

WATER RETENTION IN B SUBHORIZONS OF SOME OXISOLS

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Abstract

Water retention at different tensions was determined in 15 B subhorizons (Bo1 or Bo2 or Bo3), previously selected from Brazilian Oxisols studied in the VIIIth International Soil Classification Workshop (ISCW). The volumetric water retention curves and the availability of water (calculated as the difference between the percent of water at 1/3 and 15 bars) are presented. It can be concluded that the volumetric water retention curves have similar shapes, independent of the amount of total clay in the samples; the curves become practically horizontal starting at the 5 bars tension in the majority of the samples. The amount of available water was low for 11 samples and medium for the remaining 4 samples.

The present study is a contribution to the VIIIth ISCW. Its main objective is to study the soil-water relationship in B subhorizons of Brazilian Oxisols selected for the VIIIth ISCW.

From the 24 soil profiles studied in the VIIIth ISCW, 15 classified as Oxisols were taken for the present study. From each soil profile the same subhorizon was studied by researchers of different areas of expertise. The data obtained in this study may be used along with that generated by other researchers to establish correlation with other physical, chemical, or mineralogical properties of the soil.

This study shows the data on soil-water relationships for only one subhorizon of each Oxisol sampled for the VIIIth ISCW. However, data on soil-water relationships for all soil horizons of the 15 Oxisols can be obtained from the authors if desired.

Materials and Methods

The soil analyses followed the methodology used by EMBRAPA (1979) as presented below in summarized form:

Bulk density: Determined by the core method or by the clod method.

Water retention at 1/10, 1/3, and 1 bar: The air-dried sieved samples (<2 mm) were put in a pressure cooker (Richards 1954) and desired pressure applied.

Water retention at 5 and 15 bar: Same as the previous procedure using a pressure apparatus and ceramic plate of 15 bars, applying the desired pressure.

Available water: The water retention difference between the volumetric water retained at 1/3 and 15 bars.

Classes of available water: For classification purposes the criteria suggested by the Bureau of Reclamation (U.S. Department of Interior 1953) were used:

Classes	Available water
low	< 0.60
medium	0.61 - 1.23
high	> 1.23

Results and Discussion

The data given in Table 1 show the measured volumetric water content percent at five different tensions (1/10, 1/3, 1, 5, and 15 bars) and the volumetric available water of 15 B subhorizons selected from profiles studied at the VIIIth ISCW.

The volumetric available water was low (0.37 to 0.60 mm/cm) for 11 (73 percent) of the 15 samples and medium (0.71 to 0.83 mm/cm) for the remaining 4 (27 percent) samples.

The moisture retention curves for the B subhorizons studied are shown in Figure 1.

The volumetric water retention curves shown in Figure 1 become horizontal starting at 5 bar tension. Only in pedon 9 and pedon 20 do the curves become horizontal starting at the 1 bar tension.

The most significant variations in volumetric water retention occur between 1/10 and 1/3 bar and between 1/3 and 1 bar tension for every sample studied.

Conclusions

Based upon the 15 soil subhorizons studied, the following conclusions can be made:

1. The available water was low for 11 samples and medium

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Table 1. Measured Volumetric Water Content (%) and Available Water in Bo1 or Bo2 or Bo3 Subhorizons of Oxisols

Pedon No. VIIIth ISCW	States ^a	Horizon	Volumetric water content					Available water	
			1/10	1/3	1	5	15	1/3	15
			bars					bars	
			(%)					(mm/cm)	(classes)
1	SP	Bo2	24.9	22.0	20.8	19.0	18.3	0.37	low
2	SP	Bo1	40.7	37.0	33.7	31.7	31.2	0.58	low
3	SP	Bo1	26.3	19.0	18.1	15.4	13.0	0.60	low
4	SP	Bo2	36.2	30.7	27.9	25.6	23.0	0.77	medium
7	SP	Bo2	37.4	35.1	33.6	29.4	28.0	0.71	medium
8	SP	Bo2	41.9	34.6	31.6	28.7	28.6	0.60	low
9	SP	Bo1	24.3	19.7	16.1	15.5	15.5	0.42	low
10	SP	Bo2	18.3	14.6	11.8	10.4	9.9	0.47	low
11	MG	Bo3	38.4	32.1	30.1	27.0	27.0	0.51	low
13	MG	Bo2	16.9	11.6	9.7	8.0	8.0	0.36	low
14	GO	Bo2	48.6	39.3	35.0	31.1	31.0	0.83	medium
17	GO	Bo3	27.7	23.4	20.8	20.1	19.9	0.35	low
18	GO	Bo	28.4	25.7	24.6	22.8	22.6	0.31	low
20	DF	Bo2	29.6	27.2	24.7	23.8	23.2	0.40	low
22	DF	Bo1	30.7	25.4	21.2	18.8	18.2	0.72	medium

^a SP = São Paulo; DF = Distrito Federal; MG = Minas Gerais; GO = Goiás.
Source: SNLCS-EMBRAPA, Rio de Janeiro, Brazil.

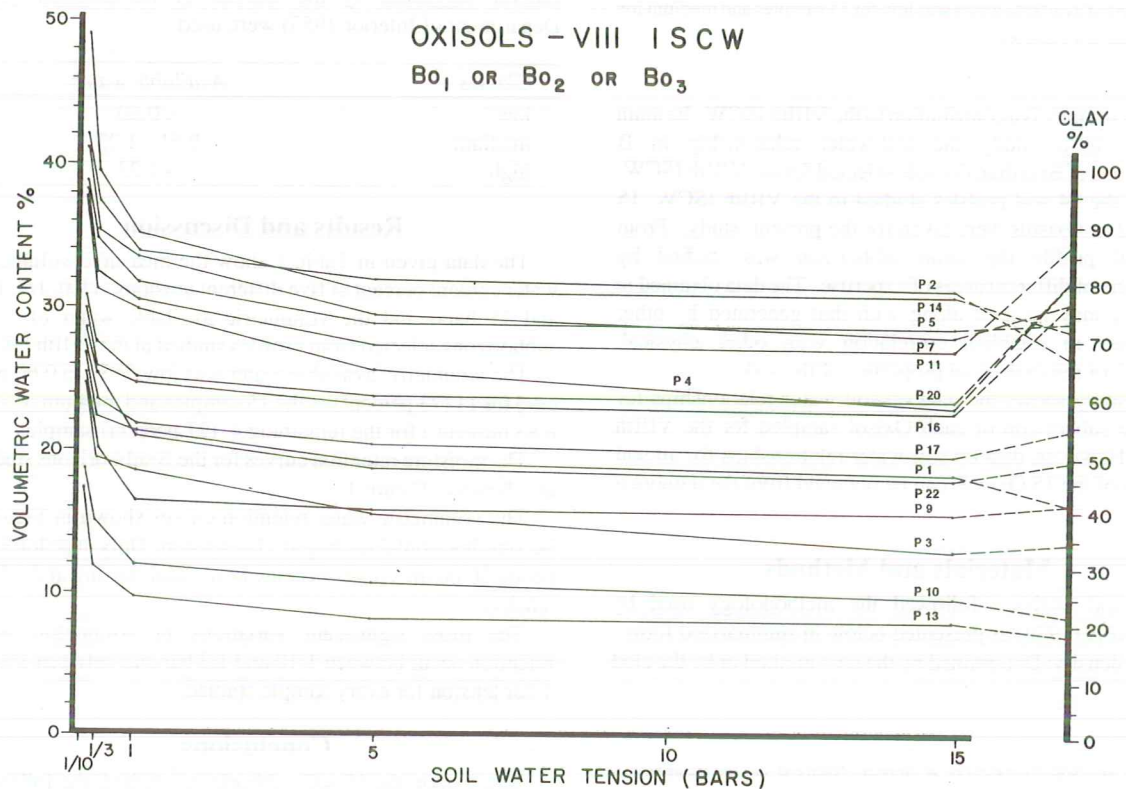


Fig. 1. Volumetric water content % as a function of tension applied in the Bo1 or Bo2 or Bo3 subhorizons of medium and clayey textured Oxisols from Brazil.

- for the remaining 4 soil samples;
2. The shape of the volumetric water retention curves are similar, independent of the amount of total clay in the samples;
 3. The tendency of volumetric water retention curves to become horizontal starts at 5 bars tension for almost all samples.

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