

HYDRAULIC CONDUCTIVITY OF HYDROMORPHIC SALINE AND ACID SALINE SOILS UNDER SALINIZED AND DESALINIZED CONDITIONS

Vast areas of the Vembanad lake adjoining the **Kuttanad** in Kerala have been **reclaimed** for rice cultivation. This region is situated at about 1.0 - 1.5 m below sea level and is subject to periodical inundation with sea water. During the monsoon periods of **June-September**, this tract will be covered with fresh flood **water**, but during the summer months of **December-April**, there will be saline water intrusion. The soils of this region have been **classified** as **hydromorphic** saline and acid saline groups. Hydraulic conductivity of a soil is the most important single parameter required for any drainage design. It is known to vary with the nature of fluid as well as **soil** characteristics. In this report an attempt has been made to study the hydraulic conductivity of the hydromorphic saline and acid **saline** soils under **salinized** and desalinized conditions.

To study the hydraulic conductivity of the soils under salinized and desalinized conditions, five sites, viz., Eror (hydromorphic **saline-pokkali** soil) at **Vytilla**, **Puthupalli** (hydromorphic **saline-orumundakan**) at **Kayamkulam**, Muthukulam (hydromorphic **saline-orumundakan**), **Purakkad** (acid **saline-kari**) and **Vechoor** (acid **saline - kayal**) were located which are subjected to sea water inundation.

During the **monsoon** period, the above mentioned soils are washed by fresh water and the **desalinization** takes place. At each of the above sites, horizon-wise profile samples were **studied** during March-April (**salinized** condition) and again during September-October (desalinized condition) during

1978-1979 and 1979-1980. Four profiles were collected from each site. For measuring the hydraulic conductivity of the **soils**, the undisturbed and disturbed cores were saturated with water by capillary rise and it was determined by constant head method (**Black, 1965**) wherein a constant flux was obtained under a small positive head of 2 cm in each case. **Darcy's** equation was employed to calculate hydraulic conductivity of saturated soils cores.

Laboratory tests were conducted to determine the saturated hydraulic conductivity of both undisturbed and disturbed soil samples of all the twenty soil profiles. Care was taken to maintain the same bulk density in the case of disturbed soil samples as existed in the undisturbed core samples of the **respective** soils.

The results indicate very high values for saturated hydraulic conductivity under both disturbed as well as undisturbed conditions for most of the profiles, the exceptions being the Eror and Vechoor profiles (**Sharda and Gupta, 1978**). In general, the saturated hydraulic conductivity values were more in the case of the undisturbed soil samples as compared to disturbed soils for the **Puthupalli** and Muthukulam profiles even though the same bulk density was maintained. The reverse was true of the **soils** of the Eror (hydromorphic saline) and Purakkad and Vechoor profiles (acid saline).

In Eror profiles under salinized conditions, the saturated hydraulic conductivity varied from 0.0049 to 0.0095 **cm/h** and from 0.0076 to 0.013 **cm/h** for

undisturbed and disturbed **soil** samples respectively. Under desalinized condition it varied from 0.011 to 0.23 **cm/h** and from 0.034 to 0.046 **cm/h** for **undisturbed** and disturbed samples.

In Puthupalli profiles under **salinized** conditions the saturated hydraulic conductivity varied from 28.49 to 35.16 **cm/h** and from 28.16 to 34.30 **cm/h** for the undisturbed and disturbed **soil** samples respectively. Under desalinized conditions it ranged from 44.13 to 54.56 **cm/h** and from 42.60 to 52.65 **cm/h** respectively for the undisturbed and disturbed **soil** samples. In the case of **Muthukulam** profiles under salinized conditions, the saturated hydraulic conductivity ranged from 28.16 to 38.12 **cm/h** and from 29.11 to 37.64 **cm/h** for the undisturbed and disturbed soils respectively. But under **desalinized** conditions the variation was from 47.54 to 54.74 **cm/h** and from 47.42 to 53.45 **cm/h** for undisturbed and disturbed soils.

In the **Purakkad** profiles, under salinized conditions the saturated hydraulic conductivity ranged from 8.93 to 26.19 **cm/h** and from 9.41 to 27.20 **cm/h** for undisturbed and disturbed soils respectively. But under **desalinized**

conditions, it varied from 16.51 to 32.91 **cm/h** and from 17.05 to 35.76 **cm/h** respectively for the undisturbed and disturbed **soils**.

In the **Venchoor** profiles, the saturated hydraulic conductivity ranged from 0.0031 to 0.080 **cm/h** and from 0.033 to 0.086 **cm/h** for the undisturbed and disturbed soils **samples**, under salinized conditions were from 0.0081 to 0.22 **cm/h** and from 0.0095 to 0.23 **cm/h** for the undisturbed and disturbed soil samples.

It was observed that the saturated hydraulic conductivities in all the soils at the different locations were always higher under desalinized conditions than under salinized conditions, as the soils get dispersed under saline conditions and this retards the movement of water through them. Similar findings were reported by Singh (1972) and **McIntyre** (1979).

Very high values of saturated hydraulic conductivity were observed in Puthupalli and Muthukulam profiles under **hydromorphic** saline group and Purakkad profiles under acid saline group. The hydraulic conductivity was more under **nonsalinity** conditions as compared to conditions of **salinization**.

College of Agriculture
Vellayani 695 522, Thiruvananthapuram

P.C. Antony
M.M. Koshy

REFERENCES

- Black, C.A. 1965. *Methods of Soil Analysis. Part I* American Society of Agronomy, Inc. Publishers, Madison, Wisconsin, USA
- McIntyre, D.S. 1979. Exchangeable Na, subplasticity and hydraulic conductivity of some Australian soils. *Aust. J. Soil Res.* 17 115- 120
- Sharda, A.K. and Gupta, R.P. 1978. Evaluation and use of **flow** functions in predicting vertical infiltration of water at different soil bulk densities. *Indian Geotechnical J.* VIII (i) : 27-38
- Singh, T.A. 1972. Physical characteristics of salt affected soils, minographed notes. Summer Inst. Soil Physics, G.B.P.U.A.T., Pantnagar