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Evaluation of soil fertility status of Bhaderwah orchard under temperate condition

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Abstract

Soil fertility evaluation of an area or region is most basic decision making tool for the sustainable soil nutrient management. An investigation was conducted to ascertain the properties of the soils and available nutrients of Regional Horticultural Research Sub-station, Bhaderwah. Soil properties and available nutrients *i.e.* pH, electric conductivity (EC), organic carbon (OC) and available nitrogen, phosphorus and potassium in soils of various blocks of the research farm of Bhaderwah, district Doda. During study, it was observed that the dissimilar fruit and agriculture block of the soil properties and available nutrients was more in the variation of surface soils (0-15 cm). Soil properties and available N, phosphorus and K parameters ranged between pH (5.50 -6.42), EC (0.115- 0.166 dSm⁻¹), Organic Carbon (4.12-5.64 g kg⁻¹), available N (198.56 - 254.45 Kg ha⁻¹), available phosphorus (11.45-16.50 Kg ha⁻¹) and available K (125.26- 165.00 Kg ha⁻¹) in different fruit and agriculture crops block of the research farm. The fertilizer recommendation can be done based on determined soil fertility status to economize crop production. Moreover, research farm should develop future research strategy accord with the prepared soil data base.

Keywords: Chemical properties, available NPK, nutrient status, temperate areas and soil

Introduction

Soil is a complex system comprised of minerals, soil organic matter (SOM), water, and air (Flores-Magdaleno *et al.*, 2011) [3]. Soil quality includes mutually interactive attributes of physical, chemical and biological properties, which influence many processes in the soil that make it suitable for agri and horticultural practices and other purpose (Rakesh *et al.*, 2012) [15]. The soil reaction (pH), organic matter, macro and micronutrients etc. are also important soil chemical parameters. These properties play important role for the soil fertility and determined after soil testing (Brady and Weil, 2004). The evaluation of soil fertility includes the measurement of available plant essential nutrients and estimation of capacity of soil to maintain a continuous supply of plant nutrients for a crop. Soil properties vary spatially and temporally from a field to a larger region scale, and are influenced by both intrinsic (soil formation factors, such as soil parent materials) and extrinsic factors (soil management practices, fertilization and crop rotation)

Soil fertility is one of the imperative factors governing by the crop yield and productivity. Soil associated limitations affecting the crop productivity including nutritional disorders may be resolute by evaluating the fertility status of the soils. The nutrient deficiencies in soils are the major constraints to productivity, stability and sustainability of the soils (Chaudhari *et al.*, 2012) [2]. The nutrient availability in soil depends upon soil pH, organic matter, adsorptive surfaces and other physical, chemical and biological conditions in the rhizosphere (Jiang *et al.*, 2009) [6]. Soil pH is one of the attributes delicate to changes in the natural environment and soil management developments for human activity. The fertility of the soil is the major indicator *i.e.* organic matter, cation exchange capacity (CEC), pH and soil texture. The soil pH is decreasing trend with increasing number of years in cultivation (Agriculture and horticulture) as soils tend to be slightly leached and become acidic in reaction (Jaiyeoba, 2003) [5]. The applications of organic and inorganic fertilizer increase the nutrient availability of nectarine crop of Bhaderwah areas of Doda district in Jammu and Kashmir (Kumar *et al.*, 2020) [11]. The macronutrient are essential in soil to plants growth, sustain ecosystems and

great crop yields. The inequality fertilization, depreciate the valuable soil environment particularly nitrogen and phosphorus could be due to potentially hazardous of water resources while their constituents in soils are extreme, as available macronutrients may be transported off site in runoff due to rain or irrigation and subsequently degrades the soil and reduced the productivity (Ju *et al.* 2007) [7]. Consequently proper management practices are compulsory to avoid failing environment whereas meeting the requirement of extraordinary crop productivity and farmer must be advised to use unique fertilizers, manures, and accordingly take on suitable cropping pattern. The orchard management practice is compulsory for proper utilization of nutrients (Kumar *et al.*, 2018) [10].

Plant nutrition plays an imperative role in humanizing the quantity and quality of horticultural and agricultural crops and, thus, is essential for successful fruit and field crop growing. The macro-nutrients elements such as nitrogen, phosphorus and potassium are required in large amount. The soil is very important factor among an assortment of biotic and abiotic factors for sustainable crop production. It has been observed that in many fruit and agriculture block of research farm Bhaderwah that they are adopting the same dosages of NPK for a particular crop under unreliable soil properties. The soil properties and available nutrients diverge greatly with in a small area. The soil properties and nutrients of soil are crucial in view of telling a package of agricultural practices and judicial use of inputs for increased crop production in the orchard. Keeping in view of the above facts, the present investigation was undertaken to assess the status of soil properties and available nutrients in the different fruit and agriculture block of the orchard and presented in this announcement.

Materials and Methods

The present study was carried out during at the experimental

field of Regional Horticultural Research Sub-station, Bhaderwah, Sher-e- Kashmir University of Agricultural Sciences and Technology Jammu, (J&K), India. Experiment site is located 32° 53' and 34° 21' latitude and 75° 01' and 76° 47' E longitudes with an altitudinal 1600 m above the sea level. The climate is characterized as sub humid temperate region, rainfall restricted mostly to winter months. Snowfalls during January and February months are also experienced. Research farm Bhaderwah grows different fruit and agriculture crops in 2.675 hectare area under temperate condition in Doda district of Jammu and Kashmir. The productivity of fruit crops depends on many factors such as climate, site, varieties, fertilization, irrigation, soil management practices, pests and diseases management. Among the factors, adequate supply of nutrients play very crucial role in regulating cropping and quality of the fruits. The sixty soil samples from twelve blocks of fruit and agriculture field representing agriculture crops, *viz.*, Maize+ Rajmash, Sole Rajmash, Bush type Rajmash and Paddy field and fruit crops are Walnut, Apple, Strawberry, Pecan nut, Pear, Persimmon, Nursery fruit plants and Apricot block. In each fruit and agriculture block four pits were dugged at random and soil surfaces were collected at a depth of 0-15 cm of soil surfaces in the year-2019. After collection, soil samples were air dried, gently grounded in a wooden pestle, passed through 2 mm sieve, and used for analysis. The soil samples were analyzed for pH, EC, organic carbon, available N, P, and K by adopting standard procedures Jackson (1973) [4].

Result and Discussion

The perusal of data in fig-1 shows that the soil pH was slightly acid to slightly neutral in reaction and ranged 5.50 - 6.52. The lowest being in apple fruit block (5.50) and highest in sole Rajmash (6.52). The overall average of soil pH is 6.00 in all over the orchard.

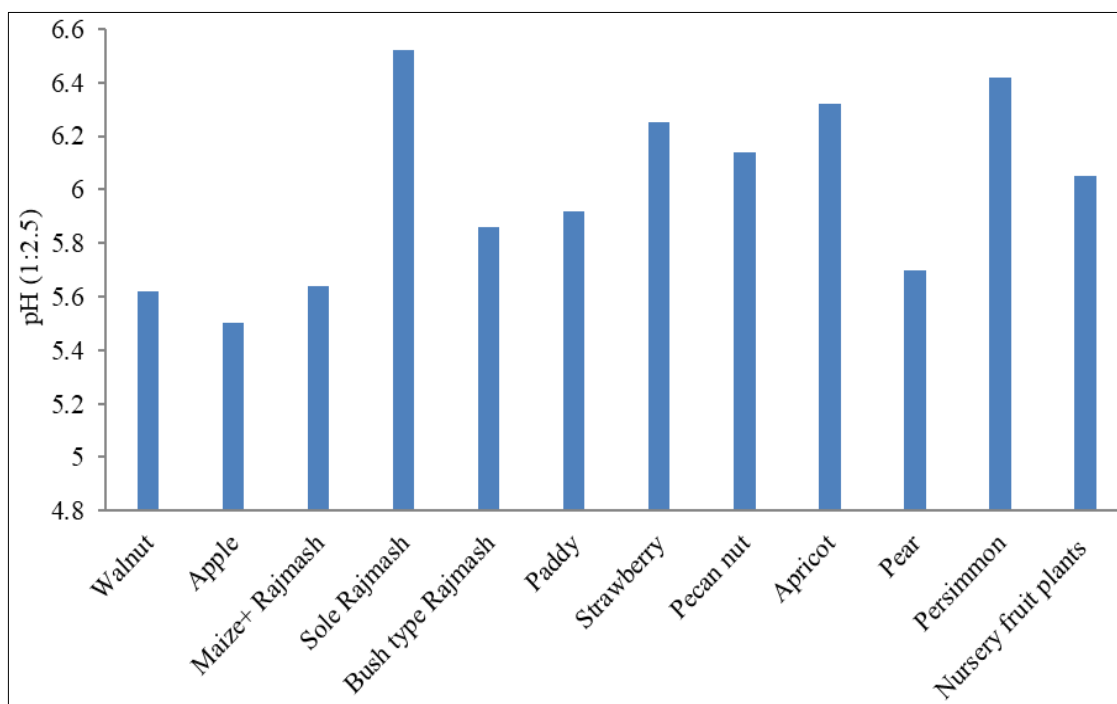


Fig 1: Soil pH of Bhaderwah orchard under temperate condition

The reason could be attributed to be accumulation of bases. The soils were non saline nature with EC ranging in (0.115-0.166 dSm-1). The lowest was in paddy block (0.115 dSm-1)

and was highest in maize + Rajmash (0.166 dSm⁻¹) in figure 2. The overall average of electrical conductivity is 0.14 dSm⁻¹ in the Bhaderwah orchard.

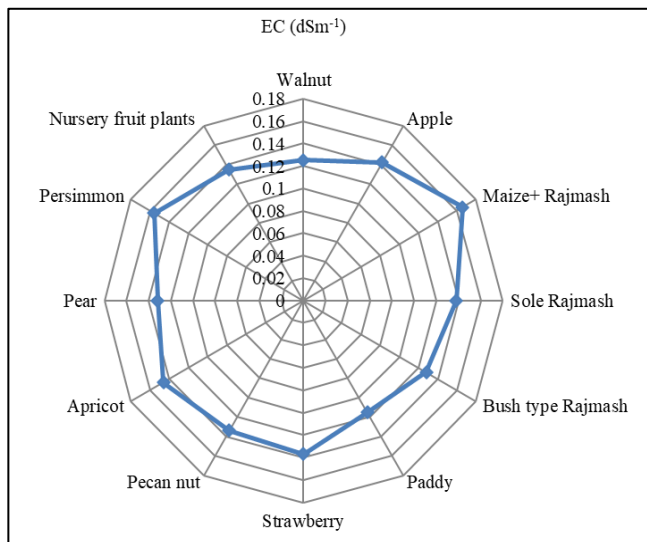


Fig 2: Electrical conductivity (EC) of Bhaderwah orchard under temperate condition

The organic carbon content was low ranged from 4.12 – 5.64 g kg⁻¹ (fig. 3). The lowest was in persimmon fruit block (4.12 g kg⁻¹) and highest in maize + Rajmash (5.64 g kg⁻¹). There was wide variation in many fruit and agriculture block of research farm. The overall average of organic carbon content of (4.69 g kg⁻¹) in the temperate orchard of Bhaderwah. The reason might be due to less application of organic manures.

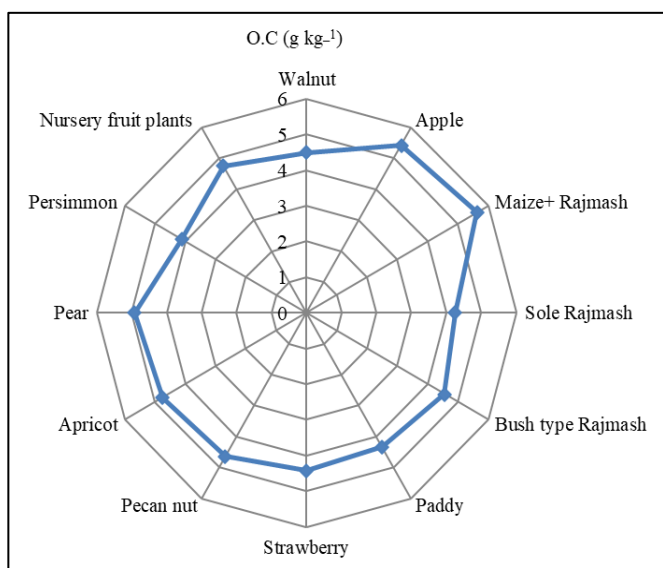


Fig 3: Organic carbon content of Bhaderwah orchard under temperate condition

The result revealed that the fig. 4 to the available soil nitrogen was in the range from 198.56 to 254.45 kg ha⁻¹. There was more wide variation in different fruit and agriculture block of this orchard. The lowest content available N in persimmon fruit block (198.56 kg ha⁻¹) and highest in maize + Rajmash block (254.45 kg ha⁻¹) was observed in the fruit block. The available nitrogen of overall average is 225.98 kg ha⁻¹. The higher content of available N in maize + Rajmash surface soil might be due to their organic carbon content by the application of fertilizer.

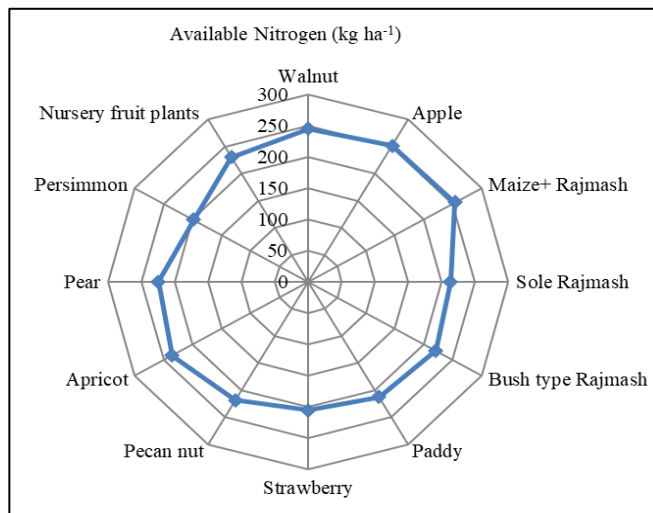


Fig 4: Available Nitrogen content of Bhaderwah orchard under temperate condition

The values of available phosphorus ranged from 11.45-16.510 Kg ha⁻¹ (fig. 5). Phosphorus status was generally medium in all research farm block. The lowest content of available phosphorus was in strawberry fruit block (11.45 kg ha⁻¹) and highest in maize + Rajmash block (16.50 kg ha⁻¹). In general, maximum accumulation of available phosphorus was found in surface layer soil. The available potassium ranged from 125.56-165.00 kg ha⁻¹ and the overall average is medium range is 13.67 kg ha⁻¹.

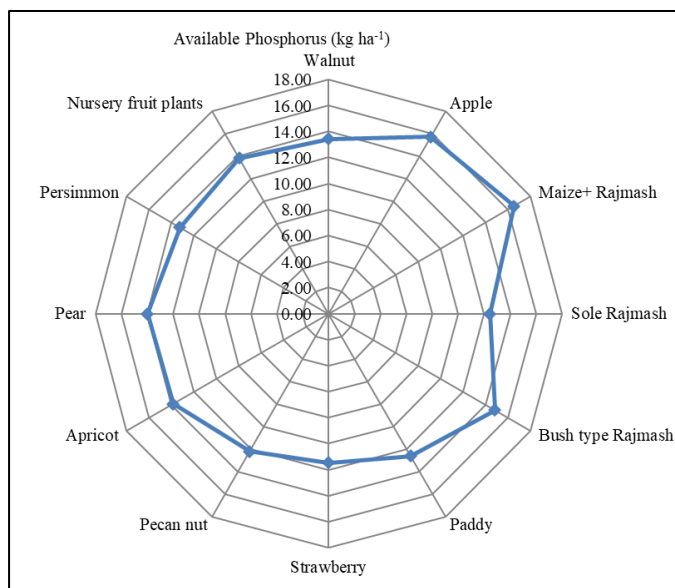


Fig 5: Available Phosphorus content of Bhaderwah orchard under temperate condition

The lowest content of available K was in paddy fruit block (125.56 kg ha⁻¹) and highest in maize + Rajmash block (165.00 kg ha⁻¹) of this research farm (fig. 6). The overall average of available potassium is 141.33 in the Bhaderwah orchard. Available potassium was generally in medium in all research farm blocks. The variation in potassium content might be because of the occurrence of minerals in varying proportion in different blocks of the area.

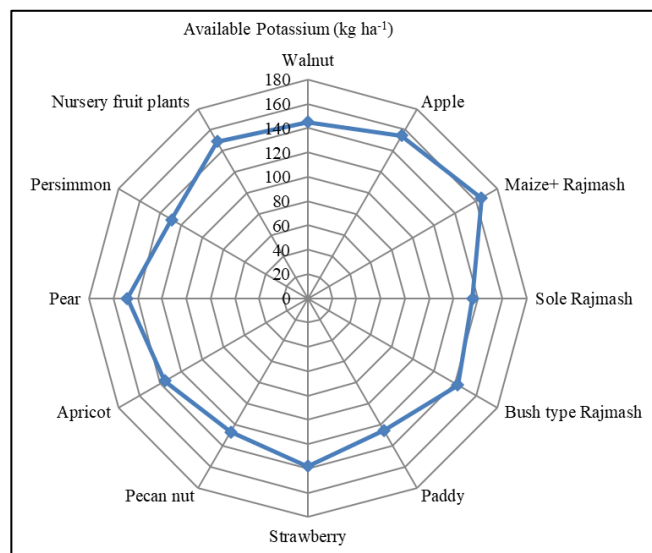


Fig 6: Available Potassium content of Bhaderwah orchard under temperate condition

Fertility status with respect to available nitrogen and phosphorus was dependent upon the amount of organic matter added in the soil where as status of potassium was mineral based. These results are in accordance with the findings of Kumar *et al.* (2010) [12], Kumar and Sohan (2012) [9], Rai *et al.*, (2018a) [13], Rai *et al.*, (2018b) [14] and Kumar and Sharma (2018) [10]. Thus, it may be concluded that soils were slightly acid to slightly neutral reaction, low organic carbon content. Regarding available nutrient contents of N, P, and K they were low to medium in general.

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