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EXTENDED ABSTRACT

Application of Sugarcane Bagasse in Controlling the Clogging of the Synthetic Drainage Envelopes in Ramhormoz Limy Soils

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Introduction

While there are several types of salts in the soil, salts that have higher solubility in water are dissolved and removed from the soil, But salts with low solubility in soil, sediment layers hard to cause clogging in the soil or in their coverage. Among the salts in soils of the arid and semi-arid areas, three compounds of calcium carbonate (with solubility of 0.013 gr/lit), magnesium carbonate (with solubility of 1.9 gr/lit) and calcium sulfate (with solubility of 2.5 gr/lit) salts, usually are found in these areas and have low solubility. Among the mentioned compounds, magnesium carbonate accumulation in soil is very low, while calcium carbonate and calcium sulfate salts concentration are found higher and can cause clogging by the sequential deposition. The amount of calcium carbonate in the soils of arid regions may reach up to 80 percent of soil weight. It provides the conditions for rapid deposition and a layer of rigid form and clogging the system (FAO, 1973).

This experiment was conducted in order to analyze the application of sugarcane bagasse in controlling the clogging of the agricultural sub-surface drain envelopes.

Methodology

This experiment was conducted at the physical models experimental lab of the Shahid Chamran University of Ahvaz, between February 2016 And September 2016. The 1:1 physical model utilized in this practice for simulating the drainage trench consists of a 150cm height, 40cm width and 120cm length (Fig. 1). In the first case the Sugarcane Bagasse with a volumetric ratio of 30 to 70 was mixed with soil and placed around the drainage pipe and was established to flow continuously for 2,000 hours. The other tests were carried out with not covered drainage pipes. The quantities of out-flow rate and changes in water table level were recorded once per ten days. The clogging indexes Langelier, Ryznar and Stiff -Davis were used to analyze for the water and soil utilized in this study. The soil used in this study had an overall loam texture (Table 1). Chemical characteristics of the soil before the experiment are illustrated in Table 2 and Chemical characteristics of the water are illustrated in Table 3.

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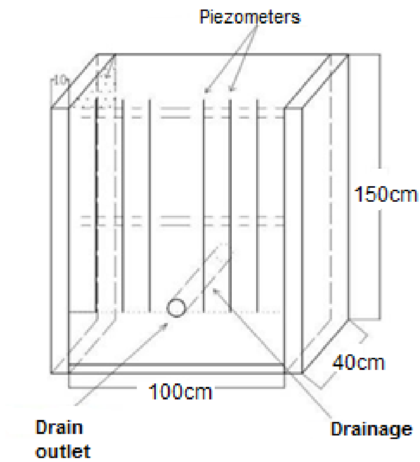

Fig. 1- Physical model details

Table 1- Physical properties of the soil (%)

Silt	Clay	Sand
38.0	31.5	30.5

Table 2- Chemical properties of the soil before the start of the experiment

Parameter	Cl	HCO_3^-	CO_3^{2-}	K	Na	Mg	Ca
(meq/lit)	60.0	25.0	negligible	0.8	10.0	25.0	40.0

Table 3- Chemical properties of the water before the start of experiment

Parameter	Cl	HCO_3^-	CO_3^{2-}	K	Na	Mg	Ca
(meq/lit)	40.0	12.0	negligible	2	13.0	6.0	15.0

Results and Discussion

Investigating the calcium carbonate precipitation potential

Table (4) shows the results of calculations of calcium carbonate precipitation potential indices in water and extraction of soil saturation extracts used. In summary, if in the drainage or extraction of soil saturation, the carbonate content exceeds 2 meq/lit and the acidity is more than 7.5, the LSI (Langelier index) and S & DSI (Stiff-Davis index) are positive and the RSI (Ryznar index) Less than seven indicates calcium carbonate tends to precipitate(Ghobadinia, 2013). According to Table 4 and what is explained, all indices show the tendency for calcium carbonate to precipitate in the water and soil used. Therefore, the sample water and soil have the potential for calcium carbonate precipitation.

Table 4 - Indicators for the study of the potential of calcium carbonate in water and soil

Indicator	water	soil
Langelier	1.31	1.64
Ryznar	5.15	4.36
Stiff-Davis	1.46	1.84
Acidity	7.75	7.64

Drainage Flow Discharge

Drainage discharge changes from time to time in the presence of bagasse over drainage artificial and synthetic coating and its absence are shown in Fig. 3. As shown in Fig. 3, although the measured

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output flow rate was lower in both periods of experiment, the measured flow rate was higher in the case where the bagasse was rounded than in the case of bagasse absence. This indicates that the presence of bagasse in all measurements makes it easy to move the flow of water towards the drainage.

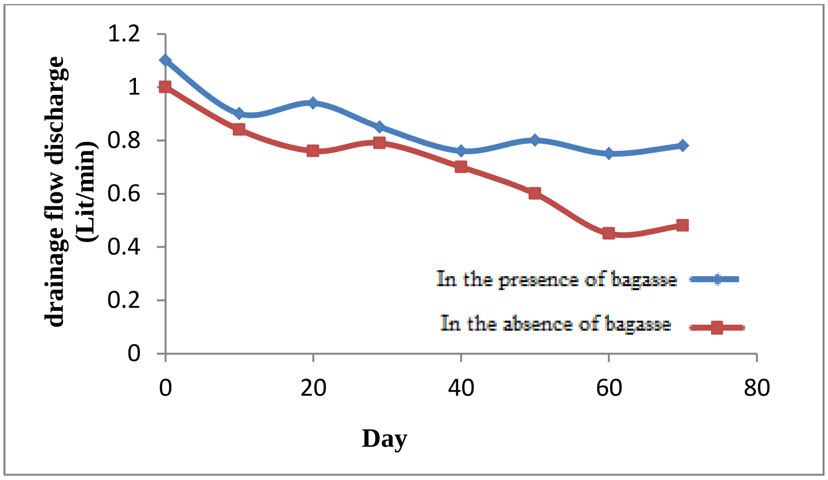

Fig 2- Drainage discharge variations in the presence and absence of bagasse

Conclusion

The results showed that the discharge of water from the soil used in this study was approximately mitigated by 29 percent during the whole study period, being 1.1 lit/min and 0.78 lit/min in the first (day one) and last day (day seventy) of experiment when a layer of Bagasse was placed around the drain pipe. This is while, it decreased from the value of 1 lit/min in the day one (first day) to 0.48 lit/min in the day seventy (last day) (an overall decrease of about 52 percent) when there was no Bagasse around the drainage pipe. This implies that the decrease in the amount of out flow from the drain pipe was mitigated by 23 percent as a result of Bagasse. According to the results, despite both the water and soil, based on the clogging indexes, had high clogging potential, almost no clogging was observed during the experiment..

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Reference

1- Ghobadinia, M. and Rahimi, H., 2013. Clogging of drain covers. *Seventh drainage and environmental workshop.* (In Persion).

2- Irrigation, D., 1973. Salinity-An International Source Book. *FAO/UNESCO/Hutchinson, London*.

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