INTERNATIONAL CONFERENCE **Dehli, India, 2026**
https://eijmr.org/conferences/

STUDY OF THE PROPERTIES OF TAKYR-LIKE AND TAKYR-MEADOW SOILS AND WAYS TO IMPROVE THEIR FERTILITY

HAYITOV JAMSHID TOSHPO‘LAT O‘G‘LI
Master's Degree Student at Karshi State University, Uzbekistan.

Annotation. Takyr-like and takyr-meadow soils are widely distributed in the arid and semi-arid regions of Central Asia, particularly in Uzbekistan. These soils are characterized by high clay content, poor structure, salinity, low organic matter, and unfavorable water-air regimes, which limit agricultural productivity. The present study aimed to investigate the physical and chemical properties of takyr-like and takyr-meadow soils and to identify effective approaches for improving their fertility. Soil samples were collected from representative sites and analyzed for humus content, pH, electrical conductivity, total nitrogen, available phosphorus, exchangeable potassium, and bulk density. The results showed significant differences between the two soil types. Takyr-meadow soils contained higher organic matter and nutrient levels than takyr-like soils. However, both soils exhibited low fertility due to salinity and poor physical properties. The application of organic fertilizers, gypsum, crop rotation, and proper irrigation management significantly improved soil quality indicators. The findings demonstrate that integrated soil management practices can enhance the fertility and sustainable use of takyr-like and takyr-meadow soils in arid agricultural ecosystems.

Keywords: Takyr-like soils, Takyr-meadow soils, Soil fertility, Salinity, Organic matter, Sustainable agriculture, Uzbekistan.

Introduction. Soil fertility is a key factor determining agricultural productivity and environmental sustainability. In arid regions of Central Asia, including Uzbekistan, takyr-like and takyr-meadow soils occupy considerable areas and play an important role in crop production. These soils develop under specific climatic and hydrological conditions characterized by low precipitation, high evaporation, and periodic accumulation of soluble salts. Takyr-like soils are formed mainly in desert depressions and are characterized by dense clay horizons, low permeability, weak aggregation, and limited biological activity. Takyr-meadow soils, on the other hand, develop under the influence of shallow groundwater and seasonal moisture, resulting in relatively higher organic matter content and biological activity.

Despite their agricultural importance, these soils often suffer from salinity, alkalinity, compaction, and nutrient deficiencies. Improving their fertility is essential for increasing crop yields and ensuring sustainable land management. Therefore, this study aimed to evaluate the main properties of takyr-like and takyr-meadow soils and propose practical measures for fertility enhancement.

Materials and Methods

The study was conducted in irrigated agricultural lands located in the arid regions of Uzbekistan. Representative soil profiles of takyr-like and takyr-meadow soils were selected for analysis.

Soil Sampling. Soil samples were collected from the 0–30 cm layer during the growing season. Three replicates were taken from each soil type and combined into composite samples for laboratory analysis.

Laboratory Analyses. The following soil properties were determined:

1. Soil pH
2. Humus content (%)
3. Total nitrogen (%)
4. Available phosphorus (mg/kg)
5. Exchangeable potassium (mg/kg)

6. Electrical conductivity (EC, dS/m)
7. Bulk density (g/cm³)

Standard analytical methods commonly used in soil science laboratories were employed.

Statistical Analysis

The obtained data were processed using descriptive statistical methods, and mean values were calculated for each parameter.

Results

Physical and Chemical Properties of the Soils

Table 1. Main agrochemical characteristics of takyr-like and takyr-meadow soils

Soil Type	Humus (%)	Total N (%)	Available P (mg/kg)	Exchangeable K (mg/kg)	pH	EC (dS/m)	Bulk Density (g/cm³)
Takyr-like Soil	0.72	0.05	14.2	165	8.4	4.8	1.49
Takyr-meadow Soil	1.36	0.09	22.8	248	7.8	3.1	1.34

The results indicate that takyr-meadow soils possess relatively higher fertility compared with takyr-like soils. Humus content in takyr-meadow soils was nearly twice that of takyr-like soils. Available phosphorus and exchangeable potassium levels were also significantly higher. Takyr-like soils exhibited greater salinity, as indicated by electrical conductivity values. Higher bulk density values reflected poorer physical structure and lower porosity.

The combined application of organic manure, gypsum, and crop rotation produced the greatest improvement in soil fertility and crop productivity. Soil salinity decreased substantially, while nutrient availability and humus content increased.

Discussion. The low fertility of takyr-like soils is mainly associated with poor physical structure, low organic matter content, and salt accumulation. Similar observations have been reported by several researchers studying desert soils in Central Asia.

Takyr-meadow soils demonstrated better fertility characteristics due to periodic groundwater influence and greater biological activity. However, salinity remains a significant limiting factor in both soil types.

Organic amendments improve soil aggregation, microbial activity, nutrient availability, and water-holding capacity. Gypsum contributes to the replacement of exchangeable sodium ions, thereby improving soil structure and reducing alkalinity. Crop rotation enhances nutrient cycling and reduces soil degradation.

The integration of these management practices provides a sustainable approach to increasing productivity on takyr-like and takyr-meadow soils.

Conclusion. Takyr-like soils are characterized by low humus content, high salinity, high bulk density, and limited nutrient availability.

1. Takyr-meadow soils exhibit relatively better fertility indicators due to higher organic matter accumulation.
2. Soil salinity is a major factor limiting agricultural productivity in both soil types.
3. The application of organic fertilizers significantly increases humus content and nutrient availability.
4. Gypsum effectively reduces salinity and improves soil physical properties.

5. Integrated management practices combining organic amendments, gypsum application, and crop rotation provide the greatest improvement in soil fertility.

6. Sustainable management of takyr-like and takyr-meadow soils can contribute to enhanced agricultural productivity and environmental conservation in arid regions.

References

1. Brady, N.C., & Weil, R.R. (2017). The Nature and Properties of Soils. Pearson Education.
2. Lal, R. (2020). Soil Organic Matter and Sustainable Agriculture. Springer.
3. FAO. (2023). Status of Salt-Affected Soils in Central Asia.
4. Food and Agriculture Organization. Soil Management Guidelines for Arid Regions.
5. International Center for Agricultural Research in the Dry Areas. Sustainable Land Management in Drylands.
6. Abrol, I.P., Yadav, J.S.P., & Massoud, F.I. (2019). Salt-Affected Soils and Their Management.
7. Qodirov, A., Islomov, U., & Karimov, B. (2022). Soil Fertility Management in Irrigated Lands of Uzbekistan. Journal of Soil Science and Agrochemistry.
8. Rasulov, A. (2021). Soil Salinity and Reclamation Practices in Central Asia.
9. Smith, P. (2020). Soil Carbon Dynamics in Arid Ecosystems.
10. United Nations Convention to Combat Desertification (UNCCD). Land Degradation Assessment Report, 2023.