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## SELECTION OF OPTIMAL TECHNICAL MEANS DURING THE PROCESSING OF WHEAT AGAINST AGRICULTURAL PESTS

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*The question of choosing the best technical means in the processing of winter wheat against pests during the growing period is considered on the example of a farm located in the Limansky district of the Odessa region (Ukraine). The climatic condition that has been considered affects the cultivation of this crop, and the composition of the soil. The question of identifying the main types of pests has been analyzed during the cultivation of the selected crop, which are common in the area. A general analysis of plant protection products against pests has been carried out. The calculation of the optimal choice of drugs, taking into account the minimum cost for pest control. The composition of the main technical means for the treatment of crops against pests during the growth of crops has been analyzed. The compressed comparative characteristics of some of the most common sprayers are considered. The optimal composition of technical means is proposed. The recommendations for the use of drug choice and the composition of basic technical means were developed.*

**Key words:** agricultural potential, grain crops, winter wheat, insecticide, fungicide, agricultural pests, plant protection, front-mounted sprayer, trailed, pricing.

**Introduction.** Agriculture is one of the priority sectors of the national economy of Ukraine today. The development of agriculture contributes to raising the material well-being of the population, strengthening the economic country's and food security, as well as increasing export potential. The country has a favorable geological and geographical location, and the climatic conditions are favorable for conducting favorable competition in agriculture. The agrarian potential of Ukraine is the basis of ensuring the integration of the national economy into the world. The agricultural sector of production is one of the most risky sectors of the economy, because its development is influenced by natural and biological factors [1]. Grain crops have the highest proportion in the structure of crops and gross crops. This is due to their exceptional value and versatile use. Grain is the main and irreplaceable feed in the production of livestock products. It has a significantly higher nutritional value compared to other types of feed, characterized by high content of feed units, digestible protein, macro- and microelements. The feed is also used as a by-product of growing crops-straw and floor. Crop production is a raw material for the processing industry. For example, as a result of grain processing, alcohol, starch and other products are obtained, from straw - cellulose, paper and so on. Cereal is an important export product that should provide substantial cash inflows. The grain practically does not lose its qualities when stored and therefore suitable for the

creation of state reserves of food and feed. Wheat is one of the most widespread crops in the world and one of the main products of human consumption, because it is used for the preparation of different types of products: it is refined flour, coarse meal, bran, beer. Wheat has high caloric content, it provides 339 calories per 100 grams; it contains: carbohydrates; saturated, unsaturated and monounsaturated fats; proteins, vitamins and minerals. Odessa region is an important link in the agro-industrial complex of Ukraine. The climate is damp, moderately continental, combining the features of continental and marine. Winter is mild, snowless and unstable; the average air temperature is "minus" 2°C in the south to "minus" 5°C in the north. There are strong winds, 7 ... 15 m / s, especially in February in the southern part of the region. The spring is characterized by cloudy weather, fogs due to the cooling effect of the sea. Summer is mostly hot, dry; average July temperature from 21°C in the northwest to 23°C in the south; maximum 36 ... 39°C (in recent years and more). The autumn is lasted, warmer than spring, mostly cloudy. The average annual temperature ranges from 8.2°C in the north to 10.8°C in the south. The total rainfall is 340 ... 470 mm per year, mainly falls in the summer (often it is in the form of storms). The number of hours of sunshine is about 2,200 per year. The duration of the growing season is 168 ... 210 days, with a total temperature of 28 to 34°C. The most characteristic soils are black southern and common, medium and low-humus; black earths are predominantly non-humus and pious in the north. The black soils of southern saline are in the seaside part of the region. The activation of microbiological processes in the development of black soil contributes to the mobilization of nitrogen and phosphorus, so the sprouted black soils differ in the high content of nutrients available to plants [4]. There are more than 2.5 million hectares of agricultural land in the region, including more than 2 million hectares of arable land, over 80 thousand hectares of vineyards and orchards. Almost 10% of the cultivated land is irrigated due to the arid climate (especially dry in the south of the region). In the crop production of the Odessa region, the grain economy occupies the leading place. The winter wheat, barley, corn, millet, rice and corn are grown here. The powerful flour-grub industry has been on the basis of the grain industry [1]. Some data for September 1, 2018 in the Odessa region are given in Table 1 [2, 3].

**Table 1. The indicators of harvesting of agricultural crops are in the Odessa region for September 1, 2018.**

The name of the culture	Gross fee		Crop capacity	
	thousand tons	in percentages until 1.09.2017	quintals per 1 hectare	in percentages until 1.09.2017
Cereals and legumes *,	3555,9	93,7	35,3	94,5
including:				
wheat	2335,5	99,8	37,9	95,1
barley	1148,2	88,5	34,0	95,0
Rape and colza	343,1	130,5	23,3	97,7
Sunflower	199,0	159,8	23,8	101,8

Note: \* In the initial weight that was taken into account.

From Table 1, we see that wheat has been occupying a major place among grain crops grown in the Odessa region, both in terms of gross harvest and yield. Thus, a major issue in the grain industry is the issue of growing and storing the crop and, subsequently, the quality of grain.

**The problem.** The following signs and reasons for the weak development of the agricultural sector of the Odessa region can be distinguished: the high degree of cultivation of agricultural products does not provide traditional technologies that do not meet the world standards.

As a result:

- the yield is not high enough;
- the structure of exports is mainly raw material.

The answer to the general question of preserving the yield and quality of the grain is given by the system of protection of winter wheat from the influence of harmful objects. In each individual case, the choice of terms, dosages and combination of drugs is determined taking into account the specific conditions of the economy, or rather, each field. In addition, the diversity of modern engineering on designs and technological parameters also requires a careful approach to the regulations for the use of plant protection products in each individual case.

**The purpose of research.** The purpose of the following studies was to analyze the composition of the main technical equipment for the treatment of crops against pests in the period of cultivation. The objective is to determine the main objectives of the study:

- analyze the climatic conditions affecting the cultivation of this culture, the composition of the soil of the farm, located in the Limansky district of the Odessa region;
- studying the issue of identifying the main types of pests during the period of cultivation of the selected agricultural crop, which are distributed in the area;
- to conduct a general analysis of means for protecting plants from pests, to calculate the optimal choice of drugs for controlling pests, taking into account the minimum costs;
- considering the modern technique used in the treatment of wheat against pests, according to designs and technological parameters;
- developing recommendations for the optimal use of technical means.

**The results of the research.** The phytosanitary inspection is an important link in the plant protection system. The effectiveness of drugs is covered by the stage, intensity of development, general biology and species composition of harmful objects. Of course, dry weather is more conducive to the development of harmful insects, and moisture - diseases and weeds. In conjunction with the knowledge of the phytosanitary situation, this allows in some cases to conduct preventive treatment before the appearance of harmful objects or at the very beginning of their development, which will provide maximum efficiency. It should be noted that the propagation of the technology of minimal or "zero" soil treatment brings its specificity into the system of protection. At the same time, the amount of weed seeds in the upper layer of soil increases significantly, and the number of harmful

insects and microorganisms that hibernate in the cultivar remains also increasing. Accordingly, the role of pesticides for the preservation of crop and quality is increasing. Drugs used to protect plants from pests and diseases are divided into several types according to a number of criteria.

1. By chemical composition, preparations are divided into:

- the inorganic compounds (compounds of mercury, copper, barium, phosphorus, etc.);
- the organic (synthetic, organochlorine, organophosphorus, etc.);
- the biogenic (based on the products of vital functions of fungi, bacteria, plants, viruses).

2. By the object of influence, the drugs are divided into herbicides (from weeds); fungicides (from fungal infection); acaricides (from ticks); insecticides (from insects); rodenticides (from rodents); bactericides (from bacteria).

3. By the nature of action:

- the systemic pesticides - drugs that are able to penetrate inside the plant and destroy the harmful object;
- the contact pesticides - have a negative impact on the harmful organism in direct contact.

4. By the method of penetration distinguish preparations of intestinal action (acting on the pest when absorbed by the treated parts of the plant); contact action (penetrate the tissues of the pest through its outer covers); fumigants (penetrate the organism of the pest through its airways).

Plant protection products can be produced in various forms - in the form of suspensions, granules, powders, concentrates, emulsions, tablets, etc. In the wheat and barley crops, a very high level of settlement with the bread trips and aphids is now observed. On the background of drought, their harmfulness increases in geometric progression. At the same time, the damage to the crops with sharp-edged bugs and the high density of egg bugs of the bug of the turtle are noted [5]. They should be immediately monitored for pests before processing crop crops. Therefore, the fields are treated with systemic insecticides (insectoacaricides) to choose from (Table 2). In this table, the unit cost of a drug is given on 10/01/2018, depending on the inflation rate, the cost may vary. The most widespread preparations of different manufacturers for combating pest complexes are presented. As a rule, taking into account the development of cereals in the phase of the flag leaf, this treatment can be combined with fungicides, leaf feeding, which will reduce the stress of plants from high temperatures and droughts, improve the absorption of leaf feeding and increase the resistance to stress in plants during flowering and pouring grain. Spraying is one of the main ways of using pesticides to protect crops. It consists in applying to the surface of plants, insects, soil of sprayed pesticides or their working liquids: solutions, suspensions, emulsions. By purpose sprayers are divided into field, garden, vineyard, universal, for closed soil, etc. By way of spraying the working fluid distinguish sprayers hydraulic and pneumatic. Tractor sprayers are divided into trailed, hinged and mounted [7]. Table 3 summarizes the comparative characteristics of some of the most common sprayers, depending on the capacity of the tank (from 1000 liters to 2000 liters).

**Table 2. Systemic insecticides (insectoacaricides) which were used in the cultivation of wheat [6]**

Name of the drug, manufacturer (distributor)	Pests	Unit cost of drug, UAH	Preparation consumption rate, l / ha	Expenditures for the entire processing area l / 500 hectares (maximal)	Cost, total, UAH
Borea Neo, s.c. (Ukraine)	Bread sticks, bad bug, bird beetles, aphids, leeches, trips	1283 UAH/ 5 l	0,15 - 0,3	150	38 490
	Bread ground beetle, cereal flies		0,2 - 0,4	200	51 320
Zalp, c.e. (Ukraine)	Grasshoppers, bug harmful bug, aphids, leeches, trips, cereal ground beetles, grain beetles, weevils, moth, leaf roller, moths, mites, beetle that eats peas, crucial flea beetles, rape weevil, beetles with secretive proboscis	1572 UAH / 5 l	0,2 - 0,4	200	62 880
Lamdex, c.e. (ADAMA - Israel)	Bug is a harmful turtle, aphids, leeches	625 UAH / l	0,15	150 (at double processing)	93 750
	Bread ground beetle, trips, blisters		0,2	100	62 500
Danadim Stable 40%, c.e. (Denmark)	Cereal flies, aphids, cicadas, trips, bread sawdust, bad bug, bug is a harmful turtle	300 UAH / l	1,0 - 1,5	1500 (at double processing)	450 000
Нуприд-600, s.c. (Germany)	Bread sticks, cicadas, cereal flies, aphids, striped cereal stuff	840 UAH/ 5 l (1 pack. 3360 UAH / 4x5l)	0,15 - 12,0	6000	1 008 000

**Table 3. Comparative characteristics trailed sprayers and sprayers that are mounted in the front [9]**

Name of sprayer	Width of seizure, m	The capacity of the tank, l	Aggregation with tractors	Cost, UAH
Sprayers that are mounted in the front				
JARMET	14	1000	MT3-50, MT3-52, MT3-80, MT3-82, ЮМ3-6, Т-25, Т-40	12 000
Polmark	16	1000	MT3, ЮМ3, Т-25, Т-40	19 500
Kuhn Omnis 1000	15	1000	K-700	356 852
Trailed sprayers				

Sprayer equipped with a barbell ОПШ-15А [8]	10,8; 16,2	1200	МТЗ-50, МТЗ-52, МТЗ-80, МТЗ-82, ЮМЗ-6, Т-70С	15 600
Kuhn Omnis RHX 1200L	14	1200	К-700	60 000*
Pilmet 1618 Plus	18	1600	К-700	183 162
ОП-2000-2-01 [8]	18; 21,6; 22,5	2000	те ж	150 000
Seguip 2000	18	2000	К-700	56 618
Ekosystem 2018	18	2000	К-700	157 273

Note: \* the price is negotiable.

**Conclusions.** It is proposed to use a sprayer ОПШ-15А with a capacity of 1200 liters and a seizing width of 16.2 meters As a sprayer for spreading the drug against pests of winter wheat. The proposed sprayer is attractive for the price and has a wide range of aggregation with tractors among the sprayers considered. It is recommended to use the systemic insecticide drug "Zalp", which is a capsule emulsion (Ukraine) for the protection of winter wheat during the period of growth against pests. This insecticide drug has the maximum efficiency against wheat pests and corresponds to the price level.

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## **ВЫБОР ОПТИМАЛЬНЫХ ТЕХНИЧЕСКИХ СРЕДСТВ ПРИ ОБРАБОТКЕ ПШЕНИЦЫ ПРОТИВ ВРЕДИТЕЛЕЙ**

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**Ключевые слова:** аграрный потенциал, зерновая культура, озимая пшеница, инсектицид, фунгицид, вредители, защита растений, опрыскиватель передненавесной, прицепной, ценообразование.

### **Резюме**

*Рассмотрен вопрос выбора оптимальных технических средств при обработке озимой пшеницы против вредителей в период выращивания на примере фермерского хозяйства, расположенного в Лиманском районе Одесской области (Украина). Рассмотрены климатические условия, которые влияют на выращивание данной культуры, состав грунтов. Проанализирован вопрос выявления основных видов вредителей в период выращивания выбранной сельскохозяйственной культуры, которые распространены в данной местности. Проведен общий анализ средств для защиты растений от вредителей. Приведен расчет оптимального выбора препаратов с учётом минимальных затрат для борьбы с вредителями. Проведен анализ состава основных технических средств для обработки посевов против вредителей в период роста посевов. Рассмотрены сжатые сравнительные характеристики некоторых наиболее распространенных опрыскивателей. Предложен оптимальный состав технических средств. Разработаны рекомендации применения выбора препаратов и состав основных технических средств.*

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### **Summary**

*The question of choosing the best technical means in the processing of winter wheat against pests during the growing period is considered on the example of a farm located in the Limansky district of the Odessa region (Ukraine). The climatic condition that has been considered affects the cultivation of this crop, and the composition of the soil. The question of identifying the main types of pests has been analyzed during the cultivation of the selected crop, which are common in the area. A general analysis of plant protection products against pests has been carried out. The calculation of the optimal choice of drugs, taking into account the minimum cost for pest control. The composition of the main technical means for the treatment of crops against pests during the growth of crops has been analyzed. The compressed comparative characteristics of some of the most common sprayers are considered. The optimal composition of technical means is proposed. The recommendations for the use of drug choice and the composition of basic technical means were developed.*