Soil Quality Assessment for Plantation of Ashwagandha in Barshi Tahsil, Solapur [MH]

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Abstract: A field study was conducted at Barshi Tahsil for soil and its various contents throughout period of 2014 to 2015. A through survey was conducted to examine the quality of soil samples collected from agricultural farmlands around Barshi Tahsil of Maharashtra state, India. The soil is mainly alluvial in nature. Data presentation revealed different values of physical and chemical characteristics of soil. The objective of the study was to assess and compare the soil physicochemical properties of this soil. The study was carried on few selected physical and chemical characterization and that to the quality soil and its nature. The standard analytical methods were applied for analysis of soil. The present study was conducted to determine geographical feasibility of commercial plantation of Ashwagandha in Barshi Tahsil of Solapur regions of Maharashtra. On the basis of these research results it can be concluded that soil properties of this area were more operative for Ashwagandha plantation in respective area.
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1. Introduction

Over the last 10 years, soil quality has been one of the topics of greatest interest in soil science, so much so that a database such as the Soil Science CAB Abstracts Database (CAB International Publishing) supplies more than 1500 publications that use the term 'soil quality' as a key word. This interest has been focused on defining the concept of soil quality and on searching for reliable ways for evaluating this quality. With regard to the definition of soil quality, in recent years the key involvement of the soil in crop production and in water and atmospheric purification has been recognized, thus emphasizing the role of the soil both for production and for environmental quality.

This has led to a profusion of definitions of soil quality, but that of Karlen et al. (1997): "soil quality is the capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation", is widely accepted. Cultivation of agricultural soils has until relatively recently predominantly been achieved by inverting the soil using tools such as the plough. Continual soil inversion can in some situations lead to a degradation of soil structure leading to a compacted soil composed of fine particles with low levels of soil organic matter (SOM). Such soils are more prone to soil loss through water and wind erosion eventually resulting in desertification, as experienced in USA in the 1930s (Biswas, 1984).

Soil may be defined as a natural body, synthesized in profile form a variable mixture of broken and weathered minerals and decayed organic matter, which covers the earth in a thin layer and which supplies, when containing the amounts of air and water, mechanical support and imparts sustenance for plants. Partial heterogeneity in nutrient availability affects not only the spatial patterning of vegetative cover but overall community structure and productivity. The importance of the soil as a reservoir of nutrients and moisture for the production of forage and plant species has been recognized since the beginning of the forest management as a science. Grasslands have deep soils that are very nutrient rich because of the large amount of plant tissue (biomass) that dies off and is added to the soils through decomposition every year (Kodesova, 2009; Lawrence et al, 2000).

Vegetation distribution and development largely depends on the soil conditions (Schoenholtza, 2000). Nutrient limitation occurring in the soils is one of the most important factors affecting the structure of plant communities. On the other hand, the changes in vegetation can cause shifts in the soil properties because individual plants concentrate biomass in soils beneath their canopies and modify biogeochemical processes occurring in the soils (Sarkar, 1988). Chemistry of soil covers chemical reaction and process in the soil pertaining to plant and animal growth and human development (Jana, 1996; Manchanda and Kudrat, 2002). Soil chemical

processes are fundamental to the evolution of geoderma, the biosphere and the human environment.

A through survey was conducted to examine the quality of some soil samples collected from agricultural farmlands around Barshi Tahsil of Maharashtra state, India. This paper traces development of the concept of soil quality, explores use of soil chemical and physical properties as determinants of soil quality, and presents challenges and opportunities for agriculture soil scientists to play a relevant role in assessment and advancement of sustainable agriculture man argument by developing the concept of soil quality as an indicator of sustainability.

Therefore, the aim of the present study was to determine soil feasibility for plantation of Ashwagandha in Barshi Tahsil of Solapur region, Maharashtra. Lastly suggest some noble suitable locations for Ashwagandha plantation in research area.

2. Material and methods

2.1. Study Area

Barshi Tahsil in Solapur district has been selected for the present research investigation as the study area. The Barshi Tahsil is situated at Solapur District in Pune Region of Maharashtra state. The Solapur District has a geographical area of 14845 Sq. Km., which forms 4.82 per cent of the total geographical area of Maharashtra State. The district is situated in the Deccan Plateau. Barshi tahsil is one of the 11 tahsils of Solapur District. The Tahsil has a geographical area of 1433.1 Sq. Km., which forms 9.65 per cent of the total geographical area of Solapur district. The headquarter of the tahsil i.e. Barshi town is located on 18°14'3" North latitude and 75°41'42" East longitudes. Barshi Tahsil bounded by 17°8'37" to 18°8'11" North Latitude and 75°30'10" to 76°0'3" East Longitude and at an altitude of 515.62 m above the mean sea level. The Tahsil is situated at drought-prone zone of Maharashtra state, where the climate is dry. Annual average temperature ranges between 15°C and 41°C and annual rainfall is about 657.4 mm with 42.5 rainy days.

On the basis of relief and structure, the physiographic divisions of the region are formed. These physiographic divisions have a profound impact on the economy of the region. To a certain extent, the relief and structure also influence the climate, soil types, and vegetation pattern in a particular region. It is, therefore, necessary to demarcate the district of Solapur, into its physiographic regions, in order to have a precise geographical understanding. There are various landforms as expected in Solapur district. Bhima is the major river flowing through the Solapur district, most of the area in the Bhima river basin is more or less plain. Most of the area of the district belongs to the Deccan plateau region.

The soils of plateau region are suitable and fertile for the production of various kinds of crops. The central part of the district lies in the plain region. The plain region naturally is found along the both sides of river Bhima and its major tributaries such as river Sina, and river Man. The soil of the plain region is most fertile due to the deposition of eroded material transported by the river Bhima and its tributaries. The Solapur city, the head quarter of district is located at the border of plateau and plain region. The plain area in the district covers about 20 percent of the geographical area of the district.

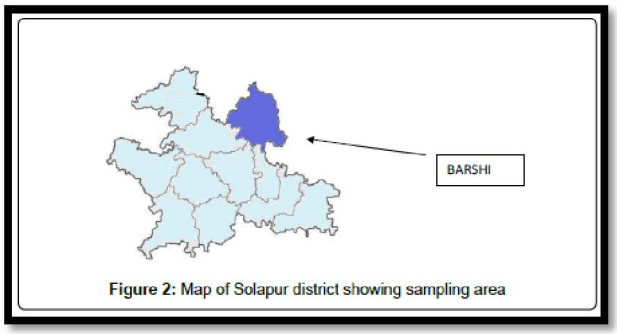

Fig. 2.1 Showing the location map of the study area of barshi Tahsil from Solapur

2.2 Methodology

The present investigation would be mainly deals with the principal information sources and experimental analysis of soil and climatic conditions in geographical region. Soils samples of would be collected from various sub-regions / villages of the tahsil. The soil samples mainly used for actual experiments in the Barshi region are twelve in numbers. It including Shripat Pimpari, Shendri, Barshi, Dhas Pimpalgaon, Chumb, Agalgaon, Jamgaon (A), Pathri, Chincholi, Tandulwadi, Chikharde and Nari from the Barshi tahsil of Solapur. Soil samples from selected sites was analyzed considering following parameters as pH, EC, Ca, Mg, Sulphur, $CaCo_3$, Organic Corban, Potassium, Total amount of organic matter, Phosphate and nitrates. Standard methods, apparatus is useful for physical and chemical properties to analyze form APHA, Trivedy and Goal (1998).

The actual experiments are carried out for finding soil fertility, to improve the yield of Ashwagandha at various soil types, collected from the Barshi tahsil area. Such experiments are carried out for the two years with variety of inputs. According to Singh (1980) it is necessary to classify the region on the basis of natural and human inputs for study of agricultural productivity. Here in the proposed study,

the selected study region will be classified as per the natural inputs such as soils, water, FYM, etc.

2.3 Sample Collection:

The soil samples were collected from a sub-surface of dam by using a corer and were brought to the laboratory in a plastic pouch. Determining the pH, first the soil samples were mixed thoroughly, air dried and passed through a mesh sieve. The samples were used for subsequent physico-chemical analysis by following methods.

2.4 Determination of Physico-chemical parameters of soil samples:

The soil analysis was performed according to standard method APHA, (2000) and using U.V. Spectroscopy. All solution was preparing with deionized water. The soil is dried in an oven at 150^{o}C. Soil pH of the soil was determined in 1:5 soils water suspensions with the help of a pH meter. Electrical conductivity (EC) of the soil was determined in 1:5 soils: water suspension with the help of Conductivity meter. Organic carbon (OC) content of the soil samples was determined by titrometric method, the Walkley and Black widely useful and represented as % of OC. Organic matter (OM) content of the soil samples were determined and calculated from organic carbon by multiplying it by Von Bemmlen factor.

Calcium (Ca) and magnesium (Mg) were determined by complex metric titration method Jackson M.L. (1973) which is popularly known and applicable largely. The chloride is an essential ion for the plant growth. The chlorides present in the samples were determined in 1:5 soils: water suspension by Argentometric method. Soil alkalinity is due to presence of soil minerals producing sodium carbonate upon weathering. It was determined by titrating the soil suspension with a strong acid using methyl orange as an indicator. Exchangeable Sodium (Na) and Potassium (K) determined by flame photometric method. Lastly Available phosphorus determined by extracting it with sulphuric acid by stannous chloride method by spectrophotometer (Trivedy and Goel, 1998).

3. Results and discussion

In this investigation soil samples, are utilized to examine in the adjacent area of the Barshi tahsil of Solapur. In the present study the data revealed that there were considerable variations in the quality with respect to their characteristics. Physicochemical analysis of soil and vegetative growth parameters was studied in different season (2014 - 2015). The study of the soil is important for the purposes of domestic agriculture for Ashwagandha plantation. The average value of various parameters had been stated in graphs below:

From this study, it was determined that the Basmath has black cotton soil, which is rich in calcium and magnesium. The soil is mainly alluvial in nature. From the results of the work, it can be concluded that the pH of all the soil samples were slightly neutral. The organic carbon and calcium carbonate are low in all the soil samples. The pH shows the neither a high pH above 8.4 nor a low below 5.0 is favorable for maximum yield of crops. Present study showed that the EC of the soil from study sites ranges from 220 µ/cm to 840 µ/cm.

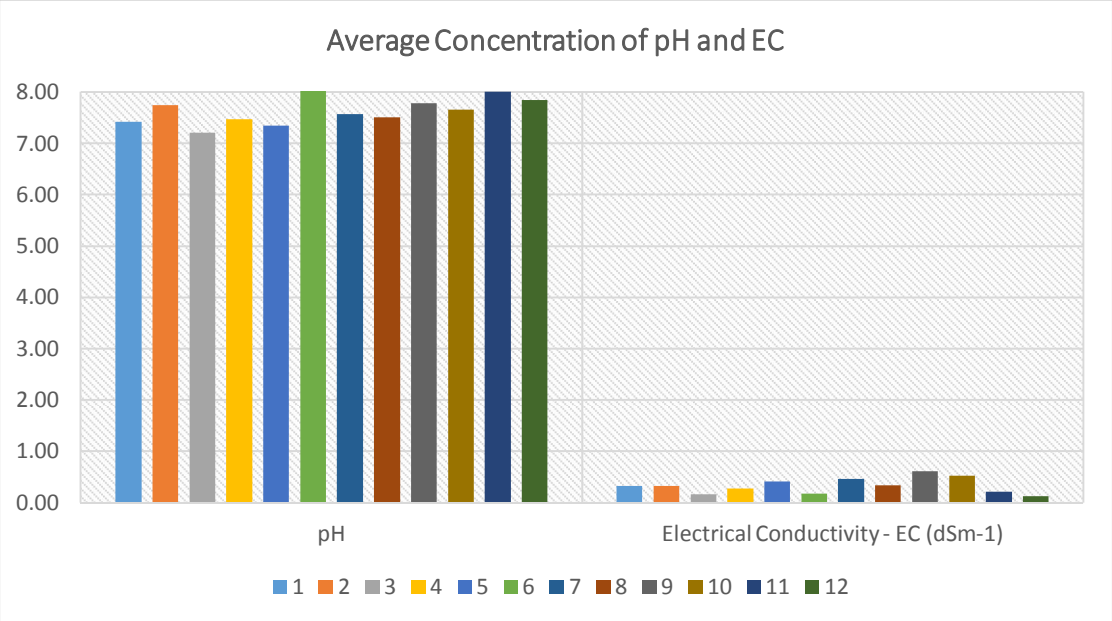

Fig.3.1: shows the mean values of soil samples for pH and EC at different sites of Barshi area

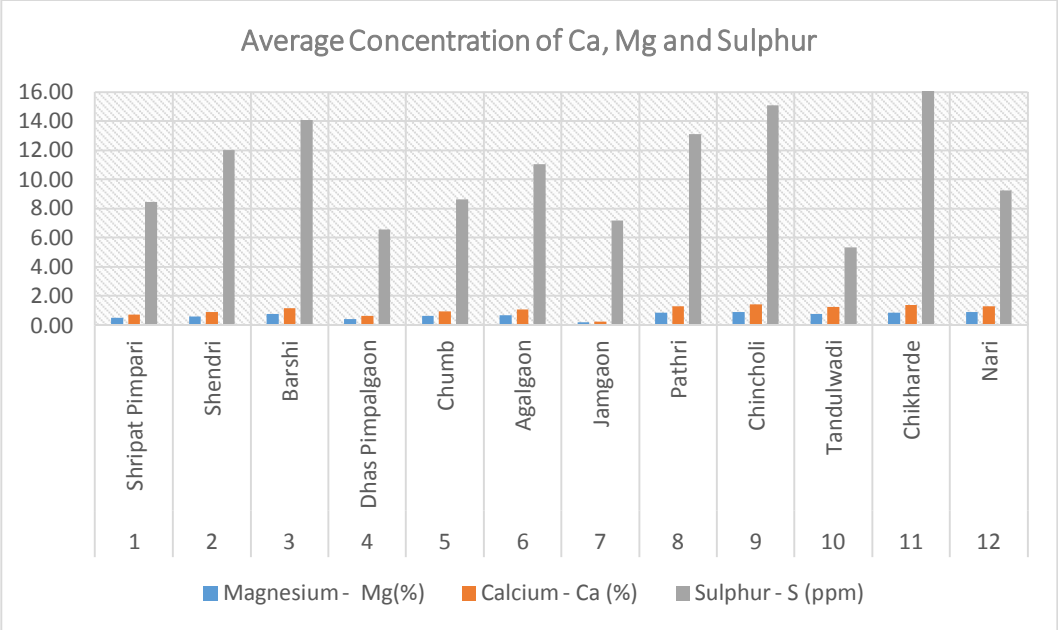

Fig.3.2: shows Mean concentration of Ca, Mg and Sulphur different sites at study area

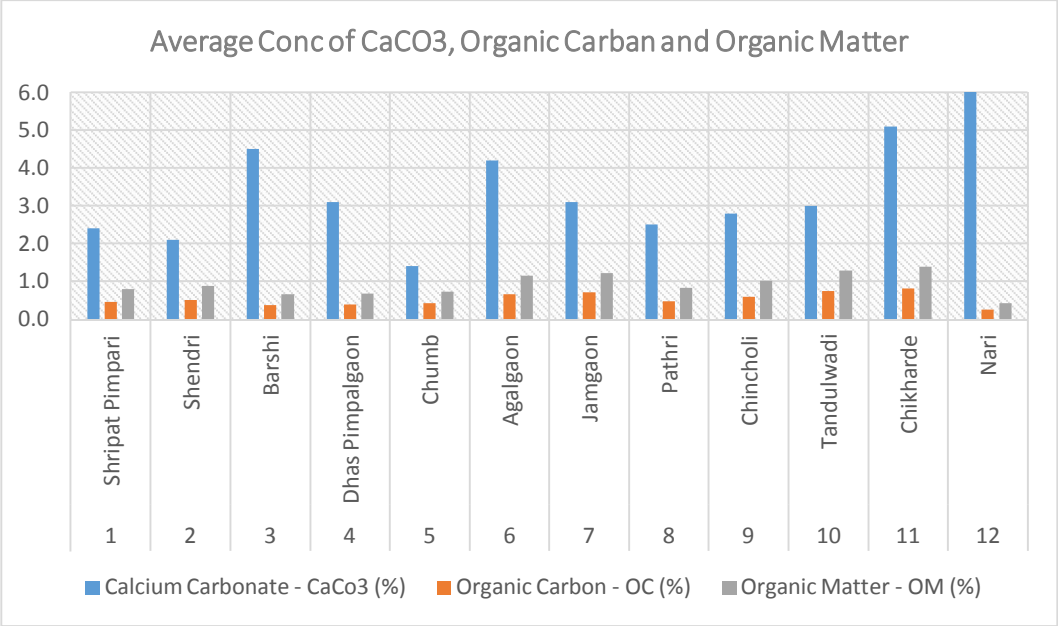

Fig.3.3: shows the mean values of CaCo3, OC and OM of soil sample at different sites

Maharashtra state rich in black cotton soil, so the similar results are received from Barshi region area of Solapur. The Barshi area has majorly black cotton soil, which contributes about 80 % and 20 % other soil type. This soil type is rich in calcium and magnesium. The soil is mainly alluvial in nature. Similar results are received to Shaikh et al., (2012); Yannawar et al., (2013). from other parts of Maharashtra i.e. in Nanded region.

Conclusion

From this study, it was determined that the Barshi has black cotton soil, which is rich in calcium and magnesium. The soil is mainly alluvial in nature. From the results of the work, it can be concluded that the pH of all the soil samples were slightly neutral. The organic carbon and calcium carbonate are low in all the soil samples. The pH shows the neither a high

pH above 8.1 nor a low below 7.1 is favorable for an extreme yield of harvests. Present study showed that the EC of the soil from study sites ranges from 0.13 dSm-1 to 61 dSm-1. The microorganisms are also present in this soil. The organic carbon and calcium carbonate are low in all the soil samples. The organic manures must be used for improvement in the fertility of the soil instead of chemical fertilizers. Here I find that the, soil of this area is feasible for Ashwagandha plantation in Barshi Tahsil of Solapur has satisfactory prove its potential. So finally, it was concluded that Ashwagandha has suggested for plantation in the Barshi and surrounding area of Solapur region of Maharashtra.

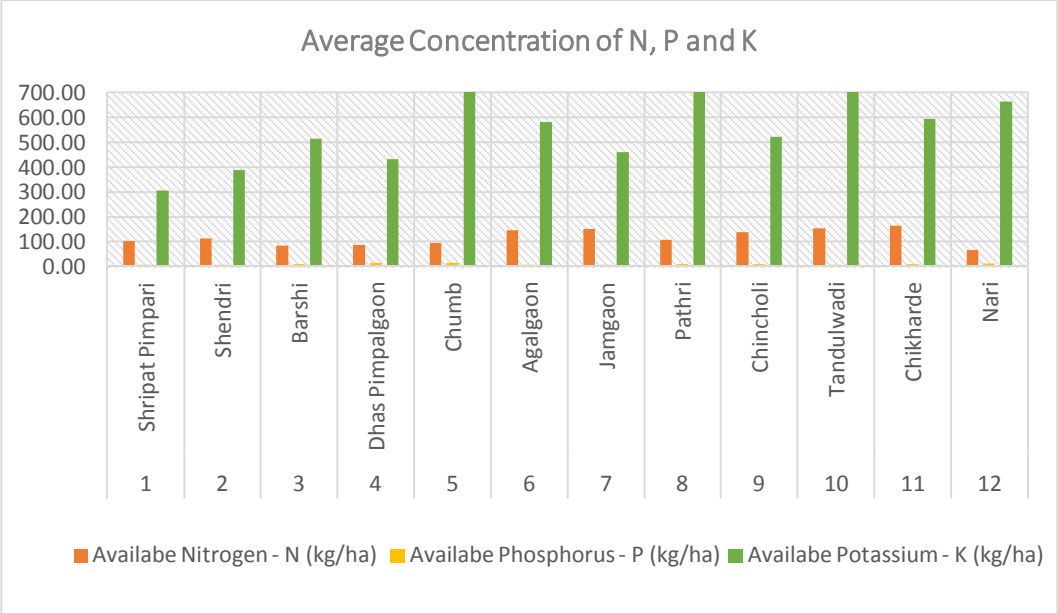

Fig.3.4: shows the mean values of N, P and K of soil samples at different sites at Barshi

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