



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

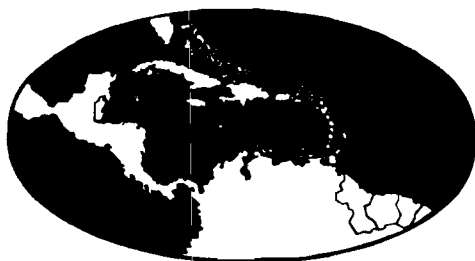
Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

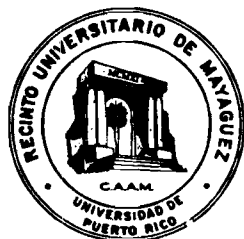
*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

CARIBBEAN FOOD CROPS SOCIETY



**THIRTEENTH ANNUAL MEETING
ST. AUGUSTINE TRINIDAD, W. I.
JULY 6-12, 1975**

**PUBLISHED WITH THE COOPERATION
OF THE
UNIVERSITY OF PUERTO RICO
MAYAGUEZ CAMPUS
1980**



VOLUME XIII

EFFECT OF NITROGEN, PHOSPHORUS, MOLYBDENUM AND LIMING ON GRAIN YIELD OF PIGEON PEA (*CAJANUS CAJAN*, (L) MILLSP.)

R.C. DALAL and P.QUILT

Caribbean Agricultural Research and Development Institute,
St. Augustine, Trinidad.

ABSTRACT

A field experiment was conducted at the University Field Station to study the effect of nitrogen (N), phosphorus (P), molybdenum (Mo) and liming on the grain yield of pigeon pea (*Cajanus cajan* (L.) Millsp.). It was observed that Mo did not have any effect on grain yield. Generally, the grain yield of pigeon pea increased with the increasing levels of N, P and lime, although yield increases were insignificant except when P was applied at the rate of 250 kg P/ha. Interaction between N and P was also observed.

INTRODUCTION

It is usual practice in the Caribbean to grow pigeon pea without any addition of fertilizers, for it has been observed that generally pigeon pea does not respond to the added nutrients. Pietri, Abrams and Julia (1971) reported that pigeon pea grown on a clay soil (oxisol) did not respond to the fertilizers up to 112 kg N, 75 kg P, 140 kg K, 67 kg Mg, 95 kg Ca and 4,200 kg Si per hectare. However, Chowdhury and Bhatia (1971) observed that pigeon pea responded to the application of phosphorus fertilizer. They found that pigeon pea yielded 2,030, 2,340 and 2,760 kg/ha when P was added at the rate of 15, 30 and 45 kg P/ha, respectively. Similarly, Veeraswamy *et al.* (1972) reported that P fertilizer increased pigeon pea yield.

The present investigation was undertaken to study the effect of N, P, Mo and liming on the grain yield of pigeon pea, since earlier it was observed that pigeon pea grain yield was increased by the application of small amounts of N fertilizer although at higher rates, adverse effects on grain yield were observed (Dalal, 1974), and that P and Mo are generally needed in greater amounts by legumes than non-legumes.

MATERIALS AND METHODS

The field experiment was conducted on a River Estate loam, University Field Station, Champs Fleurs, Trinidad. The characteristics of the soil (0-20 cm depth) are: pH(H₂O), 5.2; clay content, 16%; organic carbon, 0.98%; total N, 0.14%; and available P, 5 ppm.

The experimental design consisted of two replicates of four blocks in a modified composite design (Lauckner and Springer, 1973; Lauckner, 1974). Table 1 gives the fertilizer rates. N, P and liming formed the main treatment and Mo was applied in split blocks. Pigeon pea, St. Augustine Dwarf (cv. 27/4a) was planted on 26 June, 1974 at 45.7 x 45.7 cm spacing (about 48 x 10³ plants/ha) and at 5 cm depth. The plot size was 7.32 x 9.14 m. Calcium was applied as limestone (finely ground material) a week before planting and it was thoroughly rotovated in upper 15 cm soil. Nitrogen, P and Mo fertilizers were applied a day after planting in furrow 5 cm deep and 5 cm away from the seed. The pigeon pea was harvested in three harvests, each one month apart, in the months of December 1974; January 1975 and February 1975.

There was no visible infestations of disease and insect-pests except the pod borer which was controlled by fortnightly spraying the pods with Toxaphene E.C. 60.

RESULTS AND DISCUSSION

The grain yield of pigeon pea was increased by the increasing rate of N, P and Ca, but the significant increase in yield was only when P was applied at 250 kg P/ha (Table 1). Molybdenum did not affect the grain yield significantly. This was possibly because enough Mo was present in soil for optimum plant growth and that very little demand for extra Mo was made since N fixation was poor (as evidenced by acetylene reduction assay).

The analysis of variance of the yield data when no molybdenum was added, showed that N and P interacted significantly, that is, the grain yield was significantly increased when both N and P were applied at increasing rates (Table 3). The response to added N was possibly because of poor N fixation by the pigeon peas. Dalal (1974) also observed that pigeon pea grown in the same soil responded to added N up to 20 kg N/ha. The response to P by pigeon pea has been observed elsewhere as well (Chowdhury and Bhatia, 1971).

From Tables 3 and 4 it was observed that quadratic model fitted the data better than linear and curvilinear models. In addition, it was observed that the grain yield at the highest rate of fertilizers applied, was significantly greater than the control (Tables 3 and 4), even though it was not evident from the mean yield (Table 2). Analysis of variance of the yield data of the individual harvests showed that N X P interaction was significant for harvests 1 and 2 only. Further, it was found that Ca significantly hastened the maturity of the crop.

It is concluded that some beneficial effect to pigeon pea accrued by the application of N, Ca and particularly P on the River Estate loam. However, it is essential that cost/yield analysis should be undertaken with respect to the fertilizer rates and grain yield.

ACKNOWLEDGEMENTS

The authors are grateful to Messrs. E. Mohammed, Y. Mahabir, Sayad Ali, Shan Ali and O. Kayum for their able technical assistance, and to Mrs. J.C. Sanchez for statistical analysis. This project formed a part of the Grain Legume Programme of the Faculty of Agriculture, financed by Regional Research Centre and Overseas Development Ministry of United Kingdom.

REFERENCES

- Chowdhury, S.L. and Bhatia, P.C. (1971). Profits triple when arhar is adequately fertilized. *Indian Farming*, 20, 27 - 30.
- Dalal, R.C. (1974). Effects of intercropping maize with pigeon peas on grain yield and nutrient uptake. *Expl. Agric.*, 10, 219 - 224.
- Pietri, R.; Abrams, R. and Julia, F.J. (1971). Influence of fertility level on the protein content and agronomic characters of pigeon peas in an oxisol. *J. Agric. Univ. Puerto Rico*, 55, 474 - 477.
- Veeraswamy, R.; Rajasekaran, V.P.A.; Selvakumari, G. and Mohamed, S.N. (1972). Effects of phosphoric acid and organic manure on red grain (*Cajanus cajan* (L.) Millsp.). *Madras Agri. J.*, 59, 304 - 305.

TABLE 1. Fertilizer rates*

Factor Level	N	P	Ca	Mo
	kg/ha			
0	0	0	0	0
1	10	50	500	0.25
2	20	100	1000	
3	30	250	2000	

* N, P, Ca and Mo were applied as $(\text{NH}_4)_2\text{SO}_4$, triple superphosphate, pulverized limestone and $\text{Na}_2\text{MoO}_4 \cdot 2\text{H}_2\text{O}$, respectively.

TABLE 2. Effect of N, P, Ca and Mo on grain yield

Factor Level	N	Grain Yield (kg/ha)	
		P	Ca
0	2023	2063	1853
1	1962	1962	1962
2	2053	2012	2222
3	2401	3191	2058
LSD (5%)		527	
Mo added			
0	1725	1369	1553
1	1737	1737	1737
2	1467	1823	1640
3	1937	3013	1918
LSD (5%)		882	

TABLE 3. Analysis of Variance without Mo treatment

Source	D.F.	S.S.	M.S.	F
Blocks	1	255374	255374	2.76
N	1	1770.12	1770.12	0.02
P	1	5151.12	5151.12	0.06
Ca	1	271953	271953	2.94
NXP	1	856086	856086	9.26*
NxCa	1	84255.1	84255.1	0.91
PxCa	1	119316	119316	1.29
Curvilinear	1	15150.4	15150.4	0.16
Out Vs Cube	1	1154190	1154190	12.48
Linear	1	117306	117306	1.27
Quadratic	1	1232000	1232000	13.32*
Residual	6	554810	92468.3	
Total	17	4667370		

TABLE 4. Analysis of Variance with Mo treatment

Source	D.F.	S.S.	M.S.	F
Blocks	1	2121800	2121800	8.19*
N	1	133128	133128	0.51
P	1	412232	412232	1.59
Ca	1	15138	15138	0.06
NxP	1	167621	167621	0.65
NxCa	1	3784.5	3784.5	0.01
PxCa	1	31500.5	31500.5	0.12
Curvilinear	1	52640.7	52640.7	0.20
Out Vs Cube	1	1667970	1667979	6.44*
Linear	1	.361	.361	0.00
Quadratic	1	1571080	1571080	6.07*
Residual	6	1553680	258947	
Total	17	7730940		