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Evaluation of Phosphorimeter for Estimation Phosphorus Avilability of *Bhal* and Coastal Soils in Gujarat State

D. P. Motiramani, J. C. Patel, J. D. Giri
S. Raman and J. H. Agrawal

National Agricultural Research Project, Sub-Project (Arnej), Gujarat Agricultural University

The present-day investigations indicate that the Indian soils are generally found deficient in nitrogen and almost sufficient in potash (Kanwar, 1976), so application of nitrogenous fertilizer is always being recommended while potash is not, even without testing the soils for their availability. However, phosphorus is always required to be estimated before sowing of any crop.

Phosphorus estimation in soils and plant has been since decades done over costly instruments like spectro-photometer or colorimeter. In addition to the cost factor another limitation in its use is the availability of an established laboratory (with power supply) and poor mobility as these instruments can not be taken to the field.

In view of the above limitation, the scientists at Jawaharlal Nehru Krushi Vishwa Vidyalaya, Jabalpur have designed and constructed a prototype of a simple, easy to operate, portable, low-priced (material and component cost, excluding battery, approx. Rs. 800/- as in 1980) phosphorimeter for determination of available phosphorus in soils. It gives readings directly in terms of very low, low, medium, high and very high status of phosphorus. The phosphorimeter incorporates a double beam optical path, a matched pair of photocells with built-in 660 nm red filter, and solid-state IC amplifier. The instrument works on 12 volts and needs a wet battery used in motor vehicles.

In view of the above facts and for its adaptibility on a large scale in the field itself, the present study was initiated to evaluate the phosphorimeter for its efficiency against the standard instrument. Surface soil samples (228 nos.) from the *Bhal* and coastal region of Gujarat State were analysed for their available phosphorus content by Olsen's method (Jackson, 1973) using two instruments viz., Bausch & Lomb Spectronik-20 spectrophotometer (standard) and phosphorimeter (Fig. 1). The phosphorimeter was first tested for its obeyance of the Beer-Lambert's Law of colorimeter. Calibration of the phosphorimeter was accomplished by adjusting the needle at 80 on the dial using standard phosphate solution equivalent to 34 kg P_2O_5/ha. Standard curves for both the instruments (Fig. 2) were prepared by using definate quantity of phosphorus as suggested by Department of Agriculture, Gujarat State with slight modification in IARI ranges for grading the Gujarat soils and measuring the intensity of molybdophosphoric blue colour (Muhr *et al.*, 1965). From recommendation

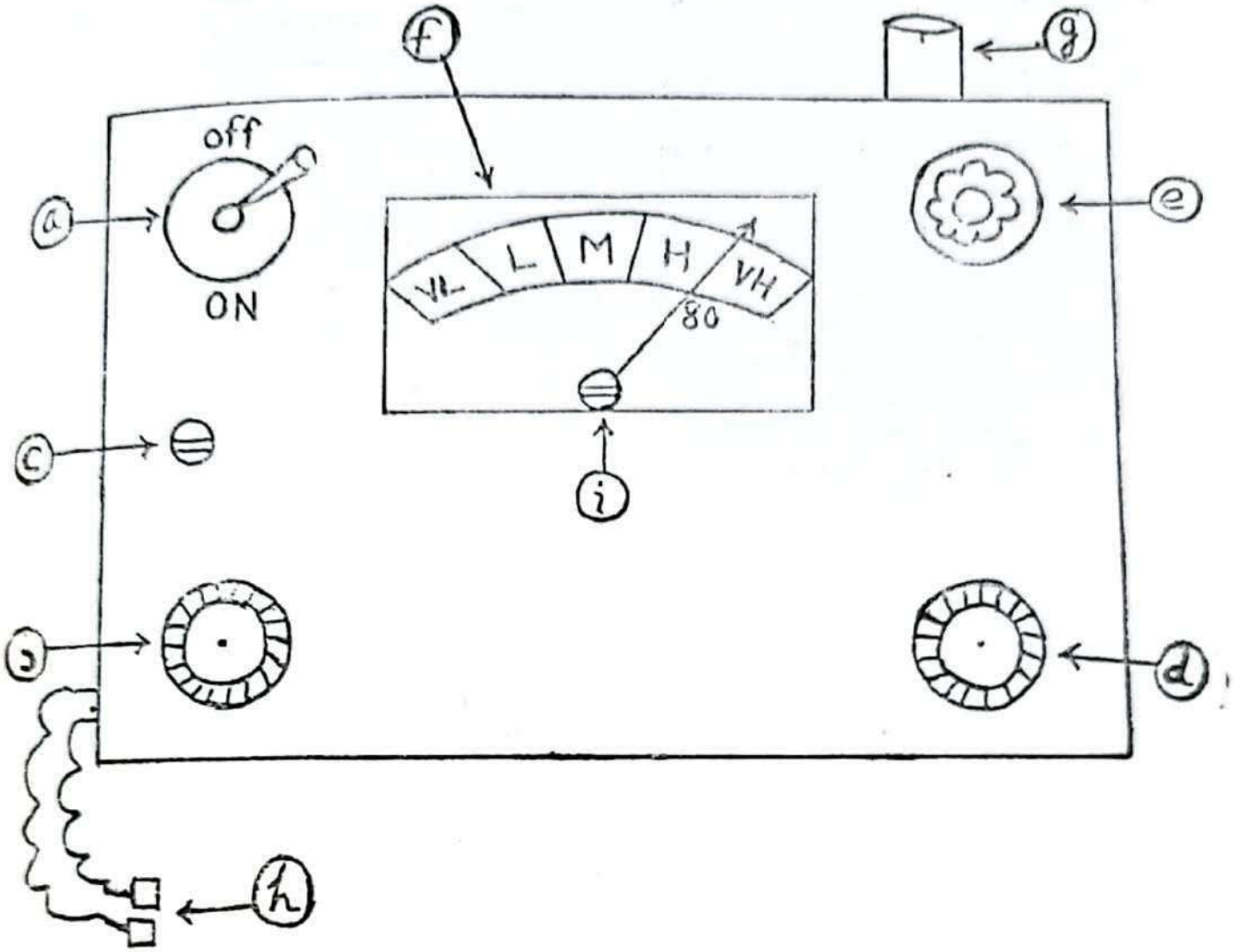
TABLE 1

Range and mean values of Olsen's P_2O_5 (kg/ha) of *Bhal* and coastal soils and their 'r' values for comparing two colorimeters.

Group	*High*		*Medium*		*Low*		*Very low*	
	A	*B*	*A*	*B*	*A*	*B*	*A*	*B*
Soil Samples	4	4	14	14	23	23	191	191
% Distribution	1.7	1.7	6.0	6.0	9.9	9.9	82	82
Range	56.8-77.28	58.69-74.37	28.26-52.28	31.81-55.5	14.89-26.26	18.82-27.8	0.81-15.86	0.89-16.27
Mean	69.17	69.66	39.37	43.73	20.09	24.93	5.31	6.82
Soil pH (1 : 2.5)	7.0-9.0		7.4-9.1		7.5-8.9		7.8-8.9	
'r' value	0.815 NS		0.992**		0.847**		0.45**	

Very High : More than 84 (non sample)
High : 56.0 — 84.0
Medium : 28.0 — 56.0
Low : 16.4 — 28.0
Very low : Less than 16.4
(All the figures in kg/ha)

A = Spectronik-20
B = Phosphorimeter
NS = Not Significant
** = Significant at 1% level.



ⓐ ON/off switch ⓑ Zero set
ⓒ Amplifier zero ⓓ Standardisation set
ⓔ Pilot lamp (red) ⓕ Meter for readout
ⓖ Insert for cuvette
ⓗ Pair of leads for battery (12V - Wet) Connection
ⓘ Mechanical zeroing for the meter

fig - 1 : Phosphorimeter

point of view, the marginal values (for grading the soil) were kept within the safe limits of recommendation (i. e. values shifted by 1 kg) and accordingly marked on the scale. The values for available psosphorus contents obtained by using both the instruments were compared using correlation test (Panse and Sukhatme, 1967). It is seen from Table 1 that the value for medium, low and very low groups was significant at 1% level, while it was not significant for the soils under high group, though the values fall within the range fixed for their proper group. The values for the phosphorimeter were slightly higher for all the groups as compared to the Spectronik-20. However, the predictibility remains the same.

From the results, it is revealed that this simple phosphorimeter may be recommended for use on the field where on the spot investigation of the phosphorus content is required. Due to its cost benefits and easy portability, this instrument would be ideal for a mobile soil testing laboratory.

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REFERENCES

Jackson, M. L. 1973. Soil Chemical Analysis, Prentice Hall, Inc., Engle Wood Chiffs, N. J.

Kanwar, J. S. 1976. Soil Fertility : Theory and Practice I.A.R.I., New Delhi.

Muhr, G. R., N. P. Datta, Sankarsubramoney, V. K. Laley and R. L. Donahue 1965, Soil Testing in India, United States Agency for International Development Mission to India, New Delhi.

Panse, V. G. and P. V. Sukhatme 1967. Statistical Methods for Agricultural Workers, Second Enlarged Edition, I.A.R.I., New Delhi.