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The role of artificial forest plantations in the accumulation processes and carbon various forms distribution in urban soils (on the example of the Rostov city agglomeration)

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Abstract

The aim of study was to investigate the effect of plant associations change on the accumulation mechanisms, spatial diversity, and carbon various forms profile distribution in urban agglomeration native soils in steppe zone.

We hypothesized that Calcic Chernozem evolution process would significantly change under tree plantations.On the one hand, this have effects the soil organic matter accumulation, on the other hand the water regime type change and the of carbon various forms migration intensivly in the soil profile.

The study area was included 14 monitoring sites in the forest protection belt of the Rostov agglomeration (Rostov-on-Don, Aksay and Bataysk). The Calcic Chernozems of long-time fallow has been used as a conditional reference standard for the study of soil properties. It is situated on the territory of the exhibition area of the semiarid grassland steppe in Southern Federal University Botanical Garden.

The soils of forest parks, compared with soils under steppe vegetation, have increase the humus-accumulative stratum thickness by an average of 15-20 cm. These soils were characterized by pronounced agronomically valuable structure formation of the soddy horizon and decrease the effervescence depth in the B and BC illuvial horizons. The surface Chernozem's humus-accumulative horizons (0-10 cm depth) under woody vegetation have an increase of the organic carbon content relative to virgin soils. On average, the content of Corg. was 4.13% with fluctuations from 2.67 to 5.72% in soil of the forest park zone. The content of Corg. was 2.35% with fluctuations from 2.13 to 2.65% for virgin Chernozem. The inorganic carbon content in the surface horizon has the highest values in the chernozems of fallow plots (0.36%). The content is much lower (0.10%) in similar soil horizons under woody vegetation. The Chernozems under steppe grassy vegetation were characterized by formations of carbonate mold at 30 cm depth and carbonate nodules from 70 cm depth. While in the chernozems of forest parks were observed only carbonate nodules at a depth of 110 cm. The accumulation of secondary carbonates in veins or carbonate mold forms were absent or can be found at 78-90 cm depth. Thus, the phenomenon of secondary leaching of carbonates was observed in the chernozems of forest parks. This process has associated with moisture downward currents prevailing as a result of the microclimate formation and in the temperature and hydrological regime changes of these soils.

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