

STUDY OF THE SOIL PROFILE OF TRIVENI PLANT ASSEMBLY IN BHIWANI REGION

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ABSTRACT

Triveni is the assembly of three medicinal plants i.e. neem, Peepal and barghad has some specific soil properties with significant bacterial composition. In order to find out the soil properties, soil samples from different Triveni plant assemblies are taken and followed by soil testing. Different soil properties such as soil pH, electrical conductivity and texture of soil are compared among these Triveni plant assembly of Bhiwani region, Haryana. The soil profile of Triveni and individual plant are compared in context of quality. It is found that the Triveni soil pH and electrical conductivity lies in the range which is beneficial in all aspects as growth and nutrients availability.

Keywords: Triveni, Medicinal plant assembly, soil profile

Introduction

Medicinal plants are immense and huge sources of natural bio resources, which can be used in medicine and agricultural fields in different ways. With time we need to shift towards the natural bio resources, and to aware the people about their importance and significance. So the use of medicinal plant as a natural product elevate and boost our nation economy as well as reduce the pollution level in environment. Triveni assembly is the association and together growth of three plants i.e. neem, peepal and barghad which are well known for their medicinal and other valuable properties. Neem (*Azadirachta indica*) itself as Amrita in Veda's and distributed in tropical and semi-tropical regions (Lokanadhan et al. 2012). Leaves, barks, roots, seeds and oil of neem used as traditional and multipurpose medicine for treatment of number of diseases. Allochemicals from the neem are also widely used as natural bio herbicides and natural bio pesticides in agricultural sector from the long time. Peepal (*Ficus religiosa*) is worshipped as Bodhi tree and is the member of family Moraceae. Ficus use as a traditional medicine for wound healing, for treating diabetes, gastric ulcers and various other microbial diseases (Singh and Jaiswal. 2014). Anthocyanin derivatives, beta-sisteroglucoside, mesoinositol and aliphatic long chain ketones are some enlisted allochemicals secreted by the *Ficus benghalensis* (Uma and Prabahakar., 2009). Many researches are done in order to find out the anti-inflammatory, anti-helminthic, anti-microbial, anti-diabetic and anti-bacterial activities of the plant (Taur and Patil., 2009). These three medicinal plants of Triveni also shows huge extent of allelopathy in which the secondary metabolite produced from these plants, inhibit the growth of other nearby plants by releasing the allochemicals in the soil. So it is very interesting to observe what kind of interaction is present between these three huge plants with each other when they grow within close vicinity. Triveni assembly is present only in few localities of north-west India because they grow in specific conditions of soil and environment that

favor the growth of these three huge plants together. When we study and compare the soil profile of assembly of three plants of Triveni with the individual plants of neem, peepal and barghad, we find the huge differences in their soil characteristics. The soil factors such as PH, electrical conductivity and texture are the main factors which are responsible for the soil quality and soil characteristics. According to the past literature, the pH range of the soil 5.5- 7.0 is optimal and most appropriate for plant growth as the availability of nutrients is optimum (Sharma et al., 2019). PH of soil and other environmental factors exert a large effect on microbial community of soil of that plant (Zhalnanina et al., 2015). pH of soil affects the solubility of nutrients present inside the soil and solubility of nutrients is highest in acidic soils. Slightly alkaline pH of soil i.e. 7.4- 7.8 or higher pH causes problem in iron availability to the plants (Neina Dora., 2019). So the soil pH is detrimental to the plant growth because it affects the solubility of nutrients in soil and also have effect on soil microorganisms too.

Other factor is the soil electrical conductivity that is used to measure the salinity of the soil. Soil salinity is due to presence of many inorganic solutes in aqueous phase of soil. It includes HCO_3^- , NO_3^- , SO_4^{2-} , Ca^{+2} , Na^+ , Mg^{+2} , K^+ etc. It was found that with increase in salinity of soil, the osmotic potential of water decreases and hence the total water potential decreases as the solubility of ions in the solution increases. It results in reduction of water absorption by the plants and also disrupts the ion exchange inside the plant cells. Hence the increased salinity leads to decreased productivity. When Electrical conductivity (EC) is less than 1, means lower level of fertilizers and salts are present in soil and when the value of Electrical conductivity (EC) is more than 1, it means higher level of fertilizers and salts present in the soil. For proper growth of plant electrical conductivity (EC) value should be from 1- 3 MilliSiemens. EC is the apparent electrical conductivity through solid soil particles or through exchangeable cations present at solid liquid interface of clay minerals. Electrical conductivity (EC) is an index of salt concentration and an indicator of electrolyte concentration of the solution (Nemali et al., 2004). EC of the nutrient solution is related the amount of ions available to the plants in root zone for nutrient exchange and absorption ability of soil (Sooneveld et al., 2009). The most optimum range of EC is 0.81-2.5 Milli Siemens for the healthy and appropriate growth of the crop plant. Study of pH and electrical conductivity helps in determining the chemical nature of the soil and also indicates the effect on biological activities of the microbes. So it is very interesting to study out the following properties of Triveni soil.

Materials and Methods:

1. Searching Triveni Plants sites at Bhiwani Regions.

The three plants of Triveni 'Neem, Peepal and Barghad' are known for their medicinal properties. They are planted in different location commonly in northern region of India. However planting the tree together as Triveni, mostly find in north- west region of India i.e. in state Haryana and very frequently seen in Bhiwani district. This allows us to find out how these three huge plants survive and flourish together while sharing a common

rhizosphere. In the present study we have selected six Triveni sites and observed the growth of all three plant of Triveni.

2. Analysis of Soil Samples of plant area

The soil samples are collected from the different sites of Triveni and individual plants of Neem, Peepal and barghad nearby region Bhiwani. The soil samples are taken with the help of scapula from 3 cm below the soil surface. The fresh soil samples are tested by using soil testing kits of Himedia, to check the pH, Electrical conductivity and quality of soil. The following results are shown in the tabular form given below:

Steps followed to calculate pH:

1. Take a clean test tube and pour 5ml of distilled water in it.
2. Add 2gm of soil in the test tube.
3. Add 0.5 gm of reagent pH/ R1 (Himedia).
4. Close the test tube with rubber cork, shake for 30 seconds.
5. Keep the test tubes in the stand and allow the soil to settle down, clear solution will appear in upper part of test tube. Match the colour of the solution with pH colour chart.

Steps followed to calculate electrical conductivity:

1. Prepare a 1:5 soil: water suspension by weighing 10g dry soil into a flask. Add 50ml deionised water. Mechanically shake at 200 rpm for 60 minutes to dissolve soluble salts.
2. Calibrate the conductivity meter using KCl reference solution to obtain cell constant.
3. Rinse the conductivity cell with the soil suspension. Refill the conductivity cell and record the value indicated on the conductivity meter.

RESULTS

The Triveni plants were searched in different location of Bhiwani region. Total six Triveni sites were used for present study. The geographical locations of all six sites are given below (Table 1).

Table 1: Triveni plant assembly and the soil characteristics

Sr. no	Place of Triveni site	Type of soil	pH of soil	Electrical conductivity of soil	Growth observation	Observation	GPS Location
1.	Sector-13, Bhiwani	S:L (Sandy: Loam)	7.40	1.40	Growth of Barghad is more followed by Peepal	Growth of Neem is least	28.81434999890168, 76.1357358714905

2	Near Haluwasiya school, Bhiwani	S:L (Sandy: Loam)	7.20	0.80	Growth of Barghad is more followed by Peepal	Growth of Neem is least	28.79764091978646 76.15305130221314
3	Village-Dinod	S:L (Sandy: Loam)	7.21	0.98	Growth of Barghad is more followed by Peepal	Growth of Neem is least	28.79633015558745 76.0501397635757
4	Village-Ghuskani, Near Pond	S:L (Sandy: Loam)	7.32	.86	Growth of Barghad is more followed by Peepal	Growth of Neem is least	28.873313829535025 76.15560647253095
5	Village-Kungar, roadside	S:L (Sandy: Loam)	7.4	1.64	Growth of Barghad is more followed by Peepal	Growth of Neem is least	29.010258130251987 76.09718783515017
6	Village-Premnagar	S:L (Sandy: Loam)	7.00	.96	Growth of Barghad is more followed by Peepal	Growth of Neem is least	28°51'33.9"N 76°06'10.1"E

Sandy loam contains approximately 60% sand particles, 30% silt particles and 10% clay particles. Sandy loam soil is also referred as Agricultural soil which is rich in sand and also contain clay and sediments for improved water absorption and increasing the exchange of ions among plant roots and soil (Jaskulskae al, 2020). As the above table results shows that the range of Triveni soil lies in between 7-7.5, which is near to neutral range and appropriate for plant growth and development. Further, pictures were taken of all the Triveni assembly to analyze the growth patterns of all three plants (Fig. 1). In most of Triveni plant assembly it is observed that not all the three plants grow equally and their fresh biomass varies in weight. *Ficus benghalensis* i.e. Barghad is dominating with its huge growth, followed by (moderate growth), While *Azadirachta indica* (Neem) growth was least out of three plants of Triveni assembly (Fig. 1). One of the possible reasons for this discriminative growth may be allelopathy in which the secondary metabolites of *Ficus benghalensis* and *Ficus religiosa* might have inhibitory impact on the *Azadirachta indica* plant. The competitive approach for growth, nutrients and area to be covered is high among these three plants. *Ficus* is huge plants and its roots are deep sited in the soil, showing competitive interactions with other plants to absorb nutrients and other growth elements. The fig1.is the

pictorial view of the above mentioned observation in which it is clearly seen that stem and apical growth of *Ficus benghalensis* is large and full.

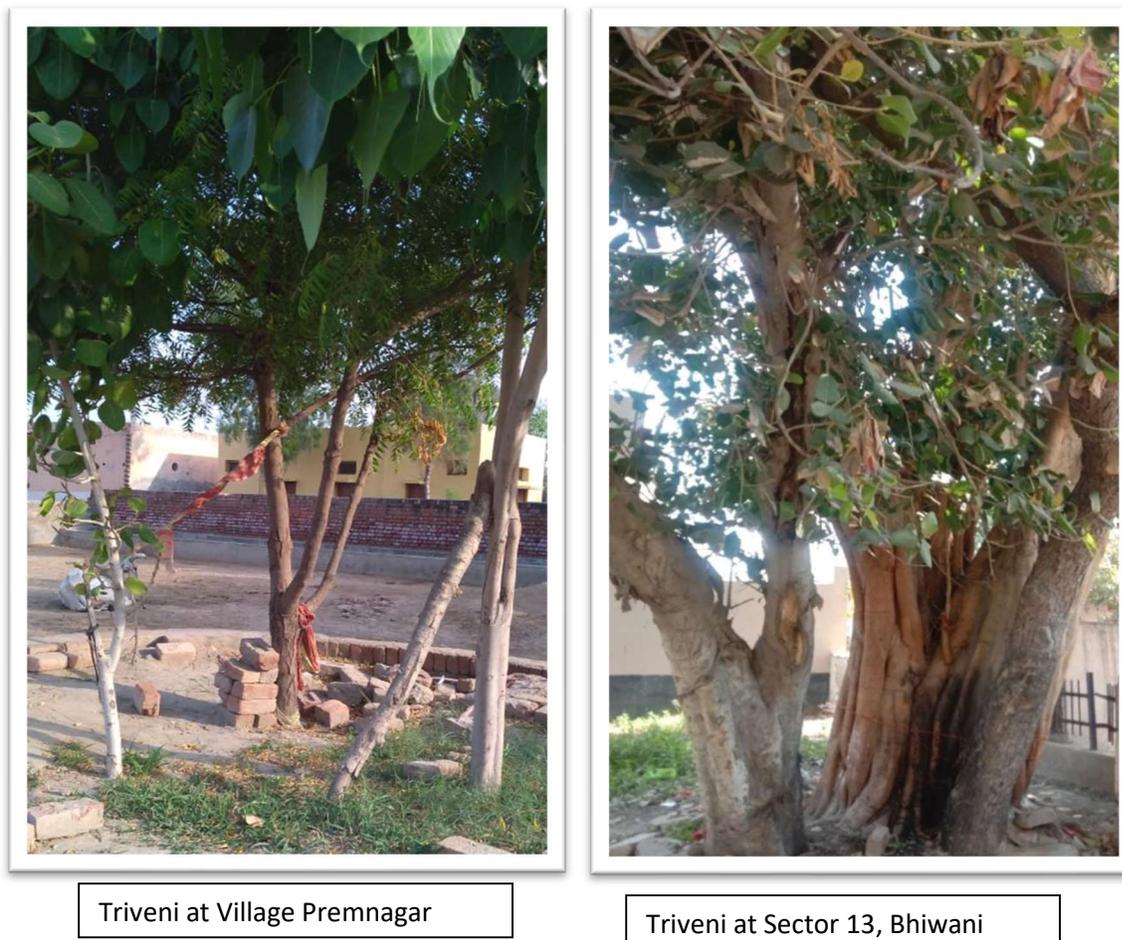


Fig. 1: Triveni Plant assembly from two different geographical locations
 pH and electrical conductivity of individual plant different soil samples were tested, it was found that most of the soil were slightly acidic in nature with very low electrical conductivity as shown in table 2. The results of table 2 shows that this pH range is not much suitable and appropriate for plant growth.

Table 2: Soil characteristics of individual plants of Neem, Peepal and Barghad.

Sr.no	Site of plant	Type of soil	PH of soil	Electrical conductivity of soil	Observation
1	Bhiwani (Neem)	Sandy loam	6.15	.32	Acidic soil with low ionic conductivity
2	Kungar (Neem)	Sandy loam	6.10	.20	Acidic soil with low

					ionic concentration
3	Bhiwani (Peepal)	Sandy loam	6.02	.17	Acidic soil with low ionic conductivity
4	Kungar (Peepal)	Sandy loam	6.5	.32	Slightly Acidic with conductivity
5	Bhiwani (Barghad)	Sandy loam	6.04	.38	Acidic soil with low conductivity
6	Kungar (Barghad)	Sandy loam	6.5	.21	Slightly acidic with low conductivity

Conclusion and Discussion

According to the authentic data from the literature the physical and chemical factors affect the soil health and its fertile capacity. For the normal soil the most appropriate value of pH and electrical conductivity must lies in between 6.5- 8.5 and 0.81- 2.5 respectively. The above mentioned table shows that the value of pH and electrical conductivity of Triveni plants are lies in between 7.0- 7.5 and 0.5-1.5 respectively.

These values signify that the value of Electrical conductivity above 1 that Triveni assembly soil rich in fertilizers and salt which are beneficial and promotes the plant growth. Whereas the value of pH and electrical conductivity of individual plant are lies in between 6.0- 6.5 and 0.5- 0.9 which are very low in comparison with the Triveni plant assembly. The above data shows that the soil of Triveni assembly is much appropriate and suitable in terms of alkalinity and salt concentration. The Triveni soil rich in nutrient values in terms of fertilizer and facilitate the easy exchange of nutrients uptake to the roots from the nearby region. The above results help to conclude that the Triveni plant assembly improves the quality and fertility of the soil of nearby region. The medicinal properties of these plants may help in development of beneficial bacteria that may improve the health and condition of soil. These beneficial bacteria might be contribute in plant growth promotion and plant protection for commercial cultivation of medicinal plants. Planting huge number of Triveni assembly improves the quality and condition of barren land, with time the barren land might be converted into fertile land.

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Conflict of interest

The author declares no conflict of interest

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