

## Influence of Phosphorus and Molybdenum Nutrition with Rhizobial Inoculation on Nutrient Uptake Pattern of Redgram\*

P. SUBBIAN<sup>1</sup> and S. RAMIAH<sup>2</sup>

Field experiment with 0, 25 and 50 kg  $P_2O_5$ /ha with and without rhizobial seed inoculation and seed and soil application of Sodium Molybdate were tried on redgram during summer and kharif seasons of 1978. Phosphorus application resulted in significant increase in N, P and K uptake in both the seasons. Both rhizobial seed inoculation and molybdenum nutrition did not show any marked increase in NPK uptake. Molybdenum uptake was not influenced by the above three factors.

Pulses play an important role in Indian Agriculture owing to their high protein content and soil enriching properties. Application of P to pulses with rhizobial inoculation improves yield, quality of grains and fixation of atmospheric N resulting in restoration of soil fertility (Kalyan Singh *et al.*, 1976). It is also observed that application of molybdenum along with P and rhizobial inoculation improves the nutrient uptake pattern of pulses. Hence an investigation was undertaken to study the influence of different P levels with rhizobial seed inoculation and seed and soil application of Molybdenum on nutrient uptake pattern of redgram.

### MATERIAL AND METHODS

Field experiments on phosphorus and molybdenum nutrition with rhizobial seed inoculation in redgram were conducted at 'F' and 'C' blocks of wetlands of Tamil Nadu Agrl. University Farm, Coimbatore in summer and kharif

1978 respectively. The characteristics of the experimental fields are presented in Table 1. Redgram Co. 3, a high yielding, medium in duration (135 days) was chosen for the study. Three levels of P viz., 0(P0), 25(P1) and 50(P2) Kg  $P_2O_5$ /ha were tried as main plot treatments. The sub-plots included five treatments viz., i) soaking the seeds in water for 30 minutes (S1), ii) dry seed treatment of 1% sodium molybdate (S2), iii) seed treatment with 1% sodium molybdate solution (S3), iv) soil application of 0.5 kg (S4) and v) 1.0 kg sodium molybdate/ha (S5). The experiments were laid out in split plot design and the treatments were replicated thrice.

For inoculating the seeds with rhizobium, bacterial culture was thoroughly mixed with seeds and dried during the previous evening. On the succeeding day, seeds were treated with sodium molybdate as per the schedule. Seeds were sown in lines drawn 60 cm

\*Forms part of M. Sc. (Ag.) thesis submitted to the Tamil Nadu Agrl. University, Coimbatore by the first author

1. Research Associate, Agrl. Research Station, Bhavanisagar.
2. Professor & Head, Kumara Perumal Farm Science Centre, Trichi.



apart adopting a spacing of 30cm between each plants. The plants were thinned on 15th day after sowing retaining one healthy plant per hill. Cultural practices commonly followed in the University farm were adopted. Adequate prophylactic plant protection measures were taken.

The contents of N, P and K and Mo in plant tissues were estimated by the methods described by Humphries (1956), Jackson (1973) and Purvis and Peterson (1956) respectively and the uptake of N, P, K and Mo were worked out by multiplying the N, P, K and Mo contents of the whole plant sample with the respective dry weight of the plant per unit area and expressed in kg/ha. The data collected were subjected to statistical scrutiny and the inference drawn are discussed in this paper.

#### RESULTS AND DISCUSSION:

i) *Nitrogen uptake*: In general N uptake was significantly higher in plots receiving P in both the seasons (Table 2). The higher uptake of N due to P application might probably be due to better root development and increased absorption of N and P from soil and also due to higher DMP. This is in accordance with the results of Kalyan Singh and Prasad (1976).

1i) *Phosphorus uptake*: Application of P increased the P uptake over control in all the growth stages of the crop (Table 3). The rate of P uptake was maximum during the pod development stage of the crop. Application of P might have increased the availability of soil P. Increase in P uptake in

redgram due to the applied P was also reported by Dalal and Quilt (1977).

iii) *Potassium uptake*: Phosphorus application had a favourable influence on K uptake over no P application (Table 4). Application of P increased not only the uptake of N and P but also K to meet the balanced requirement of these nutrients by redgram.

Both Rhizobial seed inoculation and sodium molybdate application did not show any significant influence on the uptake pattern of N, P and K in redgram.

iv) *Molybdenum uptake*: The uptake of Mo in redgram was found to be not significant (Table 5) due to either P and Mo nutrition or rhizobial seed inoculation in both the seasons.

#### REFERENCES

- DALAL, R. C. and P. QUILT. 1977. Effect of N, P, Liming and Mo on nutrition and grain yield of pigeonpea. *Agron. J.* 69: 854-57.
- HUMPHRIES, E. C. 1956. Mineral components and also analysis in Modern methods of plant Analysis. Springer Verlag, Berlin, 1: 468-02.
- JACKSON, M. L. 1973. Soil Chemical Analysis (Revised Indian Edition). Prentice-Hall of India (Pvt.) Ltd., New Dhelhi.
- KALYAN SINGH and R. PRASAD. 1976 Effect of nitrogen, phosphorus and rhizobium inoculation on protein content and nutrient uptake of pigeon pea. *Indian J. Agron.* 21: 266-70.
- KALYAN SINGH, R. PRASAD and S. L. CHOWDHURY. 1976 Effect of nitrogen, phosphorus and rhizobium inoculation on growth and yield of pigeon pea under rainfed conditions. *Indian J. Agron.* 21: 49-53.
- PURVIS, E. R. and N. K. PETERSON. 1956. Methods of soil and plant analysis for Molybdenum *Soil Sc.* 81: 223-28.



and P was also  
lt (1977).

Phosphorus  
le influence  
application  
P increased  
and P but  
ed require-  
redgram.

inoculation  
lication did  
fluence on  
and K in

The uptake  
nd to be  
e to either  
obial seed  
ons.

Effect of N, P,  
grain yield of

components  
hods of plant  
l: 468-02.

ical Analysis  
tice-Hall of

76 Effect of  
n inoculation  
t uptake of  
66-70.

L CHOW-  
phosphorus  
growth and  
conditions.

l. 1956.  
for Molyb-

TABLE 1 Chemical Properties of the Soil of the Experimental Fields.

Properties	Summer '78	Kharif '78
Available N (kg/ha)	270 (low)	297 (medium)
Available $P_2O_5$ (kg/ha)	18.4 (medium)	20.0 (medium)
Available $K_2O$ (kg/ha)	520 (high)	547 (high)
Available MO (ppm)	0.047	0.047
pH (1:2 Soil-water suspension)	7.5	7.4



TABLE 2 Effect of Phosphorus, Molybdenum and Rhizobial seed Inoculation on Nitrogen Uptake by Redgram (Mean values-kg/ha)

Treatment	Summer '78				Kharif '78			
	Days after sowing				Days after sowing			
	45	75	105	135	45	75	105	135
PO	14.54	53.04	81.41	100.73	16.75	51.19	88.76	108.39
P1	14.95	60.29	90.70	116.76	17.49	58.27	95.50	122.84
P2	15.35	64.62	94.66	122.63	17.98	63.29	101.06	130.90
S. E.	0.44	1.71	2.84	4.85	0.58	1.87	2.94	3.16
C. D. (P=0.05)	N. S.	5.39	8.95	15.28	N. S.	5.88	9.26	12.16
I0	14.65	58.16	87.67	110.41	17.30	56.24	93.17	117.82
I1	15.25	60.48	90.19	116.34	17.51	58.93	97.06	123.58
S. E.	0.36	1.40	2.32	3.96	0.47	1.52	2.40	3.15
C. D. (P=0.05)	N. S.	N. S.	N. S.	N. S.	N. S.	N. S.	N. S.	N. S.
S1	14.49	57.07	86.31	110.53	16.93	55.21	93.18	119.10
S2	14.84	57.45	88.37	112.09	17.38	58.12	94.09	119.82
S3	14.69	57.89	87.03	111.38	17.15	57.33	95.16	120.28
S4	15.05	61.76	90.66	115.96	17.67	58.25	96.30	121.74
S5	15.67	62.41	92.26	116.92	17.90	59.01	96.85	122.56
S. E.	0.48	2.05	2.56	3.65	0.43	1.65	2.25	2.86
C. D. (P=0.05)	N. S.	N. S.	N. S.	N. S.	N. S.	N. S.	N. S.	N. S.

N. S. : Not significant.



TABLE 3 Effect of Phosphorus, Molybdenum and Rhizobial Seed Inoculation on Phosphorus Uptake (Mean Values kg/ha)

Treatments	Summer '78				Kharif '78			
	Days after sowing				Days after sowing			
	45	75	105	135	45	75	105	135
PO	0.85	2.70	6.65	8.78	0.90	2.59	6.98	9.08
P1	1.02	3.05	8.66	9.73	0.94	2.96	8.02	10.88
P2	1.15	3.50	9.98	10.34	0.99	3.16	9.15	11.59
S. E.	0.29	0.31	0.42	0.49	0.02	0.10	0.18	0.27
C. D. (P=0.05)	N. S	N. S	1.32	1.56	0.07	0.32	0.55	0.84
IO	0.90	2.94	8.02	9.28	0.92	2.88	7.85	10.29
I1	1.11	3.22	8.85	9.96	0.97	2.98	8.25	10.75
S. E.	0.23	0.25	0.34	0.40	0.02	0.08	0.15	0.22
C. D. (P=0.05)	N. S	N. S	N. S	N. S	N. S	N. S	N. S	N. S
S1	0.92	2.90	8.22	9.43	0.92	2.85	7.83	10.32
S2	0.96	3.07	8.50	9.31	0.94	2.92	8.01	10.41
S3	1.02	2.98	8.36	9.58	0.93	2.78	7.96	10.55
S4	1.04	3.18	8.48	9.82	0.96	2.92	8.16	10.62
S5	1.09	3.28	8.64	9.94	0.97	3.03	8.28	10.70
S. E.	0.15	0.26	0.30	0.38	0.03	0.08	0.17	0.22
C. D. (P=0.05)	N. S	N. S	N. S	N. S	N. S	N. S	N. S	N. S

N. S.: Not significant.



TABLE 4 Effect of Phosphorus, Molybdenum and Rhizobial Seed Inoculation on Potassium Uptake (Mean values - Kg/ha)

Treatments	Summer '78				Kharif '78			
	Days after sowing				Days after sowing			
	45	75	105	135	45	75	105	135
PO	8.86	30.50	63.07	68.92	9.65	33.74	64.86	72.42
P1	9.12	33.63	69.96	75.15	10.23	37.93	72.84	76.45
P2	9.40	35.97	73.30	80.83	10.50	40.05	78.67	80.82
S. E.	0.35	0.77	1.43	2.04	0.31	0.77	1.88	2.03
C. D. (P=0.05)	N.S.	2.43	4.51	6.43	N.S.	2.43	5.92	6.39
IO	8.96	32.72	68.20	74.08	9.90	36.48	70.52	74.31
I1	9.30	34.01	69.31	75.86	10.36	38.01	73.72	78.81
S. E.	0.29	0.63	1.17	1.67	0.25	0.63	1.53	1.66
C. D. (P=0.05)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
S1	8.90	32.97	67.92	73.53	9.97	36.05	71.05	74.64
S2	9.14	32.86	67.60	74.48	10.07	37.33	71.75	75.87
S3	9.05	32.58	68.40	74.20	10.15	36.94	71.20	76.12
S4	9.25	33.74	69.03	76.14	10.19	37.85	72.25	78.01
S5	9.31	34.68	70.84	76.48	10.26	38.06	74.36	78.18
S. E.	0.28	0.75	1.14	1.58	0.24	0.86	1.59	1.84
C. D. (P=0.05)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

N. S.; Not Significant.



## PHOSPHORUS AND MOLYBDENUM NUTRITION OF REDGRAM

TABLE 5 Effect of Phosphorus, Molybdenum and Rhizobial Seed Inoculation on Molybdenum Uptake  
(Mean values - g/ha)

Treatments	Summer '78	Kharif '78
P0	31.70	34.45
P1	33.39	34.71
P2	34.24	38.03
S. E.	0.99	1.20
C. D. (P=0.05)	N. S.	N. S.
I0	32.27	35.14
I1	33.86	37.84
S. E.	0.65	0.98
C. D. (P=0.05)	N. S.	N. S.
S1	32.43	35.04
S2	32.78	35.47
S3	32.24	35.61
S4	33.35	37.96
S5	34.60	38.20
S. E.	0.90	1.18
C. D. (P=0.05)	N. S.	N. S.