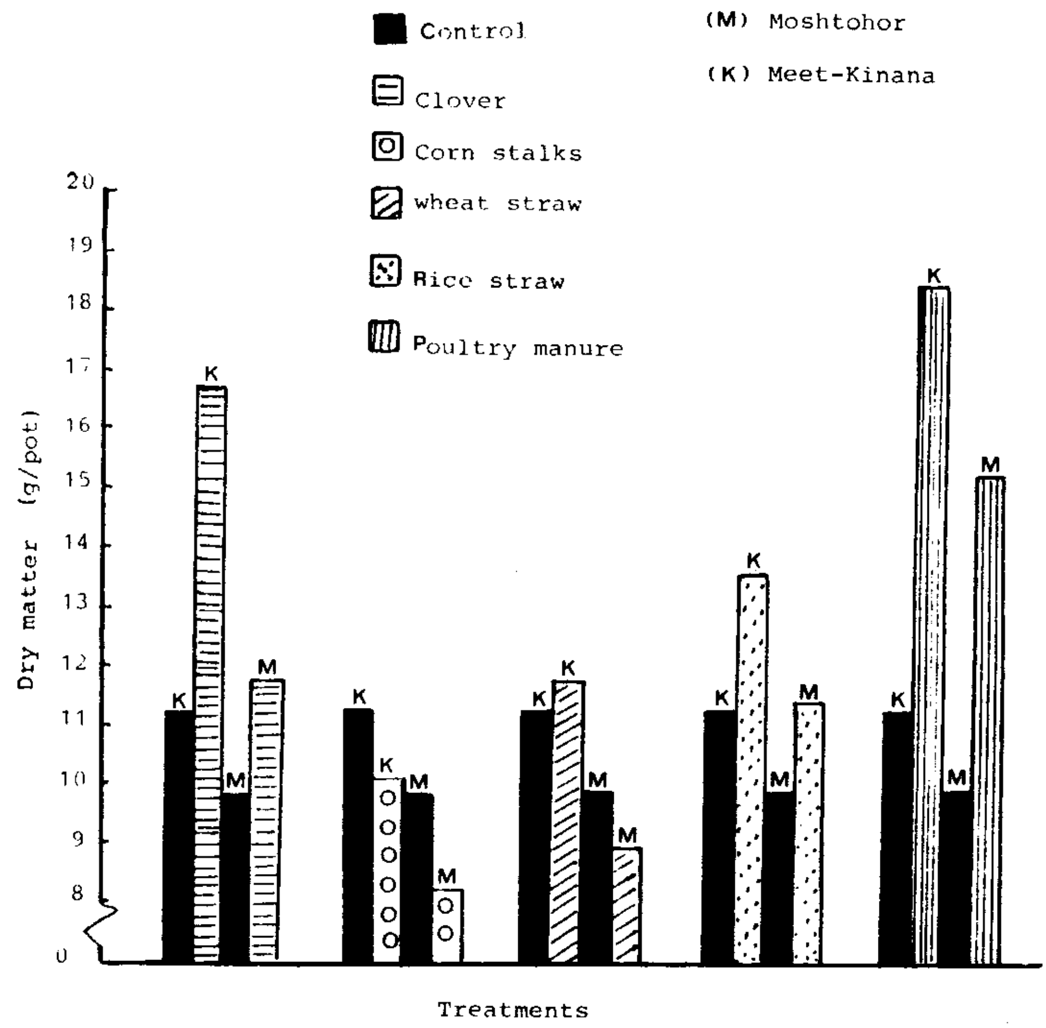

Fig (12) Effect of different organic residues on dry matter yield of soybean plants,(g/pot).

decreased the dry matter yield by about 10%.

In Meet-Kinana soil, clover, rice straw and poultry manure treatments increased the dry matter yield by 19, 16 and 55% over control (t_o), respectively, but corn stalks and wheat straw decreased the dry matter yield by 16 and 9% respectively.

Moubarek (1960) pointed out that, green manures and compost, when applied to Tahreer sandy soil before cultivation, significantly increased the yield of both barley and corn. Abdou et al (1960) reported highly significant increases in yield of corn due to addition of farmyard manure and town refuse manure either in sandy loam or loamy sand soil. Abd-Elnaim et al. (1975) pointed out that, farmyard manuring gave high significant increase on corn yield that reached its peak with application rates of 20 and 30 m^3/fed.

According to the above mentioned results, generally at the period of 60 days from application, the resulted increases averaged 35, 19 and 60% over control in case of clover, rice straw and poultry manure, respectively, while corn stalks and wheat straw treatments insignificantly decreased the yield of dry matter by 12 and 2%, respectivley. However, the results obtained indicated significant differences between the two soils under investigation.

In this respect, Elliott et al. (1983) mentioned that, when winter wheat straw was mixed with the soil,whea-plant yield decreased significantly and nitrogen immobilization during decomposition of mixed straw appeared to be the primary factor causing yield decrease. Sinha (1975) attributed the reduction in yield of dry matter to N-immobilization or to the production of phytotoxic substances during decomposition.

Statistical analysis for the interaction between different treatments and both soils, shows that, these interactions were not significant.

The results obtained show that, the highest yield of dry matter (18.44 g/pot) was recorded with poultry manure application to Moshtohor soil, whereas the lowest yield (8.28 g/pot) was obtained from Meet-Kinana soil treated with corn stalks.

In both soils, the poultry manure treatment proved itself as the best material tested, while corn stalks did not show serious effect .

The net effect due to the different organic treatments on the dry matter yield of soybean plants, in both soils , decreased in the order: poultry manure > Clover > Rice straw. While wheat straw and corn stalks failed significantly to be positively effective.

4.3.2. Effect of organic manuring on P concentration in soybean plants at different growth periods:

The effect of tested organic residues on P concentration in soybean plants as compared to the control treatments is given in table (14) and depicted in Fig. (13).

Values reveal that, P concentration in soybean plants behaved quite differently with respect to the different soils, the different periods of plant growth, and the different organic manures added.
These results could be summarized as follows:

After 20 days from planting; data obtained indicate, generally, that except for poultry manure treatments which increased P concentration average by 48% over control treatment, all the other residues tended to decrease the P concentration. The observed decreases averaged 41, 28 , 25 and 36% for clover, corn stalks, wheat straw, and rice straw , respectively.

In Moshtohor soil, poultry manure slightly increased the P concentration in soybean plants. The other materials; clover, corn stalks, wheat straw and rice straw, reduced the P concentration by 58, 56, 60 and 55% respectivley.

In Meet-Kinana soil, poultry manure treatment increased P concentration by 111% over control (t_o). The corn

Table (14) : Effect of different organic recidues on P concentration in soybean plants at different growth periods, ppm.

(A) 20 days from planting

Soil sample	Control t_0	Clover t_1	Corn stalks t_2	Wheat straw t_3	Rice straw t_4	Poultry manure t_5	Mean
Moshtohor	3028	1273	1320	1211	1351	3211	1899
Meet-Kinana	2049	1718	2336	2578	1875	4328	2481
Mean	2539	1496	1828	1895	1613	3769	2190
L.S.D. 5% / 1%	S N.S.		T N.S.		SXT	N.S.	

(b) 40 days from planting

Soil sample	Control t_0	Clover t_1	Corn stalks t_2	Wheat straw t_3	Rice straw t_4	Poultry manure t_5	Mean
Moshtohor	2415	2166	1926	1832	1551	4290	2363
Meet-Kinana	1624	1728	2478	2561	1895	3103	2231
Mean	2019	1947	2202	2196	1723	3696	2297
L.S.D. 5% / 1%	S N.S.		T 451 / 569		SXT	639 / 805	

(C) 60 days from planting

Soil sample	Control t_0	Clover t_1	Corn stalks t_2	Wheat straw t_3	Rice straw t_4	Poultry manure t_5	Mean
Moshtohor	2410	2997	2997	2557	1760	2928	2580
Meet-Kinana	1938	3093	3217	4276	2612	2970	3017
Mean	2089	3045	3107	3416	2186	2949	2799
L.S.D. 5% / 1%		S 222 / 280	T 386 / 486		SXT 546 / 688		

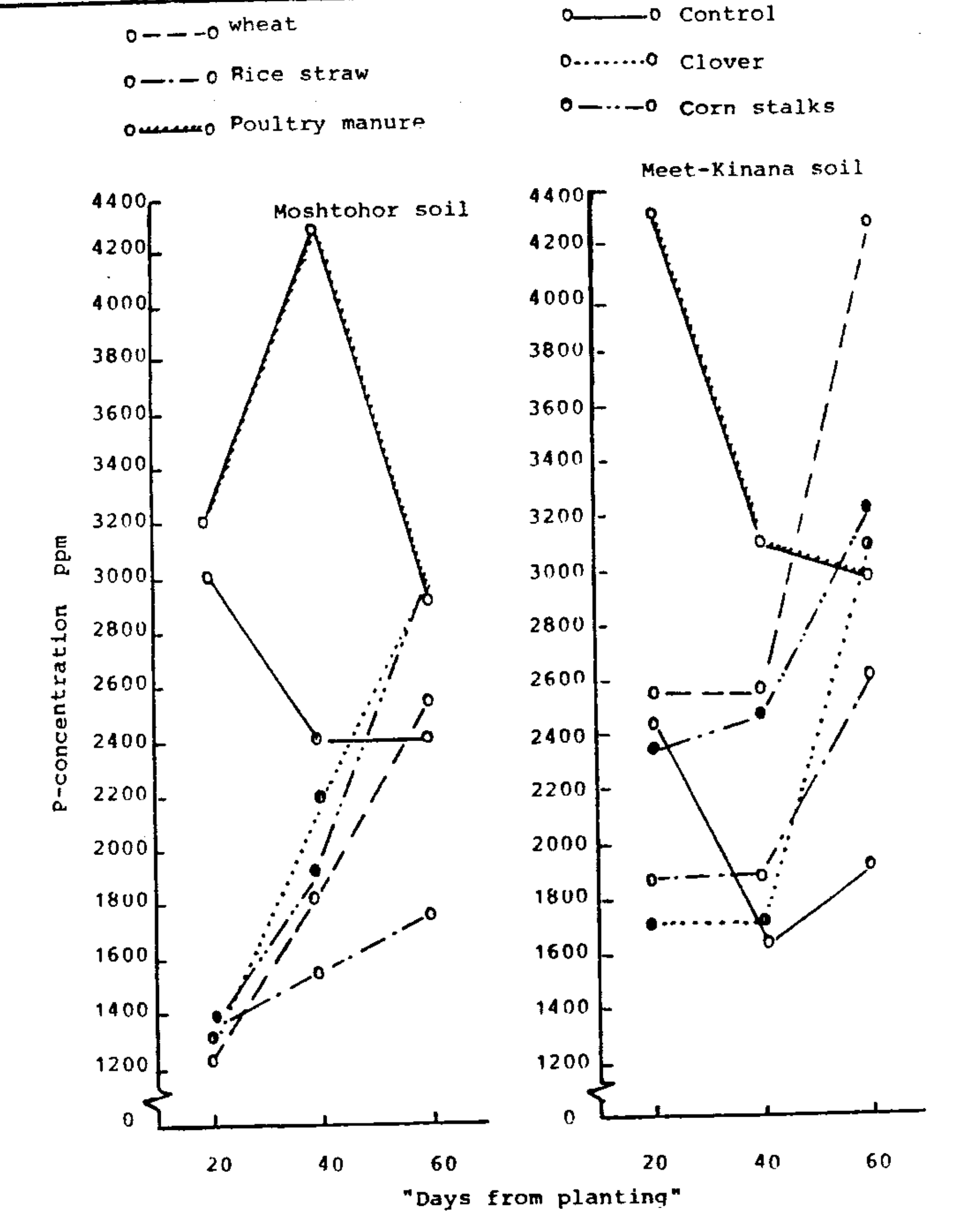

Fig (13): Effect of different organic residues on P concentration in soybean plants at different growth periods ppm:

stalks and wheat straw also, increased P concentration in soybean plants by 14 and 26%, over control, respectively. On the other hand, clover and rice straw decreased P concentration by 16 and 8%, respectively.

After 40 days from planting; results obtained reveal, a general increasing trend due to application of poultry manure, corn stalks, and wheat straw which increased P concentration by 83, 9 and 9% over control, respectively, whereas clover, and rice straw decreased the P concentration by about 4 and 15%, respectivley.

In Moshtohor soil application of poultry manure at a rate of 3% resulted in an increase in P concentration of about 78% over control. However, clover, corn stalks, wheat straw and rice straw decreased P concentration by 10, 20, 24 and 35%,respectively.

In Meet-Kinana soil, all residues; clover, corn stalks, wheat straw, rice straw, and poultry manure, increased P concentration in soybean plants by 6, 53, 58, 17, 91%, respectivley.

After 60 days from planting, all treatments; clover, corn stalks, wheat straw, rice straw and poultry manure, increased P concentration by 46, 49, 64, 5and 41%, over control, respectively.

In Moshtohor soil, except the rice straw treatment which decreased P concentration by 27%, all the organic residues namely; clover, corn stalks, wheat straw and poultry manure increased the P concentration in soybean plants by 24, 24, 6 and 2%, respectively.

In Meet-Kinana soil, all the residues; clover, corn stalks, wheat straw, rice straw, and poultry manure; increased the P concentration in soybean plants by 60, 66, 121, 35 and 53% , respectively.

Such results partly agree with those obtained by Mongia <u>et</u> <u>al</u>. (1981), Abdel latif and Abdel-Fattah (1983), and Hensler <u>et al</u>. (1970) who concluded that, the highest concentration of P in plant tissue was achieved at the highest rate of manuring (613 metric t/ha). Sutton <u>et</u> <u>al</u>., (1978) indicated that, P concentration in corn ear leaf tissue increased with increasing rates of annually addition of swine waste to the soil.

The results obtained could be summarized as follows:

(1) The highest P concentration (4328 ppm) was attained with poultry manure treatment in Meet Kinana soil, but the lowest P concentration in soybean plants (1211 ppm) was recorded by wheat straw treatment in Moshtohor soil.

(2) With all growth periods, poultry manure treatment significantly increased P concentration in soybean plants in

both Moshtohor and Meet Kinana soils.

(3) P concentration in soybean plants was at its minimum level after 20 days but increased to the maximum level after 60 days growth period.

4.3.3. Effect of organic manuring on P uptake by soybean plants at different growth periods:

The effect of organic residues on P uptake by soybean plants as compared to control treatment (t_o) is shown in table (15) and graphically depicted in Fig. (14).

Results, in general, indicate that, addition of organic residues to both soils positively affected the availability of P in soils and consequently its uptake by soybean plants. The yielded effects could be presented and discussed as follows:

(1) After 20 days from planting:

In Moshtohor soil, poultry manure increased P uptake by 52%, but the residues of clover, corn stalks, wheat straw and rice straw decreased P uptake by 65,63, 63 and 60% , respectivley.

With Meet-Kinana soil, the poultry manure was the

Table (15) : Effect of different organic residues on P uptake by soyean plants at different growth periods (ug P/plant).

Soil sample	Control t_0	Clover t_1	Corn stalks t_2	Wheat straw t_3	Rice straw t_4	poultry manure t_5	Mean
(A) 20 days from planting							
Moshtohor	1705	593	622	620	679	2600	1137
Meet-Kinana	822	550	943	945	883	3024	1194
Mean	1263	572	782	782	781	2812	1166
L.S.D. 5% / 1%	S 240 / 322		T 416 / 558	SXT	589 / 742		
(B) 40 days from planting							
Moshtohor	2476	1559	1251	1348	1263	4182	2013
Meet-Kinana	1058	1246	2182	1795	1177	3598	1842
Mean	1767	1402	1716	1571	1220	3890	1928
L.S.D. 5% / 1%	S N.S.		T 538 / 722	SXT	762 / 961		
(C) 60 days from planting							
Moshtohor	3600	7152	4332	4332	3363	7751	5081
Meet-Kinana	2710	5162	3819	5476	3401	5970	4573
Mean	3155	6157	4076	4904	3832	6861	4827
L.S.D. 5% / 1%	S N.S.		T 1078 / 1446	SXT	1525 / 1922		

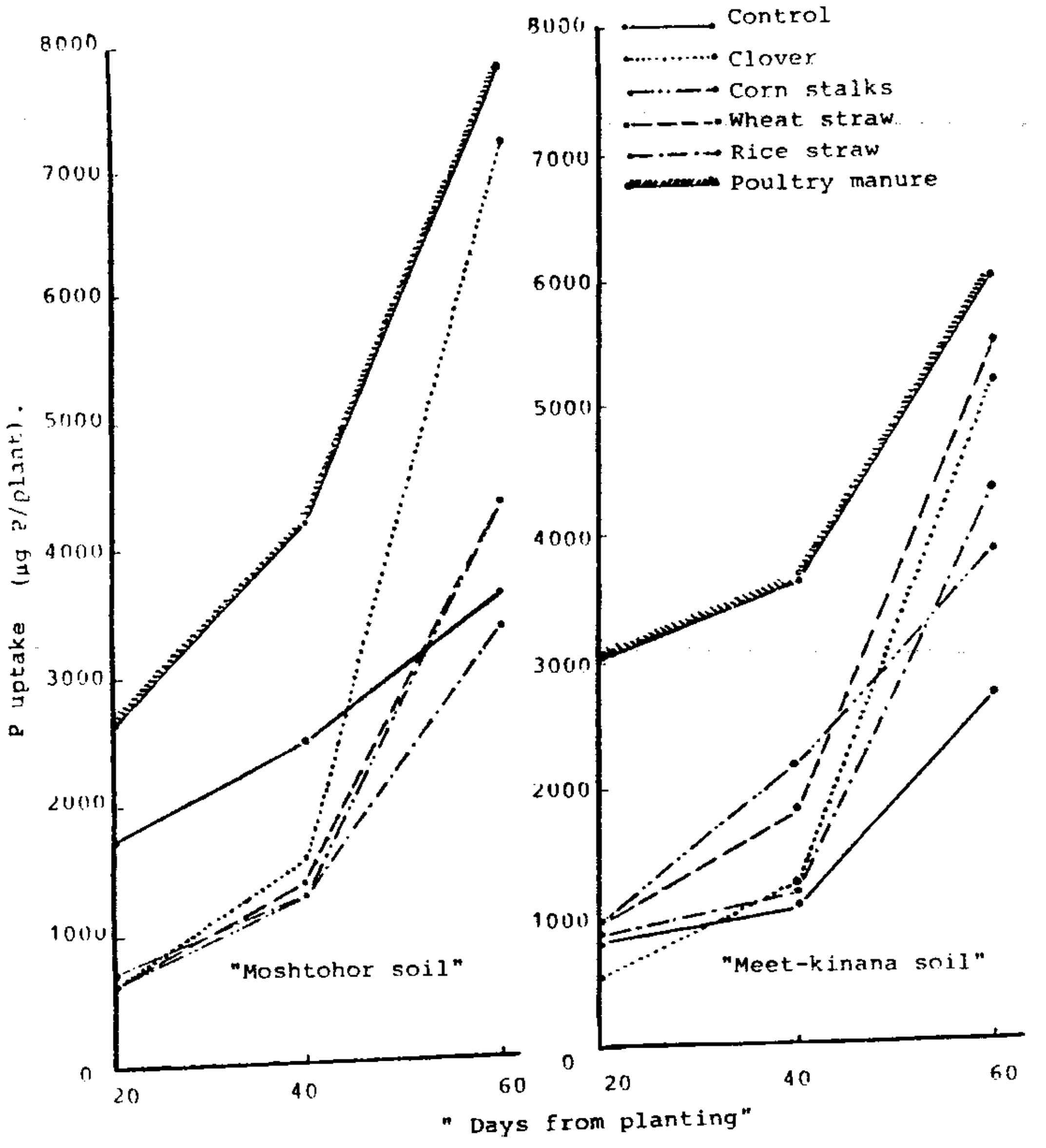

Fig.(14): Effect of different organic residues on P uptake by soybean plant at different growth periods (µg P/plant).

most effective in increasing P uptake, as it yielded an increase that reached 268%, while all the other residues (clover, corn stalks, wheat straw and rice straw) decreased the P uptake of soybean plants (by 33, 15, 15 and 7% respectively).

Such stimulative effect, resulted during the first 20 days after planting due to poultry manure, could be attributed to its relatively high content of available P that is readily soluble, table (2). The depressive effect of the other sources of organic residues through the initial stage after application could be attributed mainly to (1) the relatively low content of available P, and (2) the relatively long time period needed for decomposition, release of immobilized P and the formation of organic acids and other like materials that can positively affect the P solubility in the medium.

(2) After 40 days from planting:

In Moshtohor soil, a trend similar to that observed with the 20 days was revealed, as poultry manure treatments increased P uptake by an average of 69%, while all other residues decreased the P uptake by an average of 37, 49, 46 and 49% for clover, corn stalks, wheat straw and rice straw, respectively.

On contrary, in Meet-Kinana soil, all organic residues used; clover, corn stalks, wheat straw, rice straw and poultry manure increased the P uptake. The resulted increases were, 17, 106, 70, 11 and 240%, respectively.

The conversion in the trend observed with Meet-Kinana soil with respect to the effect of manuring after 40 days from planting could be explained on a basis of rapid decomposition rate of organic residues in such light-textured soil of rather good aeration conditions, as compared to the heavy textured soil of Moshtohor.

(3) <u>After 60 days from planting</u>:

In Moshtohor soil, except to the rice straw treatment which decreased P uptake by 7%, all the other residues; clover, corn stalks, wheat straw and poultry manure, increased P uptake by soybean plants. The resulted increased averaged 99, 20, 19 and 115%, respectively.

In meet Kinana soil, all residues used (clover, corn stalks, wheat straw, rice straw and puoltry manure increased P uptake. The obtained increase averaged 90, 41, 102, 59 and 120%, respectivley.

El-Seidy (1967) concluded that, the permanent application of farmyard manure increased the amount of soil water soluble P.

Statistical analysis of interaction between different soils and different organic residues with respect fo the effect on P uptake show that, the values of P uptake were significantly affected by this interaction. The highest P uptake (7751 μg P/plant) was recorded with poultry manure application in case of Moshtohor soil, while the lowest uptake (55 μg P/plant) was attained with clover residues in Meet Kinana soil.

4.3.4. Soil available P as affected by different organic manuring:

The values of soil available P extracted according to Olsen et al (1954), from alluvial and sandy loam soils treated with the five organic residues are listed in table (16) and illustrated in Fig. (15).

Organic residues used (clover, corn stalks, wheat straw, rice straw and poultry manure) increased soil available P by an average of 20, 83, 79, 22 and 365 respectively.

In Moshtohor soil, application of corn stalks, wheat straw and poultry manure increased the level of soil available P by 31, 34, and 254%, respectively ; however, clover, and rice straw treatments slightly decreased it by 11 and 0.7% respectively.

Table (16) : Soil available phosphorus as affected by different organic residues,ppm.

Soils	Control t_0	Clover t_I	Corn stalks t_2	Wheat straw t_3	Rice straw t_4	Poultry manure t_5	Mean
Moshtohor	25.32	22.50	33.12	34.20	25.15	89.70	88.33
Meet-Kinana	18.45	80.00	46.80	44.28	28.20	114.00	46.96
Mean	21.89	26.25	39.96	39.24	26.68	101.85	42.65

L.S.D.	T	S	SXT
5%	4,573	2.640	6.467
1%	6.136	3.538	8.665

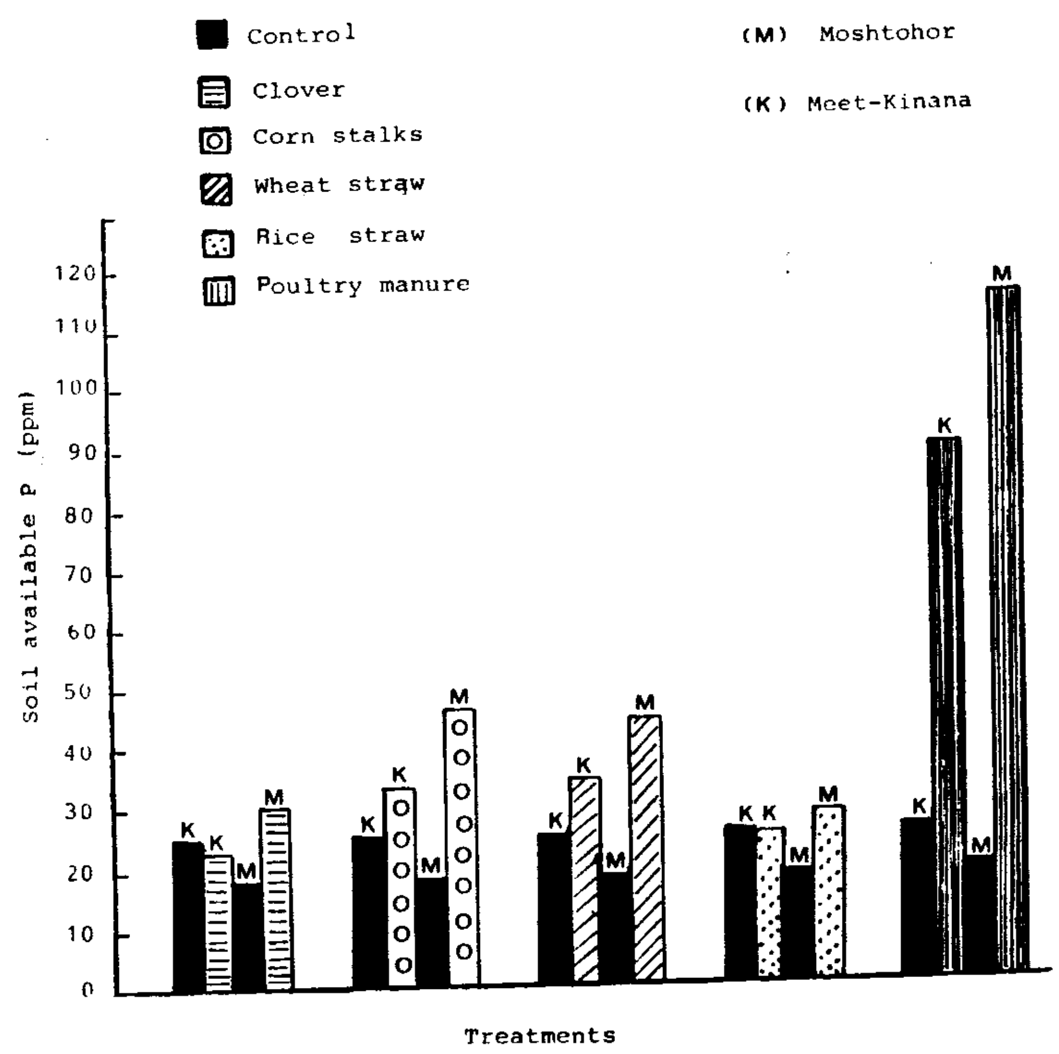

Fig (15) soil available phosphorus as affected by different organic residues (ppm) .

In Meet-Kinana soil, all organic residues used (clover, corn stalks, wheat straw, rice straw and poultry manure) increased the soil available P. The resulted increase averaged 63, 145, 140, 53 and 517%, respectively.

Dalton et al. (1952) showed that, organic matter added to the soil as an amendment was effective in increasing the availability of soil P. Grunes (1955) found that, the manured plots showed higher content of soil available P than did the untreated ones. Basu (1974) concluded that organic matter increased the available P content with P availability reaching its maximum after 32 days of flooding.

Singh and Jones (1976) found that, incubating organic residues for 30 days (alfalfa, Barley, Beans, corn, wheat, saw dust, and poultry manure) decreased the amount of P sorbed by soil. However, after incubating for 75 or 150 days, the P content of organic residues markedly increased the sorption of added P and desorption of sorbed P. Ali (1980) reported that, the addition of organic residues consistently increased the level of water soluble P in soils and this promoting effect was faster with carbonacious residues (rice straw) than with those of lower carbon content (bean stalks).

The results obtained could be summarized as follows:

(1) With all growth periods, application of poultry manure

at a rate of 3%, significantly increased available P in both Moshtohor and Meet kinana soils, because its richness in soluble P content and many other nutrients.

(2) Clover and rice straw treatments were ineffective in Moshtohor soil through the period of experiment (60 days after planting).

(3) Corn stalks and wheat straw application are of intermediate effect.

(4) The net effect due to the different organic residues (applied at a rate of 3%) on the concentration of soil available P in both soils followed the order; poultry manure > corn stalks > wheat straw > rice straw > clover.

Highly significant correlation ($r = 0.4802^{**}$) was obtained for the soil content of available and total P uptake by soybean plants, Fig. (16).

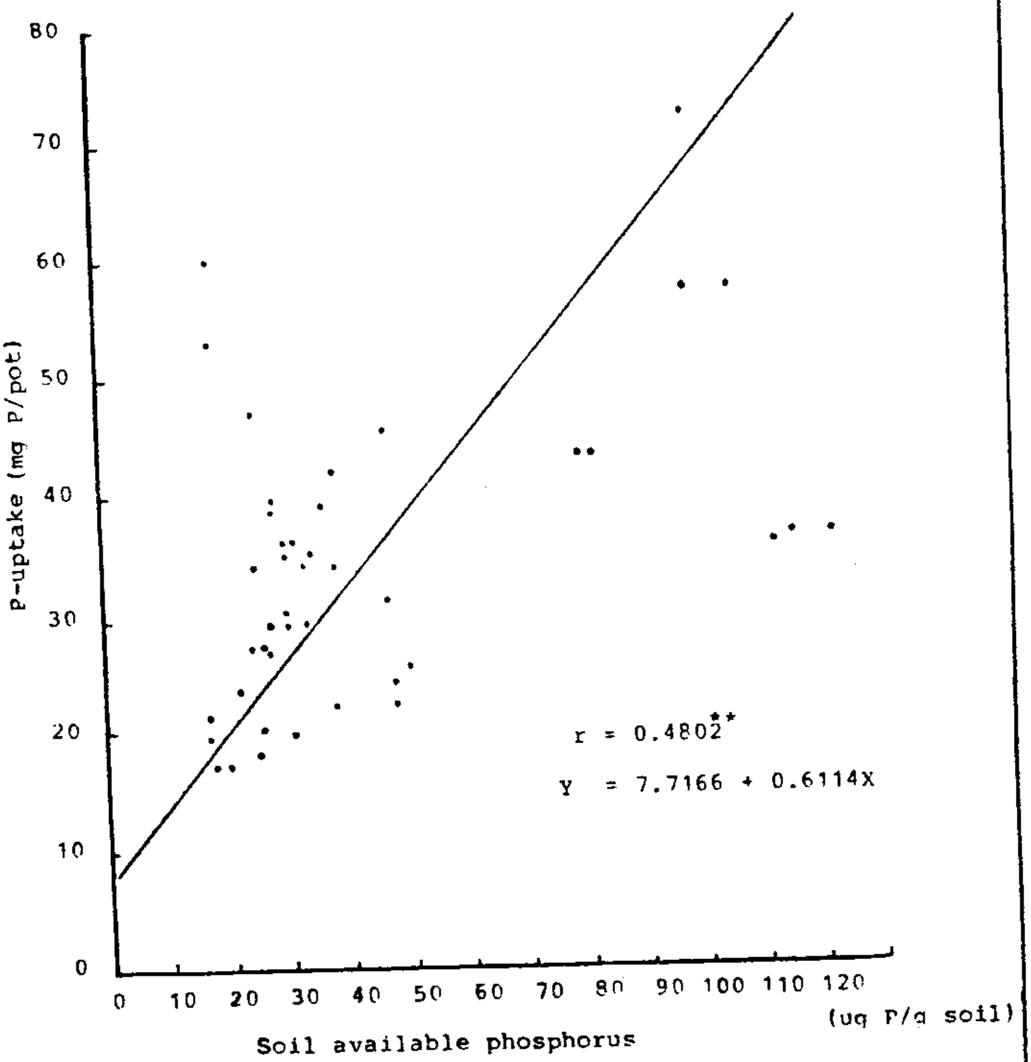

Fig (16) : The relationship between soil available P(ug P/g soil) and P- uptake by soybean plant (mg P/pot) .