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TANCHIK S., Doctor of Agricultural Science, Professor

PETRENKO I., post-graduate student

National University of Life and Environmental Sciences of Ukraine

e-mail: [impetrenko@ukr.net](mailto:impetrenko@ukr.net)

## HARMFULNESS OF PROBLEMATIC WEED SPECIES IN SUGAR BEET CROPS IN THE RIGHT-BANK FOREST-STEPPE OF UKRAINE

*The results of research on the harmfulness of weeds depending on the its amount level and participation in weeds formation in sugar beet crops in The Right-Bank Forest-steppe of Ukraine*

**Keywords:** sugar beet, species, weeds, crops, harmfulness, harming, harm, yield, agrophitocenoses

**Introduction.** Sugar beet is a record holder of the biological productivity of crops including moderate temperate zone of the planet. Only sugar beet can synthesize up to 28 t/ha of dry matter during the growing season under favorable conditions and maximum accumulate energy of sunlight in it to form of carbohydrates - sugars [7].

Sugar beet in Ukraine is the only raw material for the industrial production of sugar [11]. Trends in global energy development make growing of sugar beet more important not only as an industrial base production of sugar, and in fact it is inexhaustible source of bioenergy feedstock for bioethanol production [7].

Main area (80%) of sugar beet crops are located in forest-steppe zone on the black soils. Soil and climatic conditions of this area of Ukraine are the most favorable for the cultivation of this crop and disclosure of the potential of sugar beet [11].

Along sugar beet is the most selective and sensitive to the conditions of growth culture. Particularly acute sugar beet plants react to the presence of a mass of weeds that can reduce the yield of root crops up to 90% or more [7].

Weeds are competitors with crop plants using the factors of life, because their presence in the cultural agrophytocenoses unacceptable. They are highly adapted to the environment and highly competitive in crops. Damage of weeds in crop plants is very high. According to the International Organization for Food and Agriculture (FAO), losses of agricultural production from weeds and other pests around the world are estimated at 75 billion dollars. per year, which is the third part of potential harvest [4].

According to V. O. Eshchenko average global losses from weeds of sugar beet yield is 37% [5]. According to calculations probable losses from weeds in Ukraine amount to 15 million tons of sugar beets and other crop production for a total of 30 billion USD at current prices [9].

S.V. Begey has calculated that *Cirsium arvense* L. with an average weediness (5-6 plants per 1 m<sup>2</sup>) for each hectare absorbs of soil a number of nutrients, which is enough to generate 31.8 centners of winter wheat and 200 kg of sugar beet. For growing of this yield need to add to the soil more than 11 kg/ha of fertilizers [2].

According to the O.O. Ivashchenko in forest-steppe zone of Ukraine for 80 days from the start of the growing season weeds are able to take out from the soil nitrogen - 160-200 kg/ha, phosphorus - 55-90 kg/ha, potassium - 170-250 kg/ha. This amount of available nitrogen is enough to grow 4.5 t/ha of winter wheat or 39 t/ha of sugar beet. Accordingly, due to phosphorus and potassium - 4.5 t/ha of grain and 35-36 t/ha of sugar beet root crops [6].

According to research of V.K. Slobodyanyk, the degree of harmfulness of weeds influenced their period of growth with culture. Weediness of sugar beet crops during the first 30 days led to a reduction of sugar beet yield on 2.9 t/ha, 50 days - 13 t/ha, 80 days - 19 t/ha, 140 days - 24.4 t/ha [10].

*Purpose.* To determine the value of harmfulness of weeds, depending on its amount level in sugar beet crops in the Right-Bank Forest-steppe of Ukraine.

**Materials and methods.** The study was conducted in a stationary experiment of the Department of Agriculture and Herbology at the Agronomic Research Station NULES of Ukraine, Kyiv region, during 2012-2013 yy. Soil cover research areas typical black soil humus. The humus content in the plow layer soil is 4%, pH - 6.8, absorption capacity is 32,5 mh-ekv/100 g soil.

Crop rotation: alfalfa – winter wheat – sugar beet – maize silage – winter wheat – maize – pea – winter wheat – sugar beet – barley sowing with alfalfa.

For determination of harmfulness of weeds was made single-field experiments in sugar beet crops by biological farming systems.

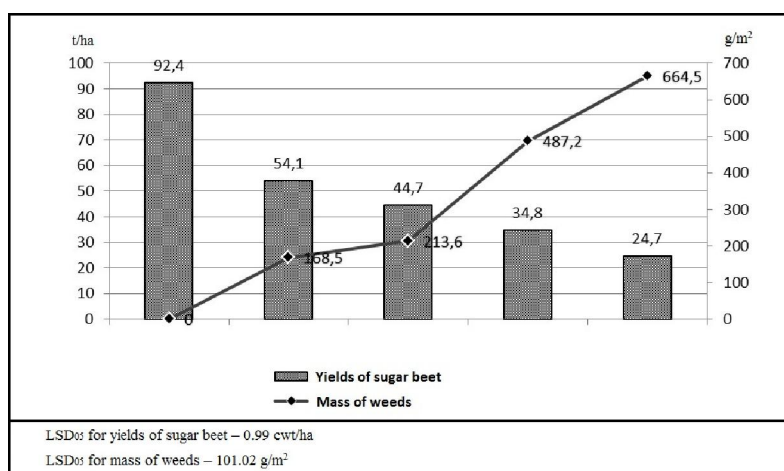
The scheme of the experiment provides the following variants in the fourfold reiteration:

1. Control 1 (without weeds)
2. Control 2 (no weeding)
3. Amount 10 pcs./m<sup>2</sup>
4. Amount 25 pcs./m<sup>2</sup>
5. Amount 50 pcs./m<sup>2</sup>
6. Amount 100 pcs./m<sup>2</sup>

Level of weeds amount of botanical abundance structures to determine its harmfulness created by the following algorithm:

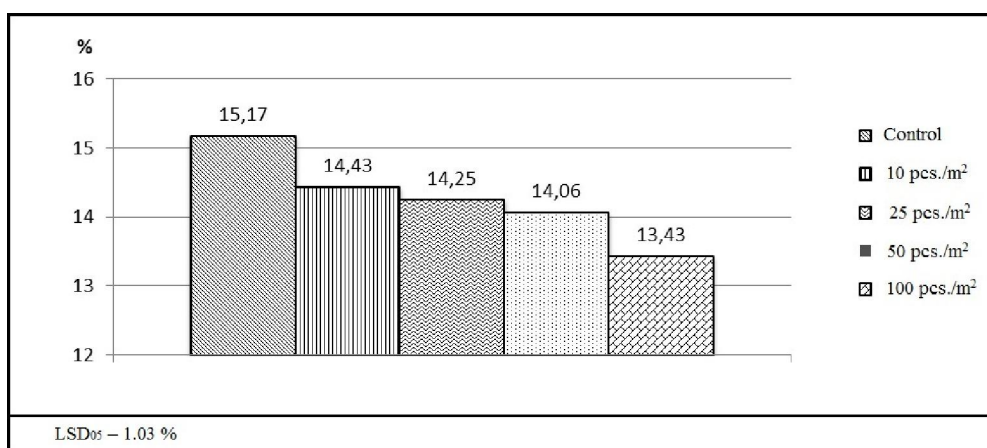
- 1) Each experimental area form the same number of crops during the growing season.
- 2) Before formation of the weediness defined botanical structure (in %) in respect of which an artificially created group of weeds for amount level and participation.
- 3) Formed by the amount level and structure supporting for cultural vegetation, removing new shoots.
- 4) Before harvesting determined aboveground mass of all weeds by type in air-dry condition.
- 5) Determine the yield of sugar beet and yield losses from weeds.
- 6) Calculate the fraction of the damage caused by each type of weeds as part of their group for the defined proportion of their above-ground mass.
- 7) Calculate the harmfulness of weeds in sugar beet crops.

**Results and discussion.** Quantitative and weight weediness of crops at harvest time objectively reflect the end result of a competitive relationship in agrophytocenoses. This result appears size of damage from weeds, pronounced decrease in the yield of crops.



**Fig. 1. Influence of weediness and weeds mass on the yield of sugar beet (average for 2012-2013)**

Research has established that between the amount of weediness and yield of sugar beet there is a strong inverse correlation ( $r = -0,96$ ). The same dependence is observed between the mass of weeds and yield of sugar beet ( $r = -0,85$ ).



**Fig. 2. Influence of weediness on sugar content in sugar beet (average for 2012-2013)**

Research has shown a negative impact of crop weediness on sugar content in sugar beet. This shows a strong inverse correlation ( $r = -0,92$ ).

Established that the value of harmfulness of certain weed species impact the amount of crops weediness, it is shows strong inverse correlation ( $r = -0,76$  to  $-0,9$ ). In this case, the phenomenon of reversion: the lower amount of weeds harm is much greater than in most of their amount as few weeds form a large vegetative mass and thereby exacerbate the harmful effects on crops. Therefore, to obtain objective data on the average yield losses, we investigated the harmfulness of weeds under different of weediness levels.

*Table 1*

**Harmfulness of weeds depending on their amount levels in crops of sugar beet (average for 2012-2013)**

Weed species	Harmfulness of weeds kg/ha for 1pcs./s <sup>2</sup>					LSD05
	10 pcs./m <sup>2</sup>	25 pcs./m <sup>2</sup>	50 pcs./m <sup>2</sup>	100 pcs./m <sup>2</sup>	Average	
<i>Setaria glauca</i> L.	30,93	10,62	8,72	3,37	13,41	4,65
<i>Echinochloa crus-galli</i> L.	38,18	15,11	6,89	4,69	16,22	6,31
<i>Amaranthus retroflexus</i> L.	69,12	31,25	13,33	9,39	30,77	3,8
<i>Chenopodium album</i> L.	95,32	42,74	18,20	10,77	41,76	4,97
<i>Elytrigia repens</i> L.	22,06	14,82	5,39	2,66	11,23	3,34
<i>Cirsium arvense</i> L.	36,40	15,78	13,05	9,32	18,64	3,03

Most harmful are dicotyledonous weeds, especially *Chenopodium album* L. The losses of 1 pcs./m<sup>2</sup> is 95.32 kg/ha of sugar beet by amount levels of 10 pcs./m<sup>2</sup>. This is achieved through a more vegetative mass than other weed species.

**Conclusions.** Research has established strong inverse correlation between weed amount and its mass with harmfulness and yield of sugar beet. Determined the harmfulness of most problematic weed species in sugar beet crops depending on their amount and participation in weeds group. This information is obtained in the long-term observations can be used to concretization of harmfulness module of certain weeds amount with corresponding botanical structure.

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#### *Анотація*

**Танчик С.П., Петренко І.М.**

**Шкодочинність проблемних видів бур'янів у посівах буряків цукрових Правобережного Лісостепу України**

Наведено результати досліджень щодо шкодочинності бур'янів залежно від ступенів їх рясності та участі в бур'яновій синузії в посівах буряків цукрових Правобережного Лісостепу України.

**Ключові слова:** буряки цукрові, види, бур'яни, посіви, шкодочинність, шкідливість, шкода, урожайність, агрофітоценоз

#### *Аннотация*

**Танчик С.П., Петренко И.М.**

**Вредоносность проблемных видов сорняков у посевах сахарной свеклы Правобережной Лесостепи Украины**

Приведены результаты исследований по вредоносности сорняков в зависимости от степени их обильности и участия в сорной синузии в посевах сахарной свеклы Правобережной Лесостепи Украины.

**Ключевые слова:** сахарная свекла, виды, сорняки, посева, вредоносность, вредность, вред, урожайность, агрофитоценоз