UDC:633.1:631.5:631.67:(477.7)
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WEEDINESS OF MILLET AND BUCKWHEAT STUBBLE IN THE INTERMEDIATE SOWING AFTER OIL-BEARING FLAX IN THE SOUTH OF UKRAINE

The results of research on studying the impact of fertilizers, soil tillage, row spacing and irrigation mode on the weediness of millet and buckwheat stubble in the steppe zone of southern Ukraine are presented.

Keywords: *millet , buckwheat, intermediate sowing, nourishment background, soil tillage, irrigation mode, row spacing, weediness*

Introduction. In recent decades, the quality of food consumed by the basic groups of population has worsened significantly, the intake of protein produce being especially low. Providing people with protein is performed by the use of proteins of animal and plant origin, about 50% of each group. The production of animal proteins is a high-cost one, that is why people are searching for the ways for their partial replacement by plant proteins. The priority direction of the plant proteins production in the world is the growing of legumes, however, cereal crops, including millet and buckwheat, are also a valuable source of plant proteins.

Besides the fact that due to their chemical composition and nutritious qualities cereal crops have a great nutritious value, they are also good forecrops for other ones, being used for resowing both winter and spring crops, as well as for green manure. But the most reasonable cultivation of millet and buckwheat is observed in the stubble crops, especially in the regions with a long frost-free period and an adequate rainfall or under irrigation.

Weeds are among the factors that affect the crop yields, make the produce quality worse, increase the cost of production, cause the spreading of diseases and pests.

Stubble crops are considered to be one of the measures for regulating weeds, they strongly suppress their number, thereby reducing the herbicide cost and improving the ecological purity of the produce obtained [1].

According to the data [2, 3], in the initial phase of development, especially during germination when plants achieve a height of 15-20 cm, due to its slow growth millet is strongly suppressed by weeds, in particular by barnyard grass, field thistle, bindweed and mayweed.

However, millet weediness depends not only on the physiological, but on the factors of production as well. According to V.M. Novikov [4], the application of surface and flat soil tillage increases the number of weeds in millet crops by 2,4-3,3 times, which is the main factor of its yield reduction.

O. V. Averchev [5] states that stubble millet on non-fertilized soils is mainly weeded by cereal weeds, and by dicotyledonous ones on fertilized soils.

Buckwheat, on the contrary, suppresses weeds in the first phase of the growing season, but in the period of mass blossoming and fruit browning the plant's growth stops, and the weeds begin to grow rapidly, shadowing the crops, which in turn leads to the spreading of botrytis and ascochyta-leaf spot [6].

In addition [3] notes that in Ukraine buckwheat acreage is 90% weeded, 1% of which having weediness to 5 pieces per 1 m^2, 40 % of the area - 6-15 pieces per 1 m^2 and 11%- more than 100 pieces per m^2. However, according to R. Y. Havrylyanchyk [7] buckwheat weediness in late sowing depends only on its forecrops.

The research objective is to develop and improve the technology of millet and buckwheat cultivation in the intermediate sowing after oil-bearing flax on the irrigated lands of southern

Ukraine, namely the level of mineral nutrition, presowing background, row spacing and irrigation mode that make it possible to reduce the level of weediness of the investigated crops.

Materials and methods. Studying the technology of millet and buckwheat cultivation in the oil-bearing flax stubble on the irrigated soils in the south of Ukraine was carried out by setting four-factor field experiment, which was based on the method of split sections according to the requirements for conducting field experiments, the case study of the SPA "Driada", Genichesk district, Kherson region during 2006-2008.

The experiment's pattern is represented by the following factors and their variants: factor A – nourishment background - without fertilizers, $N_{45}P_{60}$, $N_{90}P_{120}$; factor B - pre-sowing background - stubble, ploughing 20-22 cm deep; factor C - row spacing of 23 and 46 cm; factor D - irrigation mode – pre-watering soil moisture of 60-65 % and 70-75% of NS. The experiment's frequency is four times.

General agricultural cultivation of oil-bearing flax and cereal crops in the intermediate crops in the field experiments is commonly accepted for this area, with the exception of the factors and options studied. When growing intermediate crops, mineral fertilizers are applied according to the pattern of the experiment during tillage: ammophos and ammonium saltpeter are used as fertilizers. Ploughing is held by the plough PLN-5-35 into 20-22 cm. Millet sowing is carried out by the drill CZC-2,1. During the growing season irrigation is performed by the irrigation system "Center Linear" according to the experiment's pattern. The yield is harvested in a separate way when 75% of the plants has ripened.

Results and discussion. Our research shows that fertilizers, soil tillage, row spacing and irrigation mode affect the weediness of millet and buckwheat stubble crops (Table 1).

The highest weediness rate of the intermediate crops of millet and buckwheat is observed while seeding in stubble with row spacing of 46 cm with maximum standards of fertilizers and pre-irrigated soil moisture of 70-75%.

Nourishment background significantly influences the number of weeds in the intermediate crops, i.e, raising the rate of chemical fertilizers, we increase the weediness of crops.

When applying the fertilizers of $N_{45}P_{60,}$ the number of weeds at the beginning of the growing season of millet and buckwheat is 14.4 and 16.5 % higher, before harvesting it increases by 26.1 and 19 %, respectively, in comparison with non-fertilized options. When increasing the fertilizers' rate up to $N_{90}P_{120}$, this index rises at the beginning of the growing season and before millet harvesting, by 27.1 and 56.3 %, on the average, and in the case of buckwheat – by 32.2 and 35.6 %, respectively.

In the south of Ukraine under arid climatic conditions, the main factor of competition between weeds and cultural vegetation is moisture reserve in the soil, which can be controlled by means of optimum irrigation modes.

Our research has determined that in the options with pre-irrigated soil moisture of 70-75% a larger number of weeds is observed at the beginning of the growing season as well as before harvesting the crops studied, compared to less intensive irrigation mode (soil moisture of 60-65%) Thus, at the beginning of the growing season the weediness of millet and buckwheat crops in the areas with pre-irrigated soil moisture of 70-75% is 37.7 and 16.4% higher than in the areas with pre-irrigated soil moisture of 60-65%, and before harvesting it is 12.5 and 15.9% higher, respectively.

Decreasing the tillage depth in our experiments, we raise the weediness of cereal crops. Ploughing 20-22 cm deep at the beginning of the growing season of millet and buckwheat, the number of weeds is 11.7 and 25 % lower, respectively than in the options with stubble sowing.

Row spacing also affects the weediness of crops. The experiments have shown that applying the row spacing of 46 cm in the both crops, a larger number of weeds is observed compared to the one of 23 cm.

Table 1

Weediness of millet and buckwheat in stubble crops depending on the factors studied, pieces per m^2

Presowing background	Nourishment background	Row spacing, cm	Weediness of crops, pieces per m^2			
			Millet		Buckwheat	
			Beginning of growth	Before harvesting	Beginning of growth	Before harvesting
Pre-irrigated soil moisture of 60-65%						
Stubble	Without fertilizers	23	**5,3**	**18,2**	**8,1**	**26,3**
		46	**5,8**	**18,9**	**10,7**	**28,5**
	$N_{45}P_{60}$	23	6,4	22,6	9,6	32,5
		46	7,1	23,7	10,3	34,3
	$N_{90}P_{120}$	23	**6,9**	**28,5**	**10,5**	**37,8**
		46	**8,0**	**29,6**	**11,1**	**39,6**
Ploughing, 20-22 см deep	Without fertilizers	23	4,2	14,5	5,4	20,9
		46	4,9	15,5	6,0	23,2
	$N_{45}P_{60}$	23	**5,1**	**17,3**	**7,2**	**25,4**
		46	**6,0**	**18,7**	**7,8**	**28,1**
	$N_{90}P_{120}$	23	6,3	22,1	7,9	29,3
		46	7,1	24,6	9,3	30,8
Pre-irrigated soil moisture of 70-75%						
Stubble	Without fertilizers	23	**7,8**	**19,0**	**9,7**	**29,1**
		46	**8,2**	**20,2**	**10,9**	**32,2**
	$N_{45}P_{60}$	23	8,5	25,9	10,8	35,7
		46	9,3	27,3	11,8	38,9
	$N_{90}P_{120}$	23	**9,1**	**31,6**	**12,1**	**40,3**
		46	**9,9**	**32,9**	**12,9**	**44,9**
Ploughing, 20-22 см deep	Without fertilizers	23	6,9	16,8	6,3	27,4
		46	7,8	18,2	7,4	29,6
	$N_{45}P_{60}$	23	**7,6**	**20,1**	**8,4**	**30,1**
		46	**8,2**	**22,6**	**9,2**	**33,5**
	$N_{90}P_{120}$	23	8,3	24,3	10,5	35,6
		46	9,1	27,2	11,0	36,2

Conclusions. The stubble millet crops are less weed-infested than the crops of buckwheat, which depends on the biological peculiarities of the mentioned cereals and the factors studied. A less number of weeds in millet (14.5 pieces per m^2) and buckwheat (20.9 pieces per m^2) crops before harvesting is observed when applying the ploughing into the depth of 20-22 cm, row spacing of 23 cm, without fertilizers and irrigation. Pre-irrigated soil moisture is equal to 60-65 %.

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Анотація

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Забур'яненість післяжнивних посівів проса та гречки в проміжних посівах після льону олійного в умовах півдня України

Наведено результати досліджень з вивчення впливу мінеральних добрив, обробітку грунту, ширини міжрядь і режиму зрошення на забур'яненість післяжнивних посівів проса й гречки в умовах південного Степу України.

Ключові слова: *просо, гречка, проміжні посіви, фон живлення, обробіток грунту, режим зрошення, ширина міжряддя, забур'яненість*

Аннотация

Чернышова Е.О., Марковская Е.Е.

Засоренность пожнивных посевов проса и гречихи в промежуточных посевах после лена масличного в условиях юга Украины

В статье отражены результаты исследований по изучению влияния минеральных удобрений, обработки почвы, ширины междурядий и режима орошения на засоренность пожнивных посевов проса и гречихи в условиях южной Степи Украины.

Ключевые слова*: просо, гречиха, промежуточные посевы, фон питания, обработка почвы, режим орошения, ширина междурядий, засоренность*