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The efficiency of insecticide on *Sinapis* alba

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Abstract
On seed crops of *Sinapis* alba on sod-weakly podzolic soil the main phytophages - wavy, black cruciferous fleas, blossom beetles, cabbage, grass, mustard bugs and cabbage aphids are revealed. The high efficiency of the insecticide Sumi-Alpha with a flow rate of 0.2 L/ha-93.5-99.3 % was established. The efficiency of the microbiological preparation of bitoxybacillin with the consumption rate of 4 kg/ha was 85.5-100.0 %.

Keywords: *Sinapis* alba, testes, pests, number, protection, insecticide, efficiency

Introduction
Sinapis ALBA is a multi-purpose crop. It is cultivated for forage, green manure and as a honey plant. Belongs to Brassicaceae, has bright yellow flowers and the growing season is up to 79-84 days. It grows well and gives seeds in the North-West region of Russia. In sectpests (phytophagous) reduceseed yield by 15-25% or more.
Phytosanitation control of sowing with an assessment of the phytophagous influence, with the establishment of their development and distribution is the most important condition for the development of protection against insect pests [1, 2].
The problem statement is that the Vologda Regionhas not studied the species composition of phytophagous, abundance dynamics, and protection against pests.
The purpose of the article was to identify the main pests, its numbers and the protection from insect pests.

Means and Methods
The work was performed at the Department of Horticulture, Agriculture and Agrochemistry of the Vologda State Dairy Farming Academy. Record plots were laid annually since 2010 on the experimental field of the Academy. The soil of the experimental field is soddy and slightly cryptopodzolic, medium loamy, the thickness of the plough-layer is 20-22 cm, the humus content is 2.6%, the presence of labile phosphorus is 125 mg per 1 kg of soil, exchange potassium is 100 mg per 1 kg of soil, pH of salt extract is 5.2. The plots size is 5x2 m (10 m^2), the record plot is at least 15 m^2. The repetition of the experiment is fourfold, the plots allocation is systematic [3, 4]. Observations were carried out during the growing season of *Sinapis* ALBA, from May to September. The calculations were carried out once a decade. Pests were collected using a standard butterfly net, taking into account single samples of 10 swings, the density of insects per 1 m^2. The seeds yield was determined manually by pods browning, by the method of continuous metering of the crop, when the entire crop from the accounting part of each plot was harvested and weighed.
The study of the insecticides effectiveness of was carried out by comparing the number of damaged plants with the control [5]. The effectiveness of the preparations was established according to the formula according of N.S. Karaviansky:

$$K = \frac{A - B}{A} \times 100$$

K is the effectiveness of the insecticide, %; A is the average number of damaged plants in the control (without treatment), specimen; B is the average number of damaged plants in the experiment after treatment with an insecticide, specimen.
The species composition of pests was determined according to the accepted classification of B.M. Mamaev [6].
Winters in 2012, 2014, 2015 and 2018 were warm in comparison with the cold winters of 2010, 2011. January 2010 was very cold and air temperature was 10°C below normal. Winters in 2013, 2016 were moderately warm and cooling-down was from December 14thto 24th, from January 17thto 20thin 2013 and from January 5thto 11th, from January 15thto 17thin 2016. The winter in 2017 was very changeable, cooling-down was from January 3rdto 9th, when the average temperature was below the norm by 7°C. Spring 2010, 2011, 2012, 2013, 2017 was cold and lingering. Especially in 2010 and 2011, when the average daily temperature passed through 0°C to positive values only occurred on March 27thand from the 28thintensive snow melting began. May 2011, 2017 was cold. In 2017, the average May temperature was below the norm by 10°C. May 2010, 2014, 2018. It was warm (especially 1 and 2 decades) when the air temperature was + 20 ... 26°C and the average temperature in May was + 14 ... 15°C, which is 4-6°C higher than normal.
In June 2010, 2017, 2018, the weather was rather cold and in June 2017, 2 times more precipitation fell from the norm. In the second and third decades of June 2012 and in the first decade of June 2015 and 2016 it was rather cold weather. In 2010, showers occurred on June 4th, 13th, and on June 27th there was a hurricane, and in 2012, showers occurred on

June 27th, 28th. In July 2010, 2011, 2012, 2013, 2014, 2018 prevailed the warm weather, compared with 2016, 2017. Especially in July 2010, 2011, 2018 the temperature was + 30 ... 32°C, the weather was very hot, with a deficit of precipitation throughout the month. Autumns in 2010, 2012, 2013, 2018 were rather warm and dry weather prevailed, especially in the first ten days of August 2012 there was the warm weather and the air temperature was + 26 ... 30°C. In 2010, 2011, 2013 autumn was characterized by cold weather, in September 2010 the average temperature was below the norm by 3°C. The first snow fell in 2010 - October 13th, in 2011 - October 15th, in 2012 - October 10th, 2013 - September 29th, 2014 - October 1st, 2015 - October 5th, 2016 - October 14th and in 2017 - October 19th, 2018 - October 14th.

In general, beetles, bugs, lepidopteran caterpillars rather intensively fed on *Sinapis* ALBA in 2010, 2011, 2013, 2014, 2018, due to the warm and dry summers and periods of rather hot weather, compared to the cold and damp summers of 2012, 2015, 2017, when the beetles had reduced nutrition and the percentage decreased damaged plants.

The largest number of fleas was recorded, especially in 2013 and 2016, when the weather was rather hot and the fleas caused significant damage to the culture. In 2015, at moderate temperatures and high humidity, aphids multiplied at a high speed, in contrast to 2010 and 2013, when at high summer temperatures and at low humidity, aphids multiplied significantly and summer depression started. Cold weather in the summer of 2011, 2017 restrained the reproduction of aphids. Aphid colonies formed at the end of June, and during the formation of young pods the number of aphids reached the same maximum. Thus, adverse climatic conditions, such as spring cooling, heavy rains, lower temperatures in the summer influenced the number of beetles, bugs, aphids and caterpillars of butterflies.

Results

While examining the seeds of *Sinapis* ALBA on the experimental field of the Vologda State Dairy Farming Academy in 2010-2017, a complex of pests damaging this culture was revealed (Table 1).

During the entire study period, cruciferous fleas prevailed in the crops [7, 8, 9, 10].

Table 1: Species composition of pests on seed crops of *Sinapis* alba (Experimental field of the Vologda State Dairy Farming Academy, 2010-2017)

Specific name	Averagenumberofpests, sp./m ²								
	2010	2011	2012	2013	2014	2015	2016	2017	Onaveragefor 8 years
Wavy cruciferous flea beetle (Phyllotretaundulate Kutsch.)	45,0	20,0	47,0	49,0	47,0	47,0	48,0	20,0	40,4
Turnip flea beetle (Phyllotretaatra F.)	21,0	10,0	26,0	28,6	23,9	24,0	23,9	15,0	21,6
Blossom beetle (Meligethesaeneus F.)	14,0	12,0	15,0	17,4	16,8	16,8	18,0	10,0	15,0
Cabbage bug (Eurydemaventralis Kol.)	12,0	10,0	14,0	14,8	14,0	14,0	16,0	9,0	13,0
Grass bug (Lygus rugulipennis Popp.)	10,0	6,5	13,0	14,0	13,2	13,2	15,0	5,0	11,2
Mustard bug (*Eurydemaornata* L.)	8,0	5,5	9,0	10,2	9,6	9,6	9,6	5,0	8,3
Cabbage aphid (*Brevicorynebrassi*-cae L.)	8,0	5,5	9,0	8,6	8,6	8,6	9,0	4,0	7,7
Cabbage butterfly (*Pieris brassicae* L.)	2,5	2,0	2,6	2,8	2,8	2,8	2,8	1,5	2,5
Pentatomid rape bug (*Eurydomaoleracea* L.)	-	-	1,5	2,5	2,5	2,5	2,0	1,0	1,5
Diamondback moth (Plutellamaculipe-nnis Curt.)	1,5	1,0	1,6	1,6	1,6	1,6	2,0	0,8	1,5
Click beetle (*Agrioteslineatus* L.)	1,4	1,0	1,4	1,4	1,4	1,4	1,4	0,5	1,2
Black beetle (*Athousniger* L.)	1,0	0,5	0,5	0,5	2,2	2,2	2,2	0,5	1,2
Tarnished plant bug (*Lygus pratensis* L.)	1,0	1,0	1,2	1,4	1,4	1,4	1,4	-	1,1
Cabbage seed weevil (Ceutorhynchusassimilis Payk.)	1,0	1,0	0,5	1,1	0,9	0,9	0,9	0,3	0,8
Miridae (*Notostiraerratica* L.)	0,5	0,3	0,4	0,4	0,4	0,4	0,4	0,2	0,3
White bug (*Corizushyoscyami* L.)	0,4	0,2	0,4	0,4	0,4	0,4	0,4	-	0,3
Green shield bug (*Palomenaprasina* L.)	0,3	0,2	0,4	0,4	0,4	0,4	0,4	-	0,3
Carpocorispurpurei-pennis L.	0,3	0,2	0,4	0,4	0,4	0,4	0,4	-	0,3
Small cabbage white (*Pierisrapae* L.)	0,3	0,2	0,2	-	0,2	0,3	0,2	-	0,2
Cabbage looper (*Mamestrabrassicae* L.)	-	-	0,2	-	0,2	0,2	0,2	-	0,1
Turnip sawfly (*Athaliacolibri* Christ.)	-	-	0,3	-	-	0,3	-	-	0,1
Blue cruciferous flea (Phyllotretacruciferae Cz.)	0,2	0,2	-	-	-	-	0,2	-	0,1
Crested nutcracker (*Ctenicerapectinicoris* L.)	0,2	0,2	-	0,2	-	-	-	-	0,1
Red soldier bug (*Pyr-rhocorisapterus* L.).	-	0,2	-	-	0,2	-	-	0,2	0,1
Elaterid beetle (*Selatosomusaeneus* L.)	0,2	0,2	0,2	-	-	-	-	-	0,1
Dark nutcracker (*Agriotesobscurus* L.)	0,2	0,2	-	-	-	-	-	-	0,05
Bronze flea (Psylliodes cupreaKoch.)	-	-	0,2	-	0,2	-	-	-	0,05
Buckthorn aphid (AphisnasturtiiKalt.)	-	-	0,2	-	-	-	0,2	-	0,05

According to the results of our research, the largest abundance of *Sinapis* ALBAseeds was: wavy cruciferous flea (Phyllotreta undulate Kutsch.) On average - 40.4 specimens per m² (sp./m²), black cruciferous flea (Phyllotretaatra F.) - 21.6 sp./m², Blossom beetle (Meligethesaeneus F.) - 15.0 sp./m², cabbage bug (EurydemaventralisKol.) - 13.0 sp./m², grass bug (Lygus rugulipennis Popp.) - 11.2 sp./m², mustard bug - 8.3 sp./m², cabbage aphid (*Brevicorynebrassicae* L.) - 7.7 sp./m², cabbage butterly (*Pieris brassicae* L.) - 2.5 sp./m². Populations from 0.3 to 1.5 sp./m² had: Pentatomid rape bug (Eurydoma oleracea L.), diamondback moth (Plutellamaculipennis Curt.), Click beetle (*Agrioteslineatus* L.) and Black beetle (Athousniger L.), Tarnished plant bugs (*Lygus pratensis* L.), Ceutorhynchusquadridens Pz., Miridae (*Notostiraerratica* L.), whitebug (*Corizushyoscyami* L.), green shield bug (*Palomenaprasina* L.) and *Carpocpurpureipennis* L. Species with a population of less

than 0.3 sp./m^2 were recorded: Small cabbage white (*Pieris rapae* L.), Cabbage looper (*Mamestra brassicae* L.), Turnip sawfly (Athaliacolibri Christ.), Blue cruciferous flea (Phyllotretacruciferae Cz.), Crested nutcracker (*Ctenicera pectinicoris* L.), Red soldier bug (*Pyrrhocoris apterus* L.), Elaterid beetle (*Selatosomus aeneus* L.), Dark nutcracker (*Agriotes obscurus* L.), Bronze flea (Psylliodessuprea Koch.), Buckthorn aphid (Apisnasturtii Kalt.)

The largest number of wavy cruciferous and black cruciferous fleas, mustard bugs was in 2013 and amounted to 49 sp./m^2 and 28.6 sp./m^2, 10.2 sp./m^2. Rapeseed beetle, cabbage bug, grass bug in 2016 with a population of 18.0 sp./m^2, 16 sp./m^2, 15 sp./m^2. Tarnished plant bugs, *Corizushyoscyami*, green shield bug and Carpocorispurpureipennis were not found in 2017.

In 2018, the average abundance of the main pests was: wavy cruciferous flea - 28.5 sp./m^2, black cruciferous flea - 18.2 sp./m^2, bronzed blossom beetle - 15.5 sp./m^2, cabbage bug – 1.5 sp./m^2, grass bug - 5.5 sp./m^2, eurydemafestiva- 6.8 sp./m^2, cabbage aphid - 5.4 sp./m^2 [11].

The largest percentage of leaf surface damage was 18-24% and 25-32% in the second decade of June and in the first decade of August, respectively [12, 13].

When using chemical insecticides, regulatory preparations that are approved for use on the territory of the Russian Federation must be used. The applied insecticides should have the following advantages: act quickly on pests, be effective, have a long period of protective effect.

In order to protect the seed crops of *Sinapis* ALBA from pests, it was sprayed during the leaf forming phase with Sumi-alpha with consumption rates of 0.1, 0, 2 and 0.3 L/ha (Table 2, Fig. 1). Crop processing was carried out in the morning.

Table 2: The effectiveness of Sumi-Alpha on *Sinapis* ALBA (Experimental field of Vologda State Dairy Farming Academy)

Experiment option	Pest reduction compared to control, %								
	Flea-beetle			Bugs			Aphis		
	5	15	25	5	15	25	5	15	25
Sumi-Alpha, 0,1 L/ha	55,5	70,5	87,5	65,0	75,5	89,5	68,0	80,0	89,5
Sumi-Alpha, 0,15L/ha	65,0	72,0	88,0	73,5	89,5	90,5	82,0	90,0	90,5
Sumi-Alpha, 0,2 L/ha	77,5	90,5	93,5	79,5	93,5	98,5	79,0	94,0	99,3

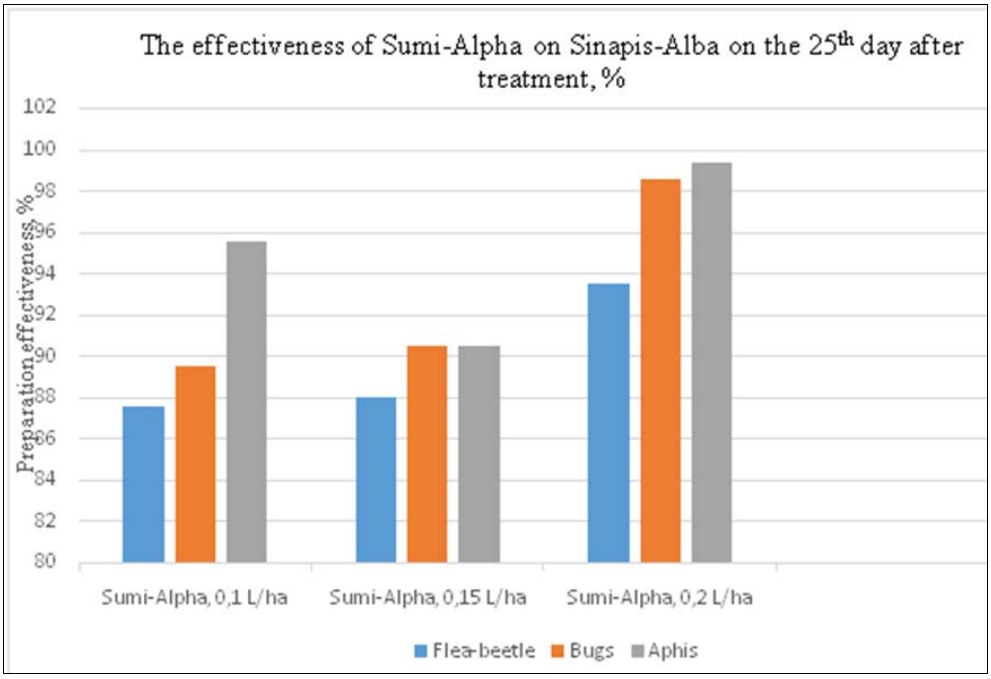

Fig 1: Efficiency of Sumi-Alpha on *Sinapis* ALBA crops (Experimental field of Vologda State Dairy Farming Academy)

Sumi-Alpha insecticide showed a rather high efficiency against insect pests with a consumption rate of 0.2 L/ha. On the 15th day after treatment, the number of flea-beetles decreased by 90.5%, bugs - 93.5% and aphids - 94.0%. On the 25th day after treatment, the efficacy against flea-beetles, bugs and aphids was 93.5%, 98.5% and 99.3%.

On the seed-plots of *Sinapis* ALBA in the beginning of flowering, spraying with the preparation Karate Zeon, MS (microencapsulated suspension) was carried out with a flow rate of 0.05 and 0.1 L/ha. Karate Zeon, the MS and the active substance - lambda-cyhalothrin, which quickly penetrates the insect cuticle and acts on the nervous system and after a few minutes the food activity of the pests ceases and it dies (Table 3, Fig. 2).

Table 3: Effectiveness of the Karate-Zeon on *Sinapis* ALBA (Experimental field of Vologda State Dairy Farming Academy)

Experiment option	Pest reduction compared to control, %								
	Blossom beetles			White butterflies			Moths		
	5	15	25	5	15	25	5	15	25
Karate-Zeon, 0,05 L/ha	50,5	71,0	88,5	65,0	75,0	90,5	70,0	85,0	90,5
Karate-Zeon, 0,1L/ha	67,0	75,0	93,5	75,5	88,5	90,5	83,0	91,0	92,5

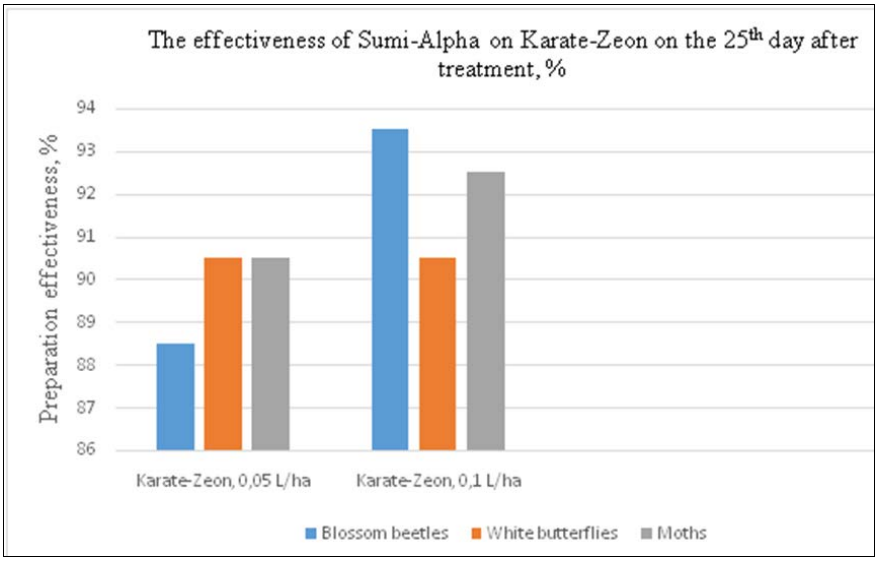

Fig 2: The effectiveness of Karate-Zeon on *Sinapis* ALBA crops (Experimental field of Vologda State Dairy Farming Academy)

The preparation Karate-Zeon (0.1 L/ha) showed efficacy on the 25th day after treatment against Blossom beetles - 93.5%, White butterflies - 90.5% and Moths - 92.5%.

On crops in the phase of the beginning of flowering, spraying with Fastak preparation with a flow rate of 0.1 L/ha was carried out (Fig. 3).

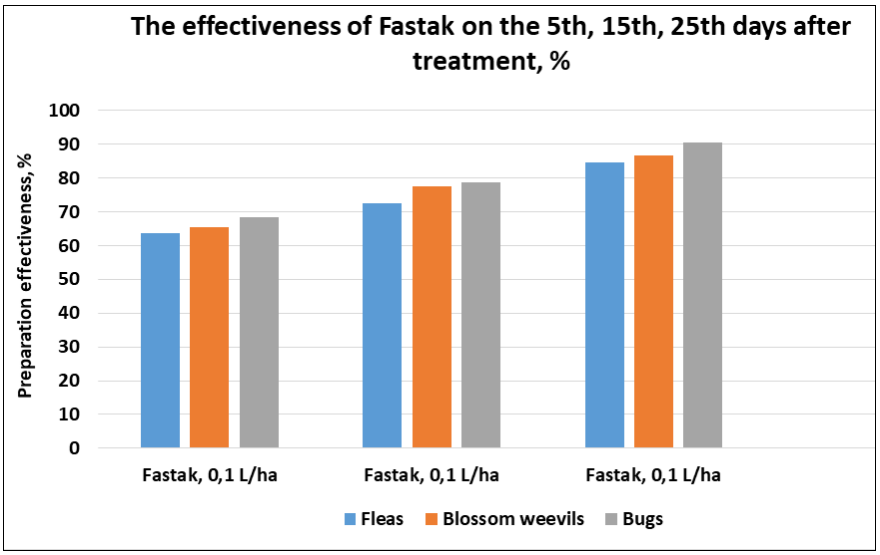

Fig 3: The effectiveness of Fastak on *Sinapis* ALBA crops (Experimental field of Vologda State Dairy Farming Academy)

Fastak (0.1 L/ha) showed efficacy on the 5th day after treatment against cruciferous fleas - 63.5%, blossom weevils- 65.5% and bugs - 68.5%, and on the 25th day after processing efficiency was against cruciferous fleas, blossom weevils and bugs - 84.5%, 86.5%, 90.5%, respectively.

In 2017-2018 we also studied the effect of Armin insecticide with consumption rates of 0.1 and 0.15 l / ha on pests of *Sinapis* ALBA. Armin is a drug of contact and intestinal action, its active substance is alpha-cypermethrin. The insecticide Armin, EC (emulsion concentrate) showed a fairly high efficiency against pests at a rate of 0.1 L/ha. On the 15th day after treatment, the number of fleas decreased by 73.5%, bugs - 89.5% and aphids - 92.0% [14, 15].

Conclusion

The main phytophages on *Sinapis* ALBA seeds were wavy cruciferous flea, black cruciferous flea, blossom beetle, cabbage bug, with more than 13 specimens per 1m^2. The most effective was an insecticide.

Sumi-alpha with a consumption rate of 0.2 L/ha. The effectiveness of the microbiological preparation Bitoxibacillin (4 kg/ha) was 85.5-100.0%.

References

1. Vasilieva TV. Biological phytosanitary monitoring / TV, Vasilieva MV, Sokolov / Materials of the IX International Conf. Tome no.29. Ecology.- Sofia.- Bulgaria, 2013, 42-43.
2. Vasilieva TV. Prospects for the development of phytosanitary monitoring in forage crops / T.V. Vasilieva / Collection of articles of the international scientific and practical conf. "Trends and prospects for the development of science of the XXI century." - MCII Omega Saints, 2016, 81-82.
3. Dospekhov BA. The method of field experience (with the basics of statistical processing of the results of the study) / B.A. Dospekhov. - M.: Alliance, 2011, 352.
4. Vasilieva, T.V. Insect pests on the seed crops of *Sinapis*

ALBAin the conditions of the Vologda region / T.V. Vasiliev // Molochnohozyaystvenny Vestnik, 2015:3:7-12.
5. Vasilieva TV. Pests and diseases of *Sinapis* ALB Ain the North-West region of Russia: monograph / T.V. Vasilieva. - Vologda-Molochnoye: Vologda State Dairy Farming Academy, 2018, 118.
6. Mamaev BM. Identifier of insects of the European part of the USSR / B. M. Mamaev. - M.: Education, 1976, 304.
7. Vasilieva TV. Phytophages on *Sinapis* ALBA crops / T.V. Vasilieva, G.V. Rastutaeva / Collection of Int. young conf. Young researchers. Volume 3. Biol. science. - Vologda-Molochnoye, 2016, 65-68.
8. Shpileva AI. The effectiveness of Sumi-Alpha on crops of *Sinapis* ALBA / A.I. Shpileva, T.V. Vasilieva / Collection of articles: Young researchers of agricultural and forestry complexes - to the regions. - Vologda-Molochnoe, 2018, 39-42.
9. Vasilieva TV. The value of *Sinapis* ALBA and growing crops on the experimental field of Vologda State Dairy Farming Academy / T.V. Vasilieva, A.I. Shpileva / Scientific young researchers - the development of the dairy industry. Vologda-Molochnoe, 2017, 75-78.
10. Vasilieva TV. The effect of insecticides on pests of *Sinapis* ALBA/ T.V. Vasilieva, A.I. Shpileva // Modern scientific research and development. - 2018. - No. 12. - P. 139-141.
11. Shpileva, A.I. The harmfulness of cruciferous fleas on *Sinapis* ALBA/ A.I. Shpileva, T.V. Vasilieva // Modern scientific research and development,2018:8(25):205-207.
12. Vasilieva TV. Phytophages on seed crops of *Sinapis* ALBA/ T.V. Vasilieva // Protection and quarantine of plants,2016:3:46-47.
13. Vasilieva TV. Pests and diseases on the testes of *Sinapis* ALBA/ T.V. Vasilieva // Dairy Bulletin,2018:1(29):17-24.
14. Vasilieva TV. The effectiveness of the armin insecticide on *Sinapis* ALBAin the experimental field of the Vologda State Dairy Farming Academy/ T.V. Vasilieva, A.I. Shpileva / Sat materials of the All-Russian scientific-practical. conf. Omsk State Agrarian University, 2019, 430-432.
15. Vasilieva TV. Protection of *Sinapis* ALBA seed crops from phytophages / T.V. Vasilieva, O.V. Chukhina, A.I. Demidova, V.I. Ivanovskaya, N.A. Schekutieva // Eur Asian Journal of BioSciences,2019:T.13.№2. - C.1961-1966.