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Variation of soil pH with different Binary solution

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ABSTRACT

Soil is the combination of rock, mineral fragments, organic matter, water and air. It is mostly made up of grains of rock weathered by wind, rain, sun, snow etc varying amounts of humus. The type of soil depends on the mixture of humus and the size of the grains of the rock. According to United States Department of Agriculture (USDA), there are over 50,000 different varieties of soil with different soil pH in the United States alone. Soil pH is a measure of how acidic or basic things are and is measured using a pH scale between 0 to 14, with acidic things having a pH between 0-7 and basic things having a pH from 7 to 14. In present research work soil samples are studied using various chemicals such as Methanol, Etahnol, Pentanol, n-Butanol and Propanol. The important information about soil quality in terms of soil pH is deducted from the present research work.

KEYWORDS

Soil pH,
Methanol,
Ethanol,
Propanol,
Pentanol,
n- Butanol etc.

INTRODUCTION

Soil means different things to different people. Earth scientists see soil as mineral or organic material that is formed on Earth's surface by dynamic, complex processes. Engineers think of soil as material to build on and are concerned with moisture conditions and the ability of soil to become compacted and hold weight. Agriculturalists think of soil as the top 15-30 cm of Earth's surface to grow crops. The five soil forming factors (parent material, climate, topography, organisms, and time) affect the properties of the soil in its natural and undisturbed state. The way the five soil-forming factors interact is always different from one place to another, so soils differ greatly from each other. Each section of soil on a landscape has its own unique characteristics. The face of a soil, or the way it looks after taking a cut section of it out of the ground, is called a soil profile, like the profile of a person's face. Every soil profile is made up of layers called soil horizons. Soil horizons can be as thin as a few millimeters or thicker than a meter (Adamchuk *et al*., 2007; Elias and Cresser, 1995).

Soil pH is a measure of the 'soil acidity 'or 'soil alkalinity'. An acid solution has a pH value less than 7. While a basic solution always has a pH larger than 7, an alkaline solution (i.e. a solution with positive acid neutralizing capacity), can also be defined as the negative logarithm of hydroxide ions in the soil. It therefore does not necessarily have a pH larger than 7 (Yuan and Xu, 2012). For instance, lemon juice and battery acid are acidic and fall in the 0-7 range, whereas seawater and bleach are basic (also called "alkaline") and fall in the 7-14 pH range. Pure water is neutral, or 7 on the pH scale (Rengel, 2003). The pH of soil or more precisely the pH of the soil solution is very important because soil solution carries in it nutrients such as Nitrogen (N), Potassium (K), and Phosphorus (P) that plants need in specific amounts to grow, thrive, and fight off diseases (Conyers *et al*., 2012; Tlustos and Blackmer, 1992).

If the pH of the soil solution is increased above 5.5, Nitrogen (in the form of nitrate) is made available to plants. Phosphorus, on the other hand, is available to plants when soil pH is between 6.0 and 7.0. If the soil solution is too acidic plants cannot utilize N, P, K and other nutrients they need. In acidic soils, plants are more likely to take up toxic metals and some plants eventually die of toxicity (poisoning) [Sun *et al*., 2012; Johannes *et al*., 2010). Knowing whether the soil pH is acidic or

basic is important because if the soil is too acidic the applied pesticides, herbicides, and fungicides will not be absorbed (held in the soil) and they will end up in garden water and rain water runoff, where they eventually become pollutants in our streams, rivers, lakes, and ground water (Baath, 1996; Singh *et al*., 2003; Fernando and José, 2012).

The pH value of a soil is influenced by the kinds of parent materials from which the soil was formed. Soils developed from basic rocks generally have higher pH values than those formed from acid rocks. Rainfall also affects soil pH. Water passing through the soil leaches basic nutrients such as calcium and magnesium from the soil. They are replaced by acidic elements such as aluminum and iron. For this reason, soils formed under high rainfall conditions are more acidic than those formed under arid (dry) conditions (Tonon and Sohi, 2010; Johannes *et al*., 2009). The paper content experimentation on soil samples which provide valuable information about quality of soil.

MATERIALS AND METHODS

Experimental work was carried out by taking various soil samples from Ahmednagar & Nasik district. Following are the experimental steps: 50 gm of soil sample is mixed with 100 ml of distilled water. The solution prepared is kept undisturbed for 24 hrs so that all the salts of soil are mixed with distilled water. Then solution is filtered & poured in 11 test tubes. Volume fraction of soil extract in each test tube increases & chemical (Methanol, Ethanol, Propanol, n-Butanol and Pentanol) decreases in each test tube. Each test tube is stirred properly for one minute and then pH value of the concentrated solution is observed from pH meter.

RESULTS AND DISCUSSION

The pH of various soil samples with variation of different chemicals is as shown in Table no.1, Table no.2.

For sample 1, 2, 3 as Volume fraction (VF) decrease pH increases & reaches to a maximum value & then decays linearly. For sample 4 as VF of methanol decreases pH of soil extract decreases. For all samples as VF of Ethanol decreases soil pH increases & then decreases gradually & remain almost constant. For sample 1 as VF of Propanol in soil extract decreases pH remains above 8. For sample 2 in first half as VF of Propanol decreases in first half pH increases & in second half decreases. For sample 3, 4 as VF of Propanol decreases initially soil pH decreases & then increases and almost remain stable. For all the samples as VF of n-Butanol decreases soil pH increases & then decays linearly. In case of Pentanol for all the samples except sample 4 initially pH increases as VF decreases soil pH increases & then decreases.

Table no. 1. pH of various soil samples with Methanol & ethanol

Sr. No	Binary Solution +chemical	pH							
		Methanol				Ethanol			
		Sample 1	Sample 2	Sample 3	Sample 4	Sample 1	Sample 2	Sample 3	Sample 4
1	10+0	7.54	8.96	8.06	8.34	7.54	8.96	8.06	8.34
2	9+1	7.74	9.02	8.4	8.72	7.68	8.95	8.06	8.52
3	8+2	7.77	9.05	8.26	8.89	7.71	9.23	8.07	8.61
4	7+3	7.82	9.08	8.23	8.72	7.74	9.25	8.26	8.71
5	6+4	7.89	9.1	8.28	8.74	7.97	9.34	8.28	8.75
6	5+5	8	9.18	8.31	8.81	7.89	9.4	8.38	8.78
7	4+6	8.12	9.21	8.34	8.91	7.97	9.3	8.41	8.68
8	3+7	8.25	9.32	8.4	9	8.08	9.47	8.44	8.53
9	2+8	8.26	9.22	8.51	8.94	8.14	9.54	8.37	8.31
10	1+9	8.22	9.17	8.77	8.77	7.66	8.97	8	7.79
11	0+10	8.6	8.16	8.6	8.6	6.31	6.31	6.31	6.31

Table 2 : pH of various soil samples with Propanol, n-Butanol and Pentanol.

Sr. No	Binary Solution +chemical	pH											
		Propanol				n-Butanol				Pentanol			
		Sample 1	Sample 2	Sample 3	Sample 4	Sample 1	Sample 2	Sample 3	Sample 4	Sample 1	Sample 2	Sample 3	Sample 4
1	10+0	7.54	8.96	8.06	8.34	7.54	8.96	8.06	8.34	7.54	8.96	8.06	8.34
2	9+1	8.45	8.29	8.6	8.28	8.39	8.74	8.27	8.79	8.32	8.61	8.11	8.18
3	8+2	8.31	8.24	8.39	8.36	8.42	8.84	8.25	8.76	8.33	8.65	8.17	8.02
4	7+3	8.28	8.36	8.53	8.53	8.47	8.91	8.3	8.81	8.37	8.68	8.14	7.92
5	6+4	8.47	8.82	8.55	8.75	8.57	9.09	8.35	8.85	8.43	8.73	8.27	7.96
6	5+5	8.52	9.12	8.74	8.91	8.66	9.48	8.43	9	8.48	8.8	8.23	8.2
7	4+6	8.61	9.38	8.78	9.22	8.7	9.93	8.48	8.97	8.38	8.84	8.36	8.68
8	3+7	8.73	9.47	8.8	9.44	8.54	10.23	8.54	8.93	8.33	8.98	8.29	8.41
9	2+8	8.58	9.56	8.68	9.26	8.52	9.89	8.49	8.8	8.1	8.91	8.41	8.16
10	1+9	8.43	9.07	8.41	8.31	8.05	9.17	8.07	8.22	7.93	8.79	7.77	8.02
11	0+10	8.47	8.47	8.47	8.47	7.45	7.49	7.45	7.45	7.25	7.25	7.25	7.25

The data so observed from various samples is plotted in the form of figures as shown in figure no.1, figure no.2, figure no.3, figure no.4 and figure no.5 as follows.

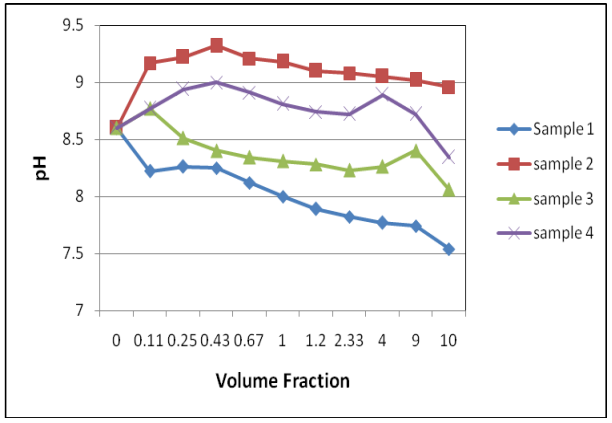

Fig. 1: pH Vs Volume Fraction for Methanol

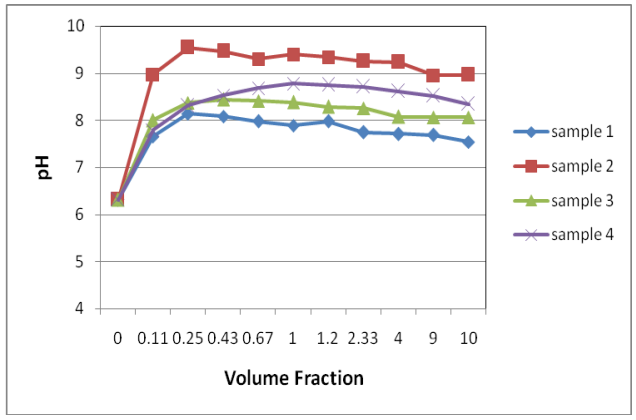

Fig. 2: pH Vs Volume Fraction for Ethanol

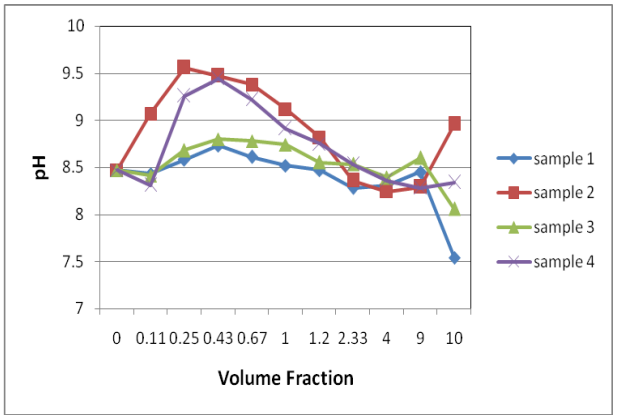

Fig. 3: pH Vs Volume Fraction for Propanol

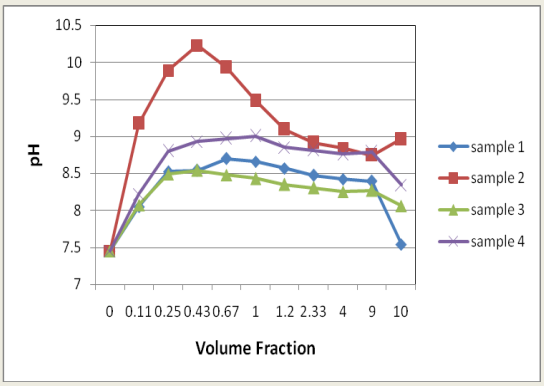

Fig.4 : pH Vs Volume Fraction for n-butanol

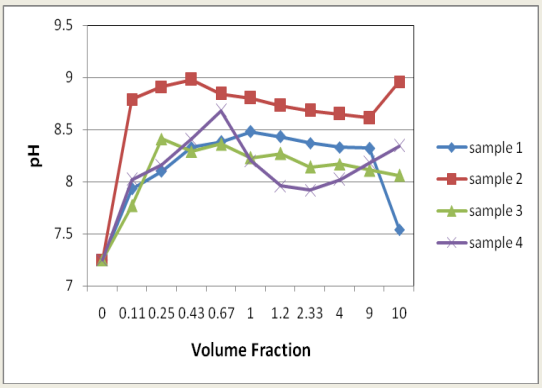

Fig. 5: pH Vs Volume Fraction for Pentanol

CONCLUSSIONS

The pH value for various samples varies according to the amount of volume fraction. The soil pH of various samples is in between 1-10 by varying the concentration of chemicals. That means all the soil samples in this region are alkaline. It is found by experimentation that soil pH of sample 1 is strongly alkaline by addition of Pentanol and n-Butanol in sample 1 below VF 50 %, pH decreases around 8 that is moderately alkaline. Soil of sample 4 is slightly alkaline and sample 2, 3 is moderately alkaline. The present study reveals the importance of pH value of soil at various places and gives valuable information to farmers, gardeners etc so that remedial actions can be taken.

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