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SOIL ORGANIC MATTER CONTENTS IN VARIOUS AREAS OF N.W.F.P.

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Abstract The organic matter contents were determined in the soils of the N.W.F.P. The results of chemical determination show that the soils of D.I. Khan are very low in organic matter. Compared with good soil organic matter contents (4-5%), the soils of the NWFP are very poor. Comparison of these results with organic matter contents for soils of the Punjab on the average basis is also low. The average organic matter content of Punjab[7] soils is 2.6% while that of the N.W.F.P. is 0.6%. Thus it is concluded that the soils of the N.W.F.P. are very poor in this factor in crop production of yield. Unfavourable soil and climatic conditions are the cause of the low matter contents.

Organic matter is one of the keys to soil productivity. The colour of the soil is a measure of this characteristic and is used in judging productivity. Dark soils have a higher organic matter content and are thus more desirable for higher crop yields. Even today darkcoloured soils are usually considered more productive than the light coloured ones. A more modern trend is to consider decomposed organic matter as one of the major factor towards crop nutrition. Organic matter aids in crop production by acting physically to provide a blanket of protection against heat and cold and against the voilence of Beating rain drops. In fact, organic matter has much to do with the physical condition of soil. Organic matter promotes the aggregation of soil particles, increases water holding capacity. It is also the source of energy for soil micro-organisms. It is of considerable importance in salt affected soils. It has been proven that organic matter counteracts the unfavourable effects of exchangeable sodium.

According to[6] that peat and muck soils containing appreciable quantities of exchangeable sodium, have good physical properties and numerous experiments have been conducted to demonstrate the benificial effect of organic matter addition on alkali soils.

The use of insecticides and fungicides to control the insects and diseases is increasing and these chemicals may be harmful to soils. But it has been proven[5] that organic matter reduces the toxicity of plant poisons that have accumulated in the soil due to continuous use of insecticide and fungicides.

Much research work has been done on the organic matter content in the soils of various other places. But very little work has been conducted on the content of organic matter in the soils of the N.W.F.P. It is with this object that the study of organic matter was undertaken in the soils of various places of N.W.F.P.

Materials and Methods

Soil samples for this study were collected from a depth of 0.6 in from various plots in farmers' fields in various districts. The samples were brought to the laboratory, air-dried, ground with a soil grinding machine, passed through a 2mm sieve and stored in polythene bottles. Pieces of wooden and straw etc. were removed before grinding.

Organic matter was determined by the Walkey-Black Method as recommended by Jackson[3] which is as follows:

Reagents

(1) Potassium dichromate normal solution. (2) Sulphuric acid conc 96%. (3) Phosphoric acid conc 85%. (4) Diphenylamine indicator solution: 0.5 g diphenylamine in a mixture of 100 H_2SO_4 and 20 ml of water and store in coloured bottle. (5) Ferrous ammonium sulphate N/2: Dissolve 392.0 g of $FeSO_4$-$(NH_4)_2$ SO_4. $6H_2O$ in water, add 40 ml H_2SO_4 and dilute to 2 liters.

Procedure

A known weight of the soil (2-10 g) was taken in 400 ml flask, 10 ml of $NK_2Cr_2O_7$ solution and 20 ml

of conc H_2SO_4 were added. The mixture was shaked for 1-2 min and allowed to stand for half an hour. Then 200 ml of water, 10 ml of phosphoric acid and 1 ml of diphenylamine indicator solution were added. A deep violet colour appeared. It was titrated against N/2 $FeSO_4$ $(NH_4)_2O$ until the violet colour changed to purple and finally to green. In the same way the blank titration was carried out, and the results calculated as follows:

(1) Weight of soil taken =W.Gram. (2) Volume of N/2 $FeSO_4$ $(NH_4)_2SO_4 . 6H_2O$ solution used in Blank titration = x ml. (3) Volume of N/2 $FeSO_4$ $(NH_4)_2SO_4$ $6H_2O$ solution used in experimental titration = y ml.

Difference: = x-y ml i.e. $K_2Cr_2O_7$ used to oxidise the organic matter

1 ml of $NK_2Cr_2O_7$ =.003 gr. carbon.

% of C in the soil $= \frac{x-y}{2} \times \frac{.003}{w} \times 100 = z$

% of organic matter in the soil: $- \frac{zx\ 100}{58}$ or zxl. 724 (1.724 conversion factor).

Reactions

1. $2K_2Cr_2O_7 + 8H_2SO_4 + 2C \rightarrow 2CO_2 + 2K_2SO_4 + 2Cr_2(SO_4)_3 + 8H_2O.$

2. $K_2Cr_2O_7 + 6\ FeSO_4 + 7H_2SO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + 3Fe_2(SO_4)_3 + 7H_2O.$

Results

Average organic matter contents calculated by the above method of different soils at various locations of different districts are given in Table 1.

TABLE 1. MEAN ORGANIC MATTER CONTENTS OF THE SOILS OF NWFP.

Name of district	No. of soil sample analysed	Organic matter %	Organic matter in labs./ acre
Hazara	80	0.730	14600
Malakand	90	0.720	14400
Mardan	150	0.587	11740
Peshawar	120	0.635	12700
Kohat	75	0.684	13680
Bannu	60	0.730	14600
D.I. Khan	65	0.426	85200
Mean organic matter content:		0.647	12940

Discussion and Conclusion

Much emphasis was placed on the organic matter content of a soil as a source of its productivity. According to Johnson, Browning and Russel[4] different crops affect the organic matter of the soil differently. The organic matter disappears more rapidly from the soil, when row crops are included in rotation than with crops which are not planted in rows. Johnson found that organic matter content of Marshall silt loam diminished within 12 years of continuous cultivation of corn but it remained constant under corn, cats, and meadow rotation. Van Bavel and Sheller[8] concluded that under a continuous corn system, soil organic matter decreased from 3.35 to 2.95% over a period of 10 years.

A good productive soil must contain 4 to 5% of organic matter[1], so the above results show that the organic matter in the N.W.F.P. soils is much below the normal level. On the average the organic matter is 84 to 85% less than that of a good productive soil.

Organic matter all depends on a number of factor including: (1). Croping system: Because of continous croping of wheat, maize, bajra, sugarcane, rice and tobacco, soil organic matter is reduced due to the exhaustive effects of these crops. (2). Use of cattle wastage: Most of the cattle dung and other wastage are used for burning purposes which impart a great loss of organic matter of soils.

There are also other factors like high temperature, scanty rain fall and soil errosion which disturb the level of organo matter in the soils.

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