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HARMFULNESS OF COCKLEBUR (*XANTHIUM ALBINUM* (WIDDER) H. SCHOLZ) AND CHEMICAL MEASURES OF ITS CONTROL IN SUNFLOWER SOWINGS

In this article the results of field experiments on harmfulness Cocklebur and efficiency of its control and other weeds by means of herbicides in the conditions of a left-bank part of the Steppe zone of Ukraine are resulted.

Keywords: harmfulness, Cocklebur, control measures, herbicides, sunflower

Introduction. Throughout last decade in connection with changes of ecological conditions of existence and managing systems in agrophytocenoses of Steppes of Ukraine the increase in a share of new kinds of weeds was observed, the majority from which become malicious weeds which are capable to lead to considerable losses of an yield and economic losses.

One of such harmful weeds is Cocklebur (*Xanthium albinum*) which native land is the South America. It has been brought to Ukraine from the central Europe and for the first time V.V. Protopopova in 1964 in the Poltava and Kharkiv areas is revealed [5]. Later the weed has extended on the south and the east of Ukraine and for last decade it has increased presence territory almost in 30 times and now fouls the cereal crops, fodder and vegetable cultures in all Steppe zones of Ukraine, every year expanding an area and thickening the populations [2].

Cocklebur – the dicotyledonous, annual summer weed from family *Asteraceae*, seedlings which, as a rule appear simultaneously with sunflower shoots. It develops the big above ground mass (to 600 – 900 g), the leaf apparatus (to 1,1 – 2,3 m²), reaches heights 110 – 140 cm, removes the significant amount of nutrients and water from soil in consequence of which it can essentially complicate harvesting takes out and can reduce productivity of cultural plants, worsen quality of production. Compound fruits, getting to green mass, straw and other forages can cause the diseases and a cattle poisoning, to spoil wool and skin of animals [2, 5].

However it is not enough data about biological features of growth and development of Cocklebur in agrophytocenoses for working out of effectual measures of the control. In this connection the purpose of our researches was to define injuriousness Cocklebur in crops of sunflower and to pick up herbicides for its destruction

Materials and methods. Field researches had been conducted since 2011 till 2013 years in accordance with the standard techniques on the soils of the rural farm «Zhytnytsya» located in the Left-bank part of the Steppe zone [1, 3, 4].

A hybrid of sunflower Liman sowed by means of wide-row method in 3 decade of April. The plant stand density made 50 thousand/hectare. As the predecessor was winter wheat. The calculation area of plot in modeling experiment on studying of harmfulness of weeds made 8,4 m², and in experiment with application of herbicides – 28 m². The replication of test was sixfold.

In modeling experiment simultaneously with sunflower crops we sowed compound fruits of Cocklebur, and after occurrence of shoots we formed the planned level of weediness, deleting manually superfluous plants of Cocklebur and other kinds of weeds.

In other field experiment we studied efficiency of application of herbicides Atsetogan 900 c.e., Prometrex 50 c.e., Raiser 25 c.e., Triflurex 48 c.e. and their mixes. Herbicides had been applied by means of backpack sprayer «Orion» under presowing cultivation with norm of a working liquid from calculation of 250 l/hectare.

The weather conditions in days of carrying out of experiments were unequal. In 2011 during sunflower vegetation (May – September) has dropped out 293,3 mm of precipitations, relative atmospheric humidity made 68,2 %, the sum of effective temperatures 1518⁰C, in 2012 – 140,8

mm, 61,0 %, 1751⁰C, in 2013 – 185,7 mm, 61,4 %, 1571⁰C accordingly. Average long-term indicators made 242 mm, 65,0 %, 1352⁰C accordingly.

Results and discussion. By experiments it has been established, that in all years of researches in sunflower agrophytocenoses the difficult type of weediness with domination of such annual weeds, as Cockspur grass (*Echinochloa crusgalli* (L.) P. Beauv.) – 19,5%, Yellow bristle grass (*Setaria pumila* (Poir.) Roem. & Schult.) – 15,4%, Annual ragweed (*Ambrosia artemisiifolia* L.) – 10,8%, Cocklebur (*Xanthium albinum*) – 10,2%. Other kinds of weeds: Redroot amaranth (*Amaranthus retroflexus* L.), Charlock mustard (*Sinapis arvensis* L.), Carelessweed (*Cyclachaena xanthiifolia* (Nutt.) Fresen), Black nightshade (*Solanum nigrum* L.), Wild radish (*Raphanus raphanistrum* L.), Wild oat (*Avena fatua* L.), Drug fumitory (*Fumaria officinalis* L.) etc. are founded across in a smaller measure or incidentally. Long-term weeds – Field bindweed (*Convolvulus arvensis* L.), Canada thistle (*Cirsium arvense* (L.) Scop.), Blue lettuce (*Lactuca tatarica* (L.) C. A. Mey.), Spurge (*Euphorbia virgata* Waldst. & Kit.) etc. in the general weediness of crops occupied 1,0 – 1,5 %. As a whole the ratio of monocotyledonous (42%) and dicotyledonous (46%) annual weeds on the average for years of researches was almost equal. In separate years (2012) prevailed the monocotyledonous kinds (54%) of weeds, in others (2011, 2013) – dicotyledonous weeds (53 – 56%).

The general profuseness of all kinds of weeds was within 182 – 207 pieces/m².

High harmful action of Cocklebur was found out already at presence in crops of sunflower of two plants of weeds on 1 m². The height of cultural plants decreased in comparison with control plants on the average for 3 cm, the crude above ground mass decreased on 300 g/m², and productivity of seeds was less on 14 % (Table 1).

The further increase in the profuseness of weeds of Cocklebur was accompanied by the still greater negative influence on growth, development and formation of yield of sunflower. So, the height of plants of sunflower at presence in crops 4 – 6 pieces /m² these weeds decreased on 11 – 25 cm, mass – on 700 – 1200 g/m², seed productivity – on 28,3 – 41,9 %. At number 8 – 10 pieces /m² the crude mass of Cocklebur exceeded the mass of sunflower, and losses of yield of sunflower made more half from the possible. The maximum yield depression (59,6 – 66,9 %) we were observed at number of weeds 10 – 12 pieces/m².

Table 1

Harmfulness of Cocklebur in crops of sunflower, on the average for 2011-2013 years

Profuse-ness of Cockle-bur, piece/m ²	Height of plants, cm		Crude above ground mass, g/m ²		Yield of sunflower seeds, t/ha	Yield depression in relation to the control	
	cocklebur	sunflower	cocklebur	sunflower		t/ha	%
2	69	170	800	4300	2,34	0,38	14,0
4	81	162	1300	3900	1,98	0,74	28,3
6	87	148	1900	3400	1,58	1,14	41,9
8	91	131	2300	3000	1,33	1,39	51,1
10	94	120	2800	2500	1,10	1,62	59,6
12	98	116	3100	2300	0,90	1,82	66,9
HIP ₀₅ , t/ha					0,22		

Accumulating a huge biomass and having the high competitive capacity, Cocklebur at the profuseness 8 pieces/m² absorbed from soil 71,8 kg/hectare of nitrogen, 85,4 kg/hectare of phosphorus and 204 kg/hectare potassium or nearly so as much, how many and the sunflower, and water is more on 64 m³/hectare.

At such high weediness of crops the mechanized control measures have appeared ineffective. The destruction of weeds at carrying out preseedling harrowing of crops and 2 inter-row cultivations did not exceed 57%, including Cocklebur 71%. Then, the action of all herbicides against weeds has appeared above. Reduction of the general level of weediness of crops made 70 – 74%. And herbicidal activity of Atsetogan and Triflurex was the highest in 2012 year when in crops prevailed the cereal weeds, and in other years was more effective herbicides Raiser and Prometrex. The same preparations were more effective and against Cocklebur, destroying it on 76 – 81% (Table 2).

The essential increase in efficiency and expansion of a spectrum of action of these herbicides without increase of norm of consumptions was reached at application of their mixes. The destruction of all kinds of weeds reached 81 – 84%, and doses of separate components of mixes decreased on 40 – 50%. And, Cocklebur was although as sensitive to mixes of herbicides and the destruction of weeds was reached 86 – 95%.

Table 2

Influence of herbicides and their mixes on the weediness of crops of sunflower, a stage of formation of heads, (2011 - 2013)

Variants of experiment	Norms of consumption of herbicides, l/ha	Quantity of weeds, piece /m ²		Destruction of weeds, %		Yield of seeds, t/ha
		altogether	including Cocklebur	altogether	including Cocklebur	
The control 1 (without crop management)	0	195	21	0	0	0,83
The control 2 (pure from weeds)	0	0	0	100	100	3,14
Mechanical management (preseedlings harrowing + 2 inter – row cultivations)	0	84	6	57	71	1,88
Prometrex 50, c.e.	3,0	54	5	72	76	2,25
Raiser 25, c.e.	3,0	50	4	74	81	2,36
Atsetogan 900, c.e.	2,5	56	13	71	38	2,18
Triflurex 48, c.e.	4,0	58	12	70	43	2,16
Prometrex + Atsetogan	1,5+1,5	38	3	81	86	2,60
Prometrex + Triflurex	1,5+2,0	34	2	83	90	2,77
Raiser + Atsetogan	1,5+1,5	36	2	82	90	2,63
Raiser + Triflurex	1,5+2,0	31	1	84	95	2,89
HIP ₀₅				0,14		

Considerable reduction of the weediness of crops of sunflower in variants of application of mixes of herbicides created favorable conditions for growth, development and formation of yield of seeds of sunflower (see table 2).

The maximum increases of the yield of sunflower seeds in comparison with plots without carrying out of crop management (1,94 – 2,06 t/hectare) and with the mechanized management (0,89 – 1,01 t/hectare) had been provided by mixes of herbicides Raiser (1,5 l/hectare) and Prometrex (1,5 l/hectare) with Triflurex (2,0 l/hectare). The increases of yield of sunflower from application of mixes of the same herbicides with Atsetogan were on the sufficiently large level (1,77 – 1,80 t/hectare and 0,72 – 0,75 t/hectare accordingly).

Application of mixes of herbicides was although the most expedient and according to economic and bioenergetical indicators. The maximum recoupment of material and energetical expenses (4,8 – 5,1 times) was reached in variants of application of herbicides Raiser and Prometrex with Triflurex.

Conclusions. In the Left-bank part of the Steppe zone of Ukraine in sunflower crops the high harmful action renders Cocklebur, which causes losses of yield of seeds (14,0 – 28,3 %) even at minimal level of weediness (2 – 4 pieces/m²).

At the profuseness of Cocklebur on the level 10 – 12 pieces/m² is lost 60 – 67% of the possible crop yield. The maximum protection of crops from Cocklebur and other weeds in sunflower crops is provided at application of mixes of herbicides Prometrex (1,5 l/hectare) and Raiser (1,5 l/hectare) in aggregate with Atsetogan (1,5 l/hectare) and Triflurex (2,0 l/hectare) which reduce the weediness of crops on 81 – 84 %.

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Анотація

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Шкідливість нетреби ельбінської (*Xanthium albinum* (Widder) H. Scholz) та хімічні заходи її контролю в посівах соняшника

У статті наведено результати польових дослідів шкідливості нетреби ельбінської та ефективності контролю її та інших бур'янів за допомогою гербіцидів в умовах лівобережної частини Степової зони України.

Ключові слова: шкідливість, нетреба ельбінська, заходи контролю, гербіциди, соняшник

Аннотация

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Вредоносность дурнишника эльбинского (*Xanthium albinum* (Widder) H. Scholz) и химические методы его контроля в посевах подсолнечника

В статье приведены результаты полевых опытов вредоносности дурнишника эльбинского и эффективности контроля его и других сорняков при помощи гербицидов в условиях левобережной части Степной зоны Украины.

Ключевые слова: вредоносность, дурнишник эльбинский, методы контроля, гербициды, подсолнечник