Relationship between the available nitrogen content and the organic carbon as determined by Walkely, and Black's Method for the typical soils of Kerala

The most commonly followed methods for estimation of available nitrogen in soils are based on determining the mineralisable nitrogen under standard humidity and temperature conditions. A modification of these methods has been advocated by Subbiah and Asija which consists of treating a weighed quantity of soil with 0.32% KMn04 and 2.5% NaOH and distilling off the ammonia into standard acid. This method is now being followed in all the Soil Testing Laboratories in India, for estimation of available nitrogen in soils.

The correctness of the modified method as compared to the total mineralisable nitrogen has been verified by Subbiah and Asija for the major soil groups in the country. The authors compared the modified method with the standard incubation method for a number of soils belonging to the different soil types found in Kerala, and found that there was fairly good correlation between the two, and so the alkaline permanganate method was being followed in this laboratory also till recently.

However with increase in the number of samples to be analysed it was found that the cumbersome nature of the equipment required, and the time required for distillation, combined with the difficulty in the installation of a number of simultaneously distilling units acted as limiting factors to the modified method in this Laboratory.

Organic carbon in soils as an indication of their available nitrogen level is being used in quite a number of Soil Testing Laboratories in other countries. This method has the advantage of rapidity, and ease of operation, especially if the colorimetric modification of the Walkley and Black's method could be used. A rating chart for available nitrogen based on the values of organic carbon by this method, for normal Indian soils has been prepared by the I. A. R. I. and is being used by quite a number of laboratories in the country. It was found that this chart could be used in this laboratory for the sandy loams and the black soils of Palghat with a fair degree of accuracy. But in the case of the other major soil types like laterites, alluvial soils, and acid peats the values were very erratic. All the soils tested gave very high ratings for nitrogen, while it is a well known fact that most of these soils respond very well to nitrogen application. This is due to the wide variation in the carbon-nitrogen ratio of these soils ranging from as low as 6 in the case of laterite soils to as high as 45 or 50 in the case of acid peats, and also due to the complex nature of the organic matter.

The present study concerns itself with finding out the relationship between the organic carbon content of these soils as determined ky the method of Walkely and Black, and the available nitrogen as determined by the alkaline permanganate method.

Hundred samples of surface soil from each of the previously mentioned three types, collected from different areas of the state, were analysed for organic carbon and availa" ble nitrogen by the permanganate method.

The coefficients of correlation between the two values was worked out. The average values for organic carbon, available nitrogen, the standard deviation, and the coefficients of correlation for each soil type are given below.

Soil type	*Av. org. carbon*	*Standard deviation*	*Average available Nitrogen*	*Standard deviation*	*Coefficient of correlation*
	%		%		
Laterite	1.21	0.46	0.0190	0.006	0.50
Alluvial loams	2.28	1.08	0.0174	0.004	0.72
Acid peats (Kan)	7.22	4.15	0.0168	0.006	0.74

The significance of the correlation coefficients was tested by the 'Z' method and it was found that it was significant in all the three cases.

On this basis the following equations were arrived at.

Laterite Available nitrogen lbs/acre = % C x 128 + 226

Alluvial loam Available nitrogen lbs/acre = % C x 50 + 236

Acid peats Available nitrogen lbs/acre = % C x 22 + 170

To test the reliability of these equations another set of samples were analysed for organic carbon and the 'Av. N' calculated from the carbon values obtained by the alkaline permanganate distillation methods are given in Table I of Appendix.

It may be seen that the values are close enough for for recommendation purposes since in no case have the two values fallen in different ranges.

On this basis the following classification table is suggested for organic carbon for these three types of soil in the state.

Available Nitrogen levels (Based on % org. C)

Soil Type	*Low*	*Medium*	*High*
		(percentage of organic carbon)	
Laterite	Below 0.2	0.2-2.1	Above 2.1
Alluvial loam	Below 0.3	0.3-5.3	Above 5.3
Acid peats	Below 3.7	3.5-14.4	Above 14.4

Reference:- (1) A Rapid procedure for the estimation of available nitrogen in soils - Curr. Sci. August 1956-25. 259-260.

APPENDIX

TABLE-I

Soil Type		*Av. N. lbs./acre calculated from carbon values*	Av. *N. Ibs.jacre. Alkaline KMn04 method*
Laterite	1	374	332
	2	328	304
	3	330	390
	4	370	330
	5	310	290
	6	406	408
	7	330	390
	8	584	484
	9	348	416
	10	584	556
	11	482	452
	12	444	450
Alluvial loam	1	310	360
	2	298	260
	3	284	304
	4	304	290
	5	318	318
	6	328	360
	7	294	260
	8	284	290
	9	580	580
	10	482	434
	11	384	302
	12	384	390
Acid peat	1	312	318
	2	408	360
	3	394	418
	4	434	476
	5	434	504
	6	232	220
	7	280	318
	8	238	192
	9	338	360
	10	332	390
	11	250	220
	12	370	360

Soil Testing Laboratory, }
Vellayani, 25-3-1961. }

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