N E W S
OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN
SERIES OF AGRICULTURAL SCIENCES
ISSN 2224-526X
Volume 2, Number 56 (2020), 78 – 86 **https://doi.org/10.32014/2020.2224-526X.16**

UDC:633.853. 494:414.22(574)(045)

A. K. Tuleeva[1], R. Zh. Abdukerim[1], V. A. Korobov[2]

[1]S. Seifullin Kazakh Agrotechnical University, Nur-Sultan, Kazakhstan;
[2]Belgorod State University, Belgorod, Russia.
E-mail: tuleeva.a.k@mail.ru, rauza91@mail.ru, vikt.korobov@mail.ru

PESTS OF SPRING RAPE AND MEASURES TO REGULATE THEIR NUMBERS

Abstract. According to data from 11 years of study (2008-2018), there is a close negative relationship between the long-term dynamics of damage to rapeseed crops by the flea complex and rainfall (May and June) (r = - 0.74), and a positive relationship with the temperature regime (r = 0.52). The number of flea beetles is reduced by 2 or more times when the sowing period is shifted from May 10 to May 20 and later. The pre-sowing treatment of rapeseed with insecticidal preparation has a high efficiency against flea beetles (92.4%). A combination of these two techniques can eliminate the problem of protecting rapeseed from the flea complex in the first period of development. The rainfall and the temperature regime of the growing season (correlation coefficients r=0.53). have mainly affected the long-term dynamics of the number of diamond moths. The years when the diamond moth populations growth the one treatment with insecticide is not working. When a biological efficiency of about 75%, the number of live larvae after treatment is 2 or more times higher than the economic threshold of harmfulness. The number of rapeseed pollen beetles in crops is negatively affected by late sowing periods and treatment with insecticides against diamond moths. In the dry years, when in the crops is the absent diamond moth, the treatment with insecticides at the beginning of budding helps to protect from the rapeseed pollen beetles and an increase in the seed yield (1.5 c/ha from the control level-without treatment). The treatment of seeds with insecticide preparations has a significant impact on crops in the conditions: wet (1.5-3.8 c/ha) and also dry years (1.0-2.0 c/ha of the control level). In the wet conditions, crops don't have to repeat spraying against flea beetles, but repeated treatments necessary against diamond moth larvae.

Key words: spring rapeseed, pest, long-term dynamics, pre-sowing treatment, spraying, biological efficiency.

Introduction. Rapeseed is one of the most important crops in the world as a source of vegetable oil. The rapeseed and cotton ranked second-third places among the oilseed crops in the world [1]. In the production of rapeseed leading: Asia – 42.5%, Europe – 34.4%, North America – 19.4% [2]. Agricultural farms in Northern Kazakhstan have a special interest in spring rape as a perspective culture. It plays a significant role in the world market as the precursor crop that helps to decrease in grain fields in the conditions of crop diversification. In favourable conditions, rapeseed is able to give high seed yields of 3.0 t/ha and more [3,4,5,6]. At the same time, the rapeseed cultivation area 14% of the total area of oilseeds in Kazakhstan, less than growing area sunflowers (32%) and flax (41%). Cultivation of this crop in the natural and climatic conditions of Northern Kazakhstan and neighboring regions of Russia is associated with risks. The rapeseed cultivation areas are not stable, and fluctuations in the direction of reduction what happens after lean years. Determining factors that affect the sustainability of rapeseed oil production are not only contrasting weather conditions, but also pests. In some cases they can cause the death of crops [3, 4]. Thus, pests were the reason for the decrease of cultivation areas of rapeseed in Kazakhstan. For example, diamondback moth attacks cause of the decrease in the area of rapeseed cultivation in Kazakhstan in 2016 from the level of 2015 (from 246 thousand hectares to 160 thousand hectares) and in 2019, compared with 2018 (from 378 thousand hectares to 300 thousand hectares) [3].

At this time, there is a lot of data about the species composition of pests of spring rapeseed, which is very important to Kazakhstan and regions of Russia, similar in the continental climate with the conditions of Northern Kazakhstan [7-13].

For the farmers in the Northern Kazakhstan, where rapeseed is cultivated mainly in the zones of black earth soils, protective measures during the growth and development of plants from pests are a necessary link in the cultivation technology. However, the issues of improving protective measures against harmful insects and safety yields do not lose actuality. Therefore attract attention researchers Russian, European, China, and other countries [14-19]. Kazakhstan researchers wrote many recommendations for the cultivation of rapeseed and protection from harmful organisms [19,20]. However, the loss of oilseed crops from rapeseed pests continues to be a big problem for farmers and needs a solution.

This article summarized the results of a long-term study was done in the subzone of the black earth soils of the Akmola region. The main goal of this research was to determine the dynamics of the number of main pests of spring rapeseed, depending on weather conditions of the year and the biological effects of treatment.

Materials and methods. Research studies have been conducted in Burabay, Atbasar and Bulandyn districts of Akmola region as part of the tasks for testing pesticides. The soil is black earth soil, the mechanical components of medium and heavy loam, with a humus content of 4.5-5.2%, pH 7.0-7.2. Varieties and hybrids of spring rape Jubilee and Abiliti (2008-2016), Ozorno (2017), PRusH - 73 (2018). The field experiments (repeat 4 times) and production (repeat 2 times) experiments were laid. Predecessors are fallow. The sowing Dates varied from May 10 to May 21, the rate of seeding varieties 2 million germinal seeds/ha, hybrids-0.7 million germinal seeds/ha. To phytosanitary monitoring and accounting of biological effects of treatment were used generally approved methods of phytosanitary monitoring and testing of plant protection products. Statistical data calculated by the «Sneedecor» software for applied statistics. Agricultural techniques in experiments are generally approved methods for the research area. The rape seeds were treatment before sowing seeds. Vegetative plants were sprayed: by insecticides on seedlings, at the beginning of budding, at the end of flowering. The consumption of working fluid was 200 l/ha. We used pesticides with registration.

Results. The study years were different from the weather conditions of the vegetation periods. 2008 (throughout the growing season) and 2010 (in May-July) were characterized by primarily dry conditions and as a result extremely adverse conditions for rapeseed. At high temperatures, rainfall less than the multi-year averages. In 2009 and 2013, there was an alternating of dry conditions with conditions of sufficient humidification (in May-about normal and above, in June-drought, in July and later - rainfall was above the multi-year averages). In 2012 was characterized by rapid increases in temperatures, abnormally hot weather in April, the summer is mostly hot with rainfall at and less than normal. In 2014 and 2017 rapeseed felt depression from a biting early summer drought (moisture deficit in May-June), with a change in the situation in July (rainfall several times higher than normal), August was also dry. In 2015 was characterized by high rainfall in May, July and a slightly less than the multi-year averages in June. In 2011, 2016, 2018 were the most favourable years for the growth and development of rapeseed (rainfall during the growing season was more than the multi-year averages).

Table 1 – The main pests of the spring rape (Akmola region)

Frequency of occurrence		
High	Average	Low
Black flea beetles *Phyllotreta arta F.*	Flea beetles *Phyllotreta undulate Kutsch*	Flea beetles *Phyllotreta nigripes F.*
Flea beetles *Phyllotreta vittata Redt.*	Cabbage aphid *Brevicoryne brassicae L.*	Cabbage stem flea beetle *Psylloides chrysocephala L.*
Flea beetles *Phyllotreta nemorum L.*	Cabbage seed weevil *Ceuthorrhynchus sp.*	Rape-leaf beetle *Entomosceles adonidis Pall.*
Pollen beetles *Meligethes aeneus F.*	Rape bug *Eurydema oleracea L.*	Turnip sawfly *Athalia rosae L.*
Diamondback moth *Plutella xylostella (maculipennis Curt)*	Cabbage bug *Eurydema ventralis Kol.*	Cabbage Stem Weevil *Ceuthorrhynchus sp.*
	Cabbage bug *Eurydema gebleri Kol.*	Bath white *Pontia daplidice L.*
	Cabbage butterfly *Pieris brassicae L*	Cabbage moth *Mamestra brassicaeL.*

The number of phytophagous and their harmfulness on rapeseed varies considerably over the years. On crops of rape after the fallow, the entomofauna was formed by migratory species. In the budding phase, we could find on the crop many species of harmful insects (table 1). The regular pest species on the rapeseed is oligophages. For 11 years of monitoring the excess of economic thresholds of harmfulness was observed only in the complex of flea beetles, diamondback moth, pollen beetles.

The rapeseed could be successfully cultivated in fallow where conserving moisture. In the total structure of crop in the Akmola region, rapeseed takes an insignificant place, just over 1%. Compliance with the principles of crop rotation (alternation of crops and spatial isolation) contributes to the improvement of crops, but it does not solve the problem of protection from the complex of flea beetles, diamondback moth, pollen beetles.

For rapeseed, one of the sensitive periods is seedlings. The negative factors that affect the density of seedlings included: drying of the surface layer of the soil; the excessive planting of seeds into the soil during sowing; at the first stages of culture development, it's low competitiveness to weeds; damage by fleas.

In the drought conditions, the number of fleas on rapeseed crops was many times higher than the criteria for the economic threshold of harmfulness (table 2). There is close feedback between the damage to rapeseed seedlings by fleas and the amount of rainfall in May and June: r = - 0.74 (figure 1). In conditions of moisture deficit, seedlings are highly damaged while still in the soil. The size of the fleas allows them to penetrate the cotyledon leaves between the lumps of soil and cause their death.

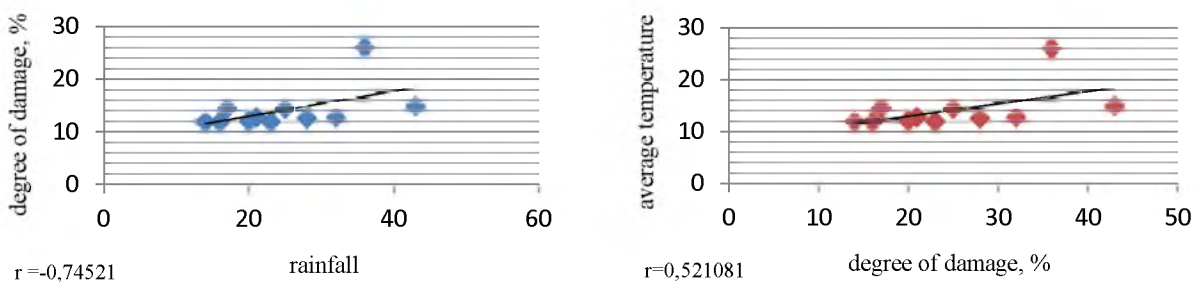

Figure 1 – Dependence of damage to rape crops on the amount of rainfall (A) and the average daily air temperature (B) in May-June

With increasing temperature, the damage to rapeseed also increases, the positive dependence r = 0.52 (figure 2).

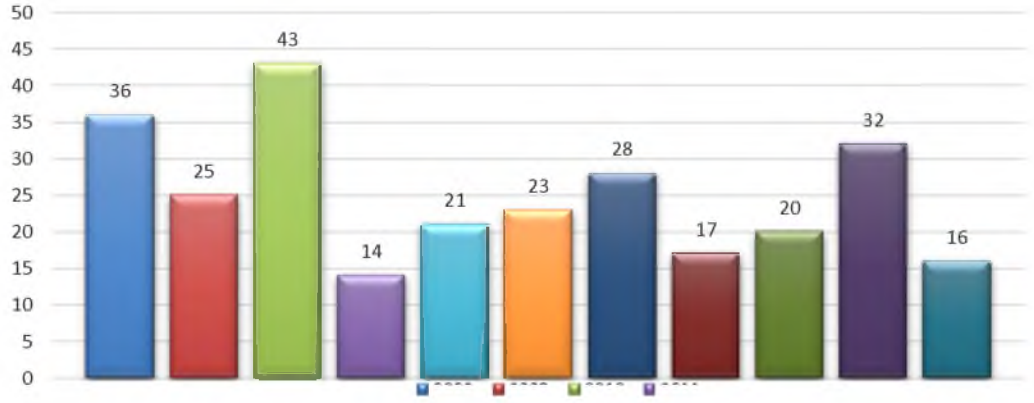

Figure 2 – Long-term dynamics of damage to rapeseed crops in the germination phase by flea beetles (%), 2008-2018 (Akmola region)

Even in wet years, but at high temperatures, the number of fleas on rapeseed early sowing dates can reach the criteria of the economic threshold of harmfulness. Increased eating of rapeseed leaves by beetles to maintain the body's water balance. After the formation of the second true leaf, the number of fleas is going on the decrease.

The main damage to rapeseed crops by flea complex in the Akmola region was observed in 2008 and 2010. Since 2011, we looked at the general trend decrease in the damage to seedling (figure 2). It's dependent on changes in the timing of sowing rapeseed at later dates.

Table 2 shows the information of how the timing of sowing affects the number of fleas and damage to plants. At earlier periods of sowing makes longer the period of growth of seedlings and seedlings are doing more the sensitive.

When moving to a later time of sowing from the beginning of the first decade to the third decade of May and therefore seedlings are growth in June, compared with seedlings that are growing in May, the number of fleas in wet years decreases by 2.2 times, in dry years by 4.1 times (table 2).

Table 2 – First phases of rapeseed development and flea beetles population depending on sowing time in dry and wet years

Sowing period	The phase of seedling	Number of flea beetles		The phase of the beginning of development rosette	Number of flea beetles	
		wet years	dry years		wet years	dry years
Beginning of the II decade of May	III decade of May	13	37	I decade of June	4	7
Beginning of the III decade	I decade of June	6	9	II decade of June	3	4

Pre-sowing treatment of seeds with preparations (active ingredients imidacloprid, clothianidin, thiamethoxam) safely protects the first leaves of rapeseed from flea beetles. Here the number of beetles was significantly (92.4%) lower than in the control-without treatment (table 3).

Table 3 – Biological efficiency of pre-sowing treatment of seeds and spraying of seedlings against flea beetles with insecticidal preparations

Variants	The phase of seedling				The phase of the beginning of development rosette			
	Damage, %	Decrease of damage, %	The number of beetles 1 м^2	The decrease of the number, %	Damage, %	Decrease of damage, %	The number of beetles 1 м^2	The decrease of the number, %
Spraying seedlings	18	71.4	7	75.0	5	40.0	3	37.5
Pre-sowing treatment	4	92.9	2	92.4	3	60.0	2	62.5
Control (without treatment)	53		28		8		5	

The beetle death on the third day after the treatment of plants with the preparation of contact-intestinal with active ingredients group of pyrethroids was 75%, however, there were still living specimens. In dry years, with a high density of the pest, this level of efficiency of the treatment seedling preparation does not allow to safely protect the seedlings, because the remaining number of pests could be above the economic threshold of harmfulness and damage to the leaves. In addition, the longtime of growth seedlings does not allow to protect all plants by treatment seedlings. Before the spraying on the seedlings had been damaged, and those that will grow after spraying are sensitive to flea beetles.

In the accepted technologies of cultivation, after chemical fallow, on the surface of the soil continue to stay the plant matter of the previous year, they are possible to the accumulation and moisture conservation in the soil, but it has a negative value thereby helping to the survival of the wintering numbers of the diamondback moth.

The reservation of diamondback moth are also weeds of the cabbage family, an integral component of the weed phytocenosis of any field culture. Frequent winds in the region can help to the transfer of butterflies over considerable distances.

The first single sign of damage to the leaves of rapeseed larvae diamondback moth noted from the beginning of the phase of the rosette. In favourable years for the diamondback moth at the beginning of budding on crops, you could find all phases of pest development and their number of larvae reaches

critical values. Especially harmful 2-3 generation of the pest. If we don't use protective measures against diamondback moth when rapeseed beginning of flowering it will seriously damage plants. The economic threshold of harmfulness is 2-5 larvae per plant by 10% of the population of plants.

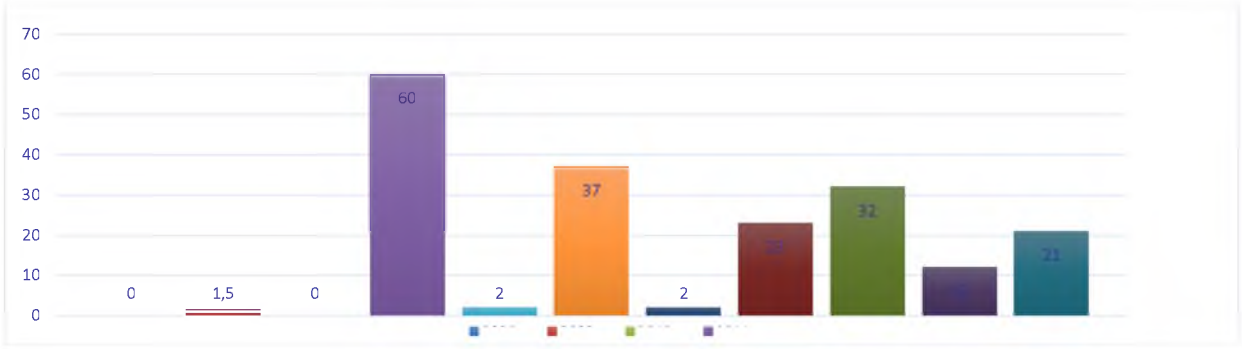

Figure 3 – Long-term dynamics of the number of larvae of diamondback moth

The long-term dynamics of the diamondback moth population is extremely unstable. Figure 3 shows that the years of depression when the pest is absent in the crops, replace with a sharp upturn of their numbers. Long-term dynamics of the number of diamondback moth had a close positive relationship with the conditions of moisture. The correlation coefficient is r=0,53.

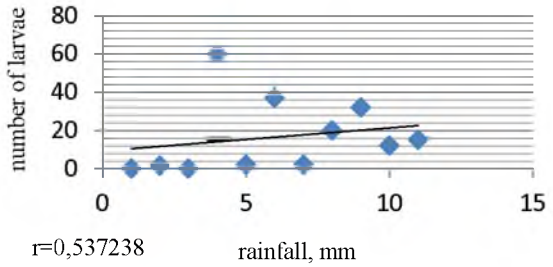

Figure 4 – Dependence of the number of diamondback moth on plants on the amount of rainfall and temperature in May - July

July in our conditions is one of the wettest months. Only four years of the eleven years of study had limited rainfall in July and the other years had rainfall more than the multi-year averages. The correlation between the amount of rainfall and the number of larvae is positive (correlation coefficient: r = 0.53). We observed an association between the local outbreaks of the diamondback moth population with local rainstorms, except for very dry years. If June is dry and July is wet, the mass outbreak of larvae will be in the later phases of rapeseed development, at the end of the flowering phase-the formation of pods.

Table 4 shows the information about the number of diamondback moth larvae and the effectiveness of preparation for the years when their number reached and exceeded the economic threshold harmfulness.

Table 4 – Biological effectiveness of protective measures against diamondback moth on rapeseed

Parameter	Day after treatment	Budding phase – the beginning of flowering		End of flowering	
		treated with insecticide	without treatment	treated with insecticide	without treatment
Number of larvae per plant	3	5	19	8	27
	7	7	22	8	30
	14	12	25	9	17
Biological effectiveness, %	3	73.6	–	70.3	–
	7	75.4	–	73.3	–
	14	52.0	–	47.0	–

The table 5 shows that when we used insecticides (systemic action) in the phases of the budding-the beginning of flowering it a biological efficiency was 73.6% on the third day of accounting and 75.4% after the seventh day. The protective effect continues at the end of flowering and the beginning of ripening and its biological efficiency was at the level of 70.3-73.3%. It's difficult to get the best effect if there were insects of different ages at the same time. The number of larvae continued to be above the economic threshold of harmfulness, despite a large death. The danger to rapeseed crops from diamondback moth larvae continued to stay after treatment. It was apparent that the time of treatment rapeseed crops against diamondback moth should be earlier than at the end of flowering. From the date of treatment in the budding phase-the beginning of flowering to the end of flowering usually goes 20-25 days. By this time, the number of larvae was renewed, and under favorable conditions, their number was much higher than in budding. The repeated treatment is conflicted between the issue of ensuring the safety of the crop from losses and harm to useful arthropods. Spraying in flowering with chemicals is dangerous for useful species.

Rape pollen beetle attracted attention less than flea beetles and diamondback moth. The number of damaged plants was in the range of 17.5 – 28.7%. The number of damaged flowers and buds was 4.6-11.8%. The changing of the sowing dates and chemical protection measures used in budding regulated not only the number of diamondback moths but also other pests, including the rapeseed pollen beetle. Therefore, has a positive effect on the size of the seed yield.

The yield varies significantly up to 3 times depending on the conditions of moisture during the growing season (table 5).

Table 5 – Effect of protective measures using insecticides on rapeseed crop

The period of use	Wet years, c/ha		Dry years, c/ha	
	crop	difference	crop	difference
Pre-sowing seed treatment	17.5	+1.5	6.8	+2.0
Spraying seedlings	17.1	+1.1	6.2	+1.0
Spraying in the budding	19.8	+3.8	6.6	+1.5
Spraying at the end of flowering	18.4	+2.4	–	–
Control - without treatment	16.0	–	4.8	–

In dry and wet years, all variant use of insecticide products gives a significant increase in the crop. All protective measures on rapeseed against pests, except spraying seedlings in wet years against fleas, ensure the safety of the rapeseed crop from losses. In dry years, the value of the additional crop was 1.0-2.0 c/ha for all variants, in wet years it was 1.5-3.8 c/ha (table 6). In wet years, the harmfulness and number of fleas were at a level that didn't provide economic efficiency. In the conditions of sufficient moisture crop of rapeseed should treatment twice against diamond moth.

Conclusions. The spring rapeseed is cultivating in the zones of black earth soils of the Akmola region. The most dangerous for it is a complex of flea beetles, diamond moth, and rapeseed pollen beetles. This study shows that the rainfall in the phase of the seedling is negatively affected by the number of flea beetles and damage to crops, however, it positively affected the number of diamond moths. The timing of the sowing of spring rapeseed is using to regulate the distribution of flea beetles in crops and reducing their number by 2.2-4.1 times by the shifting from May 10 to May 20. The pre-sowing treatment of seeds against flea beetles had high efficiency (92%) and combined with the correct choice of the sowing time it will solve the problem of protecting the crop from losses. In the phase of rapeseed budding in years with rainfall, it is necessary to treat insecticides against diamond moth larvae. If a diamond moth the mass reproduction one treatment will not work to protecting the crop from losses (the efficiency of which will not exceed 75%). They are needed additional insecticide treatments.

А. К. Тулеева[1], Р. Ж. Әбдукерім[1], В. А. Коробов[2]

[1]С. Сейфуллин атындағы Қазақ агротехникалық университеті, Нұр-Сұлтан, Қазақстан;
[2]Белгород мемлекеттік университеті, Белгород, Ресей

ЖАЗДЫҚ РАПСТЫҢ ЗИЯНКЕСТЕРІ ЖӘНЕ ОЛАРДЫҢ САНЫН РЕТТЕУ ЖӨНІНДЕГІ ШАРАЛАР

Аннотация. Бұл мақалада жылдың ауа райы жағдайына және рапсты қорғау құралдарының биологиялық тиімділігіне байланысты жаздық рапстың маңызды зиянкестері санының динамикасын анықтау мақсатында Ақмола облысының кәдімгі қара топырақтарының аймағында жүргізілген көпжылдық зерттеулердің нәтижелері жинақталған. Көбінесе сүрі жерден кейін өсірілетін рапстың зиянды энтомофаунасы миграция есебінен қалыптасады. Ақмола облысы жағдайында рапстың жаппай таралатын фитофагтарына бүргелер, қырыққабат күйесі, рапс гүлжемірі жатады.

Зерттеулер пестициидтерді сынау бойынша тапсырмасы аясында Ақмола облысының Бурабай, Атбасар және Бұланды аудандарында жүргізілді. Топырағы кәдімгі қара топырақ, механикалық құрамы орташа және ауыр саздақ, құрамындағы гумус 4,5-5,2%, pH 7,0-7,2 құрайды. Қолданылған жаздық рапстың сорттары мен будандары Юбилейный және Абилити (2008 - 2016), Озорно (2017), PRusH - 73 (2018). Танаптық (қайталануы 4 еселік) және өндірістік тәжірибелер (қайталануы 2 еселік) салынды. Алғы дақыл - сүрі жер, себу мерзімдері 10 мамырдан 21 мамырға дейін, сұрыптардың себу мөлшері 2 млн. өнгіш тұқым/га, будандардың 0,7 млн. өнгіш тұқым/га. Есеп жүргізу және бақылау, тиімділікті есептеу үшін жалпы қабылданған фитосанитариялық мониторинг пен өсімдіктерді қорғау құралдарын сынаудың әдістемелері қолданылды. . Зерттеу аймағында жүргізілген агротехникалық шаралар сол аймаққа тән. Рапс тұқымдары себу алдында өңделеді. Өсімдікті инсектициидтермен өңдеу: өскіндерде, шанақтанудың басы және гүлдеудің соңында жүргізілді. Жұмыс сұйықтығының шығыны 200 л/га. Қолданылған препараттар тіркеуден өткен.

Зерттеу жылдары вегетациялық кезеңнің ауа райы жағдайлары бойынша айтарлықтай ерекшеленді. Көбінесе құрғақшылық жағдаймен және соның салдарынан рапс үшін өте қолайсыз жылдар ретінде 2008 жыл (бүкіл вегетациялық кезең ішінде) және 2010 жыл (мамыр-шілдеде) сипатталды. Жоғары температуралық режимі салдарынан жауын-шашын мөлшері көпжылдық мөлшерден аз болды. 2009, 2013 жылдары жеткілікті ылғалдану жағдайларымен құрғақшылық жағдайлардың кезектесуі байқалды (мамырда - нормаға жуық және одан жоғары, маусымда - құрғақшылық, шілдеде және одан әрі - жауын-шашын орташа көпжылдық мәндерден жоғары болды). 2012 жылы температуралардың күрт көтерілуі байқалды, сәуір айында өте ыстық ауа райы, жазы ыстық және жауын-шашын кейде нормадан сәл төмен немесе бірдей дәрежеде болды. 2014, 2017 жылдары рапс ерте көктемгі құрғақшылықтан (мамыр-маусымда ылғалдың жетіспеуі) тежеліп, шілдеде жағдайдың өзгеруімен (жауын-шашын нормадан бірнеше есе жоғары түсті), тамыз айы құрғақ болуымен сипатталды. 2015 жылы мамырда, шілдеде жауын-шашынның мөлшері жоғары және маусымда орташа көпжылдық мәндерден сәл төмен болды. 2011, 2016, 2018 жылдары рапстың өсуі мен дамуы үшін қолайлы болды (вегетация кезеңіндегі жауын-шашын орташа көпжылдық мәндерден жоғары болды).

11 жыл бойы жүргізілген бақылаулардың нәтижесі бойынша (2008-2018 жылдар) рапс егістерінің бүргелермен зақымдануының көп жылдық динамикасы мен жауын-шашын (мамыр және маусым) арасында тығыз теріс байланыс бар (r = - 0.74), ал температуралық режиммен оң байланыс (r = 0.52). Себу мерзімін 10 мамырдан 20 мамырға ауыстырғаннан кейін бүргелердің саны екі және одан да көп рет қысқарады. Себу алдында рапс тұқымдарын инсектициидтік әсері бар препаратпен өңдеу бүргелерге қарсы жоғары тиімділік көрсетеді (92.4%). Осы екі тәсілді үйлестіру арқылы рапсты бастапқы даму кезеңінде бүргелер кешенінен қорғау мәселесін шешуге болады. Қырыққабат күйесінің көп жылдық динамикасына айқын әсер ететіндер ылғалдылықпен қамтамасыз етілуі және вегетация кезеңіндегі температуралық режим (корреляция коэффициенті r=0.53). Қырыққабат күйесінің саны артып кеткен жылдары инсектициидпен бір рет өңдеу жеткіліксіз болып табылады. Биологиялық тиімділік 75% - га жуық болса да, тірі дарақтардың саны өңдеуден кейін 2 және одан да көп есе экономикалық зияндылық шегінен асады. Рапс егісіндегі рапс гүлжемірің санына теріс әсер ететіндер себудің кеш мерзімі және қырыққабат күйесіне қарсы инсектициидтермен өңдеу. Құрғақ жылдары қырыққабат күйесі болмаған жағдайда шанақтанудың басталу фазасында жүргізілген инсектициидпен өңдеу рапсты гүлжемірден қорғай отырып, оның тұқым өнімінің айтарлықтай өсуіне ықпал етеді (1.5 ц/га бақылау деңгейінен – өңдеусіз). Тұқымдарды инсектициидтік препаратпен өңдеу ылғал жылдары да (1.5-3.8 ц/га), сондай-ақ құрғақ жылдары да (бақылау деңгейінен 1.0-2.0 ц/га) өнім мөлшеріне үлкен әсер етеді. Ылғалды жағдайларда өскіндерді бүргелерге қарсы өңдеудің қажеті жоқ, бірақ қырыққабат күйесіне қарсы қайта өңдеуді қажет етеді.

Түйін сөздер: жаздық рапс, зиянкес, көп жылдық динамика, себу алдындағы өңдеу, бүрку, биологиялық тиімділік.

А. К. Тулеева[1], Р. Ж. Абдукерим[1], В. А. Коробов[2]

[1]Казахский агротехнический университет им. С. Сейфуллина, Нур-Султан, Казахстан;
[2]Белгородский государственный университет, Белгород, Россия

ВРЕДИТЕЛИ ЯРОВОГО РАПСА И МЕРЫ ПО РЕГУЛИРОВАНИЮ ИХ ЧИСЛЕННОСТИ

Аннотация. В данной статье обобщены результаты многолетних исследований, проведенных в подзоне обыкновенных черноземов Акмолинской области с целью определения динамики численности первостепенных вредителей ярового рапса в зависимости от погодных условии года и биологической эффективности средств защиты рапса. Вредная энтомофауна рапса, возделываемого преимущественно после пара формируется за счет миграции. К наиболее массовым видам фитофагов рапса в условиях Акмолинской области относятся блошки, капустная моль, рапсовый цветоед.

Исследования были проведены в Бурабайском, Атбасарском и Буландинском районах Акмолинской области в рамках заданий по испытанию пестицидов. Почва – чернозем обыкновенный среднемощный, механический состав средний и тяжелый суглинок, с содержанием гумуса 4,5 - 5,2 %, pH 7,0-7,2. Сорта и гибриды ярового рапса Юбилейный и Абилити (2008 - 2016), Озорно (2017), PRusH - 73 (2018). Были заложены полевые (повторность 4-х кратная) и производственные опыты (повторность 2х-кратная). Предшественники - пары Сроки сева варьировали от 10 мая до 21 мая, норма высева сортов 2 млн. всхожих семян/га, гибридов - 0,7 млн всхожих семян/га. Для проведения учетов и наблюдений, расчетов эффективности применялись общепринятые апробированные методики фитосанитарного мониторинга и испытаний средств защиты растений. Агротехника в опытах общепринятая для зоны исследований. Семена рапса обрабатывались непосредственно перед посевом. Вегетирующие растения опрыскивали: инсектицидом по всходам, в начале бутонизации, в конце цветения. Расход рабочей жидкости из расчета 200 л/га. Применялись препараты имеющие регистрацию.

Годы исследований существенно различались по погодным условиям вегетационного периода. Преимущественно засушливыми условиями, и как следствие крайне неблагоприятными для рапса характеризовались 2008 год (на протяжении всего вегетационного периода) и 2010 год (в мае-июле). При повышенном температурном режиме осадков выпало в разы меньше среднемноголетних норм. В 2009, 2013 годах наблюдалось чередование засушливых условий с условиями достаточного увлажнения (в мае - около нормы и выше, в июне - засуха, в июле и дальнейшем - осадков выпало выше среднемноголетних значений). Для 2012 года был характерен быстрый набор высоких температур, аномально жаркая погода в апреле, лето в основном жаркое с осадками на уровне и чуть ниже нормы. В 2014, 2017 годах рапс испытывал угнетение от острой раннелетней засухи (недостатка влаги в мае-июне), с изменением ситуации в июле (осадков выпало в разы выше нормы), август был также сухим. Для 2015 года характерно высокое количество осадков в мае, июле и чуть ниже среднемноголетних значений в июне. 2011, 2016, 2018 годы были наиболее благоприятными для роста и развития рапса (осадков в период вегетации выпало выше среднемноголетних значений).

По данным 11 лет наблюдений (2008-2018 годы) между многолетней динамикой поврежденности посевов рапса комплексом блошек и осадками (мая и июня) существует тесная отрицательная связь (r = -0.74), с температурным режимом положительная (r = 0.52). Численность блошек в два и более раз сокращается при сдвигании сроков сева с 10 мая на 20 мая и позже. Высокой эффективностью против блошек (92.4%) обладает предпосевная обработка семян рапса препаратом инсектицидного действия. Сочетанием этих двух приемов можно искоренить проблему защиты рапса от комплекса блошек в начальный период развития. На многолетнюю динамику численности капустной моли определяющее влияние оказывает влагообеспеченность, а также темературный режим периода вегетации (коэффициенты корреляции r=0.53). Однократной обработки инсектицидом против капустной моли в годы подъема численности недостаточно. При биологической эффективности около 75% количество живых гусениц после обработки в 2 и более раза превышает ЭПВ. На численность в посевах рапса рапсового цветоеда отрицательно влияют поздние сроки сева, обработки инсектицидами против капустной моли. Обработка инсектицидами в фазе начала бутонизации при отсутствии капустной моли в сухие годы, защищая от рапсового цветоеда способствует существенному росту урожая семян (на 1.5 ц/га от уровня контроля – без обработки). Обработка семян инсектицидным препаратом оказывает существенное влияние на величину урожая как во влажные (1.5-3.8 ц/га), так и сухие годы (1.0-2.0 ц/га от уровня контроля). При влажных условиях нет необходимости в посходовом опрыскивании от блошек, но требуются повторные обработки против гусениц капустной моли.

Ключевые слова: яровой рапс, вредитель, многолетняя динамика, предпосевная обработка, опрыскивание, биологическая эффективность.

Information about authors:

Tuleeva A. K., candidate of agricultural science, associate professor of the department «Plant protection and quarantine», S. Seifullin Kazakh Agrotechnical University, Nur-Sultan, Kazakhstan; tuleeva.a.k@mail.ru; https://orcid.org/0000-0003-4227-5021

Abdukerim R. Zh., PhD, assistant of the department «Plant protection and quarantine», S. Seifullin Kazakh Agrotechnical University, Nur-Sultan, Kazakhstan; rauza91@mail.ru; https://orcid.org/0000-0002-4745-1437

Korobov V. A., doctor of agricultural sciences, professor, head of the environmental engineering laboratory, Belgorod state University, Belgorod, Russia; vikt.korobov@mail.ru; https://orcid.org/0000-0003-3918-5172

REFERENCES

[1] FAO (Ed.) FAO-Stat.Rom. Food outlook Global Market Analysis. November. 2006. N 3.

[2] Shpaar D., etc. Rape and rape (Cultivation, harvesting, utilization)/ Under the editorship of D. shpaara. - Moscow: ID of LLC "DLV Agrodelo". 2007. 320 p., ISBN 978-5-903209-05-7

[3] In Kazakhstan, natural factors and pest outbreaks are one of the main reasons for reducing the area under rapeseed. October 28, 2019 https://www.zol.ru/n/2fa3709:15

[4] Chulkina, Valentina Andreyevna. Integrated plant protection: phytosanitary systems and technologies / V.A. Chulkina, E.Yu. Toropova, G.Ya. Stetsov; edited by M.S. Sokolov and V.A. Chulkina. M.: Kolos, 2009. 669 p., ISBN 978-5-10-004030-9

[5] Andreeva I.V., Shatalova E.I. SEASONAL DEVELOPMENT OF DIAMONDBACK MOTH AND ITS ENTOMOPHAGES IN WESTERN SIBERIA. *Siberian Herald of Agricultural Science*. 2017;47(3):42-48 (in Russ.).

[6] O. Abraliev A. Beisenbaeva Zh. Naimanova // THE INTERNATIONAL EXPERIENCE OF AGRICULTURAL INNOVATIONS . NEWS OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN SERIES OF AGRICULTURAL SCIENCES ISSN 2224-526X Vol. 1, N 49 (2019), 5–15 https://doi.org/10.32014/2019. 2224-526X.1

[7] Suleimenova N.Sh., Abildayev E.S., Elshibek G.A. Ecological aspects of the use of herbicides in resource-saving technology of rapsa agroecosystems // News of the National Academy of Sciences of the Republic of Kazakhstan. Series of Agrarian Sciences. 3 (39). Almaty, May-June 2017. 222 p.

[8] Attention!!! Cabbage moth! // Agro Inform. - 14.05.2019 (http:// agroinfo.kz/vnimanie-kapustnaya-mol. html).

[9] Postovalov A.A., Grigoriev E.V. Ecological features of harmful organisms of spring rapeseed in the Kurgan region // Actual problems of ecology and nature management: sat. Tr. All-Russian science. prakt. Conf. Kurgan state agricultural Academy. T.S. Maltseva

[10] Moseyko A.G., Churikova V.G. Species composition of rapeseed and mustard entomofauna in the left-Bank part of the Lower Volga region // Bulletin of plant protection. SPb. N 1. 2012. P. 31-38.

[11] Stecov G.J., Sadovnikov G.G., Sadovnikova N.N., Potapov E.E. Effectiveness of chemical protection of crops of spring rape in the conditions of forest-steppe Ob region // Bulletin of the Altai state University, 2018, N 8 (166), P. 1-5.

[12] Kholod A.S., Korenyuk E.F. Cabbage moth-a threat to rape crops in the Omsk region // plant Protection and quarantine, 2016. N 5, P. 32-33.

[13] Kubasova E.V., Kholmov V.G., Kubasov A.V. Influence of chemical agents against phytophages on the yield of spring rape seeds in the conditions of the southern forest-steppe of Western Siberia // Bulletin of the Omsk state agrarian University, 2015. N 2 (18), P. 21-24.

[14] Abildaev E.S., Suleymenova N.Sh. Influence of resource-saving technology methods on productivity of rape agroecosystems/ KazNAU «Research, Results». 2017. N 3 (75). ISSN 2304-334-02

[15] Ekbom B., Müller A., 2011. Flea beetle (Phyllotreta undulata Kutschera) sensitivity to insecticides used in seed dressings and foliar sprays. Crop Prot. 30, 1376–1379.

[16] Sekulic G., Rempel C.B., 2016. Evaluating the role of seed treatments in canola/oilseed rape production: integrated pest management, pollinator health, and biodiversity. Plants 5, 32.

[17] Integrated Control in Oilseed Crops IOBC/wprs Bulletin Vol. 23 (6) 2000

[18] Yin Y., Wang H.Z., and Liao X. “Analysis and strategy for 2009 rapeseed industry development in China” // Chinese Journal of Oil Crop Sciences, 2009. Vol. 31. P. 259–262.

[19] Goltsman S. V., Rendov N. A., Gorbacheva T. V. Economic efficiency of intensification of the technology of cultivation of spring rapeseed for oil seeds in the southern forest-steppe of Western Siberia // Bulletin of the Krasnoyarsk GAU, 2017. N 6 (129). P. 27-31.

[20] Comprehensive system of measures to combat pests, diseases and weeds in rapeseed crops in Kazakhstan // Recommendations: Astana, 2009.