



Natural occurrence of salt efflorescences on soil surface in Hungary

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The study of salt efflorescences in various environments contributes to the knowledge of salt accumulation, their processes and factors of formation.

Quite a number of occurrences are known all over the world, but very few places are described in detail (Gumuzzio et al. 1982, Gumuzzio and Casas, 1988, Vizcayno et al. (1995). Samples of salt efflorescences of the Mediterranean region have not been systematically collected in Europe.

Salt-affected soils cover large area (ca 7%) in Hungary, mainly in the Great Hungarian Plain. Accumulation of salts is due to the high level of sodium dominated groundwater.

In the years 1998-2004, 176 promising sites for occurrences of salt efflorescences were visited, out of which 100 salt minerals on soil surfaces were found at 34 sites.

Soils were described and sampled by the Hungarian standard methods for soil survey (Szabolcs, 1990). Routine, chemical and mineralogical analysis were done according to the Hungarian standard methods (Gumuzzio, 1988, 1993). To determine salt minerals XRD and SEM-EDXRA were used.

In the past (1817-1997) 74 spots (at 45 villages) were listed (data compiled from former publications). In the 19th and early 20th century salts could be found in a great extent and with large amounts. In consequence of dropping groundwater level the extent of salt efflorescences was reduced in time.

Salt efflorescences have been found in areas of salt affected soils from the very west to the very east and from the north to the very south of the country.

Sodium bearing minerals were dominant, magnesium sulphates occurred only once. Mixed cation salts were very rare. In the salt efflorescences sodium chloride (halite), sodium sulphate (thenardite) as well as carbonate minerals (natron, thermonatrite and trona) were determined.

Salt minerals were found on the surface of soils like Solonchak, Hyposalic Fluvisol (appr. WRB) - 18%, Salic Solonetz (appr. WRB) - 18% and other soils e.g. Salic Fluvisol (appr. WRB) - 28%. Efflorescences were found only on soils where the E_c-values of surface horizons exceeded 20 dSm⁻¹. Evaluating the CO₃ triangle of the anion composition in 1:10 water extracts of surface horizons the dominating anion was close to the ideal chemical formula of salt minerals.

Salt efflorescences were on bare spots and only in a few plant associations, mainly Puccinellietum maritimi and Camphorosmetum annuae. The groundwater level generally were near to the surface (80- 250 cm, as sampled in profile). The groundwater chemistry also reflects the dominating anion of the salt minerals. It does the anion composition in 1:10 water extracts of the surface horizons, but the former relation was close.

As a consequence salt efflorescences in Hungary varied in space and in time. Concerning the nature of salt efflorescences, sodium salt minerals were in overwhelming majority, anions of salt mineral assemblages are mainly Cl⁻ (according to chemical composition: Cl⁻; SO₄²⁻; CO₃²⁻; CO₃-SO₄²⁻; CO₃-Cl⁻; SO₄-Cl⁻; CO₃-SO₄-Cl⁻). Relation could be determined between the salt minerals in efflorescences and soils type, soil properties as well as environmental parameters like vegetation, groundwater level and chemistry.

References

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