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WEED CONTROL AND SUNFLOWER PRODUCTIVITY IN THE SOUTHERN STEPPE OF UKRAINE

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The results of research on the growth and development of sunflower plants in the period of formation of its productivity in the southern steppe of Ukraine, depending on the methods of basic tillage and the degree of weeding agrophytocenosis. The effectiveness of chemical weeding with the herbicide Euro-Lightning® Plus crops of sunflower, the plants of which were grown against the background of deep (28-30 cm) shelfless tillage, has been proven.

Key words: *sunflower, weediness, methods of basic tillage, weather conditions, productivity.*

Problem statement. It is well known that sunflower (*Helianthus annuus* L.) is one of the main technical oilseeds in Ukraine. It is able to provide the population with important foodstuffs, the livestock industry with highly nutritious fodder, in particular cake and the processing industry with raw materials. In our country, the share of sunflower oil is 98% of total production of this product. Currently, *Helianthus annuus* L. remains highly liquid, the most profitable crop in the agricultural sector [1, 2, 3].

According to Oleksandr Maslak [4], the high price of sunflower seeds and an attractive level of profitability (up to 90%) will encourage farmers to grow this oilseed crop.

At the same time, according to the State Statistics Service of Ukraine on the main economic results of agricultural enterprises in agriculture, the level of profitability of sunflower seeds in 1990 was 236.5%, but in 2020 it has decreased significantly and did not exceed 39.4% [5].

According to scientists [6], in the steppe of Ukraine, the part of sunflower in the structure of crop rotation should not exceed 20%.

Currently, the area under sunflowers is growing every year. Thus, according to the State Statistics Service of Ukraine, it was covered on an area of 6457.2 thousand hectares in 2020 in Ukraine. Gross collection was concentrated at 13,110.4 thousand tons. 2.02 tons of seeds were obtained from 1 hectare of harvested area.

During the period from 2000 to 2020, the sown area of this oilseed crop in the Mykolaiv region increased from 235.1 thousand hectares to 513.0 thousand hectares, i.e. 2.2 times and their portion in the total sown area in 2020 (1564.8 thousand hectares) reached to 32.8%, which, of course, negatively affects soil fertility. During the study period (2000-2020) in the Kherson region there was an increase in the area under sunflower from 177.6 to 335.3 thousand hectares, i.e. 1.9 times. Farms in the Odessa region are characterized by a slightly smaller increase in the area of this highly liquid oilseed plant. Areas under sunflower in this southern

region have increased over the past 21 years from 265.8 to 356.6 thousand hectares, i.e. by 34.2% [7].

At the same time, it should be noted that the yield of sunflower in the South of Ukraine is quite low. Thus, in Mykolaiv region in 2000 1.07 t/ha were harvested, in 2010 - 1.48 t/ha, in 2020 - 1.35 t/ha seeds [8].

Therefore, the increase in gross seed yield is achieved by increasing the sown area, i.e. in an extensive way. As a result, crop rotations are disturbed.

At the same time, hybrids have appeared on the seed market that can provide much higher yields. There is a need to improve the technology of their cultivation, in particular to control the level of weediness of crops.

Under the conditions of the energy crisis, as a result because of the high level of fuel costs, it is necessary to explore different methods of basic tillage and their impact on crop litter and sunflower productivity and determine a more efficient resource-saving measure of autumn tillage.

Analysis of recent research and publications. A number of scientific works have been devoted to the ways to reduce weed infestation in the formation of the productivity of sunflower agrophytocenoses.

I. Tkalich and others [6] consider the basic tillage for sunflower to be one of the most important factors in increasing the productivity of this oilseed crop. This is due to the fact that it preserves the reserves of productive moisture, improves the microbiological condition of the soil and controls the level of weeds, which is essential part in modern technologies for the production of sunflower seeds.

According to M. Popova, V. Balduev, O. Borisyuk [9], Orobanche cumana Wallr. causes significant damage to sunflower plants, because its seeds can be stored in the arable soil layer for a long time. According to the results of many years of research by scientists of the Mykolaiv State Agricultural Research Station (now the State Institution "Mykolaiv State Agricultural Research Station of the Institute of Irrigated Agriculture NAAS of Ukraine"), shows that the return of sunflower to the previous place in crop rotation after 10, 6 and 4 years 2, 12 and 38 pieces/m^2, respectively, and the yield of sunflower seeds of 2.01; 1.33 and 1.11 t/ha, respectively, i.e. the more insects there is, the lower the crop productivity.

In the eastern part of the Forest-Steppe of Ukraine, sunflower agrophytocenoses, located in a 9-field steam-grain-row crop rotation after spring grain crops, were weeded by 42 species of weeds and contaminants, including blue mice, common mouse, white quince, common squirrel, black nightshade, garden purslane, ragweed, bitter mustard, pink thistle, birch. The largest number of weeds and pests in sunflower crops were counted on the background without fertilizers for plowing and in areas of organic-mineral intensive background (manure aftereffect, 30 t/ha + N30P30K30, chiseling). Due to the application of the herbicide system, the dominance and subdominance of some species of undesirable plants have changed significantly over the years of research. Scientists [10] claim that in the above-mentioned zone the better way of basic tillage under sunflower should be plowing, against the background of which the weediness of crops under study was reduced compared to free tillage (chiseling).

Common weeds include ragweed. According to K. Saenko [11], for the formation of 1 ton of dry matter, this plant removes from the soil 15.5 kg of nitrogen, 1.5 kg of phosphorus, in addition, consumes about 950 tons of water. Fields littered with ragweed deteriorate the quality of field work, in particular during shelf tillage and harvesting. To limit the harmfulness of ragweed, you can use more than 50 herbicides, for which one it is very sensitive.

According to N.V. Markova [12], herbicides reduce the degree of weeding of crops *Helianthus annuus* L., and in combination with agronomic measures have a positive effect on the preservation of productive moisture in the soil. In the research areas where herbicides were used, the moisture was actually used by sunflower plants. Weed-protected crops produced higher yields.

O.O. Onishchenko [13] reports that according to the scientists from the Institute of Oilseeds of NAAS of Ukraine (D.I. Nikitchina, A.I. Polyakova, I.V. Aksonov), biometric indicators, as well as the highest seed yield at the level 3.45 t/ha was obtained for plowing to a depth of 20-22 cm, and for tillage to the same depth - 0.24 t/ha less. However, according to its three-year data, the yield of sunflower seeds during deep loosening of the soil increased by 5.0 c/ha compared to plowing. The methods of tillage they studied in the experiment on the southern black soils had different effects on the reserve of productive moisture in the root-containing layer of the soil. They found that this indicator during sowing of sunflower against the background of plowing was lower by 8% compared to deep loosening of the soil. Due to the improvement of soil moisture supply of the experimental plot, sunflower seedlings appeared 2 days earlier, compared to plowing. This pattern was observed throughout the growing season of cultivated plants.

In the experiments of M. Berezhnyak, E. Berezhnyak [14] determined that flat-cut (shelfless) and chisel tillage had a positive effect on the agrophysical parameters of black soils with different particle size distribution. Due to the use of these methods of basic tillage, the yield of corn grain was slightly increased compared to the use of traditional plowing.

A. Melnyk and S. Govorun [15] found that the highest level of yielding on black soils of typical low-humus, in the north-eastern left-bank Forest-Steppe of Ukraine, is formed by sunflower (3.14 t/ha) after steaming. The minimum yield was obtained after corn for silage (2.46 t/ha).

Studies by A. Babenko [16], conducted in the right-bank Forest-Steppe of Ukraine, found that weeds significantly constrain the increase in sunflower productivity. She claims that weed vegetation remains the most potential factor in the deterioration of growth and development of crops, because in its crops there are 40 to 80 species of weeds, of which 8-16 are the most harmful and dangerous, especially in the first 60 days after appearance of sunflower seedlings. It is proved that the decrease in its yield ranges from 11% if weeds litter the crops within 20 days after germination, to 41% if unwanted plants grew in crops 60 days after germination, i.e.+ the shorter the period of weeds in sunflower crops, the higher its seed yield and the better - the quality of oil.

A. Ostapko [17] also insists that the main reason for the decrease in sunflower yield is the increase in weediness of its crops.

The aim of the study was to determine the impact of the methods of basic tillage and herbicide Euro-Lightning® Plus on crop weeds and the formation of productivity of Pioner P64LP130 (P64LP130) sunflower hybrid in the south of Ukraine.

Materials and methods of research. Studies to determine the productivity of sunflower, to identify the most effective method of basic tillage in non-irrigated agrophytocenoses of arid conditions, were conducted in southern Ukraine (a branch of the Mykolaiv National Agrarian University). The relief of the soil under the experiment was flat. Soil - southern black soils are residual weakly saline, heavy loam on the carbonate scaffold. The content of humus according to Turin (in a layer of 0-30 cm) - 2.9%. The reaction of the soil solution is close to neutral: the pH of the salt extract is 6.6-6.8. 100 g of soil contains an average of 1.2 mg of nitrates, 8.5 mg of mobile phosphorus and 18 mg of exchangeable potassium.

The density of the soil layer 0-60 cm is 1.25 g/cm^3, HB - 23.5%, wilting humidity - 11.4%. Groundwater lies deeper than 20 m and does not affect the process of soil formation. An average of 400 mm of precipitation falls per year, and the hydrothermal coefficient is 0.7-0.8. The average height of snow cover is 6-8 cm, and the average reserves of productive moisture in the soil layer 0-100 cm in spring are 130 mm. Pioner P64LP130 sunflower hybrid was used in the experiments. First (in 2019) they set up a production experiment in which, against the background of plowing, chemical weeding of crops with the herbicide Euro-Lightning® Plus was carried out. The uncultivated part of the area (0.2 ha) in 2 repetitions was taken for

controlling. During 2020-2021, a field experiment was established, adding to the scheme, in addition to plowing, two other methods of shelfless basic tillage: deep and shallow.

The sown area of the plot was 100 m^2, the accounted area was 50 m^2. It was Repeated three times. Predecessor is winter wheat.

Sunflowers were sown in 2020 in the third decade of April, and in 2021 - in the first decade of May in a wide row (70 cm). Pre-emergence and post-emergence harrowing and row spacing have also been used to improve phytosanitary conditions, including the destruction of weeds in the white thread phase, also used pre-emergence and post-emergence harrowing and loosening between rows.

In general, the technology of sunflower seed production was generally accepted for the zone, except for the studied factors. According to the scheme of the experiment, plowing was carried out to a depth of 28-30 cm with a plow PLN-4-35 with plowshares, tillage to a depth of 28-30 cm - cultivator-flat cutter-deep cultivator KPG-2-150, and shallow tillage to a depth of 12-14 cm - KPE-3.8.

Spraying of plants was carried out once in the morning until 11 o'clock at an air temperature of 19-20 °C in calm, windless weather. Herbicide Euro-Lightning® Plus was applied with a knapsack sprayer according to the manufacturer's recommendations (consumption rate for sunflower - 2.0 l/ha). Its active ingredients are as follows: imazamox (16.5 g/l) + imazapyr (7.5 g/l). The chemical group of DR is imidazolinones. Formulation - in the form of soluble concentrate (RC).

Weather conditions during the sunflower growing season in 2020 were drier than in 2021.

Weed counts of crops of the studied crop were performed quantitatively (30 days after sunflower sowing) and quantitatively by weight before harvesting according to generally accepted methods [18].

They set up experiments and conducted observations and records taking into account generally accepted methods in crop production [19, 20].

Processing of the received information and results of the research was carried out by means of software packages: Microsoft Excel, Agrostat New [21]. Presenting main material. Weather conditions are one of the decisive factors in the formation of productivity of both cultivated plants and the weed component of the agrophytocenosis. During May-September 2020, 181 mm of precipitation and rain fall, which is 78 mm less than norm. At the same time, during this period in 2021, 266 mm of precipitation fell, i.e. crops were moistened almost at the level of the average long-term, more precisely 8 mm more than norm.

It was found that under drier conditions in 2020 the water consumption coefficient of sunflower increased, especially when growing on the background of shallow shelf-free basic tillage and herbicide-free technology (1506 m^3/t) compared to 2021 (1096 m^3/t). The consumption of moisture by crops for the formation of the unit of yield (in our case per 1 ton of sunflower seeds with the appropriate amount of accumulated aboveground biomass) is reduced by applying the herbicide, in particular Euro-Lighting® Plus. This is due to the decrease in the crops of the studied crop of competitive plants, weeds. On average, in two years of determining the coefficient of water consumption of sunflower, the highest index was for its cultivation against the background of shallow shelf-free basic tillage and herbicide-free technology - 1301 m^3/t. During chemical weeding of crops, moisture is used more sparingly for the formation of sunflower seeds, especially against the background of deep shelfless main tillage - 836 m^3/t (Fig. 1).

It should be noted that due to the reduction of weeds in the crop, the coefficient of water consumption for sunflower seed production on the background of shallow shelf-free basic tillage decreased by 407 m^3/t, i.e. 1.5 times, and on the background of plowing slightly less - 1.4 times, because with the shelf tillage of undesirable for sunflower concurrent plants came down less.

Weeds inhibit the linear growth of sunflower plants in height.

On average, during two years of research, the height of plants was 139 cm for growing sunflower on the background of shallow tillage-free, basic tillage and herbicide-free technology, while for plowing to a depth of 28-30 cm this indicator increased by 6 cm (Fig. 2).

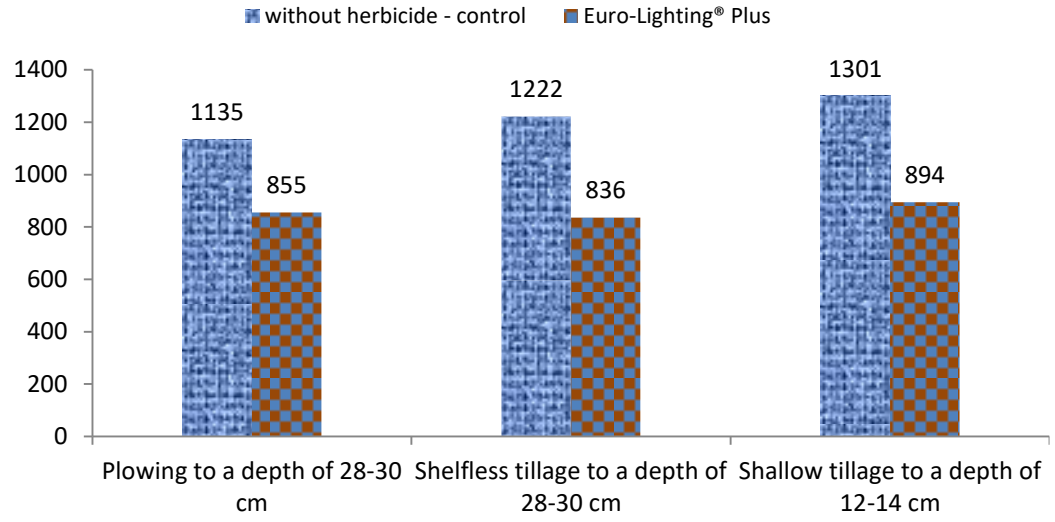

Fig. 1. **The coefficient of water consumption of sunflower depending on the methods basic tillage and herbicide Euro-lightning® Plus (average for 2020-2021), m^3/t**

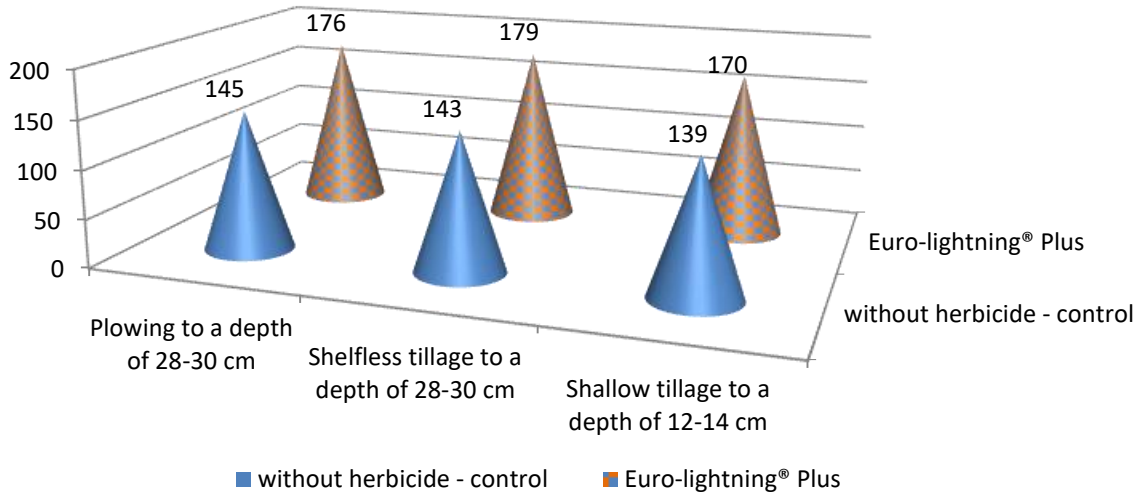

Fig. 2. **The height of sunflower plants, depending on the main methods tillage and herbicide Euro-lightning® Plus (average for 2020-2021), cm**

The highest sunflower plants were noted in the areas practically free of weeds, with chemical weeding of crops against the background of deep (28-30 cm) shelfless main tillage - 179 cm.

Weather conditions also significantly affect this indicator. Thus, under drier conditions during the growing season in 2020, the height of plants ranged from 123-130 cm (in areas not protected from weeds by herbicides) to 146-151 cm - in the options of chemical weeding. The amplitude of fluctuations in the height of the plants of the studied culture in 2021 was characterized by values from 155-159 cm to 170-179 cm, respectively.

An identical conclusion was made by D. Bozhko [22], for research at the Central Ukrainian National Technical University. It was found that with the application of soil herbicides, the height of plants was higher against the control variant. For example, in the phase of basket formation the height of control plants was 103.5 cm, and in the variants with the use of herbicides it was higher by 3.0-7.5 cm. Almost the same pattern was observed in the phase of full maturity (increase 3.0-6,5 cm), which was due to better conditions for growth and development of crop plants in weed-protected agrophytocenoses. The author states that the basic mass of weeds consume significantly more nutrients than cultivated plants, and therefore crop losses due to weed infestation can be significant.

We found that weeds in the initial period of growth in sunflower crops were represented by 64% of annual plants. The main ones were late spring (about 49%). Perennial weeds, primarily root weeds, played a smaller share in the structure of the weed phytocenosis.

During the years of research, the fields intended for sunflower sowing were practically littered with weeds of dicotyledonous species. Among the juveniles, *Amaranthus retroflexus* L., *Chenopodium album* L., *Sinapis arvensis* L., and Matricaria perforate Merat were found. The largest was in the crops of ragweed (*Ambrosia artemisiifolia* L.). This weed is a quarantine. Perennial mallards were mainly represented by field birch (*Convolvulus arvensis* L.) and field thistle (*Cirsium arvensis* L.). Yellow thistle (Sonchus arvensis L.) was also found. Of the cereal species, a small proportion in the structure of undesirable plants belonged to the creeping wheatgrass (*Elytrigia repens* L.) - a weed from the group of perennials: crus-galli L).

It has been established that, on average over two years, the weeding of sunflower crops by the herbicide Euro-Lightning® Plus is more effective in controlling weeds in all the studied methods of basic tillage.

A much larger number of weeds littered the sunflower agrophytocenosis with leafless loosening both to a depth of 12-14 cm (189 pieces/m^2) and to a depth of 28-30 cm (186 pieces/m^2), while during plowing this figure was 13-16 pieces/m^2 (7.0-8.5%) less and amounted to 173 pieces/m^2 (Table 1).

When counting 30 days after germination, there were only 14 units/m^2 of undesirable plants in the crops for plowing in areas treated with the herbicide Euro-Lightning® Plus. Against the background of shelfless cultivation to a depth of 28-30 cm and the application of herbicides, the number of weeds has become even smaller - 12 pieces/m^2. The percentage reduction in the number of weeds in the above methods of tillage under the action of herbicides was 91.9 and 93.5%, respectively.

The number of weeds in the period of harvesting sunflower seeds by herbicide-free technology, on average on all backgrounds of tillage, was 144 pieces/m^2. Due to the spraying of crops with the herbicide Euro-Lightning® Plus, this indicator decreased by 89.6%.

No significant toxic effect on the plants of the studied crop was detected, although initially there was a slight suppression of sunflower, which lasted several days. Slightly less toxicity of the drug was observed in cereals.

A.I. Babenko [16] claims that in agriculture, vegetable growing, horticulture due to weeds does not get 25-30% of the crop, and in many cases the loss reaches 50% or more. She suggests that weed damage to sunflowers should be considered from two perspectives: the effect

of weeds and their weight on crop productivity. Correlation analysis of data between weed numbers and yields shows that there is an inverse relationship between these indicators. Weed biomass has a stronger effect on sunflower yields than weeds. There is an inverse linear dependence between crop weeds and crop seed yields, which increases as weeds increase, especially the weight of unwanted plants.

Table 1

Weediness of sunflower crops depending on the methods of basic tillage and herbicide Euro-Lightning® Plus (average for 2020-2021)

Indications	Plowing to depth 28-30 cm		Policeless tillage to depth 28-30 cm		Shallow shelf-free tillage to a depth of 12-14 cm	
	without herbicide - control	Euro-Lighting® Plus	without herbicide - control	Euro-Lighting® Plus	without herbicide - control	Euro-Lighting® Plus
Number of weeds 30 days after germination, pcs/m^2	173	14	186	12	189	15
Number of weeds in seed collection period, pcs/m^2	136	15	145	14	151	17
Weed reduction, % to control	0	89,0	0	90,3	0	88,8
Dry mass of weeds during the period of seed collection, g/m^2	449	62	469	59	487	63
Biological efficiency,%	0	86,2	0	87,4	0	87,1

It is worth noting that according to the results of our research, the dry weight of weeds under control was 449 g/m^2. Due to herbicide spraying, this indicator decreased by 86.2%. Higher biological efficiency (87.4%) was shown by the herbicide Euro-Lightning® Plus in the model of sunflower seed production against the background of deep shelfless cultivation (28-30 cm).

It is clear that the presence of weeds in crops limits the ability of agricultural plants to realize their genetic potential for high yields. Thus, when studying the influence of different methods of basic tillage under alfalfa seeds, it was found that no significant difference was found between them. At the same time, with non-shelf loosening of the soil to a depth of 12-14 cm, the total energy consumption for this

agricultural event is reduced by 226.7% compared to deep plowing [23]. The density of the soil, on which the yield significantly depends, for all studied methods of basic tillage was at the level of optimal values (1.1-1.3 g/cm^3) [24].

Crop productivity decreases significantly when grown in years with insufficient moisture.

Moderately warm weather in April 2019 with sufficient moisture (45.6 mm at 25 mm) was favorable for the initial growth and development of the studied crop. In June and August, 63.9 and 44.7 mm as norm fell at 54 and 42 mm, respectively, which had a positive effect on sunflower productivity.

During the growing season of sunflower plants in the production experiment, the crops were heavily weeded, so chemical weeding against the background of deep autumn plowing was used to control unwanted plants. The results showed the high effectiveness of the chemical method of plant protection against weeds.

It was found that due to spraying crops with Euro-Lightning® Plus herbicide, seed yield increased in 2019 by 0.51 t/ha compared to the control, which was 20.8%. (Table 2).

Table 2

Yield of sunflower seeds depending on spraying of crops with herbicide Euro-lightning® Plus in 2019, t/ha

Variant	Yield, t/ha	± to control	
		t/ha	%
Without herbicide - control	2,35	0	0
Euro-Lighting® Plus	2,96	0,61	26,0

As already mentioned, 2020 was characterized by drier conditions during the growing season, which affected the yield of sunflower. It ranged from 1.70 t/ha (in areas without herbicide application on the background of shallow tillage) to 2.83 t/ha (for chemical weeding of herbicide crops on the background of deep tillage) (Table 3).

A similar pattern between the options was observed in 2021. It should be noted that the average yield in the experiment in 2020 was 2.31 t/ha, i.e. it was lower by 0.99 t/ha compared to more moisture provided in 2021.

We have found, on average, two years of accounting, that the production of sunflower seeds on the background of deep plowing is more efficient with herbicide-free technology. Yields in the plots of this variant reached 2.50 t/ha, while deep shelfless loosening (tillage) of the soil was 2.33 t/ha, and shallow no-tillage - only 2.21 t/ha of sunflower seeds. It should be emphasized that the difference in yield was significant.

A more effective model was the cultivation of sunflowers using the chemical method of weed control against the background of deep shelfless loosening (cultivation) of the soil. The yield reached the level of 3.36 t/ha, i.e. 1.03 t/ha more seeds were formed compared to the control crop (without herbicides).

Significant increase in yield due to the chemical weeding of crops was also obtained against the background of plowing (0.78 t/ha) and shallow tillage - 0.93 t/ha of seeds. Proper weed control has also increased oil yield.

It was found that the main share of influence on the formation of sunflower productivity in the experiment belongs to factor B (herbicide application) 94.5% - in 2020. Almost the same (94.7%) was in 2021.

Table 3

Yield of sunflower seeds depending on the methods of basic tillage and herbicide Euro-lightning® Plus, t/ha

Methods of basic tillage (factor A)	Herbicide (factor B)	2020	2021	Average for two years	± to control
Plowing to depth 28-30 cm	Without herbicide - control	2,02	2,97	2,50	0
	Euro-Lighting® Plus	2,79	3,76	3,28	0,78
Policeless tillage to depth 28-30 cm	Without herbicide - control	1,85	2,81	2,33	0
	Euro-Lighting® Plus	2,83	3,88	3,36	1,03
Shallow shelf-free tillage to a depth of 12-14 cm	Without herbicide - control	1,70	2,72	2,21	0
	Euro-Lighting® Plus	2,65	3,63	3,14	0,93
Average in the experiment		2,31	3,30	2,80	-
NIR05, t/ha Factor A		0,02	0,10	0,05	
Factor B		0,03	0,02	0,03	
Combined factors A and B		0,06	0,08	0,06	

Conclusions. The growth and development of sunflower plants depends on the degree of weed infestation, which ultimately affects its productivity. The coefficient of water consumption of sunflower was the highest for its cultivation against the background of shallow shelf-free basic tillage and herbicide-free technology - 1301 m^3/t. During chemical weeding of crops, moisture is used more sparingly for seed formation, especially against the background of deep shelfless main tillage - 836 m^3/t.

The highest sunflower plants were noted for chemical weeding of crops on the background of deep (28-30 cm) shelfless tillage - 179 cm, and the smallest - for sunflower cultivation on the background of shallow shelfless tillage and herbicide-free technology - 139 cm, while plowing on depth of 28-30 cm, this indicator increased by 6 cm.

During plowing for the period of sunflower harvest, the dry weight of weeds under control was 449 g/m^2. Due to herbicide spraying, this indicator decreased by 86.2%. The herbicide Euro-Lightning® Plus showed higher biological efficiency (87.4%) for seed production against the background of deep tillage.

Seed yields are also significantly affected by weather conditions during the growing season of the crop, the methods of basic tillage. More efficient (with herbicide-free technology) is the production of sunflower seeds against the background of deep plowing, as the yield reached 2.50 t/ha, while deep tillage was 2.33 t/ha, and shallow tillage - only 2, 21 t/ha of sunflower seeds. Sunflower weed control was more effective with deep weedless tillage. The yield reached the level of 3.36 t/ha, i.e. 1.03 t/ha more seeds were formed compared to the control crop (without herbicides). A significant increase in yield due to the chemical weeding of crops was also obtained against the background of plowing (0.78 t/ha) and shallow tillage (0.93 t/ha of seeds).

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Л. К. Антипова, С. Г. Чорний. **Засміченість та продуктивність посівів соняшнику у південному Степу України**

Наведено результати досліджень зростання та розвитку рослин соняшнику в період формування його продуктивності у південному Степу України залежно від способів основного обробітку ґрунту та ступеня засміченості агрофітоценозу. Доведено ефективність хімічного прополювання гербіцидом Євро-Лайтнінг Плюс посівів соняшнику, рослини якого вирощували на тлі глибокої (28-30 см) безполочної обробки.

Ключові слова: *соняшник, засміченість, способи основного обробітку ґрунту, погодні умови, продуктивність.*

Л. К. Антипова, С. Г. Чорный. **Засоренность и продуктивность посевов подсолнечника в южной Степи Украины**

Приведены результаты исследований роста и развития растений подсолнечника в период формирования его продуктивности в южной Степи Украины в зависимости от способов основного возделывания почвы и степени засоренности агрофитоценоза. Доказана эффективность химической прополки гербицидом Евро-Лайтнинг® Плюс посевов подсолнечника, растения которого выращивали на фоне глубокой (28-30 см) бесполочной обработки.

Ключевые слова: *подсолнечник, засоренность, способы основной обработки почвы, погодные условия, продуктивность.*