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PHYSICO-CHEMICAL PROPERTIES OF RIVER BANK SOIL

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ABSTRACT:

KEYWORDS:

Soil properties govern the life of the plants. Besides climatic conditions, edaphic factors have also a significant bearing on plant growth performance and type of community develop0ment. The river bank soils differ in their physic-chemical properties. As the river bank are low lying areas which receive run-off water and suspended material along with water after rainfall and thus soil remains covered with rain water for about four months. Hence, the soil has to pass in waterlogged conditions for a considerably long period. The seeds of most of the plants mature in summer and fall on the ground and remain embedded in soil during monsoon season and seeds of plants from neighboring uplands are brought by run-off of water with the start of winter session the seeds of Argemone mexicana, other species germinate, mature and the river bank community develop.

The colour of soil is one of the most significant morphological features that attract ones attention. Most of the wet soil is usually darker in colour than in dry conditions. The waterlogged state of soil brings about anaerobic conditions which reduces the oxidation potential and favours reducing reactions. The alternate reduction and oxidation of certain compounds in soil may lead to variegated colour. The colour is more or less uniform dark grey brown (10YR4/2) to dark grey (10YR4/1) in moist conditions. However, in dry conditions soils under present investigation were grayish brown (site I) and light brownish gray (site II) in colour.

Texture composition which refers to the relative proportion of different size particles is of great significance because on this several other properties of soil are dependent. The plant growth is also influenced considerably by the size of the soil particles.

The date incorporated indicates that the soil of both the sites fell to the textural class-clay. On account of shallow nature of river bank the rain water moves in these area transport clay in form of soil from surrounding upland areas and deposit on the different sites. Therefore, the sites are rich in clay. The result indicates that the soil of river bank is heavy due to his proportion of silt and clay and little amount of sand particles. Clay possesses the property of swelling on wetting and expandable lattice structure, together with greater surface activity, but contractors very much on drying. Consequently, during the dry period the soil develops very deep and wide cracks. As the soil is very compact in nature these cracks help in the aeration. By virtue of their heaviness they would be offering more resistance to root penetration and also infiltration of water is small. As a result of high clay proportion in surface layer of soil, the river bank is able to retain accumulated water for longer period of time in comparison to neighboring areas.

Clay soil has greater water holding capacity and retain the water more tenaciously. This property of soil is very much helpful for the plants growing on them. Such plants are able to survive for longer time in summer as compared to the plants of surrounding growing on other types of soil. Clay particles are small in size and have pronounced surface activity. It packs more compactly than to coarser particles like sand and silt. Due to this higher compactness bulk density is higher at site II. Due to this character of compactness the soil offers great resistance to root penetration, but root of the plants growing in present study area are adapted and adjusted to overcome this resistance.

Soil porosity provides space for soil moisture and soil

atmosphere due to transported nature of soil, there is good percentage of pore space. Pore space remain filled with moisture and there is poor aeration, but this is compensated by appearance of cracks, which help in aeration of soil and the fine roots and root has grow and derive water-nutrients from these pore spaces and thus control plant growth. The porosity is found to be inversely related to bulk density.

The soil moisture contents very in different months at the two sites. A decreasing trend was observed from November, 2006 to June, 2007. This is possible due to are transported to river bank and accumulate there, which increases the amount of organic carbon and nitrogen initially. In February, there is increase in organic carbon and nitrogen as a result of transportation of decomposed organic matter from upland areas by splash of rain as percentage of organic carbon and nitrogen as a result of transportation of decomposed organic matter from upland areas by splash of rain as percentage of organic carbon depends upon available organic carbon in February may also be due to the fact that some of the plants complete their life cycle and they are added to the soil in form of organic matter. When compared with the grassland soils of the same area the values of organic carbon and nitrogen are found high (Raman, 1959 and Pandey, 1978),this is due to the fact that is rich moisture level favours a dense vegetation and decomposition of dead organic plant residue (Vander Drift, 1970; Weigert and Evans, 1964). The content of organic carbon and nitrogen depends upon rate of decomposition which in turn is governed directly by temperature and moisture and by pH of soil indirectly (Van Cleave,1971). A higher temperature, moisture and slight range is most optimum for decomposition (Karenlampi,1971). During decomposition the carbon is used as energy source by decomposers while nitrogen is assimilated in cell-proteins and other compounds. The soil organic matter generally increases the soil aggregation and improves the soil texture thereby promoting better plant growth (Akerman and Myers, 1953; Kolondy and Neal, 1941). In the early period of growth of the plants when the moisture content is high the rate of decomposition is also quite high and liberated more amount of nitrogen (Walksman, 1928).

The C/N ratio in soil seems to characterize the nitrogen status in respect to potential mineral nitrogen mobilization (Ulrich, 1969). It is found to be an important parameter for comparison of soil characteristics in diverse regions of the contrasting environmental conditions. There is wide fluctuation in C/N ratio in different months and sites. When the moisture content is high in early periods nitrogen content is also high which decreases the C/N ratio. In summer season, maximum C/N ratio indicates slow rate of decomposition (Foth and Turk, 1972). The nitrogen content in the soil also depends upon the uptake, retention and its release. A comparison between study sites reveals highest percentage of organic carbon and nitrogen on site I which is due to higher amount of litter, which is main source of organic carbon and nitrogen. The phosphorus content is found low during summer season in comparison to early winter season. The low content of available phosphorus in these soils during summer months reflects upto some extent depressing effect on availability of phosphorus due to low moisture content.

Most of the nutrients exist in mineral and organic matter and as such are insoluble and hence are unavailable to the plants. Nutrients become available through mineral weathering, organic matter decomposition, through-fall and precipitation. The nutrients are absorbed from the soil solution or from colloid surface as cations and anions. Site II has got more m.e. % of sodium as summer months which might be due to exchange of Na ions to clay complex instead of going down with the leaching water. The values of potassium content was found higher at site II which may be due to addition of more potassium by rapid decomposition of organic matter. Calcium content is is high at site II which may be due to transportation of this element from the surrounding uplands. The fine structure of soil is responsible for more nutrients in the river bank soils (Morgan and Street, 1939) as compared to other surrounding soils.

The soils of Karamnasa river bank by virtue of their situation at low level, rich in clay content and water logging for long periods accompanied by poor drainage, result in less leaching which develops high base status. Thus even the minimum values of exchangeable cations are high as compared to grassland soils. In the present study the nutrient concentration is found to be in the following decreasing order N, Ca, K, P and Na

On the whole the soil nutrient condition on these study sites is quite favorable for good plant growth. The physical properties, texture, porosity, water holding capacity are also conducive. The moisture content is quite high and the net primary productivity shows reverse trend due to the extreme biotic disturbances which are responsible for lowering the net primary productivity of the plant community.

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