Status of soil p^H and available Nitrogen in a few tea estates of south bank of Assam.

Under the guidance of

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CERTIFICATE

This is to certify that, Akash Baruah a student of B.Sc. 6th semester of Bahona College. Jorhat under Dibrugarh University has completed his project report entitled **"Status of soil p^H and available Nitrogen in a few Tea Estates of south bank of Assam"** under the guidance and supervision of undersigned.

I wish him all success.

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ACKNOWLEDGEMENT

At first, I am most grateful to Dr. I.K Phukon, soil scientist, soil department Tocklai Experimental station, Jorhat for his much needed encouragement and guideship.

I am grateful to Ashrwafa Madam, Shamina Madam of soils department, Tocklai Experimental station for their precious advice.

I also thankful to research scholar Gauri madam , of soils department, TRA, Jorhat for his help during the project period.

I owe much to Dr. Omar.S.ahmed, Department of chemistry, Bahona College who consider me to join in the project at TRA, Jorhat.

Finally, I wish to thank my friend for their support.

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Introduction

The 13 mineral nutrients, which come from the soil are dissolved in water and absorbed through plants roots. - The mineral nutrients are divided into two groups- Macronutrients and Micronutrients.

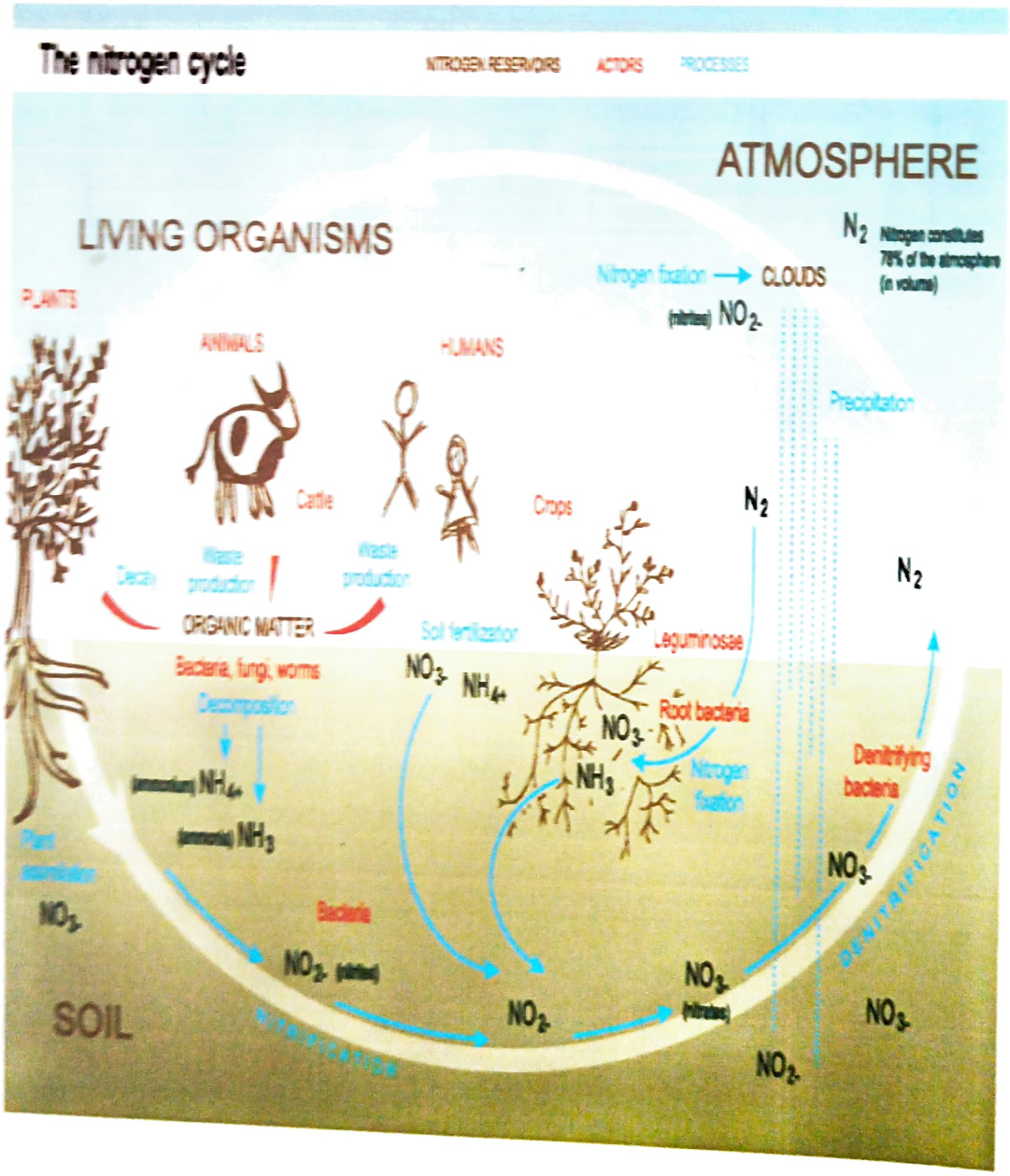
Macronutrients can be broken into two groups primary and secondary nutrients. The primary nutrients are Nitrogen (N), Phosphorus (P) and Potassium (K). These major nutrients usually are lacking from the soil first because plants use large amounts for their growth and survival. The secondary nutrients are Calcium (Ca), Magnesium (Mg) and Sulfur(S). There are enough of these nutrients in the soil so fertilization is not always needed.

Soil pH is one of the most important soil properties that affect the availability of nutrients. It has been observed that tea growth best in the pH range 4.5-5.5.Soil pH has significant affect on both plant nutrients and microbial activity on the soil. If the pH is very low the availability of nutrients like phosphate, nitrate, calcium, magnesium are limited. Availability of micro nutrients is also influenced by soil pH.

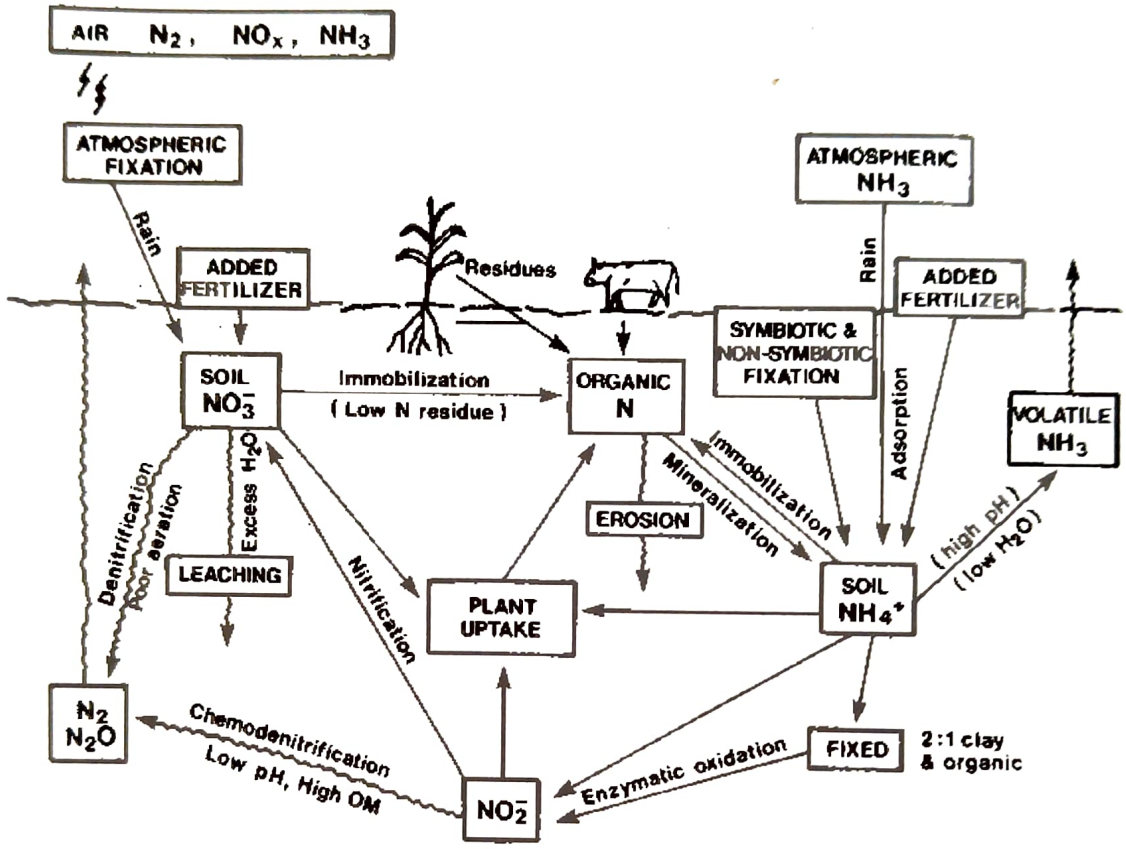
Nitrogen is a constituent of proteins and chlorophyll. Nitrogen metabolism is a major factor in stem and leaf growth (vegetative growth). It governs the utilization of phosphorous and potassium. Deficiency causes stunted growth, leaves pale yellow, defoliation begins with the lower leaves and extends to upper leaves, fewer shoots, smaller leaves (Barooah, 2011)

In the soil, nitrogen exists in different forms, which interact with one another and with plants, animals and micro organisms. Plants absorbed Nitrogen in the form of (NO_3^-) or ammonium (NH_4^+) ions, both of which are water soluble. Nitrate ions are absorbed quickly by plant roots but leach easily. Ammonuim ions are attracted to soil particles and move slowly through the soil to the plants roots. The organic nitrogen is converted to

inorganic forms via decomposition. Decomposers found in the upper soil layer chemically modify the nitrogen found in organic matter to ammonium salts (NH_4^+) in a process known as mineralization and it is carried out by a variety of bacteria, actinomycetes and fungi. (NH_4^+) ions are also formed when urea is applied to the soil as result of its hydrolysis by urease enzyme.The pathway of nitrogen cycle are shown below



The fate to the soil and its path way of utilization as well as leaching may be observed in fig 1.



Systematic investigation on soil pH and available of nitrogen in the soil is considered to be essential for proper tea growth. The information derived from the investigation will give a better understanding of the behavior of soil and hence will be useful in future for improved soil. Therefore, a study was carried out to see the availability of nitrogen and pH range in tea soil sample of some tea gardens of south Bank.

Materials and Methods

Method for soil pH:-

Soil samples from 0-15cm and 15-30 cm depths were collected from above tea estates. The sieve soil samples were stored in polythene bags and subsequently used for various chemical analysis. Available nitrogen in soil was determined by following alkaline potassium permanganate method (subbiah and Asija, 1956) and pH was determined following standard method (Jackson, 1973)

Apparatus required:-

1) Balance, 2) Beaker (100ml), 3) Distilled water,

4) pH meter 5) Buffers solution of known pH (4 and &7)

Procedure:-

For determination of pH in the samples the standard potentiometric method with glass electrode is used.

1. Weigh 20 gm soil into a 100ml beaker and add 50 ml of distilled water.
2. Stir the contents with a glass rod and shake on mechanical shaker continuously for 30 minutes.
3. Switch on the pH meter and set the temperature. Compensation knob at buffer solution temperature and range sector to zero.
4. Allow the pH meter to warm up for 10 minutes .After this period, adjust the galvanometer pointer to zero with the zero set knobs.

5. Immerse the electrodes (glass and calomel) into a buffer solution of known pH and adjust the matter with the buffer set knob to the pH of the buffer solution.
6. Turn the sector to zero position and take out the electrodes. Wash the electrodes with distilled water using a wash bottle and dry with a filter paper.
7. Shake the soil suspension and immerse the electrodes into the suspension. Turn the selector in the proper pH range and read the PH on the meter dial. Turn the selector to zero and take out electrodes.
8. Wash the electrodes with distilled water and put them back into a beaker of distilled water.

Available Nitrogen:-

Available N was determined by following the standard procedure (Subbiah and Asija, 1956)

Reagents:-

1) 2.5% NaOH solution.
2) 0.32% KMno4 solution.
3) Devarda's alloy
4) 2% Boric acid
5) 0.05H2SO4
6) Mixed indicator (B.C.G and Methyl red)

Procedure:-

- Weigh quantitatively 5gm air dried soil sample (2mm sieved) in distillation flask.
- Add 25 ml of 0.32 % $KMnO_4$ and 2.5% NaOH.
- Add 0.2 gm Deverda's alloy.
- Distillate is absorbed in 2% Boric acid solution.
- Absorb released NH_3 2% Boric Acid containing mixed indicator (B.C.G and Methyl red) 100 ml flask. This solution was then titrated against .005N H_2SO_4 solution

Determination of NH_4^+ - N

Ammonium nitrogen in the soil samples were determined following the procedure of page et al (1965). Representative 2 g soil was taken in distillation tube and 10 ml of 2M KCl and 0.1 g MgO was added. The NH_3-N liberated by steam distillation of the contents was determined by absorbing in 2 per cent boric acid solution and back titrated with 0.005N H_2SO_4.

Results:-

The range of pH, NH_4-N and available Nitrogen in tea soils of some tea estates of south bank of Assam are shown in the Table 1 and Fig 1. It is evident from the table that about 43% of soil were associated with pH less than minimum suitable value of 4.5 which is indeed a matter of concern and need pH correction through amendment. Only 60% soil could maintain the suitable range of 4.5-5.5. Nearly 5% soils were found to be associated with pH more than 5.5 which is cannot support growth of tea. Data on NH_4-N indicated large variation (8-28 ppm) under different tea estates. However, available N varied within a narrow range from 123 to 158 ppm.

Fig 1. Variation of pH

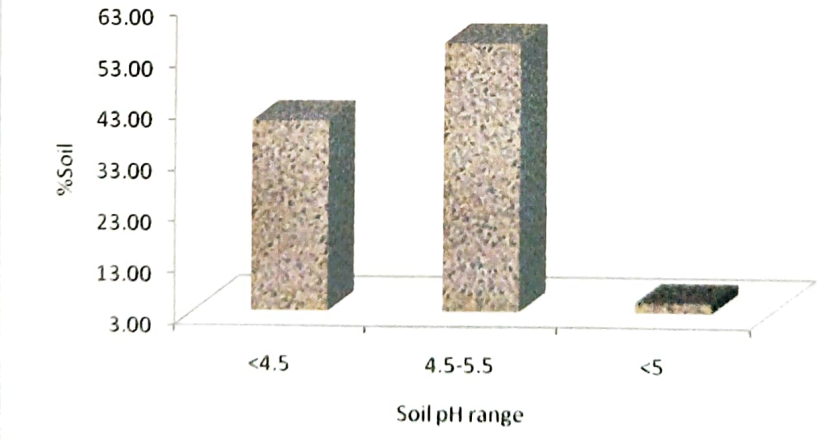


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Table 1:- Status of soil pH and av. N

Sl no.	Name of the garden	Depth in cm	sample no	pH	Available Nitrogen (ppm)	NH_4-N
1	***Borbam T.E***	0-15	1)R1	4.73	142.8	26
2			2)R2	4.95	148.4	
3			3)R3	4.97	134.4	
4		15-30	4)R4	4.82	137.2	
5			5)R5	4.75	140	
6			6)R6	4.77	114.8	
7	***Rongagarah T.E***	0-15	1)R1	4.64	70	25
8			2)R2	4.79	128	
9			3)R3	4.89	131.6	
10		15-30	4)R4	4.72	117.6	
11			5)R5	4.69	72.8	
12			6)R6	4.8	84	
13	***NumaligarhT.E***	0-15	1)R1	4.54	89.6	12
14			2)R2	4.66	72.8	
15			3)R3	4.65	84	
16		15-30	4)R4	4.51	86.8	
17			5)R5	4.55	89.6	
18			6)R6	4.54	95.2	
19	***Deha T.E***	0-15	1)R1	4.74	117.6	15
20			2)R2	4.75	123.2	
21			3)R3	4.7	92.4	
22		15-30	4)R4	4.75	134.4	
23			5)R5	4.59	128.8	
24			6)R6	4.66	148.4	
25	***Ligiripukhuri T.E***	0-15	1)R1	4.66	112	18
26			2)R2	4.62	84	
27			3)R3	4.64	67.2	
28		15-30	4)R4	4.53	84	
29			5)R5	4.56	84	
30			6)R6	4.59	106.4	

Sl no.	Name of the garden	Depth in cm	sample no	pH	Available Nitrogene (ppm)	NH_4-N
31	*Borsillah T.E*	0-15	1)R1	4.72	123.2	8
32			2)R2	4.69	100.8	
33			3)R3	4.74	117.6	
34		15-30	4)R4	4.66	100.8	
35			5)R5	4.61	106.4	
36			6)R6	4.62	112	
37	*Mukrung T.E*	0-15	1)R1	4.72	134.4	15
38			2)R2	4.68	128.8	
39			3)R3	4.54	151.2	
40		15-30	4)R4	4.63	156.8	
41			5)R5	4.6	142.8	
42			6)R6	4.62	140	
43	*Ghilladhari T.E*	0-15	1)R1	5.01	123.2	28
44			2)R2	4.7	106.4	
45			3)R3	4.73	117.6	
46		15-30	4)R4	4.9	134.4	
47			5)R5	4.72	95.2	
48			6)R6	4.69	86.8	
49	*Methoni T.E*	0-15	1)R1	5.18	123.2	14
50			2)R2	5.17	72.8	
51			3)R3	5.09	58.8	
52		15-30	4)R4	5.06	98	
53			5)R5	5.02	78.4	
54			6)R6	5	134.4	
55	*Lattakoojan T.E*	0-15	1)R1	4.92	117.6	26
56			2)R2	4.88	145.6	
57			3)R3	4.86	154	
58		15-30	4)R4	4.66	123.2	
59			5)R5	4.62	112	
60			6)R6	4.7	112	
61	*New Honowal T.E*	0-15	1)R1	4.97	114.8	10
62			2)R2	4.93	117.6	
63			3)R3	4.89	123.2	
64		15-30	4)R4	5.05	134.4	
65			5)R5	5.06	131.6	
66			6)R6	5.02	140	

Conclusion:-

Soils associated with lower pH (<4.5) needs to be treated with dolomite @2t/ha at the time of LP. Sections having higher pH (>5.50) should receive iron pyrite @ 2t/ha. However reason for high pH (section may be water logged) needs to be ascertained fist before going to apply pyrite. For nitrogen management regular application of balance manuring (N,P ank) as recommended by TRA would improve the fertility status of soil.

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