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EFFECT OF DIFFERENT TREATMENTS ON YIELD, NUTRIENTS UPTAKE AND PHYSICO-CHEMICAL PROPERTIES OF SOIL AFTER HARVEST OF MOTH BEAN [*VIGNA ACONITIFOLIA* L.]

A.H. Sipai*, N.N. Damor, B.B. Rathod and V.A. Chauhan
Regional Research Station,
S.D. Agricultural University, Bhachau, Kachchh (Gujarat)-370140, India
*Email: rrsbhachau@sdau.edu.in
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ABSTRACT

A field experiment was conducted at Regional Research Station, S. D. Agricultural University, Bhachau, Kachchh to evaluate the effect of different treatments on yield, nutrients uptake and physico-chemical properties of soil after harvest of moth bean (*Vigna aconitifolia* L.) during *Kharif* season of 2017-18, 2019-20 and 2020-21. These were eighteen treatment combinations comprising of two FYM levels [0 t/ha (F_0) and 2.5 t/ha (F_1) combined with three phosphorus levels [0 kg P_2O_5/ha (P_0), 20 kg P_2O_5/ha (P_1) and 40 kg P_2O_5/ha (P_2)] along with three levels of nitrogen [0 kg N/ha (N_0), 20 kg N/ha (N_1) and 40 kg N/ha (N_2)]. Phosphorus applied in the form of PROM and nitrogen in form of urea. The experiment was laid out in factorial RBD with three replications. Seed and stover yields of moth bean were significantly increased by the FYM, phosphorus and nitrogen treatments. The increased in seed yield due to F_1 over F_0 (698 kg/ha) increased in seed yield by 13.46 per cent. The treatment P_2 and P_1 over P_0 (776 kg/ha) was 21.92 and 13.51 per cent, respectively and treatment N_2 and N_1 over N_0 (783 kg/ha) was increased 23.35 and 10.93, respectively. Similar trend in stover yield was noted by FYM, phosphorus and nitrogen treatments. The interaction of P X N effect was significant on seed and stover yields indicate that nutrient use efficiency of P was higher when phosphorus was applied along with organic FYM @ 2.5 t/ha and nitrogen @ 20 kg N/ha. Treatment combination $F_1P_2N_2$ (FYM @ 2.5 t/ha, 40 kg P_2O_5/ha and 20 kg N/ha) was obtained significantly higher nutrients uptake by seed and stover. Available nutrients in the soil after harvest are best in the $F_1P_2N_2$ (FYM @ 2.5 t/ha, 40 kg P_2O_5/ha and 20 kg N/ha) maintained the soil physico-chemical properties.

***Keyword* :** Moth bean, Yields, Nutrients uptake and Physico-chemical properties.

Introduction

Moth bean (*Vigna aconitifolia* L.) is a draught resistant legume, belonging to the family Fabaceae, commonly grown in arid and semiarid regions of India. It is exceptionally hardy legume and known by various other names including mat bean, matki, Turkish gram, or dew bean. In India it is mostly confined to Gujarat, Karnataka, Rajasthan, Maharashtra and Haryana. In Gujarat Kachchh is the largest district and covers one third part of the Gujarat. Pulses are becoming major crops growing under Kachchh region. Compared to other parts of Gujarat, Kachchh contains highest amount of degraded lands. Main cause for the degradation of land are the arid and semi-arid climatic condition, salinization, alkalinization, light texture soil with low organic carbon content and poor water holding capacity.

The soils of arid and semi-arid regions have very low inherent productivity potential due to physical and nutritional constraints and are highly vulnerable to various degradation processes. Moth bean is minor *kharif* pulse crop and considered as one of the most drought tolerant among the grain legumes (Arunakumar and Uppar, 2007).

Chemical fertilizers play an important role to meet nutrient requirement of the crops but continuous use of these on lands will have deleterious effects on physical chemical and biological properties of soil, which in turn reflects on yield (Sarkar *et al*., 1997). In recent years organic farming is becoming great importance for sustainable agriculture to stop deterioration of the agricultural lands and environment, to get yield safer for human beings and animals and to encourage the natural enemies of harmful insects and soil borne diseases (Gomaa *et al.,* 2005).

Legumes are phosphorus loving plants; they require phosphorus for growth and seed development and most especially in nitrogen fixation which is an energy-driving process. Legumes can fix up to 11-20 kg N/ha (Sanginga *et al.,* 2000), but this is not achievable in the tropics because of low soil fertility and poor farming practices. PROM is Phosphate Rich Organic Manure, produced by composting various organic wastes with high grade rock phosphate in fine size. It contains 10.4 per cent phosphorous, 7.9 per cent organic carbon and 0.4 per cent nitrogen, acts as alternative to DAP fertilizer and makes soil soft and enriched with nutrients for long time, which plays an important role in maintaining soil fertility and productivity. FYM and

Vermicompost are known to play an important role in improving the fertility and productivity of soils through its positive effects on soil physical, chemical and biological properties and balanced plant nutrition (Kumar *et al.,* 2011). It improves the structure and water holding capacity of soil.

Yield of moth bean is much less as compared to other pulse crops. Hence, there is a need to enhance the production potential of this crop by use of organic manures, biofertilizers and micronutrients in combination. Therefore, there is an urgent need to reduce the usage of chemical fertilizers and in turn increase the usage of organic manures which are known to improve physico-chemical properties of soil and supply the nutrients in available form to the plants. Hence the present study on effect of different treatments on yields, nutrients uptake and physico-chemical properties of soil after harvest of moth bean (*Vigna aconitifolia* L.) has been conducted.

Material and Methods

The experiment was conducted at Regional Research Station, S.D. Agricultural University, Bhachau, Kachchh, to study the effect of different treatments on yield, nutrients uptake and physico-chemical properties of soil after harvest of moth bean (*Vigna aconitifolia* L.) during *Kharif* season of 2017-18, 2019-20 and 2020-21. The soil was sandy loam and low in organic matter. The soil pH was 8.03 and having organic carbon (0.27 %), available nitrogen (172.48 kg ha^{-1}) and available phosphorus (36.60 kg ha^{-1}) and medium in potassium (308.40 kg ha^{-1}). Total eighteen treatment combinations comprising of all possible treatments of two levels of FYM *viz.,* F_0 (0 t/ha) and F_1 (2.5 t/ha), three levels of phosphorus *viz.,* P_0 (0 kg P_2O_5/ha), P_1 (20 kg P_2O_5/ha) and P_2 (40 kg P_2O_5/ha) and three levels of nitrogen *viz.,* N_0 (0 kg N/ha), N_1 (20 kg N/ha) and N_2 (40 kg N/ha) were tested in factorial RBD with three replications. Moth bean variety GMO-2 was sown by opening furrow at distance of 45 cm. The full dose of fertilizers was applied according to the treatments manually before sowing the seeds. Phosphorus and nitrogen were applied in form of PROM and urea, respectively. All the recommended cultural practices and plant protection measures were followed throughout the experimental periods.

For estimation of nitrogen, phosphorus and potassium content and uptake in moth bean, composite samples of whole plant were taken after harvest and ground to powder which was used for the chemical analysis. Nitrogen was estimated by Kjeldahl's method (Jackson, 1967), phosphorus was estimated by Vanadomolydo phosphoric acid yellow colour method (di-acid extract), potassium was estimated by using the flame photometer (Jackson, 1967) and sulphur was estimated by Turbidimetric method (Chaudhary and Cornfield, 1966). The total uptake of nitrogen, phosphorus, potassium and sulphur were calculated by using given formula.

$$\text{Nutrient uptake (kg ha}^{-1}) = \frac{\text{Nutrient content (\%) x Yield (kg ha}^{-1})}{100}$$

The soil samples were randomly drawn from different spots of experimental site up to 30 cm depth composite sample was prepared after proper mixing, drying and sieving. Soil physico-chemical properties were analyzed by using the following methods

Table 1 : Methods used for estimation of physico-chemical properties of the soil.

Soil pH (1:2.5)	Potentiometric method	Jackson (1967)
EC (dSm^{-1})(1:2.5) at 25 ^{0}C	Conductometric method	Jackson (1967)
Bulk density(Mg/m^3)	Core method	Piper (1950)
Available N (kg ha^{-1})	Alkaline Potassium permanganate	Subbiah and Asija (1956)
Available P_2O_5 (kg ha^{-1})	Extraction with 0.5 M $NaHCO_3$ (pH 8.5) Colorimetric method	Olsen *et al.* (1954)
Available K_2O(kg ha^{-1})	Flame photometeric method	Richards (1954)
Available sulphur (mg kg^{-1})	1% NaCl extraction method	Williams and Steinberg (1959)

Results and Discussion

The results obtained from the present investigation as well as relevant discussion have been summarized under following headings:

Effect of FYM

Significantly higher grain yield (918, 761, 695 and 792 kg/ha) and stover yield (1536, 1461, 1404 and 1467 kg/ha) were reported with incorporation of FYM @ 2.5 t/ha (F_1) during 2017-18, 2019-20, 2020-21 and in pooled results, respectively (Table 2). This increment attributed to amplified growth probably as a consequence of effective use of nutrients absorbed through ramified root system and productive shoot growth due to amended nourishment through organics fertilization and it also might be due to application of organics which improves the physico-chemical and biotic properties of soil which in turn benefited plants by providing balanced nutrition to crop as and when needed which helped in production of a greater number of yield parameters and ultimately increased the moth bean yield. These results are conformity with those reported by Patel *et al.* (2019), Ruheentaj *et al.* (2020), Patel *et al.* (2020) and Arunakumar and Uppar (2007).

Results from the Table 5 and 6 indicated that highest nitrogen (30.58 and 12.31 kg/ha), phosphorus (2.01 and 2.66 kg/ha), potassium (12.07 and 35.91 kg/ha), sulphur (2.23 and 142.9 kg/ha), iron (1216 and 2763 g/ha) and zinc (157.8 and 229.8 g/ha) uptake by seed and stover were recorded significantly highest when crop was fertilized with FYM @ 2.5 t/ha (F_1) in pooled results. This result was agreement with research results of Kumar *et al.* (1994) and Waigwa *et al.* (2003)

There are different treatments had significant effect on soil fertility status. At the end of third year of experiments the available N (176.1 kg/ha), P_2O_5 (37.42 kg/ha), K_2O (270.0 kg/ha) and S (10.80 ppm) was significantly influenced by FYM @ 2.5 t/ha (Table 7). Soil organic matter affects soil fertility and the C and N mineralization capacity of the soil, which determines the availability of plant nutrients.

Continuous application of FYM increases the level of N, P, K and S in the soil over the year (Ginting *et al.* 2003). Thus creating a reservoir of soil nutrients for several years after application, use of FYM might have attributed to mineralization of N in soil and due to high enzyme activities in the soil amended with organic manures might have increased the transformation of nutrients to available form.

Effect of Phosphorus

Among different phosphorus levels, the higher seed yield (942, 781, 714 and 812 kg/ha) and stover yield (1585, 1507, 1451 and 1514 kg/ha) were noticed with the supply of phosphorus @ 40 P_2O_5 kg/ha (P_2) during 2017-18, 2019-20, 2020-21 and in pooled results, respectively (Table 2). The reason to such stimulating effect of phosphorus may be assigned to the fact that phosphate is a constitutes of many intermediates products of legumes crop and considered as an essential constituents of all living organisms and plays an important role in conservation and transfer of energy in metabolic reactions of living cells including biological energy transformations. Thus, application of increasing levels of phosphorus may have enhanced cell division, root elongation and proliferation of roots. Thereby more absorption of nutrients and moisture from deeper layer of soil could have taken place. Several reports indicated that cell division is increased with application of phosphorus, as a result of which growth is enhanced in legumes. These findings are in concordant with Patel *et al.* (2019), Patel *et al.* (2020), Singh *et al.* (2017), Meena *et al.* (2010) and Arunakumar and Uppar (2007).

Data presented in Table 5 and 6 indicated that highest nitrogen (31.26 and 12.51 kg/ha), phosphorus (2.27 and 2.89 kg/ha), potassium (11.65 and 35.02 kg/ha), sulphur (2.15 and 139.4 kg/ha), iron (1177 and 2693 g/ha) and zinc (153.1 and 224.6 g/ha) uptake by seed and stover were recorded significantly highest when crop was fertilized with 40 kg P_2O_5/ha through PROM (P_2) on pooled data basis. This result was agreement with research results of Kumar *et al.* (1994) and Waigwa *et al.* (2003)

The significantly highest available P_2O_5 in soil (40.11 kg/ha) was recorded under application of phosphorus @ 40 kg/ha through PROM over other levels of phosphorus, but in case of available N, K_2O and S showed did not significant effect through sources of Phosphorus. These results regarding physico-chemical properties of the soil are in line with the findings made by Vyas *et al*. (2003) and Katkar *et al.* (2005).

Effect of Nitrogen

It is evident from the data presented in Table 2 that significantly higher seed yield (955, 794, 725 and 824 kg/ha) and stover yield (1586, 1510, 1448 and 1515 kg/ha) were obtained with application of 40 kg N/ha (N_2) from urea during 2017-18, 2019-20, 2020-21 and in pooled results, respectively. This increment was attributed due to supply of nitrogen and phosphorus, resulted in amplified photosynthetic activity and helps to develop a ramified root system and thus empowers the plant to withdraw extra water and nutrient from deeper layers, resulted in better growth and yield attributes. Present results are in concordant with the finding of Saraswathy *et al.* (2004) in green gram, Indoria and Majumdar (2007) in cowpea and Trivedi (1996) in black gram.

Results from the Table 5 and 6 indicated that highest nitrogen (32.98 and 13.19 kg/ha), phosphorus (2.05 and 2.63 kg/ha), potassium (11.92 and 35.36 kg/ha), sulphur (2.19 and 140.3 kg/ha), iron (1192 and 2687 g/ha) and zinc (154.7 and 223.8 g/ha) uptake by seed and stover were recorded significantly highest when crop was fertilized with 40 kg N/ha through urea (N_2) in pooled results. This result was agreement with research results of Kumar *et al.* (1994) and Waigwa *et al.* (2003)

On the pooled data basis, after final harvesting of moth bean, the significantly highest available N in soil (180.7 kg/ha) was recorded in application of nitrogen @ 40 kg/ha through urea over other levels of nitrogen, but in case of available P_2O_5, K_2O and S showed did not significant effect through sources of nitrogen. These results regarding physico-chemical properties of the soil are in line with the findings made by Vyas *et al*. (2003) and Katkar *et al.* (2005).

Interaction Effect

Data presented in Table 5 revealed that treatment combination of P_2N_2 (40 kg P_2O_5/ha with 40 kg N/ha) recorded significantly the higher nitrogen, phosphorus, potash, sulphur, iron and zinc uptake by seed (36.81, 2.56, 13.18 and 2.42 kg/ha with 1326 and 172 g/ha, respectively) where as treatment combination of F_1P_2 (FYM @ 2.5 t/ha with 40 kg P_2O_5/ha) recorded significantly the higher phosphorus, potassium, sulphur, iron and zinc uptake by seed (2.45, 12.98 and 2.41 kg/ha with 1302 and 169 g/ha, respectively). Also data presented in Table 5 obtained that tratment combination of F_1N_2 (FYM @ 2.5 t/ha with 40 kg N/ha) recorded significantly the higher sulphur uptake by seed (2.48 kg/ha) where as treatment combination of $F_1P_2N_2$ (FYM @ 0 t/ha with 40 kg P_2O_5/ha and 40 kg N/ha) recorded significantly the higher sulphur and zinc uptake by seed (2.68 kg/ha and 188.18 g/ha) as compaired to rest of the treatment combinations during in pooled results. Present findings were in accordance with the study conducted by Patel *et al.* (2019) and Ruheentaj *et al.* (2020)

Data presented in Table 6 revealed that treatment combination of F_1P_2 (FYM @ 2.5 t/ha with 40 kg P_2O_5/ha) recorded significantly the higher nitrogen, potassium, sulphur, iron and zinc uptake by stover (13.60, 38.92 and 156 kg/ha with 3003 and 250 g/ha, respectively) where as treatment combination of P_2N_2 (40 kg P_2O_5/ha with 40 kg N/ha) recorded significantly the higher nitrogen, phosphorus, potassium, sulphur, iron and zinc uptake by stover (15.08, 3.27, 39.62 and 158 kg/ha with 3054 and 255 g/ha, respectively) and also revealed that treatment combination of $F_1P_2N_2$ (FYM @ 2.5 t/ha with 40 kg P_2O_5/ha and 40 kg N/ha) recorded significantly the higher phosphorus, potash, sulphur, iron and zinc uptake by stover (3.62, 43.23 and 174.09 kg/ha with 3354 and 279 g/ha, respectively compaired to rest of the treatment combinations during in pooled results.

Conclusion

From the results of experimentation, it can be concluded that moth bean (GMO-2) should be fertilized with application of FYM @ 2.5 t/ha along with 40 kg P_2O_5/ha through PROM and 20 kg N/ha from urea under light textured soil of Kachchh region for getting higher yield, nutrients uptake and maintained soil fertility.

Table 2 : Seed yield and stover yield of moth bean as influenced by different treatments

Treatment	Seed yield (kg/ha)				Stover yield (kg/ha)			
	2017-18	2019-20	2020-21	Pooled	2017-18	2019-20	2020-21	Pooled
FYM								
F_0	815	670	608	698	1317	1245	1190	1251
F_1	918	761	695	792	1536	1461	1404	1467
S.Em.±	17	20	20	11	53	46	40	27
C.D. at 5%	49	57	59	31	153	133	116	76
Phosphorus								
P_0	776	640	582	666	1236	1176	1124	1179
P_1	881	726	660	756	1458	1376	1317	1384
P_2	942	781	714	812	1585	1507	1451	1514
S.Em.±	21	24	25	14	65	57	49	33
C.D. at 5%	61	69	72	38	187	163	142	93
Nitrogen								
N_0	783	640	581	668	1265	1189	1137	1197
N_1	861	713	649	741	1428	1360	1306	1365
N_2	955	794	725	824	1586	1510	1448	1515
S.Em.±	21	24	25	14	65	57	49	33
C.D. at 5%	61	69	72	38	187	163	142	93
FxP								
S.Em.±	30	34	35	19	92	80	70	47
C.D. at 5%	NS	NS	NS	NS	NS	NS	NS	NS
FxN								
S.Em.±	30	34	35	19	92	80	70	47
C.D. at 5 %	NS	NS	NS	NS	NS	NS	NS	NS
PxN								
S.Em.±	36	42	43	24	113	98	85	57
C.D. at 5 %	NS	NS	NS	66	NS	NS	NS	161
FxPxN								
S.Em.±	52	59	61	33	159	139	121	81
C.D. at 5 %	NS	NS	NS	NS	NS	NS	NS	NS
YxT	NS				NS			
C.V. %	10.31	14.34	16.33	13.39	19.36	17.78	16.11	17.92

Table 3 : Combined effect of phosphorus and nitrogen on seed yield of moth bean (Pooled)

	P_0	P_1	P_2	Mean
N_0	629	687	688	668
N_1	651	728	844	741
N_2	717	851	905	824
Mean	666	756	812	
S.Em.± 23.51		**C.D. at 5% 65.93**		

Table 4 : Combined effect of phosphorus and nitrogen on stover yield (kg/ha) of moth bean (Pooled)

	P_0	P_1	P_2	Mean
N_0	1108	1238	1244	1197
N_1	1159	1335	1600	1365
N_2	1269	1577	1699	1515
Mean	1179	1384	1514	
S.Em.± 57.38		**C.D. at 5% 160.95**		

Table 5 : Nutrient uptake by seed of moth bean as influenced by different treatments (pooled).

Treatment	N (kg/ha)	P (kg/ha)	K (kg/ha)	S (kg/ha)	Fe (g/ha)	Zn (g/ha)
FYM						
F_0	25.8	1.62	9.18	1.70	919	119
F_1	30.6	2.01	12.07	2.23	1216	158
S.Em.±	0.24	0.02	0.09	0.02	9.95	1.17
C.D. at 5%	0.67	0.04	0.26	0.04	27.90	3.29
Phosphorus						
P_0	24.7	1.27	9.45	1.73	948	123
P_1	28.6	1.91	10.78	2.01	1076	140
P_2	31.3	2.27	11.65	2.15	1177	153
S.Em.±	0.29	0.02	0.11	0.02	12.18	1.44
C.D. at 5%	0.82	0.05	0.31	0.05	34.17	4.03
Nitrogen						
N_0	23.0	1.60	9.36	1.73	947	123
N_1	28.6	1.79	10.61	1.97	1063	138
N_2	33.0	2.05	11.92	2.19	1192	155
S.Em.±	0.29	0.02	0.11	0.02	12.18	1.435
C.D. at 5%	0.82	0.05	0.31	0.05	34.17	4.025
FxP						
S.Em.±	0.41	0.03	0.16	0.03	17.23	2.03
C.D. at 5%	NS	0.07	0.442	0.071	48.328	5.692
FxN						
S.Em.±	0.41	0.03	0.16	0.03	17.23	2.03
C.D. at 5 %	NS	NS	NS	0.071	NS	NS
PxN						
S.Em.±	0.51	0.03	0.19	0.03	21.1	2.49
C.D. at 5 %	1.420	0.09	0.541	0.086	59.2	6.972
FxPxN						
S.Em.±	0.72	0.05	0.27	0.04	29.84	3.52
C.D. at 5 %	NS	NS	NS	0.122	NS	9.860
YxT	NS	NS	NS	NS	NS	NS
C.V. %	7.62	7.51	7.70	6.66	8.39	7.61

Table 6 : Nutrients uptake by stover of moth bean as influenced by different treatments (pooled)

Treatment	N (kg/ha)	P (kg/ha)	K (kg/ha)	S (kg/ha)	Fe (g/ha)	Zn (g/ha)
FYM						
F_0	9.76	1.99	26.890	106.4	2020	168.1
F_1	12.31	2.66	35.911	142.9	2763	229.8
S.Em.±	0.10	0.02	0.255	1.120	19	1.7
C.D. at 5%	0.27	0.06	0.716	3.141	53	4.7
Phosphorus						
P_0	9.38	1.74	27.211	106.7	2059	170.4
P_1	11.21	2.35	31.966	127.9	2421	202.0
P_2	12.51	2.89	35.024	139.4	2693	224.6
S.Em.±	0.12	0.02	0.313	1.372	23	2.1
C.D. at 5%	0.34	0.07	0.877	3.847	65	5.8
Nitrogen						
N_0	8.90	2.01	27.251	108.1	2083	173.4
N_1	11.02	2.33	31.591	125.6	2404	199.7
N_2	13.19	2.63	35.359	140.3	2687	223.8
S.Em.±	0.12	0.02	0.313	1.372	23	2.1
C.D. at 5%	0.34	0.07	0.877	3.847	65	5.8
FxP						
S.Em.±	0.17	0.03	0.442	1.940	33	2.9
C.D. at 5%	0.47	NS	1.241	5.441	92	8.2
FxN						
S.Em.±	0.17	0.03	0.442	1.940	33	2.9
C.D. at 5 %	NS	NS	NS	NS	NS	NS
PxN						
S.Em.±	0.21	0.04	0.542	2.376	40	3.6
C.D. at 5 %	0.58	0.12	1.519	6.664	113	10.0
FxPxN						
S.Em.±	0.29	0.06	0.766	3.360	57	5.0
C.D. at 5 %	NS	0.17	2.149	9.424	160	14.1
YxT	NS	NS	NS	NS	NS	NS
C.V. %	7.95	7.64	7.32	8.09	7.2	7.6

Table 7 : Available nutrients in soil after harvest of moth bean as influenced by different treatments (pooled)

Treatment	N (kg/ha)	P_2O_5 (kg/ha)	K_2O (kg/ha)	S (ppm)	EC (dS/m)	pH
FYM						
F_0	167.0	32.87	231.9	9.320	0.804	8.24
F_1	176.1	37.42	270.0	10.80	0.802	8.18
S.Em.±	1.63	0.35	2.19	0.13	0.00	0.03
C.D. at 5%	4.57	0.99	6.15	0.36	NS	NS
Phosphorus						
P_0	169.1	29.46	250.6	9.928	0.809	8.24
P_1	170.9	35.86	250.2	10.12	0.802	8.20
P_2	174.7	40.11	252.0	10.13	0.799	8.18
S.Em.±	2.00	0.43	2.69	0.14	0.00	0.04
C.D. at 5%	NS	1.210	NS	NS	NS	NS
Nitrogen						
N_0	158.2	34.70	247.7	9.897	0.799	8.23
N_1	175.9	35.13	251.6	10.14	0.804	8.20
N_2	180.7	35.61	253.6	10.14	0.807	8.18
S.Em.±	2.00	0.43	2.69	0.16	0.00	0.04
C.D. at 5%	5.60	NS	NS	NS	NS	NS
FxP						
S.Em.±	2.82	0.61	3.80	0.22	0.01	0.05
C.D. at 5%	NS	NS	NS	NS	NS	NS
FxN						
S.Em.±	2.82	0.61	3.80	0.22	0.01	0.05
C.D. at 5 %	NS	NS	NS	NS	NS	NS
PxN						
S.Em.±	3.46	0.75	4.65	0.27	0.01	0.07
C.D. at 5 %	NS	NS	NS	NS	NS	NS
FxPxN						
S.Em.±	4.88	1.06	6.58	0.38	0.01	0.10
C.D. at 5 %	NS	NS	NS	NS	NS	NS
YxT	NS	NS	NS	NS	NS	NS
C.V. %	8.55	9.02	7.86	11.33	4.04	3.48

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