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Evaluation of available N, P and K status in soils of Dharsiwa block under Raipur district of Chhattisgarh

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Abstract

A study was undertaken to evaluate the fertility status of Dharsiwa block under Raipur district, Chhattisgarh covering 24 villages during 2017-2018. The systematic collection of samples was carried out in geo-referenced surface (0-15 cm) soil samples from 499 sites representing Inceptisols, Alfisols and Vertisols using Global Positioning System and mapped on 1:4000 Scale. The soil samples were analyzed for N, P, and K. The soils were low in available N content. It ranged from 113 to 251 kg ha⁻¹ (mean 202 kg ha⁻¹) and concluded that soils were found to be low nitrogen status. The status of available phosphorus in soils ranged from 9.00 to 20.80 kg ha⁻¹ (mean 15.45 kg ha⁻¹). The available potassium content generally medium to high. It ranged from 146 to 539 kg ha⁻¹ (mean 390 kg ha⁻¹).

Keywords: Fertility status, major nutrients

Introduction

The importance of soil fertility and plant nutrition to the health and survival of all life cannot be understated. As human population continue to increase, human disturbance of earth's ecosystem to produce food and fiber will place greater demand on soils to supply essential nutrients. Therefore, it is critical that we increase our understanding regarding the chemical, biological, and physical properties in relationships to the soil-plant-atmosphere continuum that control nutrient availability.

Plant growth nutrients such as N, P and K are important soil elements that control its fertility. Soil fertility is one of the important factors in relation to evaluation of fertility status of the soils of an area and or region. It is an important aspect in context of sustainable agriculture production.

Material and Methods**Location and climate**

Dharsiwa block is situated in Raipur district of Chhattisgarh state lying between 21.25° N latitude 81.63° E longitude with an altitude of 298 m above the mean sea level. The location of study area is shown in the map of the Chhattisgarh state (Fig.3.1). There are about 24 villages which includes for evaluation of soil fertility status in Dharsiwa block.

The region generally experiences hot, sub humid climate, having average rainfall of 1176.32 mm, with erratic pattern of distribution. Due to high rainfall and proximity to Eastern coast, the climate remains humid for about five months. On the basis of rainfall and temperature, the year may be divided into three distinct season's namely rainy season from June to September, winter season from 2nd fortnight September to January and summer season from February to June. The monsoon enters around 15th June and usually withdraws by 15th July. The climate of the area is characterized by hot summers and cool winters.

Temperature

The hottest and coolest months are May and December, respectively. The maximum temperature during the summer may exceed even 49°C and the minimum temperature often falls below 80 °C during winter season.

Soil characteristics

For evaluation of the soil fertility status of Dharsiwa block, a systematic survey was carried out. Surface (0-15cm depth) soil samples were collected from the different village of Dharsiwa block using GPS (Global Positioning System) marked. The sampling points have taken from the cadastral map of different villages by locating in such a way that from each 10-hectare area may represent one grid based soil sample.

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Systematic or grid sampling

Sampling points were pre-determined across a field for a soil type under study at fixed interval systematically across a grid from each of 10 ha area. Within each of such sample point, 5 samples were randomly taken for further analysis, to represent the 10 hectares area selected under the soil.

Field work

The study area was surveyed in each village and sampling was done considering one soil sample from each of 10 hectare area should be taken. After sampling, the points were marked by GPS with Latitude and Longitude. The soil samples were collected from 15 cm depth with the help of soil auger.

Laboratory work

Soil samples collected from the study area were dried and crushed with the help of wooden rod and passed through 2 mm sieve and then used for the determination of soil pH, organic matter, macronutrients and micronutrients content by adopting standard laboratory methods.

Result and Discussion**Available N status**

The available N content of Inceptisols, Alfisols and Vertisols varied from 113 to 251 kg ha⁻¹ with an average value of 202 kg ha⁻¹.

The available N content ranges from 125 to 250 kg ha⁻¹, 137 to 250 kg ha⁻¹ and 112 to 250 kg ha⁻¹ with mean values of 210, 187 and 199 kg ha⁻¹ in Inceptisols, Alfisols and Vertisols respectively.

The soil samples i.e. 100%, 100% and 100% were found as low available N content in Inceptisols, Alfisols and Vertisols respectively. The soils of Dharsiwa block fell under low status (<280 kg ha⁻¹) in available N content. In general, out of 499 samples 100% fell under low status.

In this way, almost all the soil samples tested for available N were found to be deficient in N. The mean value of N was found minimum i.e. 112 kg ha⁻¹ in the Mohdi village and maximum 250 kg ha⁻¹ in Temri village.

Available P status

The ratings for available P of the study area was noted from 9.0 to 20.80 kg ha⁻¹ with a mean value of 15.45 kg ha⁻¹. Further, in Inceptisols, Alfisols and Vertisols it varied from 9.14 to 20.78 kg ha⁻¹, 7.61 to 19.53 kg ha⁻¹ and 8.87 to 20.78 kg ha⁻¹ with an average value of 14.61, 14.24 and 15.64 kg ha⁻¹ respectively. The range is quite large which might be due to variation in soil properties viz., pH, organic matter content, texture and various soil management and agronomic practices. Considering the soil test rating for available phosphorus (<12.5 kg ha⁻¹ as low, 12.5-25 kg ha⁻¹ as medium and >25 kg ha⁻¹ as high) majority of the soils fell under medium status. Nearly, 62.16% (Alfisols) and 75.82% (Vertisols) soil samples were observed under medium status in available phosphorus. The 52.50%, 37.83% and 24.83% samples of study area were categorized under low available P content in Inceptisols, Alfisols and Vertisols, respectively.

The highest mean values of available phosphorus were recorded 20.78 kg ha⁻¹ in Mowa village and lowest 7.61 kg ha⁻¹ in Meharsakha village of Dharsiwa block.

Available K status

The available K content in study area soil ranged from 146 to 539 kg ha⁻¹ with an average value 390 kg ha⁻¹. The available K ranged from 150 to 545 kg ha⁻¹, 148 to 493 kg ha⁻¹ and

138 to 544 kg ha⁻¹ with an average 373, 363 and 393 kg ha⁻¹ in Inceptisols, Alfisols and Vertisols, respectively of the study area Dharsiwa block.

Considering the soils having <135 kg ha⁻¹ as low, 135-335 kg ha⁻¹ as medium and

>335 kg ha⁻¹ as high in available potassium contents. The data presented in table 4.8 revealed that 29.85% had medium and 70.14% samples had high in available K content of the study area.

Distribution of the samples with respect to available K indicated that in Inceptisols about 55% samples high and 45% medium in available K content. In Alfisols, about 40.54% samples were found in medium and 59.45% samples were found in high K content, whereas in Vertisols 27.48% samples found in medium and 72.51% in high K content.

The highest and lowest mean values of available potassium content were recorded to be 545 kg ha⁻¹ and 138 kg ha⁻¹ K in Mowa and Temri village, respectively of Dharsiwa block.

Conclusion

It can be concluded from the results under study that the soils of Dharsiwa block under Raipur district of Chhattisgarh is characterized under the area showed low in available N, low to medium level in available P and medium to high level in available K. Hence, the soils require attention regarding nutrient management practices and regular monitoring of soil health for better crop production.

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