Assiut J. Agric. Sci., (46) No. (2) 2015 (269-280) *ISSN: 1110-0486*
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Performance of Cowpea Grown in Different Soil Types Using Diverse Amendment of Phosphorus and Nitrogen Fertilizers

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Abstract:

A field experiment was conducted during two successive summer seasons (1994 and 1995) to assess the crop performance of the locally-adapted cowpea cv. 'Cream 7' as affected by soil type (clay loam, sand clay loam, and loam sand soil). Four application methods of P fertilizer (300 kg superphosphate/feddan, 15.5% P_2O_5) and two N starter treatments (45 kg N/fed., ammonium nitrate) were utilized in each soil type. The analysis of variance for the obtained data indicated that the dry-seed yield and 1000-seed weight had a consistent gradient elevation in loam sand, sand clay loam and clay loam soil types, respectively, whether or not ammonium nitrate starter fertilizer was used. However, there were substantial consistent increases for these traits in both loam sand and sand clay loam soil types with application of N starter fertilization. The dry-seed yield produced in loam sand soil was, generally, as high as 80 to 85 per cent of the seed yield produced in the most productive soil type, i.e. clay loam. Greater number of nodules formed on roots of plants grown in clay loam and sand clay loam when no ammonium nitrate was applied. Under conditions of N fertilization, however, increased number of nodules was found in sand loam soil while reduction occurred in the other soil types. The weight of nodules was greater in sand clay loam which did not receive N fertilizers. Weight of nodules reduced with application of N to clay loam and sand clay loam while increased in sand loam making both sand clay loam and loam sand soil types similar. Broadcasting of the whole amount of P fertilizer during soil preparation or half of the amount during soil preparation and sidedressing the other half after seedling emergence and before the first irrigation tended to enhance plant growth and seed yield comparing with the other methods. However, its effects were inconsistent. It is suggested that cowpea, as being a tropical plant with adaptability to wide range of soil types, could be produced successfully in the new and reclaimed soil in Southern Valley region. Providing starter N fertilizer is recommended under such conditions.

Keywords: clay loam soil, fertilization, loam sand soil, sand clay loam soil, seed yield.

Received on: 31/3/2015 **Accepted for publication on:**1/4/2015

Referees: Prof. Sayed A. Abdel-Aal Prof. Mohamed A.Farghali

Introduction:

Cowpeas (*Vigna unguiculata* (L.) Walp.) are ancient leguminous plants widely grown nowadays throughout tropics and subtropics but greater in India and Africa. There are five subspecies of *V. unguiculata* of which two are wild. The common cultivated cowpea is subsp. *unguiculata* and both West Africa and India are the modern centers of cultivars diversity. The common cowpea is grown in Egypt both for its green pods and dry seeds. It is favorable to Egyptian consumers especially in form of dry seeds. The seeds have high percentage of protein (20 to 30%) and they are rich in the essential amino acid lysine.

The crop is mainly produced in Delta region in Egypt. However, as being a tropical plant which is known to be more tolerant to unfavorable conditions than many other leguminous crops, it would be ideal crop for production in new reclaimed soil in Southern Valley. It may be useful to enhance natural properties of such soil. However, no previous report was found on comparative study conducted in different soil types in one location as affecting productivity of cowpea. The objective of the present study, therefore, was to compare pulse crop of the local favorable cv. 'Cream 7' grown in three different soil types (clay loam, sand clay loam, and sand loam) using diverse amendment of phosphorus and nitrogen fertilizers .

Materials and Methods:

The present study was carried out in the Agricultural Research Station of Assiut University at El-Ghorieb (26 kms east of Assiut city). The mechanical and chemical characteristics of three different soil types existed at the experimental site are summarized in Table (1).

Table (1): Mechanical and chemical characteristics of the three different soil types in El-Ghoriab Research Station.

Characteristics	Clay loam	Sandy clay loam	Loam sand
A- Mechanical analysis:			
Sand	15.84	49.92	79.92
Silt	48.00	22.00	12.00
Clay	36.16	28.08	8.08
B- Chemical analysis:			
P (ppm)	6.7	3.2	2.90
pH (1:1)	7.58	7.63	8.00
Ec (mmhos/cm)	2.62	1.54	0.30
Total N (%)	0.034	0.031	0.011
Total $CaCO_3$ (%)	2.11	8.11	16.31

Plant materials, studied treatments, and experimental procedures:

Two successive field trials were conducted during two successive summer season (1994 and 1995) using the locally adapted copwea cv. 'Cream 7'. The seeds were obtained from the Egyptian Agricultural Organization. The growth type of plants of this cv is determinate and it produces yellowish-white seeds. Four different application methods for superphosphate (15.5% P_2O_5) and use of ammonium nitrate (33.5% N) were studied. Superphosphate was applied at rate of 300 kgs/feddan (45.5 kgs

P_2O_5). The four application methods for superphosphate were as follows: 1) the whole amount was broadcasted during soil preparation prior to seed planting (PR method), 2) half of the amount was used as in PR method and the other half was sidedressed after emergence and before the first irrigation (HPR plus HPO method), 3) the whole amount was sidedressed after emergence while the soil surface was wet after the first irrigation (POW method), and 4) the whole amount was sidedressed while the soil surface was dry before the second irrigation (POD method).

The treatments of ammonium nitrate were fertilization with 45 kgs N/feddan vs. no nitrogen application. Ammonium nitrate fertilizer was added after complete emergence with the first irrigation. The four application methods for superphosphate and the two treatments of ammonium nitrate starter were arranged as a split-plot experiment in randomized complete-blocks with four replicates. The four application methods for superphosphate were allotted randomly to the main plots while the two treatments of ammonium nitrate were assigned at random to the sub-plots. Each sub-plot consisted of six rows which were 3 m long and 60 cm wide. The experiment was conducted separately in clay loam, sand clay loam, and loam sand soil. Seed planting was spaced within row at 25 cm on the eastern side of the rows. All other cultural practices were as usual in the production of cowpea crop. Measurements at flowering stage included plant dry weight (dried in oven at 70°C to constant weight), number and weight (g) of nodules per plant root and percentage of pod-set. At the end of the growing season, 1000-seed weight and total dry-seed yield were determined.

Statistical analysis:

All data were statistically analyzed following the appropriate procedures of analysis of variance (ANOVA) for the experimental model and design used (Gomez and Gomez, 1984). Separate and combined analyses of variance were conducted. Combined analysis for soil types was performed based on homogeneity test of error variances in the separate ANOVA for split-plot in randomized complete block design. Except replicates and trials effects, all factors were considered fixed. Significance of component of variance for different studied factors and their different interaction combinations were used to aid mean comparisons as explained by Gomez and Gomez (1984). Comparisons among main effects of the treatments showing significant variance component due to their interaction were regarded as not useful. Therefore, only those least significant values (LSDs) for appropriate and useful mean comparisons were calculated and presented along with the means.

Results and Discussion:

Crop production can be improved by breeding and/or agrotechniques. Genetic manipulation for crop improvement through breeding methods is the only avenue to attain needs for adding desirable traits, creating new genetic variability, and finding useful genetic recombination. In contrast to breeding, crop managements are rather a short-term project and substantial yield improvement can be simply achieved via this approach (Kayode and Odulaja, 1985; Patil *et al*. 1991). Studies on crop management are always required whenever manipulating different recombinant

breeding lines or new cultivars and new cultural environments or technologies. In this context, the present study provides useful information on some major factors in production of common cowpea under Assiut conditions (Tables 2 to 6).

'Cream 7' is one of the most favorable pulse cowpea to our local consumers. The dry-seed yield (Table 6) and 1000-seed weight (Table 5) for this cultivar showed a consistent gradient elevation in loam sand, sand clay loam and clay loam soil types, respectively. These differences were found whether or not ammonium nitrate fertilizer was used suggesting an effect due to differences in natural and mechanical soil characteristics (Lindsay and Gumbs, 1993).

With reference to N poverty, there were consistent increases for seed yield (Table 6) in both loam sand and sand clay loam soil types used in this study with ammonium nitrate fertilization. Other researchers indicated either increases (Amin *et al.,* 1990; Kher *et al*., 1994; Lindsay and Gumbs, 1993) or no effects (Elowad and Hall, 1987; Faris and Mohamed 1989) as a result of starter N fertilization. Contradictory data can be attributed to differences in soil characteristics, variation in forms of fertilizers, and the time and methods of application.

Varieties are different in their response to infection with *Rhizobium* (Barker and Sajise, 1985) but, generally under favorable conditions for nodulation, cowpea may not require N fertilization (Fernandez and Miller, 1985). However, the natural nodulation under our conditions was reduced in terms of number of nodules/plant root in clay loam and sand clay loam soil types and increased in loam sand soil when ammonium nitrate fertilizer was applied (Table 3). There was a reduction in terms of weight of nodules in sand clay loam in both trials and in clay loam and loam sand only in one of the two trials (Table 4). Although N fertilization may depress nodulation (Tewari, 1964) use of 20 to 30 kgs N as starter may have no effects on nodulation (Adu and Nnadi, 1990) or even increase it (Basu *et al.,* 1989).

Broadcasting 300 kgs superphosphate during soil preparation (PR method) or half of the amount as in PR method and the other half sidedressed after seedling emergence and before the first irrigation (HPR plus HPO method) significantly increased plant growth and seed yield compared with the other methods. However, its effects were inconsistent. Enhanced seed yield as a result of adding superphosphate has been widely documented (Kher *et al.,* 1994; Naceur, 1991; Nnoham, 1986; Sawant *et al.,* 1992; Tripathi *et al.,* 1984) although few others found no effects (El-Murabba. 1963; Oliveira *et al*., 1982). Most of these workers used amount close to which was used (on average, 30 kgs P_2O_5 /fed.). Pillai *et al.* (1981) indicated that application of rock phosphate gave more seed yield than superphosphate while in another study (Gajanan *et al.,* 1990) using 50% rock phosphate plus 50% superphosphate was the best treatment. This reflects the effect of contact surface with soil on availability of P. Then successive applications before and after seedling emergence to reduce P fixation may be the appropriate method especially when using mono-superphosphate.

It is a noticeable observation here that the clay loam soil which produced the greatest seed-yield had higher level of salinity (2.62

mmhos/cm) than other two soil types. This vividly indicate that cowpea is tolerant to unfavorable soil conditions relative to other legume crops such as common bean (*Phaseolus vuglaris* L.) which usually can not be produced in soil with salinity level higher than 1 mmhos/cm. Such tolerance can also be observed here in cowpea potential production in a wide range of soil types. The dry-seed yield produced in loam sand soil was, generally, as high as 80 to 85 per cent of the seed yield produced in the most productive soil type, i.e. clay loam. It is suggested, therefore, that cowpea, as being a tropical plant with adaptability to wide range of soil types, could be produced successfully in the new and reclaimed soil in Southern Valley region.

Table (2): Average dry weight (g/plant) for cowpea cv. 'Cream 7' grown during the summer season in three different soil types utilizing four diverse application methods for superphosphate (15% P_2O_5) and starter ammonium nitrate (33.5% N) vs. no N supplements[1].

Soil types (S)		First Trial (1994 and 1995)[2]				Second Trial (1994 and 1995)[2]			
Fertilization (P_2O_5)[3]	N	Clay loam	Sand clay loam	Loam sand	Mean over all (S)	Clay loam	Sand clay loam	Loam sand	Mean over all (S)
PR	NO	9.61	8.78	7.29	8.56	10.28	8.93	7.61	8.94
	45 kg	10.59	9.65	7.88	9.37	10.85	9.81	8.16	9.61
Mean over all (N)		10.10	9.22	7.58	8.97	10.57	9.37	7.89	9.27
HPR Plus HPO	NO	9.56	8.52	6.82	8.30	9.86	8.31	7.02	8.39
	45 kg	10.10	9.11	7.27	8.59	10.40	8.94	7.55	8.96
Mean over all (N)		9.88	8.82	7.04	8.58	10.13	8.62	7.28	8.68
POW	NO	8.96	7.90	6.58	7.81	9.40	8.02	6.71	8.04
	45 kg	9.71	8.37	6.99	8.86	9.94	8.48	7.17	8.53
Mean over all (N)		9.34	8.13	6.78	8.08	9.67	8.25	6.94	8.29
POD	NO	8.42	8.31	6.80	7.84	9.51	8.09	6.85	8.15
	45 kg	9.09	8.75	7.33	8.39	10.11	7.62	7.23	8.65
Mean over all (N)		8.76	8.53	7.06	8.12	9.81	8.35	7.04	8.40
Mean over all P_2O_5	NO	9.14	8.38	6.87	8.13	9.76	8.33	7.05	8.38
	45 kg	9.90	8.97	7.36	8.74	10.32	8.96	7.53	8.94
Mean over all (P_2O_5 and N)		9.52	8.67	7.12	8.44	10.04	8.65	7.29	8.66

[1]Significance

(Source of	S	$1x10^{-3}$	SxN	$1x10^{-3}$	S	$1x10^{-3}$	SxN	$2x10^{-2}$
variation and	P	$1x10^{-3}$	PxN	$2x10^{-3}$	P	$1x10^{-3}$	PxN	$1x10^{-2}$
Probability	N	$1x10^{-3}$	SxPxN	NS	N	$1x10^{-3}$	SxPxN	NS
level)	SxP	NS[4]			SxP	NS		

[2]$LSD_{0.05}$ = 0.39 to compare means of application methods for superphosphate for same or different treatments of ammonium nitrate in both trials, 0.18 and 0.14 to test differences between N treatments for each treatment combination of application method for superphosphate and soil type in the first and second trials, respectively, 0.34 and 0.42 to compare soil types for same or different treatments of N supplements in the first and second trials, respectively.

[3]PR = the whole amount was broadcasted during soil preparation prior to seed planting; HPR plus HPO = half of the amount was used during soil preparation and the other half was applied before the first irrigation; POW and POD = the whole amount was applied after the first irrigation while soil surface was wet and dry, respectively.

[4]Non-significant

Table (3): Average number of nodules per plant root for cowpea cv. 'Cream 7' grown during the summer season in three different soil types utilizing four diverse application methods for superphosphate (15% P_2O_5) and starter ammonium nitrate (33.5% N) vs. no N supplements[1].

Soil types (S)		First Trial (1994 and 1995)[2]				Second Trial (1994 and 1995)[2]			
Fertilization (P_2O_5)[3]	N	Clay loam	Sand clay loam	Loam sand	Mean over all (S)	Clay loam	Sand clay loam	Loam sand	Mean over all (S)
PR	NO	2.50	3.55	2.00	2.68	2.65	4.00	2.15	2.93
	45 kg	2.15	3.20	2.45	2.60	2.25	3.45	2.65	2.78
Mean over all (N)		2.33	3.38	2.23	2.64	2.45	3.73	2.40	2.86
HPR Plus HPO	NO	2.40	3.40	1.95	2.58	2.45	3.65	2.10	2.73
	45 kg	2.05	3.10	2.45	2.53	2.10	3.30	2.50	2.63
Mean over all (N)		2.23	3.25	2.20	2.56	2.28	3.48	2.30	2.68
POW	NO	2.40	3.50	1.95	2.62	2.45	3.70	2.00	2.72
	45 kg	1.95	3.15	2.40	2.50	2.15	3.35	2.50	2.67
Mean over all (N)		2.18	3.33	2.18	2.56	2.30	3.53	2.25	2.69
POD	NO	2.35	3.55	1.90	2.60	2.45	3.70	1.95	2.70
	45 kg	2.00	3.15	2.35	2.50	2.15	3.20	2.40	2.58
Mean over all (N)		2.18	3.35	2.13	2.55	2.30	3.45	2.18	2.64
Mean over all P_2O_5	NO	2.41	3.50	1.95	2.62	2.50	3.76	2.05	2.77
	45 kg	2.04	3.15	2.41	2.53	2.16	3.33	2.51	2.68
Mean over all (P_2O_5 and N)		2.23	3.35	2.18	2.58	2.33	3.54	2.28	2.73

[1]Significance

(Source of	S	$1x10^{-3}$	SxN	$1x10^{-3}$	S	$1x10^{-3}$	SxN	$1x10^{-3}$
variation and	P	NS[4]	PxN	NS	P	$1x10^{-3}$	PxN	NS
Probability	N	$1x10^{-3}$	SxPxN	NS	N	$1x10^{-3}$	SxPxN	NS
level)	SxP	NS[4]			SxP	NS		

[2]$LSD_{0.05}$ = 0.08 to compare to means of the application methods for superphosphate in the second trial, = 0.07 to compare the two N treatments for each soil type in both trials, = 0.09 and 0.12 to compare means of soil types when received same or different N treatment in the first and second trials, respectively.

[3]PR = the whole amount was broadcasted during soil preparation prior to seed planting; HPR plus HPO = half of the amount was used during soil preparation and the other half was applied before the first irrigation; POW and POD = the whole amount was applied after the first irrigation while soil surface was wet and dry, respectively.

[4]Non-significant

Table (4): Average weight of nodules per plant root for cowpea cv. 'Cream 7' grown during the summer season in three different soil types utilizing four diverse application methods for superphosphate (15% P_2O_5) and starter ammonium nitrate (33.5% N) vs. no N supplements[1].

Soil types (S)		First Trial (1994 and 1995)[2]				Second Trial (1994 and 1995)[2]			
Fertilization (P_2O_5)[3]	N	Clay loam	Sand clay loam	Loam sand	Mean over all (S)	Clay loam	Sand clay loam	Loam sand	Mean over all (S)
PR	NO	0.242	0.393	0.173	0.269	0.262	0.408	0.175	0.282
	45 kg	0.177	0.193	0.196	0.188	0.181	0.206	0.203	0.197
Mean over all (N)		0.209	0.293	0.184	0.229	0.222	0.307	0.189	0.239
HPR Plus HPO	NO	0.202	0.316	0.170	0.229	0.202	0.324	0.175	0.234
	45 kg	0.174	0.192	0.191	0.186	0.177	0.193	0.192	0.187
Mean over all (N)		0.188	0.254	0.180	0.207	0.190	0.259	0.183	0.210
POW	NO	0.206	0.297	0.168	0.223	0.222	0.316	0.172	0.237
	45 kg	0.175	0.189	0.190	0.185	0.177	0.192	0.195	0.188
Mean over all (N)		0.190	0.243	0.179	0.204	0.199	0.254	0.184	0.212
POD	NO	0.214	0.308	0.164	0.229	0.212	0.305	0.173	0.230
	45 kg	0.175	0.191	0.189	0.185	0.177	0.191	0.194	0.187
Mean over all (N)		0.194	0.250	0.177	0.207	0.195	0.248	0.184	0.209
Mean over all P_2O_5	NO	0.216	0.328	0.169	0.238	0.225	0.338	0.174	0.246
	45 kg	0.175	0.191	0.192	0.186	0.178	0.195	0.196	0.190
Mean over all (P_2O_5 and N)		0.195	0.260	0.180	0.212	0.201	0.267	0.185	0.218

[1]Significance

(Source of variation and Probability level)								
	S	$1x10^{-3}$	SxN	$1x10^{-3}$	S	$1x10^{-2}$	SxN	$1x10^{-3}$
	P	$1x10^{-3}$	PxN	$1x10^{-3}$	P	$1x10^{-2}$	PxN	$4x10^{-2}$
	N	$1x10^{-3}$	SxPxN	$1x10^{-3}$	N	$1x10^{-3}$	SxPxN	$1x10^{-2}$
	SxP	$1x10^{-2}$			SxP	$2x10^{-2}$		

[2]$LSD_{0.05}$ = 0.020 and 0.092 to compare means for application methods for superphosphate for same combination of N and soil type treatments, and also to test difference of the two N treatments for same combination of the soil type and method to apply superphosphate in the first and second trials, respectively, = 0.012 and 0.093 to compare means of soil types for same combination of N and methods to apply superphosphate, in 1994 and 1995, respectively.

[3]PR = the whole amount was broadcasted during soil preparation prior to seed planting; HPR plus HPO = half of the amount was used during soil preparation and the other half was applied before the first irrigation; POW and POD = the whole amount was applied after the first irrigation while soil surface was wet and dry, respectively.

Table (5): Averages of 1000-seed weight (g) for cowpea cv. 'Cream 7' grown during the summer season in three different soil types utilizing four diverse application methods for superphosphate (15% P_2O_5) and starter ammonium nitrate (33.5% N) vs. no N supplements[1].

Soil types (S)		First Trial (1994 and 1995)[2]				Second Trial (1994 and 1995)[3]			
Fertilization (P_2O_5)[4]	N	Clay loam	Sand clay loam	Loam sand	Mean over all (S)	Clay loam	Sand clay loam	Loam sand	Mean over all (S)
PR	NO	153.87	150.13	136.20	146.73	154.81	150.68	138.48	147.99
	45 kg	154.34	152.63	139.90	148.95	155.58	153.09	142.45	150.37
Mean over all (N)		154.10	151.38	138.05	147.84	155.19	151.88	140.46	149.18
HPR Plus HPO	NO	152.99	149.06	135.35	145.80	153.26	149.84	136.98	146.69
	45 kg	153.40	151.58	138.85	147.94	154.06	151.66	141.01	148.91
Mean over all (N)		153.20	150.32	137.10	146.87	153.66	150.71	138.99	147.80
POW	NO	152.46	148.30	134.70	145.15	152.68	149.04	136.63	146.20
	45 kg	152.85	150.54	138.19	147.19	153.44	151.98	140.13	148.51
Mean over all (N)		152.66	149.42	136.44	146.17	153.06	150.64	138.38	147.36
POD	NO	152.34	148.66	133.86	144.95	152.58	148.97	136.25	145.93
	45 kg	152.72	151.15	138.48	147.45	153.21	151.71	139.73	148.23
Mean over all (N)		152.53	149.91	136.17	146.20	152.89	150.34	137.99	147.07
Mean over all P_2O_5	NO	152.91	149.04	135.03	145.66	153.33	149.70	137.08	146.70
	45 kg	153.33	151.47	138.85	147.88	154.07	152.11	140.83	149.00
Mean over all (P_2O_5 and N)		153.12	150.23	136.94	146.77	153.70	150.90	138.96	147.08

[1] Significance

(Source of	S	$1x10^{-3}$	SxN	$1x10^{-3}$	S	$1x10^{-3}$	SxN	$1x10^{-3}$
variation and	P	$1x10^{-3}$	PxN	NS[5]	P	$1x10^{-3}$	PxN	NS
Probability	N	$1x10^{-3}$	SxPxN	NS	N	$1x10^{-3}$	SxPxN	NS
level)	SxP	NS[5]			SxP	NS		

[2] $LSD_{0.05}$ = 0.42, 0.30 and 0.73 to compare means for 1) methods for application of superphosphate, and 2) N treatments in each soil type, and 3) soil types receiving same or different N treatments, respectively, in the first trial.

[3] $LSD_{0.05}$ = 0.62, 0.87 and 0.51 to use for same comparisons as indicated above but in the second trial.

[4] PR = the whole amount was broadcasted during soil preparation prior to seed planting; HPR plus HPO = half of the amount was used during soil preparation and the other half was applied before the first irrigation; POW and POD = the whole amount was applied after the first irrigation while soil surface was wet and dry, respectively.

[5] Non-significant

Table (6): Average total dry-seed yield (kgs/feddan) for cowpea cv. 'Cream 7' grown during the summer season in three different soil types utilizing four diverse application methods for superphosphate (15% P_2O_5) and starter ammonium nitrate (33.5% N) vs. no N supplements[1].

Soil types (S)		First Trial (1994 and 1995)[2]				Second Trial (1994 and 1995)[3]			
Fertilization (P_2O_5)[4]	N	Clay loam	Sand clay loam	Loam sand	Mean over all (S)	Clay loam	Sand clay loam	Loam sand	Mean over all (S)
PR	NO	1159.05	958.99	884.64	1000.58	1181.89	972.26	925.40	1026.52
	45 kg	1169.50	1041.04	973.20	1061.25	1194.49	1039.51	995.00	1076.33
Mean over all (N)		1164.28	999.55	928.92	1030.91	1188.19	1005.89	960.20	1051.43
HPR Plus HPO	NO	1146.43	942.52	880.62	989.86	1168.18	967.24	914.50	1016.64
	45 kg	1149.99	1007.53	951.59	1036.37	1184.21	1028.00	987.50	1066.57
Mean over all (N)		1148.21	975.03	916.11	1013.11	1176.20	997.62	951.00	1041.61
POW	NO	1140.99	938.04	878.32	985.78	1163.42	955.04	906.00	1008.15
	45 kg	1146.55	1000.50	938.00	1028.35	1172.81	1009.00	985.00	1055.60
Mean over all (N)		1143.77	969.27	908.16	1007.07	1168.12	982.02	945.50	1031.88
POD	NO	1139.70	941.00	874.62	985.11	1160.00	954.50	908.90	1007.80
	45 kg	1143.90	1003.00	935.08	1027.33	1174.13	1005.60	985.00	1054.91
Mean over all (N)		1141.90	972.00	904.85	1006.23	1167.07	980.05	946.95	1031.36
Mean over all P_2O_5	NO	1146.54	944.90	879.55	990.33	1168.37	962.26	913.70	1014.78
	45 kg	1152.49	1013.02	949.47	1038.32	1181.41	1020.53	988.13	1063.35
Mean over all (P_2O_5 and N)		1149.51	978.96	914.51	1014.33	1174.89	991.39	950.91	1039.07

[1] Significance

(Source of variation and Probability level)								
	S	$1x10^{-3}$	SxN	$1x10^{-3}$	S	$1x10^{-3}$	SxN	$1x10^{-3}$
	P	$1x10^{-3}$	PxN	$1x10^{-3}$	P	$1x10^{-3}$	PxN	NS
	N	$1x10^{-3}$	SxPxN	NS	N	$1x10^{-3}$	SxPxN	NS
	SxP	NS[5]			SxP	NS		

[2] $LSD_{0.05}$ = 14.75, 23.52 and 25.52 to compare: 1) means of methods for application of superphosphate for each N treatments over soil types, 2) means of the two N treatments for combinations of methods for applying superphosphate and soil type, and 3) means for soil types supplemented with or did not receive N, respectively.

[3] $LSD_{0.05}$ = 10.91, 12.76 and 14.28 to compare: 1) two means for methods to apply superphosphate, 2) the two N treatments in the same soil type, and 3) soil types supplemented with or did not receive N, respectively.

[4] PR = the whole amount was broadcasted during soil preparation prior to seed planting; HPR plus HPO = half of the amount was used during soil preparation and the other half was applied before the first irrigation; POW and POD = the whole amount was applied after the first irrigation while soil surface was wet and dry, respectively.

[5] Non-significant.

Literature Cited:

Adu, J.K. and L.A. Nnadl. 1990. Response of early-maturing cultivars of cowpea (*Vigna unguiculata*) to Rhizobium inoculation and starter nitrogen in Samaru, Nigeria. Samaru Journal Agricultural Research 7, 5-16. (C.F. Soils and Fertil. 55: 11627, 1992).

Amin, M., M.Z. Abedin, G.M.P. Nauilah and A.M.A. Kamal. 1990. Effect of N and P on the yield and yield attributes of cowpea under rainfed condation. Bangladesh Journal of Agricultural Research 15: 32-37. (C.F. Field Crop Abst. 46: 4368, 1993).

Barker, T.C. and P.E. Sajise. 1985. Yield and response to inoculation of five cowpea (*Vigna unguiculata* (L.) Walp.) lines in a shifting cultivation area of southern Nueva Vizcaya. Philippin Agriculturist 68: 309-313. (C.F. Field Crop Abst. 39: 6806, 1986).

Basu, T.K., A.K. Barui and S. Bandyopadhyay. 1989. Nodulation, growth and seed yield of moong in response to rhizobium inoculation and [nitrogen] application. Indian Journal of Mycological Research 27: 153-157. (C.F. Soils and Fertil. 54: 10504, 1991).

El-Murabaa. 1963. The effect of rate and time of application of fertilizers on cowpea yield. Assiut J. of Agric. Sci., 221-227.

Elowad, H.O.A. and A.E. Hall. 1987. Influence of early and late nitrogen fertilization on yield and nitrogen fixation of cowpea under well-watered and dry field conditions. Field Crops Research 15: 229-244.

Faris, F.S. and M.A. Mohamed. 1989. Effect of fertilization on two cowpea cultivars. Egypt. J. Agric. Res., 69, 1991.

Fernandez, G.C.J. and J.C. Miller, Jr. 1985. Yield component analysis in five cowpea cultivars. Journal of the American Society for Horticultural Science 110: 553-559.

Gajanan, G.N., S. Srinivasa, N. Janakiraman and M.A. Singlachar. 1990. Relative efficiency of rock phosphate against super phosphate in rainfed crops. Current Research University of Agricultural Sciences Bangalore. 19-12:202-203.

Gomez, K.A. and A.A. Gomez. 1984. Statistical procedures for Agricultural Research. John Wiley and Sons. New York pp. 680.

Kayode, G.O. and A. Odulaja. 1985. Response of cowpea (*Vigna unguiculata*) to spacing in the savanna and Rainforest zones of Nigeria. Expl. Agric., 21: 291-296.

Kher, G.C., J.C. Patel, B.S. Patfl and D.D. Malavia. 1994. Response of summer cowpea (*Vigna unguiculata*) to irrigation, nitrogen and phosphorus. Indian Journal of Agronomy 39: 175-177. (C.F. Field Crop Abst. 48: 3494, 1995).

Lindsay, J.I., and F.A. Gumbs. 1993. Tillage and nitrogen requirement for cowpea (*Vigna unguiculata* (L.) Walp.) in different soil types in the wet season. Tropical Agriculture 70: 214-

219. (C.F. Field Crop Abst. 47: 2346, 1994).

Naceur, M.B. 1991. [Positive effect of phosphate fertilizer on the yield components of cowpea (*Vigna unguiculata* L.) in Tunisia. INRAT Ariana, Tropicultura 9: 77-80. (C.F. Field Crop Abst. 46: 7658, 1993).

Nnoham, O.I. 1986. Effect of lime and phosphorus on yields of cowpeas on acid sands of Amakama. Tropical Grain Legume Bulletin No. 33, 14-16. (C.F. Field Crop Abst. 41: 3942, 1988).

Patil, N.K.B., P.Y. Kamannavar and D.P. Biradar. 1991. Performance of cowpea varieties at two interrow spacings. Journal of Maharashtera Agricultural Universities., 16: 1.

Pillai, M.R., V.M. Nair, P. Sukumari and T.C. Mohandas. 1981. Effect of different phosphatic fertilizers and efficiency of their methods of application on the growth and yield of cowpea. Agricultural Resarch Journal of Kerala 19: 103-105. (C.F. Field Crop Abstr. 36: 4740, 1983).

Sawant, C.V., S.A. Khanvilkar, S.S. Mahalle and S.V. Kanade. 1992. Irrigation and phosphorus requirement of cowpea in Konkan. Journal of Maharashtra Agricultural Universities. 17: 2, 325-326.

Tewari, G.P. 1964. Effects of nitrogen, phosphorus and potassium on nodulation in cowpea. Expl. Agric. 257-259. (C.F. Field Crop Abst. 20: 286, 1967).

Tripathi, S.N., R.A. Singh and A.S. Gill. 1984. Evaluation of cowpea varieties for forage and seed yields under different row spacings and levels of phosphate. Agricultural Science Digest. India 4: 102-104. (C.F. Field Crop Abst. 39: 213, 1986).

أداء اللوبيا المزروعه فى انواع تربه مختلفه ومعاملات متباينه من السماد الفوسفاتى والازوتى

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الملخص:

أجريت هذه الدراسة فى عامى ١٩٩٤ و ١٩٩٥ بمحطة البحوث الزراعية بالغريب (حوالى ٢٦ كم شرق مدينة أسيوط) والتابعة لكلية الزراعة – جامعة أسيوط ، وفيها إستخدام الصنف المحلى " كريم ٧ " والذى زرع فى العروة الصيفية فى ثلاث أنواع مختلفة من التربة (طينية طميية ، رملية طينية طميية ، طميية رملية) وكانت الزراعة فى خطوط عرض ٦٠ سم والمسافة بين الجور٢٥سم ودرس تأثير أربع طرق مختلفة لاضافة ٣٠٠ كجم / فدان من السوبرفوسفات (١٥% فو٢أ٥) وهى :(أ) اضافة كل الكمية نثراً أثناء اعداد الارض للزراعة ، (ب) إضافة نصف الكمية نثراً اثناء اعداد الأرض والنصف الاخر بعد ظهور النباتات فوق سطح التربة وقبل الريه الاولى ، (جـ) اضافة كل الكمية بعد الرية الاولى والارض رطبة ، (د) اضافة كل الكمية بعد جفاف التربة عقب الرية الاولى ، هذا بالاضافة الى دراسة تأثير اضافة بادىء من التسميد الازوتى (٤٥ كجم ن/فدان) فى صورة نترات نشادر (٥ر٣٣ % ن) دفعة واحدة بعد ظهور النباتات مقارنة بعدم التسميد الازوتى ، أخذت قياسات على النمو (الوزن الجاف للنبات) ، تكون العقد الجذرية (عدد العقد على الجذر ووزنها) ، المحصول البذرى (وزن ١٠٠٠ بذرة ، وزنَ المحصول الكلى للبذور) وتم تحليل البيانات احصائياً وأظهرت النتائج ان محصول البذره الجافه ووزن ١٠٠٠– بذره قد سجل اعلى قيما فى التربه الطينيه الطمييه يليها التربه الرمليه الطينيه الطمييه ثم الرمليه الطمييه ، وقد وجد زياده فى محصول البذره الجافه ووزن ١٠٠٠– بذره بالاستجابه لبادىء التسميد الازوتى عند اضافته للتربه الرمليه الطينيه الطمييه والتربه الرمليه الطمييه ، وقد كان محصول البذره الجافه المنتج فى التربه الرمليه الطمييه يعادل٨٠%–٨٥% من ذلك الناتج من الزراعه بالتربه الطينيه الطمييه ، وكان لطريقة اضافة السماد الفوسفاتى بالطريقه (أ، ب) تأثيرا محسنا للمحصول البذرى وعدد ووزن العقد الجذريه وان لم يكن ثابتا ، وقد وجد ان اكبر عدد للعقد الجذريه كان قد تكون بالتربه الطينيه الطمييه والتربه الرمليه الطينيه الطمييه عند عدم اضافة بادىء السماد الازوتى ، وقد حدث انخفاض لعدد للعقد الجذريه عند اضافة بادىء السماد الازوتى بينما حدث زياده لها بالنباتات المزروعه بالتربه الرمليه الطمييه ، وكان اعلى وزن للعقد الجذريه قد تكون بالزراعه بالتربه الرمليه الطينيه الطمييه فى حالة عدم اضافة سماد ازوتى ، بينما ادى استخدام هذا السماد الى زيادة وزن العقد الجذريه بالتربه الرمليه الطمييه وانخفاضه بنوعى التربه الاخرين واصبحت التربه الرمليه الطمييه معادله لتلك الرمليه الطينيه الطمييه ، ويستنتج من هذه النتائج امكانية نجاح انتاج اللوبيا "كريم ٧" بالأراضى الجديدة والمستصلحة فى جنوب الوادى ويوصى فيها بالتسميد الازوتى كبادىء وباضافة كل كمية السماد الفوسفاتى نثراً أثناء اعداد الارض للزراعة او إضافة نصف الكمية نثراً اثناء اعداد الأرض والنصف الاخر بعد ظهور النباتات فوق سطح التربة وقبل الريه الاولى.