Improvement of plasticity and swelling potential of calcareous expansive clays

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Abstract: This paper considers the effect of different treatment techniques on the plasticity and swelling potential of a calcareous expansive clay from Al-Qatif area in the eastern province of Saudi Arabia. These techniques are compaction, mixing with various proportion of local dune sand and treatment with commercial lime and potassium nitrate. The percentages of the stabilizers (3, 5 and 8% of dry weight) and the curing time (1, 7, 30 and 90 days) are the variables which were considered in this study. Results indicate that lime is very effective in reducing plasticity and swelling potential of the investigated soil. A lime fixation point was observed at 3% lime for swelling potential rather than the plastic limit as reported in the literature. Potassium nitrate is not as good as lime in improving the plasticity but its fixation between the smectite sheets was very effective in increasing the osmotic suction and reducing the percentages of swell and swell pressures. X-ray results reveal that in the lime treatment the pozzolanic reaction was the main factor in reducing the swelling potential of the calcium saturated clay, while in potassium nitrate treatment the smectite peaks almost disappeared and new peaks that correspond to muscovite are formed.