

## Dynamics of physical properties of typical black earth at its different cultivation

**Aim.** A study of influence of minimization of till of soil is on physical properties of black earth typical and their dynamics during the vegetation of agricultural cultures. **Methods.** Field and laboratory. **Results.** Found out a substantial difference between the dynamics of physical properties of black earth typical during a vegetation at the different systems of till of soil. The dynamics of closeness of stowage, porosity of airing and hardness of soil during a vegetation period is presented. **Conclusions.** For ploughings there were the least indexes of closeness during a vegetation. Variants with shallow and till were characterized by the critical values of closeness (1,75-1,84 gs/of cm<sup>3</sup>) in a droughty period of vegetation in the zone of formation of «підорної sole». Dynamics of hardness and closeness of stowage of soil during a vegetation analogical, however the critical values of hardness during a vegetation in a layer were not observed. Porosity of airing of soil went down to the critical values (<10%) only at till in the second half of vegetation in the area of sole».

*Key words: black earth is typical, ploughing, безпоруцевий till, dynamics of closeness of stowage of soil, hardness of soil, porosity of airing.*

Agrotechnical measures must be sent to creation and maintenance in soil of optimal physical terms necessary for the receipt of high and proof harvests of agricultural cultures. It is arrived at by development of the differentiated complex measures that take into account the specific of soils of concrete area and give an opportunity to manage the ground processes. A closeness of soil is him by the basic most substantial physical description. There is not a single type of tooling of soil that would not render substantial influence on his closeness. In turn, a closeness has a large influence on all complex of physical terms in soil: him water, air, thermal modes, and thus, and on the terms of biological activity [1- 3].

I.B. Revut [1] gives a table, in that shows that depending on nature of structure of soil the closeness of him changes in very wide limits. In ordinary clay black earth with the clear expressed macrostructure a closeness of soil in an arable layer is not over 1,0-1,1 gs/of cm<sup>3</sup>. At loamy with the well marked microstructure by volume weight even within the limits of arable layer at a maximum compression arrives at a to 1,5-1,6 g/of cm<sup>3</sup>. The closeness of soil in the arable layer of other types occupies intermediate position. In deeper layers, where at that or other reason a breed is deprived microstructure, a to 2,0 g/of cm<sup>3</sup> is marked to the closeness.

D.V. Fedorovsky[2] marks that at a high closeness the ground moisture and elements of feed remain inaccessible for plants. The root of wheat in general does not get to the layers of soil with a closeness 1,65, and a root of cucumbers is 1,45 gs/of cm<sup>3</sup>. Apple-trees are shortlived, if one of layers of 2-meter layer of loamy soil has a closeness over 1,55, and on clay soil oppression comes at a closeness 1,30 gs/of cm<sup>3</sup>. С. Ф. Неговелов and В.Ф. Вальков [3] mark that in the loams of easy grain-size distribution passing to the fully unfavorable air mode takes place at a closeness 1,75 gs/of cm<sup>3</sup>. In easy loams physically almost impossible advancement of chums that grow at a closeness 1,75-1,85 gs/of cm<sup>3</sup>. However the increase of closeness of stowage of soil can not be simply characterized as the negative phenomenon. Yes, H.A. Larionovshowed in the model researches, that for the increase of closeness of stowage to the certain limit of еродованість soil diminished [4].

Methodology of researches. Researches conducted in stationary experience the departments of soil science and guard of soils the name. Experience is placed on the 3th fields in space and on 4th in time at a crop rotation with such duty: soy — a wheat is winter-annual — a corn on grain is a barley. Size of elementary area  $6 \times 30 = 180$  m<sup>2</sup>, test area — 100 m<sup>2</sup>. Physical properties of black earth typical studied in sowing of soy of on the 3th variants of the systems of till of soil : 1) traditional — is based on the ploughing on a 25-27 cm; 2) Soil protection

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— is based on shallow till on a 10-12 cm. Basic till of soil was executed by serial machines: ploughing — ПЛП-6-3,5, Multifaceted polygonal

— by the cultivator of КПГ-2,2, minimum till — БДТ-7.

For the study of dynamics of closeness of soil the ground standards selected three times for a month during a vegetation (on beginning of month, in a middle a month and at the end of month) by the bore of C.F. Negovelov to the depth a 1 m through each a 10 cm. Researches of hardness of soil in a dynamics during a vegetation conducted simultaneously with taking of tests on the closeness of stowage and humidity of soil. Thus the place of determination of hardness of soil on every elementary area of experience was attached to the place of selection of standards of soil on the closeness of stowage. For every variant of till the repeated for determination of closeness of stowage of soil was 9-multiple, and for determination of hardness — 36-multiple. Determination of hardness of soil was conducted by of FieldScout SC 900 to the depth a 48 cm through each a 2,5 cm. For the calculation of general porosity of soil there was a certain closeness of hard phase of soil to the depth a 1 m through each a 10 cm. For the calculation of possible compression and porosity of airing at the set humidity in a dynamics simultaneously with determination of closeness of stowage the field humidity was certain in the standards of soil.

The analysis of the ground standards is executed after the generally accepted methodologies: closeness of stowage — by a gravimetrical method in undisturbed standards with the use to the bore of Kaczynski and Negovelov and boring glasses (DSTU ISO 11272-2001); hardness of soil; aggregate analysis of soil — after Savvinov , closeness of hard phase —(ISO 11508); general porosity and porosity of airing — calculation; field moisture — by a gravimetrical method (DSTU of ISO 11465-2001). The ground cover of the experienced area is presented by black earth typical littlehumus on a loess. Overhead genetic horizon of the investigated soil is made on 51,2-65,4% a large dust, 16,8-16,7 — and contains 30,8-32,2% of physical clay a silt.

Results of researches. Researches of physical indexes of black earth typical in a dynamics depending on till of soil showed that for drying of soil (an autumn was dry) his closeness of stowage grows. The least indexes of closeness during a vegetation are characterize ploughing (rice. 1). Thus the estimation of closeness of stowage of soil was conducted after such gradation for middle loams [5]: 1) very magnificent soil (<1,13 gs/of cm<sup>3</sup>); 2) mildly magnificent (1,13-1,25); 3) magnificent (1,25-1,40); 4) mildly dense (1,40-1,54); 5) dense (1,54-1,66); 6) very dense (>1,66 gs/of cm<sup>3</sup>).

Knowing the possible airing of soil (10%), by us it was expected in a dynamics size so-called critical, or possible compression of soil (taking into account humidity of soil), higher that there can be signs of rootages and aerobic microorganisms (rice. 2) in soil. It is necessary to notice that the critical values of closeness taking into account humidity were observed on variants with shallow and till in a droughty period of vegetation in the zone of formation of sole, where 1,75-1,84 gs/of cm<sup>3</sup> (rice. 2) arrived at sizes.

Conformities to law of change of hardness of soil during a vegetation are analogical to the changes of closeness of stowage : the least values of hardness were observed in the processed epiphase of soil, and most — in a droughty period of vegetation, as the greatest hardness soils have in the dry state. Thus, although closeness of soil and acquires critical values in a certain period, however the values of his hardness during a vegetation in a кореневмічному layer kept indoors for a limit (56,55 kg/of cm<sup>2</sup>, or 5 000 kPa) at that the roots of plants already can not get to soil.

The closeness of stowage of soil plays the special role in forming of the air mode. This role is predefined by that physical properties, from one side, provide the terms of vital functions of living organisms of soil, and from the second are processes of exchange between the ground and atmospheric air. Thus for black earth soils characteristic high correlation is between the closeness of stowage and porosity of airing [5]. Porosity of airing during a vegetation in the profile of the investigated soil will mainly keep indoors legitimate values (10-30%) for scopes. The decline of porosity of airing to the critical values (<10%) takes place only at безполицевого till in the second half of vegetation in the area of «підорної sole» as a result of the increased closeness.

### Conclusions

The least indexes of closeness during a vegetation were characterize ploughing. Thus the critical values of closeness taking into account humidity were observed on variants with shallow and різноглибинним безполицевим till in a droughty period of vegetation in the zone of formation of «underwatersole», where 1,75-1,84 gs/of cm<sup>3</sup> arrived at sizes. The changes of hardness of soil during a vegetation are analogical to the changes of closeness of stowage, but their values during a vegetation in a rootedlayer did not exceed critical values. Porosity of airing of soil during a vegetation went down to the critical values (<10%) only at unpolishedtill in the second half of vegetation in the area of «підорної sole» as a result of the increased closeness.

### Bibliography

1. *Афанасьев Ю.О.* Трансформація агрофізичних властивостей чорнозему опідзоленого за краплинного зрошення/Ю.О. Афанасьєв//Спец. випуск до VIII з'їзду УТГА, м. Житомир. Кн. 2. — Х.: ПП «Рута», 2010. — С. 241–243.
2. *Бережняк М.Ф.* Оптимізація агрофізичних параметрів чорноземних ґрунтів за різних систем обробітку/М.Ф. Бережняк, Є.М. Бережняк//Вісн. аграр. науки. — 2010. — № 12. — С. 16–19.
3. *Бойчук О.В.* Зміна фізичних властивостей на чорноземах вилугуваних залежно від заходів основного обробітку/О.В. Бойчук//Спец. випуск до VIII з'їзду УТГА, м. Житомир. Кн. 2. — Х.: ПП «Рута», 2010. — С. 88–90.
4. *Ларионов Г.А.* Эродирруемость модельной почвы различной плотности /Г.А. Ларионов и др.//Почвоведение. — 2011. — № 8. — С. 995–999.
5. *Медведев В.В.* Плотность сложения почв (генетический, экологический и агрономический аспекты)/ В.В. Медведев, Т.Е. Лындина, Т.Н. Лактионова. — Х.: Изд «13-ая типография», 2004. — 244 с.
6. *Неговелов С.Ф.* Почвы и сады/С.Ф. Неговелов, В.Ф. Вальков. — Ростов: Изд-во Рост. ун-та, 1985. — 192 с.
7. *Почепцова Л.Г.* Варіювання фізичних показників чорноземів, обумовлене типом їх використання/Л.Г. Почепцова//Вісн. ХДАУ. — 2000. — № 1. — С. 116–121.
8. *Ревут И.Б.* Физика почв/И.Б. Ревут. — Л.: Колос, 1972. — 368 с.
9. *Федоровский Д.В.* Исследование некоторых физических свойств почвы/Д.В. Федоровский//Агрохимические методы исследования почв. — М.: Наука, 1975. — С. 305–307.