

SEASONAL VARIATION OF SOIL BULK DENSITY IN SOUTHERN CHERNOZEM OF ARABLE LAND

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As a result of a long-term intensive anthropogenic impact on Chernozem soils of the southern Ukraine, their physical properties undergo significant alterations, leading, in many cases, to declining of fertility and degradation the most precious, soil organic matter (SOM) reached surface layer (Medvedev et al., 2012).

The goal of our study was the determination of seasonal variations of soil bulk density of southern Chernozem under intensive agricultural loading in 2010 at the field near monitoring station “Petrodolinskoe”, 30 km far from Odessa city.

Soil bulk density determination was carried by classical method of Kachinskiy (Kachinskiy, 1965) with using soil rings for sampling at 5-6 replicas.

It was demonstrated that average bulk density of surface layer (0-10 cm) was $1.27 \pm 0.15 \text{ g cm}^{-3}$ in 2010, corresponded with mean bulk density (1.15 g cm^{-3}) by Kaurichev (1982). A decrease of bulk density on ca. 0.2 g cm^{-3} was shown after a ploughing in March ($1.00 \pm 0.30 \text{ g cm}^{-3}$), followed by an increasing up to $1.14 \pm 0.03 \text{ g cm}^{-3}$ in April via self-packing (Medvedev, 1979). A significant soil packing was detected in irrigation period and active agricultural machine activity, initiated from June ($1.29 \pm 0.04 \text{ g cm}^{-3}$) and reached the peak magnitudes in August – September ($1.42 \pm 0.03 \text{ g cm}^{-3}$), which confirmed previous results by Kaurichev (1982), who found that bulk density could exceed 1.30 g cm^{-3} under the same condition.

It was observed that soil oversaturation by water together with intensive machine usage on the field led to a compaction of surface soil, enriched by humic acids (Mikhayluk et al., 2008), as a consequence a decreasing of soil pore spaces, causing to a declining of soil aeration (Davidson and Kinglerlee, 1991; Kim et al., 2012). Such conditions, by our opinion, could provide a formation of huge amount of anaerobic microsites, colonized actively by denitrifiers, thus activation of denitrification took place, leading to significant losses of surface labile N as N_2O and N_2 (Skiba, 2008; Medinets et al., 2011), i. e. surface layer soil depletion of mineral N and SOM (Medvedev et al., 2012). It was discussed the recommendations of a preservation of optimal soil bulk density

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during an entire agricultural cycle: use of light-weight agricultural machine, “closed” drip irrigation type, rational crop rotation etc were discussed.

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