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Effects on suspensions dispersed particles & water [illegible] iron chloride, alum, and their combinations

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EUROSOIL 2008
Vienna, Austria

INTRODUCTION

Pressure to use dispersive soils has increased worldwide, soil conservation against erosion is crucial and water contamination by eroded materials is a relevant problem. Organic and inorganic conditioners reduce soils' particles dispersion, improve soils´ structure and permeability, and reduce water sources contamination. The effects of a Cardon Dato (*Stenocereus griseus* (Haw.) F. Buxb) mucilage (CD), FeCl3.6H2O and AlCl3.6H2O, on flocculating suspensions and arrangement of suspended particles from a Spain kaolin were comparatively studied.

MATERIALS AND METHODS

Suspensions were treated with the following solutions: 50 mg L^{-1} CD; 30 mg L^{-1} CD; 10 mg L^{-1} CD; 3 cmol+ kg^{-1} Fe^{+3}; 3 cmol+ kg^{-1} Al^{+3}; 1.5 cmol+ kg^{-1} Fe^{+3} + 1.5 cmol+ kg^{-1} Al^{+3}; 50 mg L^{-1} CD + 1.5 cmol+ kg^{-1} Fe^{+3}; 50 mg L^{-1} CD + 1.5 cmol+ kg^{-1} Al^{+3}; 50 mg L^{-1} CD + 1.5 cmol+ kg^{-1} Fe^{+3} + 1.5 cmol+ kg^{-1} Al^{+3}; 5 mg L^{-1} CD + 1.5 cmol+ kg^{-1} Fe^{+3} + 1.5 cmol+ kg^{-1} Al^{+3}; distilled water; 10 mg L^{-1} of PAM. Concentration of particles in suspension (CPS), an index of solutions turbidity and volume of flocculated particles (VFP), an index of particles' array were determined. CD and the kaolin were characterized (Henríquez, 2005)

Cadon Dato. Lara-Venezuela

Cadon Dato Mucilage Extract

Liofiliced and Dialiced CD

RESULTS AND DISCUSSION

Composition of the CD was: ramnose, arabinose, galactose, galactopiranose, uronic acids, carboxylic, aldoxes and alcoholic groups. Composition of kaolin was: 55% clay and 45% silt and kaolinite its main mineral. 50 mg L^{-1} CD produced the lowest CPS and the lower VFP among CD treatments, with minimum effects on solutions' pH and electric conductivity. The order of efficiency to reduce suspended particles in suspension, that is to increase their flocculation and to clarify turbid waters was the following: CD50 (0.01, lowest CPS) = PAM10 (0.01) > CD5FeAl (0.05) > Fe3 (0.07) > CD50Fe (0.08) > CD50FeAl (0.09) > CD50Al (0.10) = CD30 (0.10) > FeAl (0.14) = CD10 (0.14) > Al3 (0.26) > DW (1.24, highest CPS).

VFP of CD50 is larger than that produced by PAM10 and the VFP of CD treatments resulted larger than VFP of the mineral treatments, effect that might be explained by the mucilage's solutions higher swelling capacity which results in a more open, card-house type structure of the particles that CD bonds together (Saeki *et al.*, 2005).

CONCLUSIONS

(1) The treatment CD50 was as efficient as PAM10 in clarifying the kaolin suspension.
(2) CD50 produces the lowest CPS among all treatments and the lower VFP among the CD treatments, with a minimum effect on the solution pH and EC.
(3) The CD50 treatments combined with Fe and Al conditioners are more efficient in increasing the VFP value.
(4) CD at the lowest tasted rate (CD5FeAl), produces similar clarification effects than higher rates of CD conditioners.

Table 1. Effect of Cardon Dato mucilage, iron chloride, alum, and their combinations on pH, EC and flocculation of the kaolin suspensions.

Treatments In the kaolin suspension					CPS mg L^{-1}		VFP cm^3	
CD mg L^{-1}	Fe^{+3} $cmol^+$ kg^{-1}	Al^{+3} $cmol^+$ kg^{-1}	pH	EC µS cm^{-1}	MEAN	SE	MEAN	SE
0	0	0	7.90	51	1.24 a	±0.11	10.11 g	±0.32
0	3	0	3.77	211	0.07 cd	±0.00	11.22 f	±0.45
0	0	3	4.26	270	0.26 b	±0.08	12.08 e	±0.67
0	1.5	1.5	4.72	182	0.14 c	±0.02	12.41 e	±0.40
50	0	1.5	5.78	131	0.10 c	±0.01	16.64 b	±0.43
50	1.5	1.5	4.94	205	0.09 c	±0.02	19.16 a	±0.08
50	1.5	0	4.67	150	0.08 cd	±0.01	15.36 c	±0.83
50	0	0	7.79	151	0.01 d	±0.01	13.70 d	±0.35

Table 2. Effect of lower CD concentrations only and combined with iron chloride, alum on pH, EC and flocculation of the kaolin suspensions.

Treatments	Treatments dissolved in water		Treatments applied to kaolin suspension		CPS of the kaolin suspension (mg L^{-1})		VFP of the kaolin suspension (cm^3)	
	pH	EC µS cm^{-1}	pH	EC µS cm^{-1}	MEAN	SE	MEAN	SE
CD50	6.64	120	7.79	151	0.01d	±0.01	13.70b	±0.35
PAM10	6.28	94	7.27	126	0.01d	±0.01	12.82c	±0.42
CD5FeAl	3.37	291	4.72	259	0.05cd	±0.00	12.34c	±0.82
CD50FeAl	3.37	279	4.94	205	0.09bc	±0.02	19.16a	±0.08
CD30	6.23	86	7.63	96	0.10bc	±0.01	12.96c	±0.69
CD10	6.24	43	8.16	56	0.14b	±0.09	11.14d	±0.39
DW	5.85	29	7.90	51	1.24a	±0.1	10.11e	±0.32

ACKNOWLEDGEMENTS
To UCLA, CDCHT and UISNMP. FONACIT, Alfredo Martínez and Gregorio Cabello, UPM.

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