

DETERMINATION OF CRITICAL LIMIT OF AVAILABLE PHOSPHORUS FOR BARLEY IN SEMIARID REGION OF RAJASTHAN

P.C. KANTHALIYA AND S.N. SAXENA*

Agricultural Research Station, Keshwana, Jalor-343001

Application of phosphates in the semiarid region of Rajasthan provided variable response patterns. Fertilizer trials conducted in Udaipur and Jaipur districts exhibited variable responses to P application in barley (Saxena 1983). Variable responses to P application could be ascribed to build up of available P in soil beyond critical limit thus making them non responsive to P applications. Adequate information regarding critical levels of phosphate is not available in loamy sand soil of Chomu series (Jaipur district). Therefore present study was undertaken using barley (RDB-1) as test crop.

Field experiments were carried out at Jobner (Jaipur district) taking barley as test crop. Seventeen fields showing variation in available phosphorus ranging between 10.4 to 21.9 kg P ha⁻¹ (Olsen's P) were selected. Soils of the area (Chomu-Typic Torripsamments) are sand to loamy sand in texture, alkaline (pH₂ 8.2-8.4), poor in organic carbon, medium to high in K content (Table 1).

Table 1. Physico Chemical Characteristics of Soils (0-20 cm) and Yield of Barley (RDB-1)

Village	Org.c (%)	Avail. P (kg ha ⁻¹)	Avail. K. (kg ha ⁻¹)	Yield of Barley		
				Threshold yield q ha ⁻¹	Plateau yield q ha ⁻¹	Relative yield %
Nayabas	0.15	10.4	226	19.8	30.2	39.2
Naga Ki Dhani	0.22	10.5	187	20.2	29.9	67.5
Bhojpura	0.15	12.3	166	22.9	32.4	70.7
Gumanpura	0.31	12.5	142	22.4	36.5	61.4
Naga Ki Dhani	0.16	13.1	150	19.8	30.2	48.5
Maccharkhani	0.29	13.2	160	21.6	36.0	60.0
Dhanas	0.27	13.4	152	21.6	34.1	63.3
Naga ki Dhani	0.22	15.0	145	28.6	40.4	77.5
Maccharkhani	0.26	15.2	225	25.6	32.6	60.5
Naga Ki Dhani	0.16	15.2	185	25.5	35.1	72.6
Naga Ki Dhani	0.27	15.6	167	28.0	40.4	59.5
Bharinj Ki Dhani	0.30	15.8	180	25.6	32.6	79.5
Kalakh	0.20	18.2	125	32.1	37.2	89.5
Macchar Khani	0.16	18.4	190	19.8	30.2	65.6
Kalakh	0.33	21.9	240	27.0	35.1	80.5
Bharinji Ki Dhani	0.33	21.9	240	32.2	38.5	79.4
Dhanas	0.21	21.9	152	32.0	39.0	82.0

*Vice-chancellor, Rajasthan Agricultural University, Bikaner

Table 2. Coefficients of Determination (R^2) and Critical Level for Barley

Last value of Olsen's P included in population (kg P ha ⁻¹)	Population I		Population II		Postulated critical level between values	R^2 for postulated critical values
	Mean relative yield	Corrected sum of square of deviation from mean (CSS ¹)	Mean relative yield	Corrected sum of square of deviation from mean (CSS ²)		
10.5	65.5	2.0	73.2	956.0	10.5-13.1	0.075
13.1	64.9	80.2	78.5	281.3	13.1-15.3	0.651
15.3	69.3	459.0	82.6	30.6	15.3-18.3	0.537
18.3	71.0	789.4	82.8	82.8	18.3-21.8	0.237

$$R^2 = \frac{TCSS - (CSS^1 + CSS^2)}{TCSS} \quad (\text{Total corrected sum of square } TCSS = 1036.2)$$

The treatments consisted of four levels of P viz. 0, 10, 20, 30 kg P ha⁻¹. Nitrogen was applied @ 100 kg ha⁻¹ in two split doses at the time of sowing and at second irrigation. Potash @ 60 kg ha⁻¹ and phosphorus as per treatment were drilled at the time of sowing.

The relative yield of barley grain computed using Cate and Nelson (1971) formula and it varied from 39.2 to 89.5 per cent (Table 1) and was significantly correlated with available soil P ($r= 0.681^{**}$).

Using Cate and Nelson's (1971) statistical technique, calculation of coefficient of determination (R^2) and critical level for barley was carried out (Table 2). The coefficient of determination (R^2) increased upto 13.1 kg P ha⁻¹ and then decreased. The critical limit therefore lies between 13.1 and 15.3 kg P ha⁻¹ and can be designated as 14.2 kg P ha⁻¹ (Olsen's P) for these soils. The plot of relative yield against available P of the soil also indicated 14.2 kg P ha⁻¹ as the critical limit of the area).

REFERENCES

- Cate, R.B. Jr and Nelson L.A. 1971. A simple statistical procedure for partitioning soil test correlation data into two classes. *Proceedings of Soil Science Society of America* 35: 658-659.
- Saxena, S. N. 1983. *Rapid Soil Test Methodology for Rapid Fertilizer Phosphorus Recommendations Using Single Soil Solution Concentration Determination*. Department of Soils, Sukhadia University, Udaipur.