

AGROPHYSICAL INDICATORS OF ORDINARY CHERNOZEM DEPENDING ON THE METHODS OF ITS TILLAGE IN THE NORTHERN STEPPE OF UKRAINE

E. B. Medvediev

Luhansk Institute of Agro-Industrial Production of the National Academy of Agrarian Sciences of Ukraine, 14 Oktiabrskaya St., Metalist village, Slovianoserbsk district, Lugansk region, 93733, Ukraine

Topicality. The spread of negative processes in the soil associated with the aggravation of the economic situation in modern Ukraine, the rapid rise in prices for equipment, fuels and lubricants, the replacement of energy-intensive traditional tillage systems with non-moldboard and other resource-saving ones, requires further and deeper research on their impact on her agrophysical indicators. **Purpose.** To study the influence of the primary tillage on the agrophysical indicators of ordinary chernozem in the link of the field grain – fallow – row crop rotation (winter wheat after maize of milk-wax ripeness – peas for grain – winter wheat) in the conditions of the Northern Steppe of Ukraine. **Materials and Methods.** Methods of primary tillage based on moldboard plowing and non-moldboard loosening against the background of moldboard plowing for corn were studied. In experimental studies, we used field, laboratory and statistical-mathematical methods. The agrophysical parameters of the soil were determined according to generally accepted methods. **Results.** No significant difference has been found in the influence of the primary tillage methods on the soil density in the 0–30 cm layer under the crops of the crop rotation link in spring and at their harvesting. In 2011 and 2012, there was a significant increase in the number of water-stable aggregates (over 0.25 mm) in the soil under non-moldboard tillage, compared with plowing, under all crops of the crop rotation link in the spring and during harvesting, mainly in the 0–10 and 10–20 cm layers. This was more often observed in the spring – on average for 2010–2012, the difference in this indicator in the soil layer of 0–30 cm for the crops of the crop rotation link was: winter wheat after maize of milk-wax ripeness – 1.9, peas – 4.4 and winter wheat after peas – 3.0 %, and on average for the crop rotation link – 3.1 It is established that moldboardless tillage contributes to a significant reduction in moisture consumption for unproductive evaporation in conditions of frequently repeated drought events. **Conclusions.** The studied methods of primary tillage of ordinary heavy loam chernozem equally affect the bulk density and do not cause deterioration of this indicator. The non-moldboard tillage improves the water resistance of the arable soil layer under crops in the crop rotation link and reduces moisture consumption for evaporation, compared to plowing.

Key words: tillage, density, water resistance, productive moisture, winter wheat, peas

Introduction. The physical properties of the soil are of great importance for soil fertility. Optimal physical conditions combined with sufficient nutrients ensure maximum crop productivity.

In the context of insufficient moistening and significant climate change [1], aggravation of the energy situation in the country and replacement of traditional farming systems with less energy-consuming ones, there is a need for further and more detailed study of the impact of different tillage systems on its agrophysical parameters in order to eliminate the negative processes associated with these phenomena.

Bulk density is one of the main factors of soil fertility, as it characterizes the entire range of physical conditions in the soil. It affects the air, heat and water regimes. Tillage should be

aimed to create and maintain the optimum bulk density, which is required for the development of crops.

There is a large number of studies regarding the impact of different tillage methods on soil density. Some of them, conducted on the chernozem soils of the Steppe of Ukraine, indicate an increase in this indicator when ploughing is abandoned [2, 3]. In others, there is no difference in soil density when using moldboard and moldboardless tillage [4, 5].

Soil structure is one of the most significant indicators of soil fertility. The stability of structural aggregates plays an important role in preserving agricultural soils and reducing the impact of climate change.

Tillage significantly affects structural and aggregate state of soil, as well as its water resis-

Author information:

Eduard B. Medvediev, Candidate of Agricultural Sciences, Junior Researcher,
e-mail: eduard.medvedev.1957@gmail.com, <https://orcid.org/0000-0003-0474-6646>

tance, which is a qualitative indicator of soil structure. In some experiments conducted in the Northern Steppe of Ukraine, an increase in the number of water-resistant aggregates in the arable layer of soil was found when using moldboardless tillage [6], while in others this indicator did not differ significantly by tillage methods [5].

Changes in hydrothermal conditions of Ukraine, including in the Steppe zone, are leading to improvements in tillage technologies to ensure maximum rainfall accumulation and its rational use. In the north of this zone, some experiments show that moldboardless tillage has a better moisture conservation advantage compared to ploughing [7, 2]. In others, there was no difference in soil moisture content in different variants of tillage [8].

The purpose and objectives of the work are to establish the patterns of influence of primary tillage methods on the agrophysical parameters of ordinary chernozem in the field link of grain – fallow – row crop rotation (winter wheat after maize of milk-wax ripeness – peas for grain – winter wheat) in the conditions of the Northern Steppe of Ukraine to prevent negative phenomena associated with modern soil formation processes, and, in the future, to develop scientifically sound recommendations for the cultivation of these crops in new climatic conditions.

Materials and Methods. The following

methods were used in the experimental research: field - to determine the interaction and impact of natural and agrotechnical factors on the object, and observation of soil fertility indicators; laboratory – to establish the water and physical characteristics of the soil; statistical and mathematical – to establish the reliability of the results.

In 2010–2012, the research was conducted in the Laboratory of Crop Rotation and Crop Cultivation Technology of the Luhansk Institute of Agro-Industrial Production of the National Academy of Agrarian Sciences of Ukraine (Metalist, Luhansk region). The field trial was laid out in an 11-field crop rotation: black fallow – winter wheat – maize for grain – barley with sainfoin – sainfoin – winter wheat – maize in milk-wax ripeness – winter wheat – peas for grain – winter wheat – sunflower. The experimental part of the work was carried out in the following field link: winter wheat after maize in milk-wax ripeness – peas – winter wheat. The field trials were arranged in a systematic manner, replicated three times. The area of the field with tillage variants was 0.34 hectares, with the application of fertilizers – 187 and the accounting area – 119.6 m². The methods of tillage based on moldboard ploughing (variant 1) and moldboardless loosening (variant 2) against the background of moldboard ploughing for maize were tested (Table 1).

Table 1. Methods of primary tillage in field trial

Crop in rotation crop link	Variants for tillage	
	variant 1	variant 2
	Type of tillage	
Winter wheat after maize in milk-wax ripeness	disking with BDT-3.0 in two traces to a depth of 6–8 and 8–10 cm	harrowing with BIH-3, cultivation with KPE-3.8 at a depth of 8–10 cm
Peas	disking with BDT-3.0 to a depth of 6–8 cm, ploughing with PLN-3-35 to a depth of 25–27 cm	harrowing with BIH-3, cultivation with KPE-3.8 at a depth of 8–10 cm and KPH-250 at a depth of 25–27 cm
Winter wheat after peas	disking with BDT-3.0 to a depth of 6–8 cm, ploughing with PLN-3-35 to a depth of 18–20 cm	harrowing with BIH-3 cultivation with KPH-250 at a depth of 18–20 cm

For maize in both tillage variants, disking with BDT-3.0 by 6–8 cm and ploughing by 25–27 cm were carried out.

In the course of the research, zonal agrotechnical measures were applied. The experiments were conducted in accordance with the generally accepted methodology [9]. Soil ferti-

ty was determined by the following parameters: bulk density – by Core Cutter Method according to DSTU ISO 11272:2001, humidity – by the thermostat-weight method (GOST 5180-84), water-resistant aggregates content – according to the method of I. M. Baksheiev [10].

The results of the study were processed by

the statistical method according to B. O. Dospekhov [9] using the Microsoft Excel.

The soil of the plot is ordinary chernozem, slightly eroded, heavy loamy on loess with an average humus content of 3.82 % in the arable layer (0–30 cm).

Climate of the study area is continental, with regular easterly winds and drought and hot dry phenomena. The winters are unstable, with long-term thaws and variable temperatures, and the summers are warm, with unstable moistening and dry periods [11].

During the research, the weather conditions in terms of temperature and moisture regime had certain deviations from the average long-term indicators and they were characterized by unfavourable phenomena for crops. Autumn periods were warm, even hot (September), with strong winds, uneven and insufficient precipitation. Winters were windy, with alternating abnormally cold and warm periods, with thaws that caused complete thawing of the soil, and uneven precipitation, which led to a significant decrease in the snow cover or its complete absence in the fields. In 2010–2012, the early spring were characterized mainly by low temperatures, with the soil freezing, sometimes up to the late April. As a result, moisture from precipitation was almost not absorbed by the soil. In 2010, drought conditions were observed already in the late March, which was caused by uneven, insufficient and short-term precipitation, high temperatures and strong winds. Such weather conditions also occurred in the summer, which significantly reduced the effectiveness of precipitation. The most unfavourable weather conditions were observed in 2010, when a significant moisture deficit and a high air temperature were observed throughout the growing season.

Results and Discussion. According to the results of our research, there was no significant difference in the impact of the primary tillage on the bulk density in the 0–30 cm soil layer in the crops of the crop rotation link during spring and at harvesting (Table 2). This can be explained by a reduced effect of soil particles sticking together on very loose clay and loamy soils due to their high non-capillary porosity [12].

During the growing season, there was a slight increase in density in the soil layers of 10–20 and 20–30 cm in all tillage variants – on average in the crop rotation link over the years

of research: moldboard tillage – by 0.08 and 0.05 g/cm³, or 8.3 and 5.0 %, and moldboardless tillage – by 0.09 and 0.04 g/cm³, or 9.4 and 4.0 %, respectively. This phenomenon can be explained by natural and anthropogenic factors.

In our experiments in 2011 and 2012, we observed that the number of water-resistant aggregates (more than 0.25 mm) increased significantly under moldboardless tillage compared to ploughing under all crops of the crop rotation link in spring and at harvest time, mainly in 0–10 and 10–20 cm soil layers. This phenomenon was more often observed in spring – on average in 2010–2012 the difference in this indicator in the 0–30 cm soil layer for all crop rotation links was: winter wheat after maize in milky-wax ripeness – 1.9, peas – 4.4 and winter wheat after peas – 3.0 %, and on average in the crop rotation link – 3.1 % (Table 3).

The correlation analysis revealed that the water resistance of the structural aggregates of chernozem is provided by its organic part [13]. The improvement of humus content in arable layer for all variants of moldboardless tillage, as compared to moldboard tillage, established in our experiments [14], gives us reason to conclude that such tillage has less negative effect on the integrity of chernozem structure and contributes to soil formation processes.

At the time of harvesting, the difference in the content of water-resistant aggregates reduced between the tillage variants, which can be explained by a slowdown in the intensity of soil processes under changes in temperature and water regimes during the growing season [15]. In all variants of tillage, in almost all years of research, a significant decrease in the percentage of water-resistant aggregates in the upper (0–10 cm) layer under crops of the crop rotation link was found compared to the lower layer, which is most affected by factors of natural and anthropogenic origin.

It should also be noted that background ploughing under maize in the crop rotation affected the studied agrophysical indicators of soil fertility.

The content of productive moisture in the soil under crops in the crop rotation varied over the years. The lowest moisture content in the 0–100 cm layer was in 2010, when the greatest deficit in moisture supply was observed (Table 4).

In the spring, the productive moisture re-

Table 2. Dynamics of bulk density of soil under crops of the crop rotation link by years, g/cm³

Tillage	Soil layer, cm	Winter wheat after maize in milk-wax ripeness				Peas				Winter wheat after peas				Average by link
		2010	2011	2012	Average	2010	2011	2012	Average	2010	2011	2012	Average	
In spring														
Moldboard	0–10	0.98	1.04	0.96	0.99	0.94	1.01	0.90	0.95	1.05	0.95	0.93	0.98	0.97
	10–20	0.93	1.06	1.10	1.03	0.84	0.97	0.91	0.90	0.91	1.05	0.96	0.97	0.97
	20–30	1.01	1.11	1.08	1.06	0.84	1.05	1.04	0.97	0.87	1.05	1.04	0.99	1.01
	0–30	0.97	1.07	1.05	1.03	0.87	1.01	0.95	0.94	0.94	1.02	0.98	0.98	0.98
Moldboardless	0–10	1.01	1.00	0.95	0.98	0.96	1.04	0.90	0.97	1.03	0.93	0.93	0.96	0.97
	10–20	0.91	1.03	1.11	1.02	0.84	0.96	0.91	0.90	0.86	1.05	0.96	0.96	0.96
	20–30	0.98	1.09	1.09	1.05	0.86	1.08	1.04	0.99	0.86	1.06	1.04	0.98	1.01
	0–30	0.97	1.04	1.05	1.02	0.89	1.03	0.95	0.96	0.92	1.01	0.98	0.97	0.98
LSD ₀₅	0–10 cm	0.07	0.14	0.06		0.20	0.07	0.01		0.11	0.18	0.02		
	10–20 cm	0.10	0.06	0.09		0.06	0.13	0.02		0.10	0.18	0.07		
	20–30 cm	0.17	0.07	0.03		0.06	0.08	0.04		0.15	0.08	0.14		
At harvesting														
Moldboard	0–10	1.04	0.87	0.98	0.96	1.05	0.93	0.93	0.97	0.93	0.98	0.95	0.95	0.96
	10–20	1.05	1.06	1.10	1.07	0.99	1.13	0.95	1.02	1.05	1.12	0.97	1.05	1.05
	20–30	0.99	1.16	1.11	1.09	0.92	1.06	1.05	1.01	1.00	1.18	1.04	1.07	1.06
	0–30	1.03	1.03	1.06	1.04	0.99	1.04	0.98	1.00	0.99	1.10	0.99	1.03	1.02
Moldboardless	0–10	1.03	0.87	0.97	0.96	1.09	0.96	0.94	1.00	0.95	0.98	0.94	0.96	0.97
	10–20	0.99	1.03	1.09	1.04	1.04	1.14	0.96	1.05	1.07	1.16	0.97	1.07	1.05
	20–30	0.94	1.14	1.12	1.07	0.91	1.08	1.04	1.01	1.01	1.16	1.03	1.07	1.05
	0–30	0.99	1.01	1.06	1.02	1.01	1.06	0.98	1.02	1.01	1.10	0.98	1.03	1.02
LSD ₀₅	0–10 cm	0.10	0.02	0.07		0.14	0.03	0.03		0.06	0.10	0.08		
	10–20 cm	0.08	0.08	0.04		0.21	0.04	0.07		0.19	0.08	0.05		
	20–30 cm	0.20	0.06	0.05		0.06	0.06	0.05		0.10	0.06	0.04		

Table 3. The content of water-resistant aggregates smaller than 0.25 mm in the soil under crops by years, %

Tillage	Soil layer, cm	Winter wheat after maize in milk-wax ripeness				Peas				Winter wheat after peas				Average by link
		2010	2011	2012	average	2010	2011	2012	average	2010	2011	2012	average	
In spring														
Moldboard	0–10	47.8	41.4	42.9	44.0	43.1	48.4	43.8	45.1	53.4	45.5	44.0	47.6	45.6
	10–20	52.3	43.5	53.0	49.6	55.1	47.5	50.5	51.0	59.6	46.9	47.5	51.3	50.6
	20–30	57.7	48.3	56.8	54.3	52.7	51.8	53.7	52.7	60.4	54.9	49.2	54.8	53.9
	0–30	52.6	44.4	50.9	49.3	50.3	49.2	49.3	49.6	57.8	49.1	46.9	51.2	50.0
Moldboardless	0–10	51.6	44.8	47.2	47.9	50.0	46.5	48.4	48.3	52.6	53.9	45.9	50.8	49.0
	10–20	50.8	51.2	56.7	52.9	58.2	49.7	60.9	56.3	60.2	54.2	53.8	56.1	55.1
	20–30	54.8	48.0	55.8	52.9	56.0	57.8	58.1	57.3	61.3	54.6	51.6	55.8	55.3
	0–30	52.4	48.0	53.2	51.2	54.7	51.3	55.8	54.0	58.0	54.2	50.4	54.2	53.1
LSD ₀₅	0–10 cm	0.07	0.14	0.0		0.20	0.07	0.0		0.11	0.18	0.02		
	10–20 cm	0.10	0.06	6		0.06	0.13	1		0.10	0.18	0.07		
	20–30 cm	0.17	0.07	0.0		0.06	0.08	0.0		0.15	0.08	0.14		
				9				2						
			0.0				0.0							
			3				4							

Table 3 continuation

At harvesting														
Moldboard	0–10	41.3	47.2	48.7	45.7	47.2	41.8	47.5	45.5	43.0	51.2	54.7	49.6	46.9
	10–20	50.0	52.8	52.3	51.7	46.7	49.6	59.7	52.0	50.1	57.4	51.7	53.1	52.3
	20–30	48.2	48.8	50.0	49.0	52.4	54.4	51.6	52.8	48.5	58.6	52.7	53.3	51.7
	0–30	46.5	49.6	50.3	48.8	48.8	48.6	52.9	50.1	47.2	55.7	53.0	52.0	50.3
Moldboard-less	0–10	47.1	48.3	45.2	46.9	47.2	42.9	51.0	47.0	42.4	53.0	50.7	48.7	47.5
	10–20	48.0	51.1	57.2	52.1	51.6	52.2	52.1	52.0	48.5	67.0	51.2	55.6	53.2
	20–30	44.5	48.4	49.3	47.4	52.5	61.2	55.8	56.5	48.9	63.8	54.3	55.7	53.2
	0–30	46.5	49.3	50.6	48.8	50.5	52.1	53.0	51.8	46.6	61.3	52.1	53.3	51.3
LSD ₀₅														
0–10 cm		6.5	3.3	4.7		1.9	3.8	2.6		5.5	3.5	3.8		
10–20 cm		2.8	5.2	4.0		5.5	1.6	5.8		2.8	4.9	5.8		
20–30 cm		7.1	4.3	4.2		5.8	7.0	4.2		2.2	4.9	5.9		

Table 4. Dynamics of productive moisture content in the one-metre layer of soil under crops in the crop rotation link by years, mm

Tillage	Winter wheat after maize in milk-wax ripeness				Peas				Winter wheat after peas				Average by link	
	2010	2011	2012	average	2010	2011	2012	average	2010	2011	2012	average		
In spring														
Moldboard	124.8	144.9	135.5	135.1	113.1	142.3	119.3	124.9	129.6	141.9	144.3	138.6	132.9	
Moldboard-less	128.0	141.7	135.7	135.1	117.7	145.1	118.3	127.0	130.9	142.0	144.8	139.2	133.8	
LSD ₀₅	3.4	3.7	5.1		2.7	4.5	4.4		4.6	7.5	7.5			
At harvesting														
Moldboard	45.5	82.4	88.4	72.1	84.5	83.4	84.9	84.3	54.1	73.9	96.1	74.7	77.0	
Moldboard-less	57.3	82.5	89.0	76.3	91.3	90.2	83.2	88.2	62.6	75.2	95.0	77.6	80.7	
LSD ₀₅	6.5	6.6	8.1		3.1	4.5	8.1		7.5	2.5	2.1			

serves in the one-metre soil layer under crops in the crop rotation link did not differ significantly by tillage variants. However, it was found that moldboardless tillage significantly reduces moisture consumption for unproductive evaporation under frequent drought events. This was most common in 2010. On average, over the years of research, the difference in the productive moisture content at harvest time in the one-metre soil layer in favour of moldboardless tillage was 4.2 mm (winter wheat after maize in milk-wax ripeness), 3.9 mm (peas) and 2.9 mm (winter wheat after peas).

It should be noted that the plant residues

spread over the field during this tillage process reduced the moisture evaporation from the soil, as other scientists have also pointed out in their research [2, 16].

Conclusions. Moldboardless tillage in the link of grain – fallow – row crop rotation (winter wheat after maize in milk-wax ripeness – peas – winter wheat) in the Northern Steppe of Ukraine does not deteriorate agrophysical parameters of ordinary heavy loamy chernozem.

On average, over the years of research, the difference in the content of water-resistant aggregates in the 0–30 cm soil layer in the crop rotation link in favour of this tillage in spring was 3.1 %.

In arid conditions, moldboardless tillage reduces the consumption of productive moisture for evaporation compared to ploughing: at harvest time, the productive moisture in the one-metre soil layer (average for 2010–2012) is 4.2 mm (winter wheat after maize in milk-wax ripeness), 3.9 mm (peas) and 2.9 mm (winter wheat after peas).

The observed differences in the agrophysical parameters of ordinary chernozem in the

tillage variants did not significantly affect the grain yield and quality of crops in the crop rotation link [14].

Given that the dry conditions of the research years slowed down soil formation processes, in order to obtain more complete information on the impact of these tillage methods on the indicators under consideration in more favourable weather conditions, the experiments should be continued.

References

1. Prosunko, Z. (1999). The impact of global climate changes on the weather in Ukraine. *Nauka i suspilstvo* [Science and Society], 10–12. 60–63. [in Ukrainian].
2. Pikovska, O. V. (2005). Minimization of soil cultivation in the Northern Steppe of Ukraine. *Naukovyi visnyk NAU* [Scientific Bulletin of the National Agrarian University], 81. 25–29. [in Ukrainian].
3. Khomiak, P. V. (2005). Influence of systems of basic tillage under sunflower on the dynamics of its water-physical properties, biometric indicators and productivity in a short-rotation crop rotation in the conditions of the southern Steppe of Ukraine. *Visnyk ahrarnoyi nauky Prychornomoriia* [Bulletin of Agrarian Science of the Black Sea Region], 2 (30). 182–189. [in Ukrainian].
4. Tkalic, I. D., Kaban, V. M. (2007). Influence of tillage, fertilizers, sowing dates on sunflower productivity. *Biuletyn Instytutu zernovoho hospodarstva* [Bulletin of Institute of grain farming], 31–32. 82–85. [in Ukrainian].
5. Cheriachukin, M. I. (2003). Effectiveness of minimization of tillage in the conditions of the Kirovohrad region. *Ahrokhimiya i gruntoznavstvo* [Agrochemistry and soil science], 64. 68–76. [in Ukrainian].
6. Pikovska, O. V. (2011). The structural state of ordinary black soil and the content of humus under different crop cultivation technologies. *Visnyk Kharkivskoho NAU* [Bulletin of Kharkiv National Agrarian University], 2. 56–58. [in Ukrainian].
7. Kochetkov, V. S., Komar, E. A. (2004). Dynamics of soil moisture during plowing and non-moldboard tillage under conditions of insufficient moisture. *Zbirnik naukovikh prats Luganskogo NAU* [Collection of scientific works of the Luhansk National Agrarian University], 36 (48). 55–59. [in Ukrainian].
8. Yakunin, O. P., Pashchenko, Yu. M., Tkalic, Yu. I. (2005). Tillage, crop care, grain yield of corn hybrids. *Biuletyn instytutu zernovoho hospodarstva* [Bulletin of Institute of grain farming], 26–27, 216–218. [in Ukrainian].
9. Dospikhov, B. A. (1985). *Metodika polevogo opyta (s osnovami statisticheskoy obrabotki rezultatov issledovaniy)* [Methodology of field experience (with the basics of statistical processing of the results of research)]. Moscow: Agropromizdat. [in Russian].
10. Vadyunina, A. F., Korchagina, Z. A. (1986). *Metody issledovaniya fizicheskikh svoystv pochvy* [Methods for studying the physical properties of soils]. Moscow: Agropromizdat. [in Russian].
11. *Ahroklimatychnyi dovidnyk po Luhanskii oblasti (1986–2005 rr.)* [Agro-climatic reference book on Lugansk region (1986–2005)] (2011). Lugansk: LLC Virtual Reality. [in Ukrainian].
12. Korolev, P. V. (1978). Relative hardness – complex indicator of the physical state of the soil and its use. *Aktualnyye voprosy obrabotki pochvy: Sbornik nauchnykh trudov LSKHI* [Topical issues of soil cultivation: Collection of scientific papers of the Leningrad Agricultural Institute], 363. 3–32. [in Russian].
13. Chekar, O. Yu. (2004). The function of humus in ensuring the main agronomic characteristics of black soil. *Visnyk Kharkivskoho NAU* [Bulletin of Kharkiv National Agrarian University], 1. 103–105 [in Ukrainian].
14. Medvedev, E. B. (2021). *Vplyv sposobiv obrobittu ta dobryv na pokaznyky rodyuchosti chornozemu zvychnoho i urozhainist silskohospodarskykh kultur lanky zerno-paro-prosapnoi sivozminy v umovakh pivnichnogo Stepu Ukrainy* [Influence of processing methods and fertilizers on fertility indicators of ordinary black soil and crop yields of a grain-steam-tilled crop rotation link in conditions of the northern Steppe of Ukraine]. (Cand. Agric. Sci. Diss.). Dnipro. [in Ukrainian].
15. Tsvei, Y. P., Boychuk, O. V., Mazur, H. M., Martyniuk, L. S. (2013). Nutrient regime of typical black soil depending on methods of tillage for sugar beets. *Visnyk ahrarnoyi nauky* [Bulletin of Agrarian Science], 2. 5–9. [in Ukrainian].
16. Tsyliuryk, O. I., Sudak, V. M. (2012). Efficiency of mulch tillage for sunflower in the northern Steppe of Ukraine. *Biuletyn Instytutu zernovoho hospodarstva* [Bulletin of Institute of grain farming], 2. 82–87. [in Ukrainian].

УДК 631.512: 631.452(477.6)

Медведєв Е. Б. Агрофізичні показники чорнозему звичайного залежно від способів його обробітку у Північному Степу України. Зернові культури. 2022. 6 (2). 159–165.

Луганський інститут агропромислового виробництва НААН, вул. Жовтнева, 14, сел. Металіст, Слав'янськський район, Луганська область, 93733, Україна

Актуальність. Поширення негативних процесів у ґрунті, пов'язаних з загостренням економічної ситуації в сучасній Україні, стрімким зростанням цін на техніку, паливо-мастильні матеріали, за-

міною енерговитратних традиційних систем обробітку ґрунту на безполіцеві та інші ресурсозберігаючі, потребує подальших і більш глибоких досліджень їх впливу на його агрофізичні показники. **Мета.** Вивчити вплив способів основного обробітку ґрунту на агрофізичні показники чорнозему звичайного в ланці польової зерно-паро-просапної сівозміни: пшениця озима після кукурудзи МВС (молочно-воскова стиглість зерна) – горох на зерно – пшениця озима в умовах Північного Степу України. **Матеріали і методи.** Досліджувалися способи основного обробітку ґрунту, засновані на поліцевій оранці і безполіцевому розпушуванні на фоні поліцевої оранки під кукурудзу. В експериментальних дослідженнях використовували польовий, лабораторний і статистично-математичний методи. Агрофізичні показники ґрунту визначали за загальноприйнятими методиками. **Результати.** Не встановлено істотної різниці за впливом способів основного обробітку на щільність складання ґрунту в шарі 0–30 см під культурами ланки сівозміни навесні та на час їх збирання. Мало місце суттєве збільшення кількості водотривких агрегатів (понад 0,25 мм) в ґрунті за безполіцевого обробітку, порівняно з оранкою, у 2011 та 2012 рр. під всіма культурами ланки сівозміни у весняний період і на час збирання урожаю, переважно у шарах 0–10 і 10–20 см. Частіше це спостерігалось навесні – у середньому за 2010–2012 роки різниця за цим показником у шарі ґрунту 0–30 см по культурах ланки сівозміни була: пшениця озима по кукурудзі МВС – 1,9, горох – 4,4 і пшениця озима по гороху – 3,0 %, а у середньому по ланці сівозміни – 3,1 %. Встановлено, що безполіцевий обробіток ґрунту сприяє суттєвому зменшенню витрат вологи на непродуктивне випаровування в умовах часто повторюваних посушливих явищ. **Висновки.** Досліджувані способи основного обробітку чорнозему звичайного важкосуглинкового однаково впливають на щільність його складання і не зумовлюють погіршення цього показнику. Безполіцевий обробіток поліпшує водостійкість орного шару ґрунту під культурами ланки сівозміни і зменшує витрати вологи на випаровування, у порівнянні з оранкою.

Ключові слова: обробіток ґрунту, щільність, водостійкість, продуктивна волога, пшениця озима, горох