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Growth Attributes of Finger Millet as Influenced by Different Levels and Methods of Phosphorus Application*

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In a field experiment, the influence of P fertilization on the growth attributes of two cv. of *ragi* was studied in a calcareous clay loam. Phosphorus application has significantly increased the plant height, panicle number, number of functional leaves and nodes, length of panicle, number of fingers in ear, test grain, weight and grain yield. Among the four methods of phosphorus application tried, band application was found to be superior. Simple correlations were worked out between the grain yield and its attributes viz., plant height, number of leaves, test weight of grain and straw yield and found to be positively correlated.

Phosphorus is one of the major nutrients needed in adequate quantity in available form for the growth and reproduction of cereals. It ts essential for the process of cell division formation of fat and albumen and for the conversion of starch into sugar. It plays a fundamental role in enzymatic reactions.

Venkataramana and Krishna Rao (1961), Mustafa and Durairaj (1968), Raniperumal *et al.* (1969) observed definite response to added phosphorus in finger millet. Its placement in bands reduces the soil contact and increases its concentration in small area near root zone and improves its availability to cereals. Singh (1961), Bathkal (1965) and Sinha (1968) have reported beneficial effects of placement of phosphorus. Narayanan and Vinodhini (1957), Moosa Sheriff *et al.* (1964), Bodade (1966), Datta and Vyas (1969) have reported the advantages of foliar nutrition of P.

A field experiment was conducted at Agricultural College farm, Coimbatore in a soil which contained per cent composition of 39.6 per cent clay, 10.6 per cent silt, 16.5 per cent fine sand, 24.0 per cent coarse sand, 0.092 per cent total P_2O_5, 0.072 per cent total N, 0.64 per cent of total K_2O, 3.19 per cent of CaO, 0.514 per cent MgO, 13.4 kg/ha. of available P_2O_5 and with a pH of 8.2.

In a 8x5 split plot design, two cv. of finger millet viz., CO.7 (brown grain type) and ECW 840 (white grain type) and four methods of P application viz., broadcast, plough-sole, band placement and foliar spray were assigned to main plots and five levels of P_2O_5, viz., 0, 17.5, 35, 52.5 and 70 kg/ha. were allotted to sub-plots. For the plots receiv-

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ing P through foliar application, half the dose of that of soil application was adopted. To assess the growth characteristics ten plant hills from each net plot were selected at random. The results of the eight growth attributes (Table I) and their influence on grain yield are discussed.

Plant samples were drawn on 60th day after planting, analysed for P (colorimetry) and N content (micro Kjeldhal method) and expressed as per centage on dry basis.

RESULTS AND DISCUSSION

The data on eight growth attributes and grain yield are presented in Table I.

Plant height at maturity : The variety, ECW 840 recorded signifi-

TABLE I. Influence of levels of P and method of application on growth and yield attributes of finger millet

Treatments	Plant height at maturity (cm)	No. of nodes	Functional leaves at maturity (No.)	Mean leaf area/blade (cm^2)	Panicle No./m^2	Near panicle length (cm)	Mean No. of fingers per panicle	Thousand grain weight (gm)	Grain yield (q/ha)
A) VARIETY									
CO. 7	75.5	4.9	8.2	43.5	190.2	6.32	7.0	2.29	34.39
ECW. 840	89.5	5.5	9.6	50.1	202.2	5.25	5.9	2.51	32.78
S. E.	1.3	0.07	0.13	1.3	17.3	0.04	0.09	0.01	0.52
C.D. (P=0.05)	3.8	0.20	0.39	4.0	N.S.	0.13	0.26	0.02	1.30
B) METHOD OF P APPLICATION									
Broad cast	81.7	5.2	8.9	—	196.0	5.58	6.35	2.31	32.45
Plough-sole	84.3	4.9	8.5	—	196.0	5.87	6.67	2.40	32.70
Band placement	81.6	5.4	9.2	—	193.8	5.92	6.48	2.45	34.60
Foliar spray	82.4	5.3	9.0	—	198.2	5.77	6.29	2.43	34.58
S. E.	1.8	0.1	0.25	—	24.4	0.06	—	0.01	0.61
C.D. (P=0.05)	N.S.	0.3	N.S.	N.S.	N.S.	0.08	—	0.03	1.83
C) LEVELS OF P_2O_5 (kg/ha)									
0	79.9	5.0	8.3	—	180.9	5.42	6.17	2.07	31.34
17.5	83.0	5.1	8.7	—	187.1	5.71	6.40	2.30	33.65
35.0	84.3	5.2	9.4	—	204.4	5.94	6.47	2.45	34.40
52.5	83.5	5.2	9.4	—	208.9	5.91	6.59	2.61	34.28
70	83.9	5.4	9.2	—	199.6	5.95	6.62	2.56	34.26
S. E.	1.1	0.06	0.1	—	5.3	0.10	0.11	0.01	0.49
C.D. (P=0.05)	3.0	0.16	0.3	N.S.	14.7	0.27	0.29	0.04	1.40

N.S. : Not significant

cantly increased height over CO. 7. Among the levels of P, 30 kg/ha recorded the maximum increase in height. This could perhaps be explained in terms of increased uptake of N through P application. The N content of plant sample also lends support to this (Table II.)

TABLE II. Nitrogen and P content in plant samples (drawn on 60th day of planting) expressed in oven dry basis.

Levels of P_2O_5 (kg/ha)	N content per cent	P content per cent
0	1.46	0.250
17.5	1.60	0.270
35.0	1.71	0.280
52.5	1.84	0.290
70.0	1.92	0.300
S. E.	0.01	0.003
C.D. (P = 0.05)	0.03	0.009

Panicle number/m² : Significant increase in panicle number was noticed in both the varieties tested at the level of 52.5 kg P_2O_5/ha (Fig. 1). This is in conformity with the earlier findings of (Raheja and Misra (1952), and Singh (1964).)

Number of functional leaves at maturity : More number of leaves was recorded by ECW 840 over CO. 7. The maximum increase was recorded with the level of 52.5 kg/ha of P. The reasons adduced under plant height are also applicable to the increased number of functional leaves.

Leaf area : ECW 840 recorded significantly increased leaf area over CO.7.

Number of nodes . ECW 840 recorded more number of nodes over

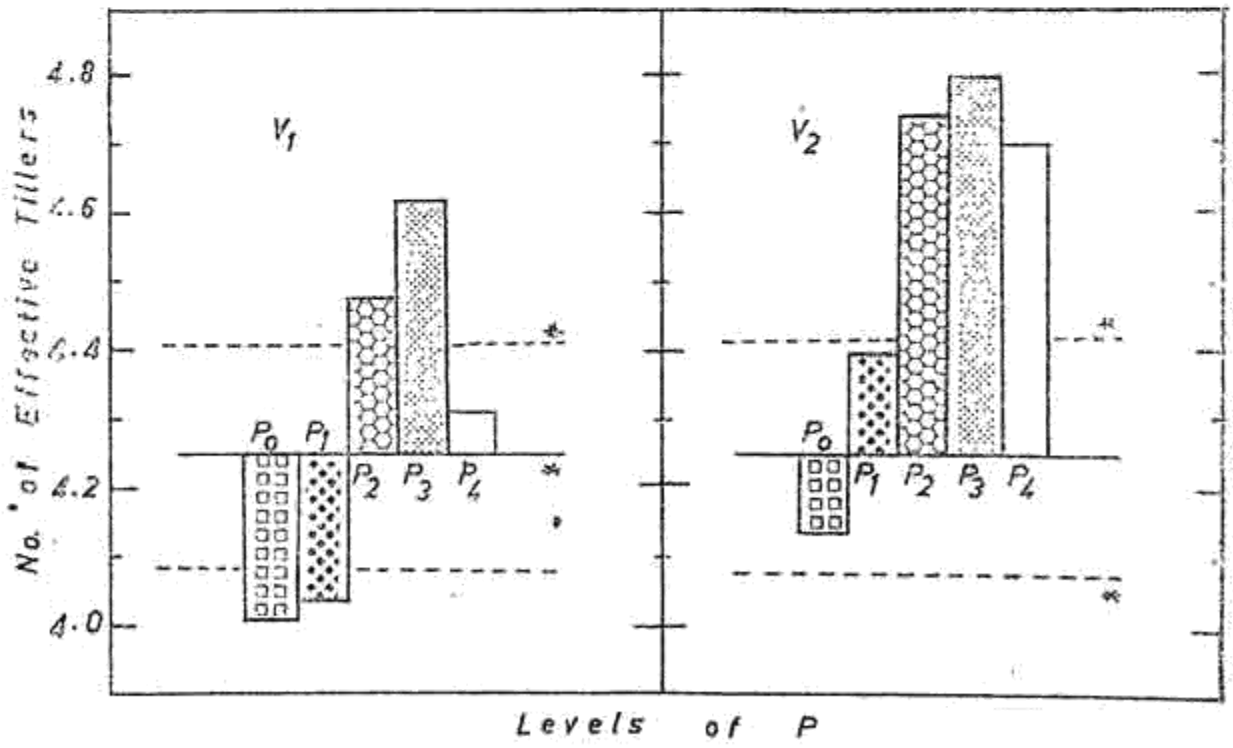

Fig. 1.

Co.7. Band placement and the level of 70 kg/ P_2O_5 ha have resulted in more number of nodes.

Length of panicle : *Ragi* CO.7 recorded significantly increased length of panicle which is an important yield attribute. Band placement of P has increased the length of panicle in both the varieties under study. CO.7 *ragi* recorded increased panicle length under all methods of application (Fig. 2).

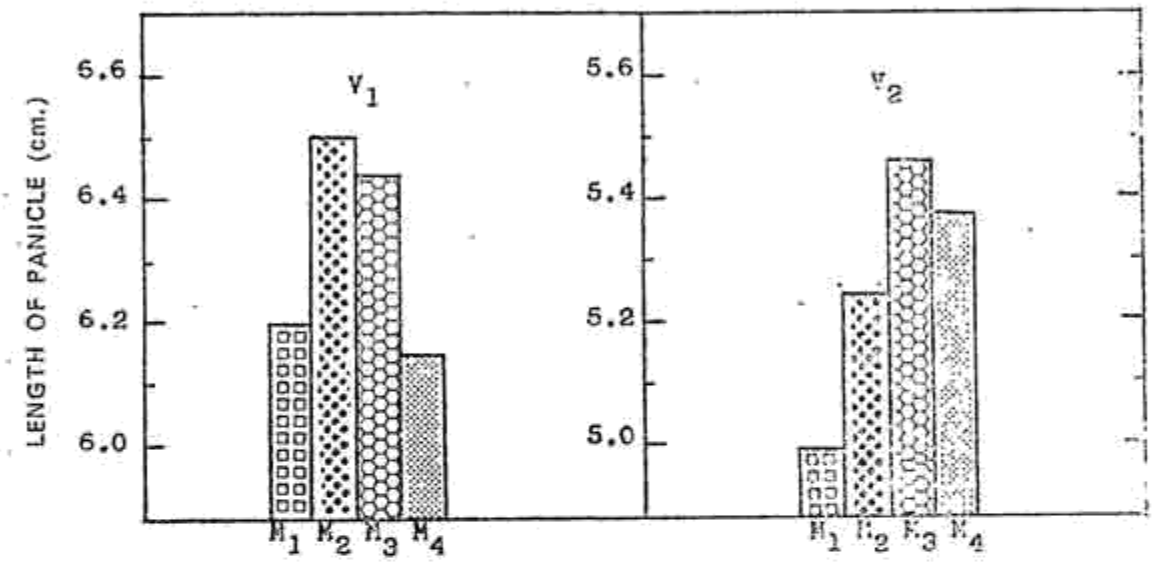

Fig. 2 Method of Application of P

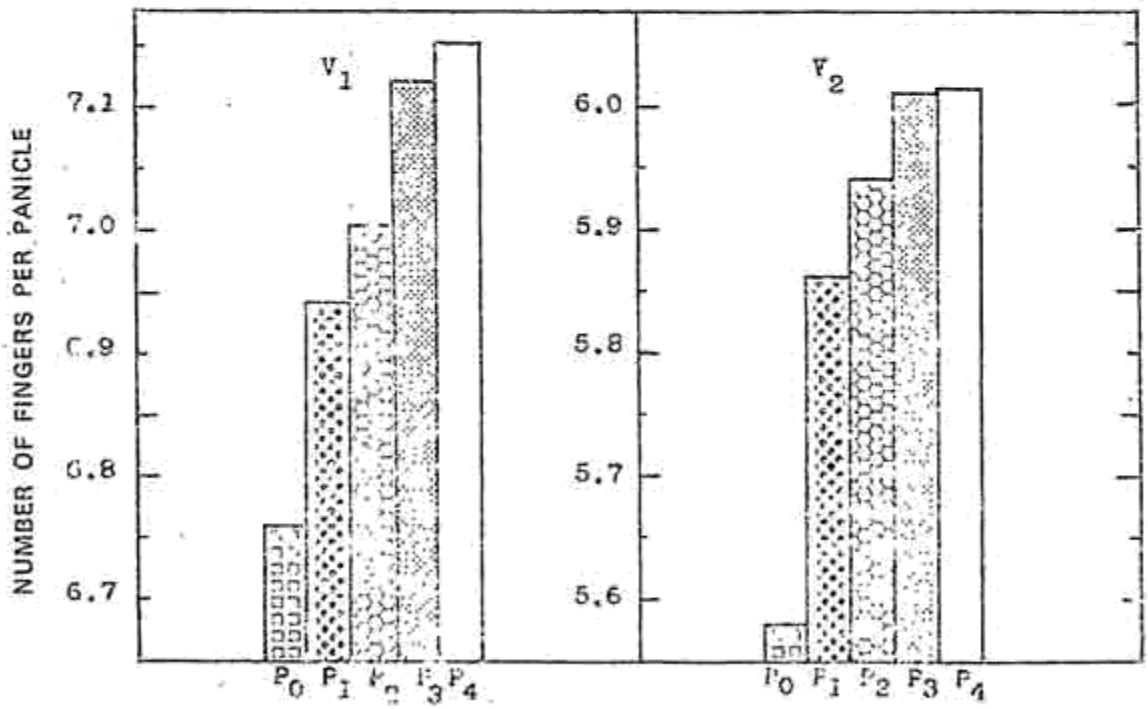

Fig. 3 Leaves of P.

Among the levels of P, 70 kg/ P_2O_5/ha has recorded the maximum increase.

Number of fingers in a ear : Variety CO.7 was superior to culture ECW 840 and among the levels of P, 70 kg/P_2O_5 ha has recorded the highest number of fingers in ear (Fig. 3). It is obvious that the high yielding nature of variety CO. 7 is established in more number of fingers which is yet another important factor for grain yield.

Test weight of grain : ECW 840 has shown higher test weight of grain than CO.7. Among the methods, band placement and among levels, 52.5 kgP_2O_5/ha have recorded higher values for thousand grain weight. This can be attributed to the better uptake of phosphorus through band placement.

Grain yield : CO.7 being a high yielding variety, responds well to P levels and its mode of application. The increase in yield of grain of variety CO. 7 over ECW 840 is attributed mainly to the increase in number of panicles per square metre, panicle length, number of fingers per panicle and thousand grain weight. These yield attributes are favourably influenced by P nutrition which resulted in increased grain yield in variety CO.7.

Phosphorus levels exceeding 52.5 kgP_2O_5/ha resulted in significant increase in panicle number, length, fingers per panicle and thousand grain weight. These yield attributes were found to be important in increasing grain yield of finger millet (Mahadevapa and Ponnaiya, 1962). Higher the dose of P, greater is its availability to crop plants as evidenced by the P content of the plant samples drawn on 60th day after planting. Higher P uptake also resulted in increased N uptake as seen from the N content of the plant (Table II.) The combined effect of P and N seemed to have favourably influenced the above yield attributes and the final grain yield.

Among the various methods of P application, band placement increased the yield attributes. This suggests that the placement of P in bands reduces soil contact of P, reduces its fixation in soil and thereby increases its avail-

TABLE III. Simple correlation coefficients between grain yield and its attributes

Yield attributes	Simple correlation coefficient 'r' value	Linear regression coefficients	Regression equation
Plant height	+ 0.515**	0.044	$\hat{Y} = 0.670 + 0.044x$
Number of leaves	+ 0.524**	0.347	$\hat{Y} = 1.147 + 0.347x$
Thousand grain weight	+ 0.577**	0.950	$\hat{Y} = 1.719 + 0.950x$
Straw weight	+ 0.641**	0.115	$\hat{Y} = 2.212 + 0.115X$

** Significant at 1% level $\hat{Y}$ = yield predicted

ability to crop plants for efficient grain production.

Correlation studies : Simple correlations studies released that plant height, number of leaves, weight of thousand grains and straw yield are positively correlated with yield. Thus, it is evident that P nutrition in finger millet influenced these yield attributes.

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REFERENCES

RATHKAL, B.G. 1965. Studies on N and P fertilization and method of application for wheat under rainfed conditions. *Indian J. Agron.*, **10** : 201-6.

SODADE, V.N. 1966. Effect of foliar application of N and P on the yield of Jowar. *Indian J. Agron.*, **11** : 267-69.

DATTA, N. P. and K. K. VYAS. 1969. Uptake and utilization of Phosphorus by maize from foliar sprays. *Soils Fert.*, **32** : 1464.

MAHADEVAPPA and P.W.X. PONNAIYA. 1962. Selection Index for yield in *ragi*. *Madras agric. J.* **50** : 85.

MOOSA SHERIFF, M., VINODHINI VASUDEVAN, SUNANDHA S. RAO and N. BALASUBRAMANIAN. 1964. Foliar nutrition studies with major nutrients on paddy. *Madras agric. J.*, **51** : 75.

MUSTAFA, S.P. and D. J. DURAIRAJ. 1968. Effect of phosphate carriers and doses on yield of CO. 7 ragi. *Madras agric. J.* **54** : 569-74.

NARAYANAN, T. R. and VINODHINI VASUDEVAN. 1959. Studies on foliar nutrition of crops III *ragi* and maize. *Madras agric. J.* **56** : 223-29.

RANIPERUMAL; R., L. MOHAMED GHOUSE and R. SUNDARARAJAN. 1969. Effect of continuous application of fertilizers and manure on yield and composition of certain crops. 1. Effect on *ragi*. *Madras agric. J.* **56** : 58-63.

SINGH, GAJADHAR. 1961. Response of wheat to superphosphate in varying doses and different depths with and without ammonium sulphate. *Indian J. Agron.*, **6**: 84-97.

SINHA, M.N. 1968. Relative abitity of maize plant to absorb Phosphorus placed at different soil zones - Studies with p. 32. *Indian J. Agron.*, **13** : 234-36.

VENKATARAMAN, R. S. and KRISHNA RAO. 1961. Chemical composition and nutrient uptake of *ragi*. *J. Indian Soc. Soil Sci.*, **9** : 245-52.