

THE INFLUENCE OF SOIL TEXTURE AND ORGANIC MATTER ON THE RETENTION CURVES AT SOIL MOISTURE IN THE HUMIC CALCARIC REGOSOL OF THE OVČE POLE REGION



Mile MARKOSKI^{1*}, Tatjana MITKOVA¹, Vjekoslav TANASKOVIK¹ Stojanče NECHKOVSKI and Velibor SPALEVIC²

¹Faculty of Agricultural Sciences and Food-Skopje, University "Ss. Cyril and Methodius" in Skopje, Blvd. Aleksandar Makedonski bb. R. Macedonia

*Correspondence (mile_markoski@yahoo.com; mmarkoski@zf.ukim.edu.mk)

²University of Montenegro, Faculty of Philosophy Niksic, Department of Geography, Montenegro; velibor.spalevic@gmail.com



INTRODUCTION

Rendzina Calcaric Regosol, which are formed by the weathering of the carbonate rocks of various geological formations, are inter-zonal soils developed in the subboreal, boreal, as well as in some regions of the subtropical zones. Their characteristic features are the occurrence of the fragments of the parent material in the surface level and neutral or abasic reaction of the soil in a solution with a high content of calcium (Dobrzański et al., 1987; FAO/UNESCO, 1997; Pranagal et al., 2005).

The hydrous and physical relations, in addition to the mineralogical composition of the soil, are also influenced by the mechanical content, the content of organic matter etc. (Hillel 1980). Maclean and Yager (1972), Jamison and Kroth (1958), Shaykewich and Zvarich (1968) as well as Heinonen (1971) studied the influence of organic matter and the mechanical composition over the retention of moisture in several different soils in the USA, Europe and Asia. In the research of (Hollist et al., 1977), it is confirmed that the soil moisture retention in Western Midland (Great Britain) depends mainly on the organic matter and mineralogical composition of soil. According to (Filipovski, 1996), the retention of moisture at different tensions is strongly correlated with the content of humus, clay, silt and the mineralogical composition of the clay.

MATERIAL AND METHODS

Determinates in mechanical composition and chemical properties in soils has been wait standard methods described by (Bogdanović et al., 1966), (Mitrikeski & Mitkova, 2006); (Resulović et al., 1971), (Džamić et al. 1996). The determination of moisture retention at a pressure of 0.33 bar (pF-2.54) and 1 bar (pF-3), was performed by a method of applying pressure with a Bar extractor. To determine the retention of soil moisture at higher pressures, the method of (Richards 1982), (Porous plate extractor), 2.0 bar (pF-3.3); 6.25 bar (pF-3.90); 11 bar (pF-4.04) and 15 bar (pF-4.2) was applied, described by (Resulović et al. 1971). There has been descriptive statistics (average value, standard deviation and variation coefficient were determined) of the mechanical composition, chemical properties and constants of soil moisture in Microsoft Excel. The correlation between retention of moisture, mechanical composition and humus is determined using the computer program Microsoft Excel.

RESULTS AND DISCUSSION

The mechanical composition (texture) and organic matter of the soil are of great importance to physical, physical-mechanical and chemical properties of the Rendzina Calcaric Regosol.

Rendzina Calcaric Regosol prevalent in Ovče Pole e region were formatted on Pliocene sediments, carbonate gravel and sand (geological map of the Republic North Macedonia).

Table 1. Mean values for mechanical composition

Hor.	N	Coarse sand 0.2 – 2 mm		Fine sand 0.02 – 0.2 mm		Total sand 0.02 – 2mm		Clay < 0.002 mm		Silt 0.002 – 0.02 mm		Silt + Clay < 0.02 mm	
		X	S.D	X	S.D	X	S.D	X	S.D	X	S.D	X	S.D
Ap		25,27	5,79	35,18	6,91	60,44	10,34	25,41	8,46	14,03	2,20	39,56	10,34
Amo	7	20,18	9,87	33,22	3,90	53,40	12,57	29,16	8,12	17,44	6,99	46,60	12,57
AC		18,07	12,76	40,16	11,90	58,23	13,00	20,67	8,94	21,10	9,96	41,77	13,00
C		19,16	16,63	46,06	13,21	65,93	18,61	13,49	8,41	20,59	15,37	34,07	18,61

Table 2. Mean values for chemical properties

Hor.	N	pH H ₂ O		Humus		N		P ₂ O ₅		K ₂ O		CaCO ₃	
		X	S.D	X	S.D	X	S.D	X	S.D	X	S.D	X	S.D
		[%]		[%]		Mg/100 g soil		mg/100 g soil		[%]			
Ap		7,47	0,75	2,1	0,13	0,12	0,01	17,83	8,78	30,31	7,58	3,52	3,62
Amo	7	7,79	1	1,36	0,21	0,1	0,01	7,73	6,07	17,67	5,98	6,47	7,2
AC		8,48	0,89	0,89	0,25	0,03	0,03	4,88	3,6	13,48	5,68	16,67	11,91
C		8,73	0,91	0,69	0,19	0,02	0,02	4,74	4,51	8,59	2,52	19,2	16

Table 3. Mean values for soil moisture retentions

Hor.	N	0,33 bar		0,5 bar		1 bar		4 bar		6,25 bar		15 bar	
		X	S.D	X	S.D	X	S.D	X	S.D	X	S.D	X	S.D
Ap		23,60	5,50	21,74	5,52	19,80	5,41	17,29	5,29	15,81	4,49	13,81	4,24
Amo	7	25,89	7,00	24,74	6,54	22,35	6,11	19,55	6,41	17,35	5,22	15,71	5,08
AC		23,22	6,62	21,95	6,80	19,64	6,29	16,57	5,97	14,63	5,18	12,65	4,66
C		19,51	6,77	18,12	6,57	15,94	5,74	12,80	5,43	10,95	4,75	9,22	4,32

Table 4. Correlation between soil texture and humus and soil moisture retention

0.2 – 2 mm	0.02 – 0.2 mm	0.02 – 0.02 mm	< 0.002 mm	0.002 – 0.02 mm	< 0.02 mm	0,33	0,5	1	4	6,25	15	Humus
1,00	-0,52	0,02	0,44	-0,96	-0,02	0,24	0,13	0,20	0,28	0,37	0,35	0,94
	1,00	0,84	-1,00	0,72	-0,84	-0,95	-0,92	-0,94	-0,97	-0,98	-0,98	-0,77
		1,00	-0,89	0,24	-1,00	-0,97	-0,99	-0,98	-0,95	-0,92	-0,93	-0,31
			1,00	-0,66	0,89	0,97	0,95	0,96	0,98	0,99	0,99	0,70
				1,00	1,00	0,97	0,99	0,98	0,98	0,95	0,92	0,31
					1,00	1,00	0,99	1,00	1,00	0,99	0,99	0,55
						1,00	1,00	0,99	0,97	0,98	0,98	0,45
							1,00	1,00	0,98	0,98	0,99	0,51
								1,00	0,99	1,00	0,58	
									1,00	1,00	0,66	
										1,00	1,00	
											1,00	
												1

RESULTS AND DISCUSSION

Chart 1. Retention curves of soil profile 1.

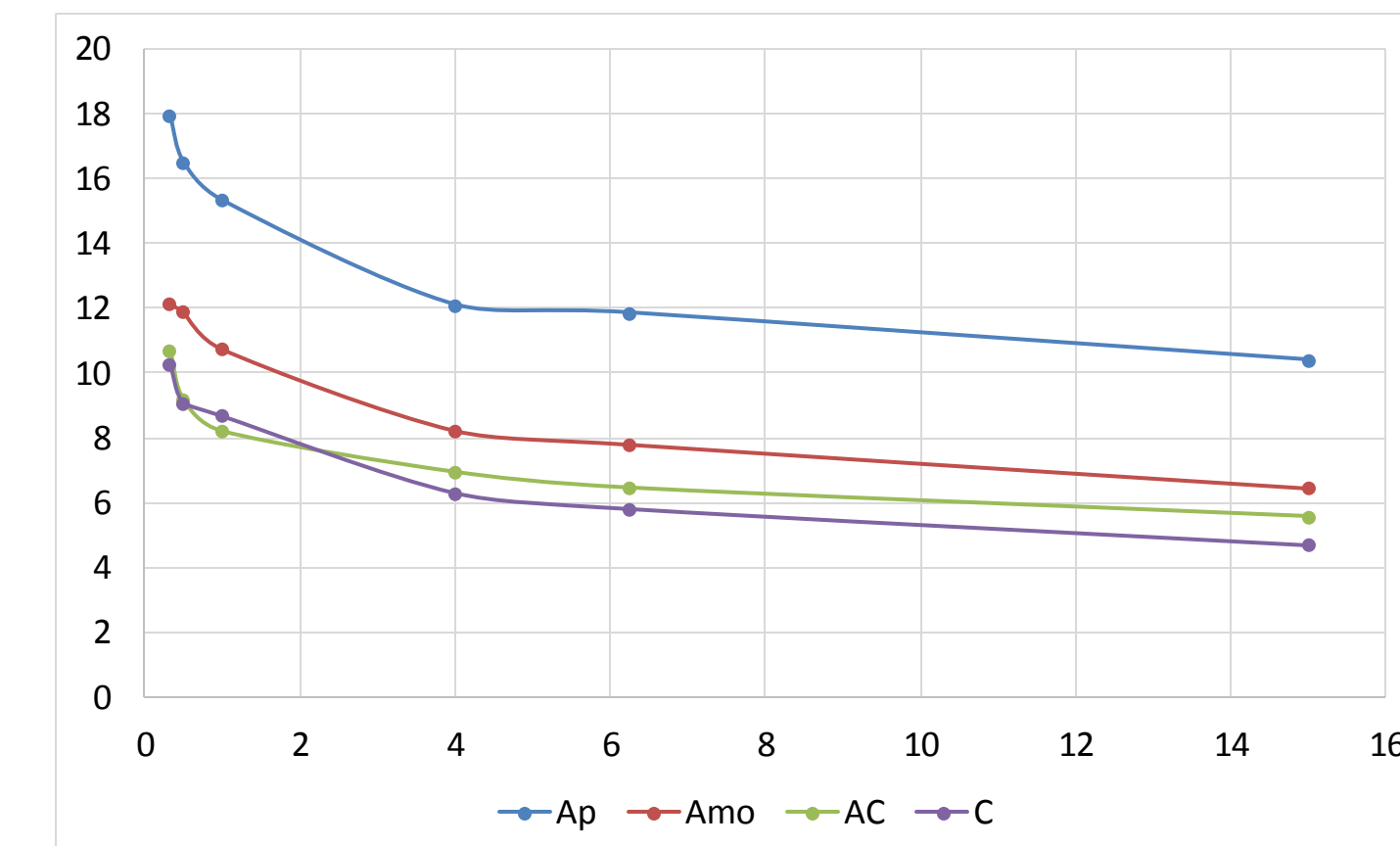


Chart 2. Retention curves of soil profile 2.

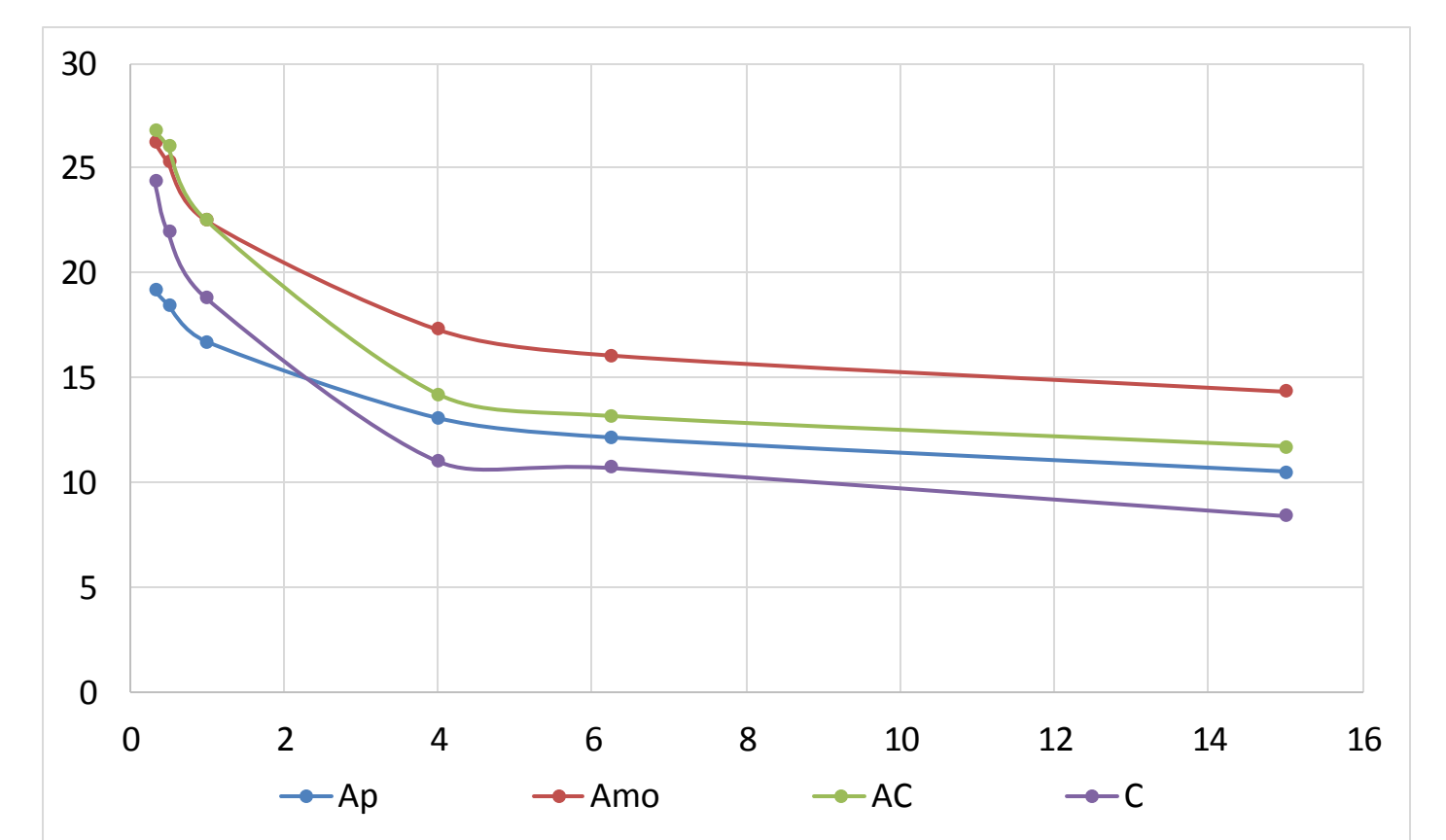


Chart 3. Retention curves of soil profile 3.

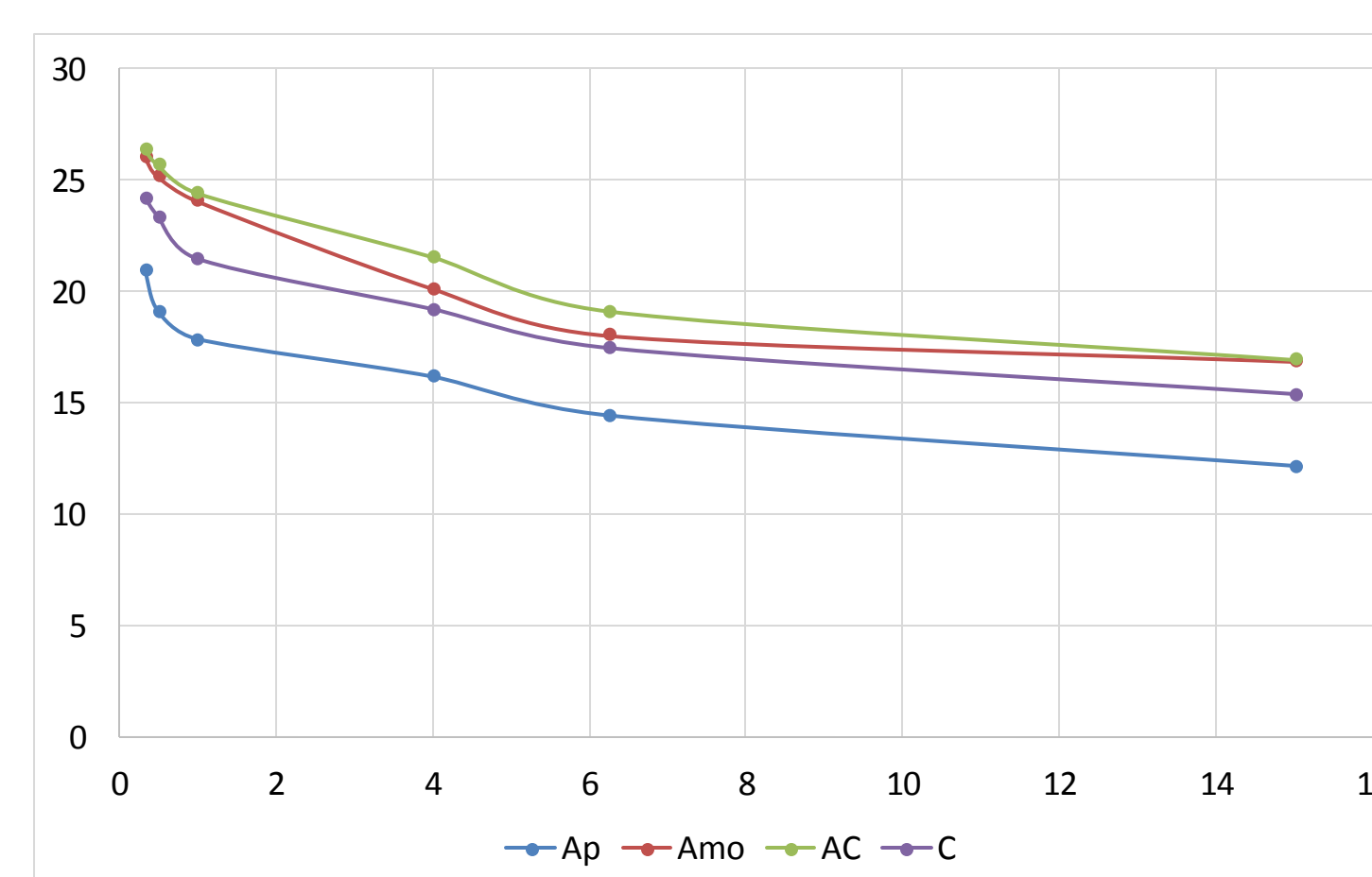


Chart 4. Retention curves of soil profile 4.

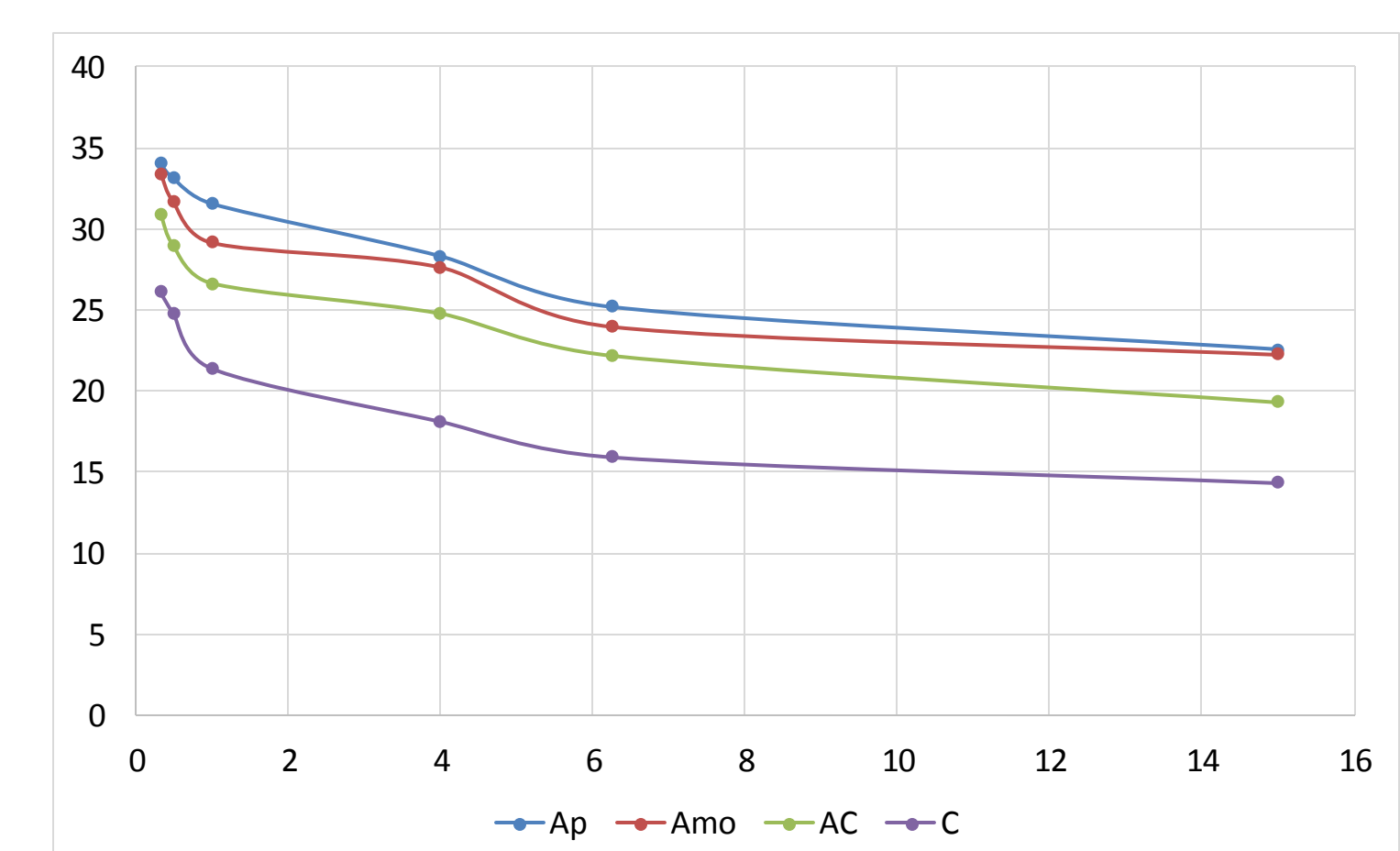


Chart 5. Retention curves of soil profile 5.

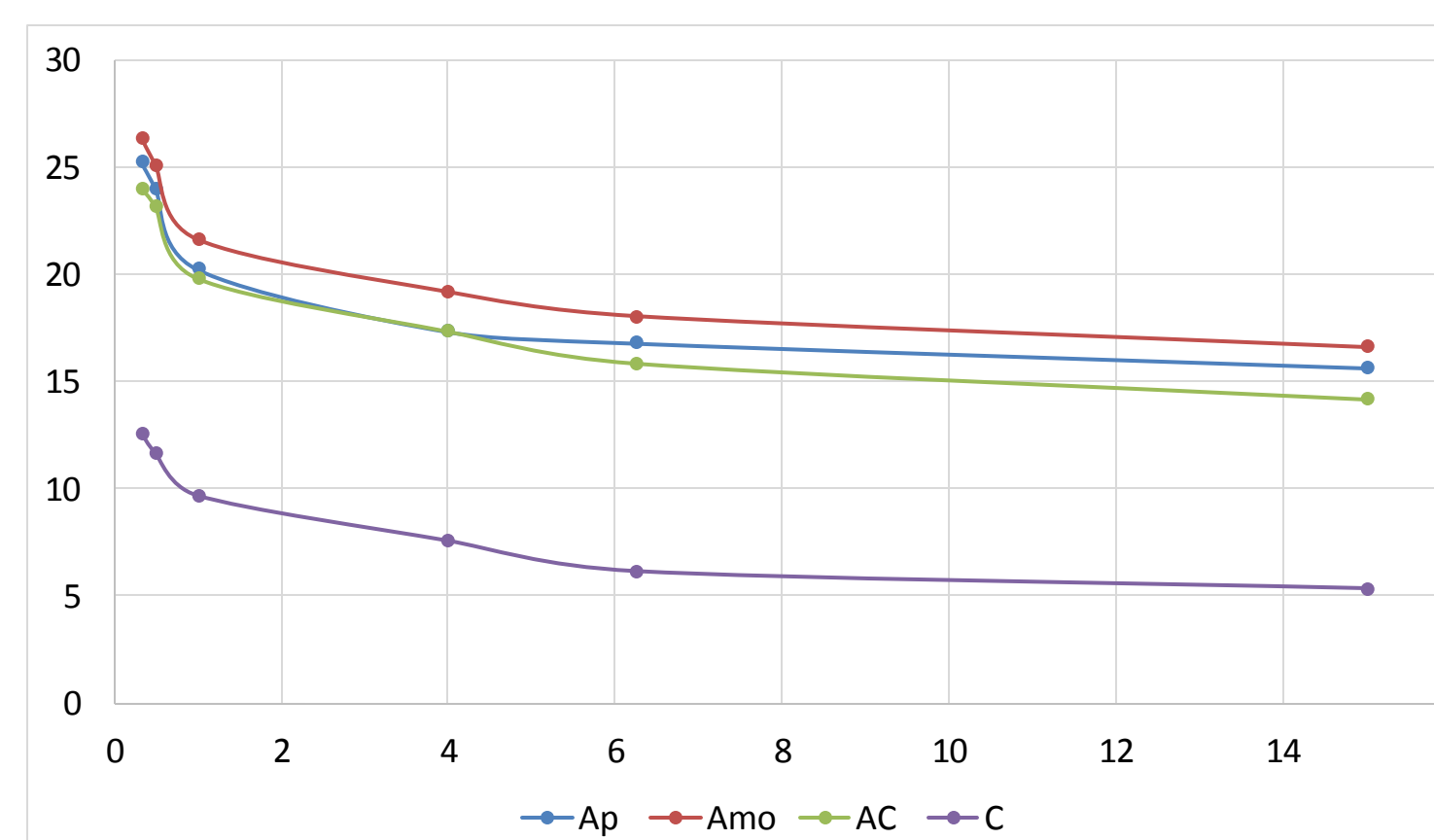


Chart 6. Retention curves of soil profile 6.

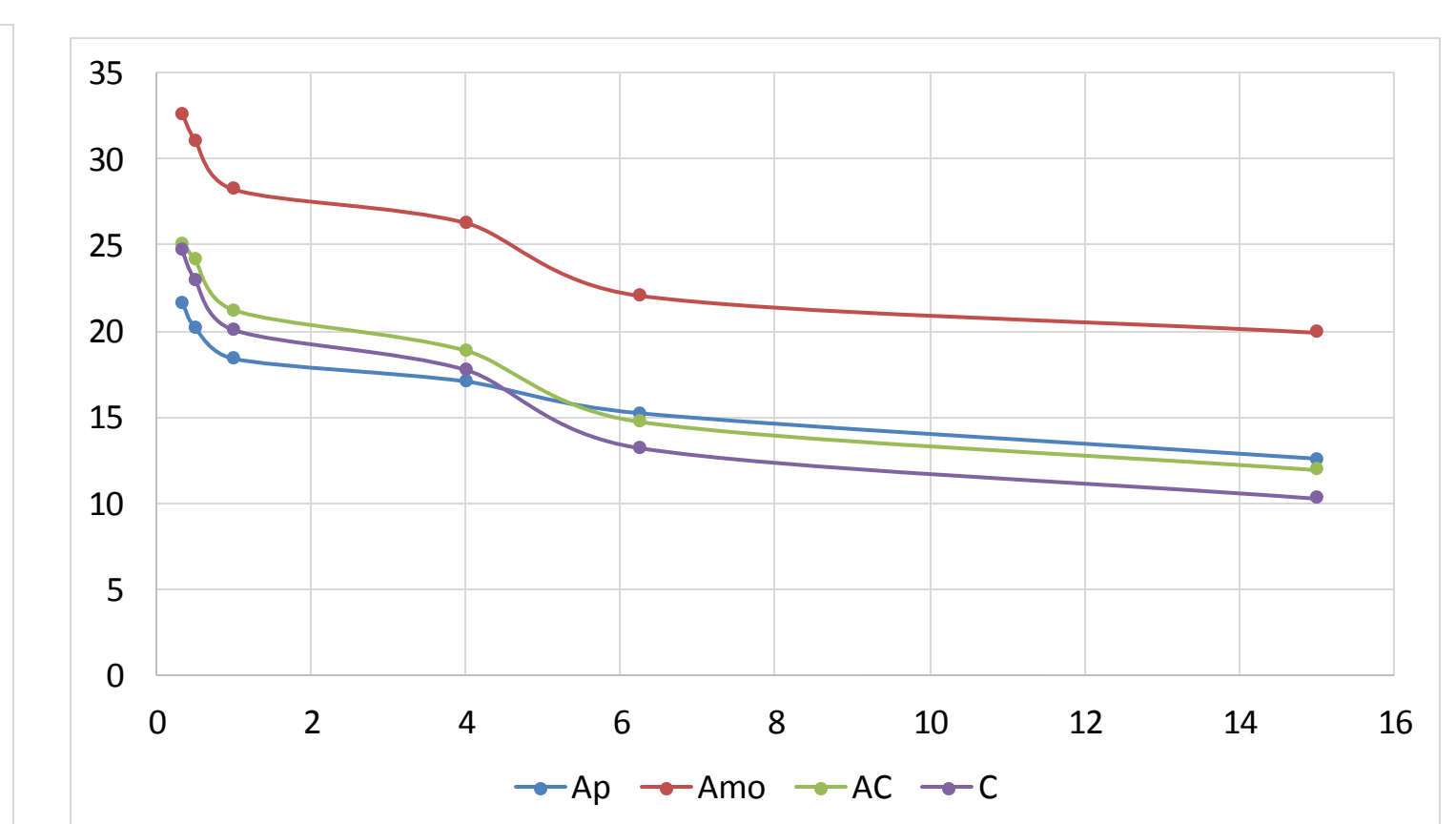
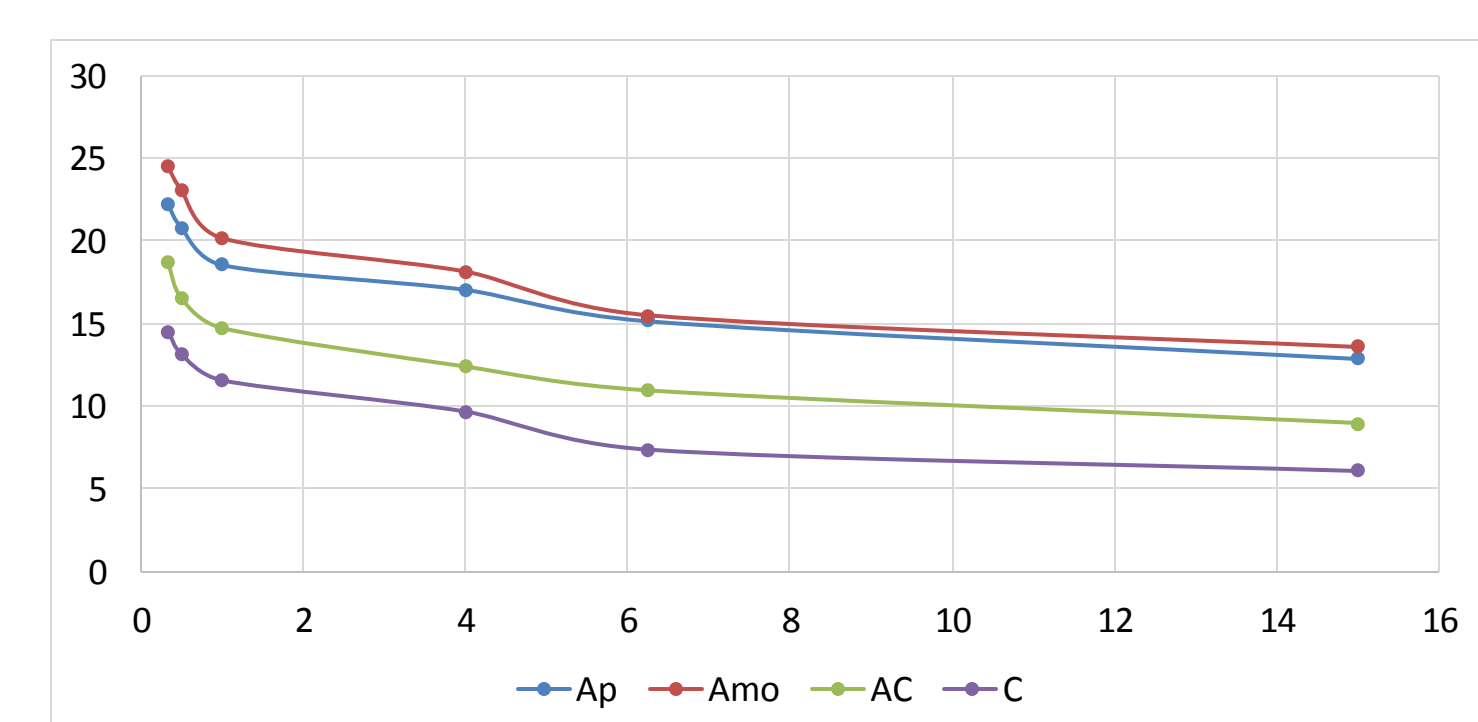


Chart 7. Retention curves of soil profile 7.



Laboratory equipment where soil tests are analyzed

