

UDC 631.5:632.5:633.15

ZADOROZHNYI V., Candidate of Agricultural Sciences

KARASEVICH V., Candidate of Agricultural Sciences

MOVCHAN I., KOLODIY S.

Institute of Feeds and Agriculture of Podillya of NAAS

EFFECT OF DIFFERENT TILLAGE METHODS ON WEED SPECIES COMPOSITION IN CORN

During the four-year study founding the major trends in weed cenosis under various tillage methods. The smallest number of weeds counting in areas where applied disking in corn planting. Also noted that during the years of research in areas where applied No-till finding reduction quantity of cereal and dicotyledonous weeds.

Keywords: maize, weeds, tillage, No-till

Introduction. Corn is a valuable cereal, fodder and industrial crop, has high productivity potential. However, the yield of corn in Ukraine is inferior to leading countries [11]. High weediness is the one of the main reason of yield losses which are 32-44 % [3,5].

High potential pollution of arable land caused by weeds biological features, such as: high seed production, long time preserve the viability of the seed in the ground, long-term of germination suitability and a high level of plasticity in the environmental conditions requirements [1,4]. Therefore, the study of the biological characteristics of weeds is essential. Earlier, doct. Doyarenko AG wrote: "Rational path of weediness reduction prospered through weeds biological features" [2]. Understudied question at present time there is a regarding the installation process features weediness of crops depending on climatic conditions and soil tillage methods. This event is an important part of the integrated weeds control methods, especially in modern organic agriculture. In this regard, there is a need to develop a system of tillage with high weed efficiency in corn. First of all must be ensured reduce overall weed-infestation of sowing and potential clogging of arable land.

Long-term studies have established that the systematic without plowing tillage (disking, cultivation) causes an increase in weed-infested crops as corn and other crops to 17-75 % compared with plowing. Thus the combined system proved the best soil tillage in crop rotation, which provides a combination of plowing, cultivation and disking . Also, set the expediency or shallow surface cultivation not only during winter and spring cereals and maize [6]. In recent years, Ukraine gaining no-till systems on soil chernozem steppe Ukraine [5,9]. At present time, the world's no-till total area is more than 100 million hectares. Every year the area under no-till system increases by 1 million hectares [10]. However, this system has not been studied in conditions of gray forest soils Right-Bank Forest-Steppe of Ukraine.

The purpose of research is to determine the effect of different soil tillage systems on weed infestation and weeds species composition in corn.

Material and methods. Field research was conducted in a stationary experiment the State Enterprise "Research Farm "Bohonytske" of the Institute of Feeds and Agriculture of Podillya of NAAS in 2010-2013. Soils of the trial field were grey forest mid-loamy by texture.

Hydrothermal conditions during the study were significantly different from the long-term indices. Vegetation period of 2012 appeared to be the dried one, with 150 mm less of precipitation than in the long-term norm. During the same period 2010-2011 was characterized by significant rainfalls. In 2013, the measures were close to long-term norm. As for the temperature mode, temperature of air exceeded the norm by 1,3-2,5 °C.

Area sown area was 423 m². Location of plots was randomized. Herbicide application (Stellar, 1,25 l/ha) was conducted by the sprayer PL- 2 "System Agrotop". Under no-till system Roundup (2,5 l/ha) was applied. Application rate of the liquid was 250 l/ha.

Maize was grown as monoculture. The following primary tillage systems were studied: 1) Plowing at the depth of 20-22 cm; 2) Disking at the depth of 10-12 cm; 3) No-till. In this variant no

tillage was conducted, only the grinded stem residues were uniformly placed on the ground – soil mulching was conducted. Sowing was performed in optimal terms by the direct seeding machine (Massey Ferguson 550)

Results and discussion. During the research, among cereal species was domination of *Setaria glauca* L. and *Echinochloa crus-galli* (L.) Roem. Dicotyledonous species were represented by *Chenopodium album* L., *Amaranthus retroflexus* L., *Polygonum aviculare* L., *Polygonum lapathifolium* L., *Galinsoga parviflora* L., *Thlapsi arvense* L. Among the perennial species dominated *Elytrigia repens* L., *Convolvulus arvensis* L. and *Cirsium arvense* L.

Over the years, studies showed the tendency to increase in weed-infested in all research plots (Table 1). Thus, if in 2010, in a phase 3 leaves of maize in areas there were 21-46 weeds per m² cereal and dicotyledonous weeds weeds per m² 8-17, during 2011-2013, the number of weeds gradually increased. Thus, in 2013 their number reached 166-197 weeds per m² particular quantity grass weeds was on average 138-149 weeds per m², dicotyledonous - 24-54 weeds per m². It should be noted that in 2013 consisted specific climatic conditions, it's development in the early stages of maize observed loss of excessive rainfall.

Table 1

Species composition and abundance of weeds in crops of corn in phase 3 leaves of corn, 2010-2013

Tillage	Annual								Perennial				Total			
	cereals				dicotyledonous				2010	2011	2012	2013	2010	2011	2012	2013
	2010	2011	2012	2013	2010	2011	2012	2013								
Control	34	89	122	139	10	14	36	49	4	3	8	5	48	106	166	193
Plowing	21	69	116	146	15	18	37	5	5	3	3	0	41	90	156	184
Disking	55	94	131	149	8	21	40	3	3	1	1	1	66	116	172	197
No-till	24	106	118	143	13	21	21	3	3	3	0	1	40	130	139	168

Note: In 2010, all counts were conducted as the plowing

Thus, for the period May-June fell 189.5 mm, while long-term norm is 143.9 mm. It was combined with increasing of the air temperature at 2,2-2,9 °C, which facilitated the emergence of a significant number of weeds. The lowest number of weeds was observed against the background of no-till - 166-168 items/m². Plants of *Cirsium arvense* L. during 2012-2013 years, in the early stages of maize, were present only in the control plots. It should be noted that the total number of weeds, slightly increased the proportion of cereal species. Thus, if in 2010 they accounted for 51-77%, while in 2013 the figure was 72-85 %. According decreased presence of dicotyledonous species - 12-37 % in 2010 to 14-27 % in 2013.

Accounting by weeds in phase 11-12 corn leaves, confirming the increase in the number of cereal and dicotyledonous weed species in cultivation all tillage methods. Among the grass species in 2010 in areas dominated by *Setaria glauca* L. 2,5-3,5 weeds per m² while the number of plants of *Echinochloa crus-galli* (L.) Roem. Was 1,0-2,0 weeds per m² (Table 2). However, during the 2011-2013 years the situation has changed and showed an increase in the number of *Echinochloa crus-galli* (L.) Roem. to 8,5-15,0 weeds per m² and the number of *Setaria glauca* L. was 4,0-6,0 weeds per m². Quantity of dicotyledonous species were almost the same and does not depend on the tillage method.

It should be noted that in 2011 - 2013 years the least amount of weed (10,6-18,0 weeds per m²) was observed on the plowing. While on a background of no-till was observed only a trend to reduce the number of weeds. This resulted from the accumulation of sufficient mulch on the soil surface, which inhibits germination of weeds. Also noted that in 2013 in all plots was observed occurrence of rare species *Erigeron canadensis* L.

Table 2

**Species composition and abundance of weeds in crops of corn
in the phase of 11-12 leaves of corn, 2010-2013**

Tillage	Number of annual weeds pieces/m ²																			
	cereals								dicotyledonous											
	<i>Echinochloa cruss-galli</i> (L.) Roem.				<i>Setaria glauca</i> L.				<i>Chenopodium album</i> L.				<i>Galinsoga parviflora</i> Cav.				<i>Amaranthus retroflexus</i> L.			
	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013	2010	2011	2012	2013
Plowing	1,0	3,8	5,0	8,5	3,5	3,5	3,5	4,0	1,0	1,0	2,0	1,5	0	1,0	1,5	2,5	1,0	1,3	1,5	1,5
Disking	1,0	6,0	10,5	15,0	2,5	2,8	5,5	6,0	1,5	1,0	2,5	3,5	1,0	1,0	3,0	4,5	1,0	1,5	1,0	4,4
No-till	2,0	4,5	6,5	9,0	2,5	5,5	8,0	5,0	1,0	1,5	7,5	2,5	1,0	1,0	3,0	2,5	0	3,2	4,5	3,6

Note: In 2010, all counts were conducted as the plowing

Conclusions. Over the years, our research found that the the gradual reduction in the number of weeds was observed in no-till plots. The lowest number of weeds in maize noted in the plowing, due to the making optimal conditions for plant growth and development. However, disking was observed by the highest number of weeds among the studied variants.

References

1. Воробйов М.Е. Загальні відомості про бур'яни / М.Е. Воробйов, І.О. Макодзеба, О.В. Фісюнов. – К.: Наукова думка, 1970. – 157 с.
2. Дояренко А.Г. Семена и всходы сорных растений / А.Г. Дояренко, П.В. Леньков. – Москва, 1925. – 84 с.
3. Задорожний В.С. Контроль бур'янів у посівах кукурудзи на зерно / В.С. Задорожний, І.В. Мовчан // Корми і кормовиробництво: міжвідом. темат. наук. зб. – Вінниця: ФОП Данилюк В.Г., 2012. – Вип. 63. – С.94–99.
4. Іващенко О.О. Бур'яни в агрофітоценозах. Проблеми практичної гербології / О.О. Іващенко – К.: Світ, 2001. – 234 с.
5. Косолап М.П. Контроль бур'янів у посівах кукурудзи за технології No-till / М.П. Косолап, І.Л. Бондарчук // Бур'яни, особливості їх біології та систем контролювання у посівах с.-г. культур : зб. наук. праць 8-ї науково-теорет. конф. Укр. наук. тов. гербологів. – К.: Колообіг, 2012. – С. 104–110.
6. Кочик Т.М. Фітоценотичний контроль бур'янів у агроценозах зони Полісся / Т.М. Кочик, Л.І. Ворона. – Збірник наукових праць ННЦ «Інститут землеробства УААН». – К.: В.Д «Екмо». – 2008. – Вип. 2. – С. 3-10
7. Манько Ю.П. Багаторічний моніторинг впливу систем основного обробітку ґрунту в зерно-просапній сівозміні на забур'яненість ріллі / Ю.П. Манько, І.В. Литвиненко // Бур'яни, особливості їх біології та систем контролювання у посівах с.-г. культур : зб. наук. праць 8-ї науково-теорет. конф. Укр. наук. тов. гербологів. – К.: Колообіг, 2012. – С. 143-149.
8. Медведєв В.В. Нульовий обробіток ґрунту в Європейських країнах / В.В. Медведєв – Харків, 2010. – 200 с.
9. Нульовий обробіток ґрунту під кукурудзу в умовах Степу / [О.І. Циліорик, А.Г. Горобець, Ю.І. Ткаліч та ін.] // Агроном. – 2011. – №4. – С. 62–65.
10. Режим доступу: <http://www.faostat.fao.org.-2010>
11. No- Tillage, Sustainable Agriculture in the New Millennium [Електронний ресурс]. – Режим доступу: <http://www.rolf-derpsch.com/no-till.-2010>. – Назва з екрану.

Анотація

Задорожний В.С., Мовчан І.В., Колодій С.В.

Влияние различных способов обработки грунта на видовой состав бур'янів при вирощуванні кукурудзи на зерно

В ході чотирирічних досліджень виявлено основні тенденції формування бур'янового ценозу під впливом різних способів обробітку ґрунту. Встановлено, що у посівах кукурудзи найменша кількість бур'янів була на ділянках, де застосовували полицевий обробіток ґрунту. Також відмічено, що протягом років досліджень на ділянках, де застосовували No-till спостерігалось зменшення кількості злакових та дводольних бур'янів.

Ключові слова: кукурудза, бур'яни, обробіток ґрунту, No-till

Аннотация

Задорожний В.С., Мовчан И.В., Колодий С.В.

Влияние различных способов обработки почвы на видовой состав сорняков при выращивании кукурузы на зерно

В ходе четырехлетних исследований выявлены основные тенденции формирования сорного ценоза под влиянием различных способов обработки почвы. Установлено, что в посевах кукурузы наименьшее количество сорняков было на участках, где применяли вспашку. Также отмечено, что в течении годов исследований, на участках, где применяли No-till наблюдалось уменьшение количества злаковых и двудольных сорняков.

Ключевые слова: кукуруза, сорняки, обработка почвы, No-till