

ANNOTATION

**dissertation work of Ukibaev Rustam Zhumanbekuly
on the topic “The main pests and diseases of onions and protective measures
against them in the conditions of the south-east of Kazakhstan”, submitted for
the degree of Doctor of Philosophy (PhD) in specialty
6D081100 - “Plant protection and quarantine”**

Relevance of the research topic: The strategy "Kazakhstan 2050" is aimed at obtaining ecologically clean agricultural products - the third of ten challenges reflected in the new political direction of the state. The third challenge is the threat of global food security. The high growth rates of the world population sharply aggravate the food problem. Even today, millions of people around the world are starving, and about a billion are experiencing constant shortages. If there were no revolutionary changes in the production of food products, these alarming figures would only grow. For us, there are huge opportunities behind this challenge. To make a qualitative breakthrough in the agricultural industry is completely what we can do. For this, we need a new type of state thinking.

Onion is one of the most valuable vegetable crops for daily consumption. It is grown for its green leaves and bulbs. In Kazakhstan, the cultivated area of this culture is about 25-28 thousand. ha. The main suppliers of commercial onions in Kazakhstan are South and South-Eastern regions. In Zhambyl region, their share is 94.3%, Almaty region — 64.7%, Turkestan region — 66.6%.

The possibility of obtaining a harvest of onions per year with the use of various technologies of its cultivation has made this valuable vegetable culture one of the most useful. However, like other agricultural crops, onions are damaged by various pests that cause significant damage to the leaves or directly to the onion.

In the process of sowing onions, the number and mass distribution of harmful objects that cause damage to the harvest in the initial phases of ontogenesis increases, due to the insufficient use of plant protection products in the fields. With the mass development of pests in the foci of the disease, a significant loss of plants is observed, their yield decreases, and the yield loss reaches 30-50%. Onions are damaged by more than 14 species of harmful arthropods, the most common pests in the fields being the onion fly (*Delia antiqua* Mg.) and tobacco thrips (*Thrips tabaci* L.).

Currently, the main onion pests (nematodes, root mites, onion weevils, wireworms, thrips, moths, onion flies, buzzing flies) and diseases (downy mildew (downy mildew), neck rot, *Alternaria* blight, stemphylosis, root rot of shoots, etc.) to the detriment of their products.

This dissertation study aimed: — study of the main pests and diseases of onions in the conditions of south-east Kazakhstan and the development and introduction into production of effective measures to combat them.

Research objectives:

1. Study of the bioecological characteristics (species composition, distribution, development and harmfulness) of the main pests and diseases of onions in the conditions of south-east Kazakhstan;

2. Study of the influence of stimulants and regulators of growth processes on the resistance and productivity of onions to pests and diseases;

3. Selection of Kazakh and foreign varieties and hybrids of onions that are resistant to diseases and pests;

4. Study of the influence of endophytic fungi on the yield and resistance of onions to diseases;

5. Study of the influence of biological preparations on the main pests and diseases of onions;

6. Development of methods for protecting onions from major diseases and pests in the conditions of southeast Kazakhstan.

Materials and research methods: When conducting research work, traditional classical methods in the field of plant protection, entomology and phytopathology were used.

Research to assess the resistance of onion varieties and hybrids to diseases was carried out in accordance with the “Methodology of state variety formation of agricultural crops” (potatoes, vegetables and melons; M., 1975).

In experiments testing new pesticides and biological products against pests and diseases of onion crops, assessing the effectiveness of stimulating and regulating plant growth activity, the following methods were used:

- 1) Methodological guidelines for conducting registration tests of insecticides, acaricides, biological products and pheromones in crop production (Almaty-Akmola, 1997; p. 120);

- 2) Methodological guidelines for conducting registration tests of fungicides, seed preparations and biological products in crop production (Almaty-Akmola, 1997; p. 64);

- 3) Methodological guidelines for conducting registration tests of herbicides, defoliant, desiccants and plant growth regulators in crop production (Almaty-Akmola, 1997; p. 32);

- 4) Rules for conducting registration and production tests and state registration of pesticides (toxic chemicals) (Astana, 2015).

Description of the main results of the study. During the phytosanitary monitoring carried out in the onion fields of Almaty and Zhambyl regions in 2018-2019, we identified 18 types of pests affecting onion crops. 18 species of pests affecting onions have been identified. Onion fly (*Delia antiqua*), onion root mite (*Rhizoglyphus echinopus*) and tobacco thrips (*Thrips tabaci* L) were registered as particularly dangerous pests of onions.

As a result of phytosanitary monitoring in the onion field, the following diseases were identified: rust, *Alternaria* blight, peronosporosis, aspergillois, neck rot of onions, fusarium rot, black moth. According to the observation results, fusarium disease (*Fusarium* spp.) in 50% of onion fields, downy mildew (*Peronospora destructor* (Berk) Caps) in 25% of onion fields, neck rot (*Botritis allii* Munn) in 30%.

The influence of crop rotation on the spread of diseases and pests in onion fields was also high. In particular, the lowest prevalence of downy mildew (19%) and the slowest development of the disease or the lowest level of damage (7.6%) were observed in the crop rotation of 7 fields. Onion fly and tobacco thrips occurred in 7-field crop rotations by 12.4% and 20.3%.

When studying the influence of new biological products that stimulate plant growth (growth regulators), produced in Kazakhstan and abroad, on the productivity of onions and their damage by diseases, it was found that the biological products *Orgamica S* and *Orgamica F* effectively eliminate fungal and bacterial infections in onion seeds, increase growth energy (by 72.5% and 62.5%, respectively), improve laboratory germination (up to 81% and 69%) and have a positive effect on the development of the root system.

In the course of studies of disease resistance of domestic varieties and foreign onion hybrids, it was found that the Karatalsky variety and the Manasa hybrid are weakly susceptible to blight, and 3 varieties are moderately sensitive (*Bayram*, *Daytona* and *Chalcedony*). And the damage to onion varieties and hybrids by onion fly was in the range of 1.8-15.0%. The pest damaged *MSX343RMF1* (1.8%), *Mereke* (2.9%), *MSX01098 F1* (3.0%), *Valeria* and *Kremen* (3.3%) in very low quantities. They were more resistant to downy mildew on onions *MSX343RMF1* - 9.0%, *Kremen* - 9.8%, *MSX 398 F1* - 11.0%. The highest yield was achieved by the *Kremen* variety (46.4 t/ha) and the *MSX01098 F1* variety (48.2 t/ha), *MSX343RM F1* (51.2 t/ha). These three varieties also stood out in terms of product marketability, amounting to 89.8%, 93.3% and 92.9%, respectively.

Fusarium sp., *Peronospora destructor*, *Penicillium expansum*, *Botritis allii* and *Alternaria sp.* Regarding phytopathogenic micromycetes, the biological drug *Trichodermin* (endophytic fungus *Trichoderma viride*) has been found to have biological control properties.

In the onion fields of the Almaty region, the biological effectiveness of various concentrations of biological preparations *Orgamica S* and *Orgamica F* against false white powder was 85.5-87.1% at a concentration of 0.4%, and in the 0.2% variants it was 75.8-77.4%. In addition, it was possible to increase the onion yield from 1 hectare to 78.1 t/ha and 68.5 t/ha, respectively.

The maximum rate of pest destruction when using the biological product *Actarofit* against onion fly with a rate of 0.3 l/ha was 78.4%, and when sprayed with a rate of 0.6, the biological efficiency reached 90.4%. Application of the biological product *Green Gold*, 0.3%, m.s. in an amount of 0.3-0.5 l/ha sufficiently reduced the number of onion flies, its biological effectiveness on the 3rd day was 40.0-55.0%, on the 7th day - 66.7-73.3% , on the 14th day - 82.0-86.0%, on the 28th day - 88.6-91.4%.

The use of chemical and biological preparations against onion fly and tobacco thrips during the growing season, in particular *Bitoxibacillin* (2 kg/ha) and *Borey* (0.1 l/ha), as well as *Ak kobelek* and *Enzhio*, was relatively more effective. In the variant of combined use of *Bitoxibacillin* (2 kg/ha) and *Borey* (0.1 l/ha), the onion fly decreased by 77.8% 3 days after spraying the crops, by 75.4% after 7

days, by 66.2% after 14 days, 58.2% after 28 days. And in the version in which Ak kobelek and Enzhio were used together, this figure was 74.5%; 72.3%; 65.8%, respectively. And when used together against tobacco thrips Bitoxibacillin (2 kg/ha) and Borea (0.1 l/ha), the pest decreased by 87.1% 3 days after spraying the crops, by 83.9% after 7 days and by 80.9% after 14 days. And in the version in which Ak kobelek and Enzhio were used together, this figure was 84.2%; 80.4%; 78.6%, respectively.

The use of the insecticide Corvette, e.g., against onion pests (onion fly, thrips) in an onion field with a rate of 0.7 turned out to be very profitable from an economic point of view. This new drug gave a net income of 271.6 thousand tenge/ha, the efficiency of application (profitability) was 229.4%.

The use of the new biofungicide Organica S (2 l/ha) against diseases (downy mildew) on an onion field showed very high economic efficiency. Here, a net income of 225.8 thousand tenge was received, the profitability is 253.1%.

Based on the results of the study for 2018-2021, recommendations were presented with an act of inclusion in research work.

Justification of the novelty and importance of the results obtained: In the conditions of south-east Kazakhstan, the bioecological characteristics of the main pests and diseases of onions have been identified, namely their species composition, distribution patterns, level of development and amount of harm. Kazakh and foreign varieties and hybrids of onion crops that are resistant to major diseases and pests have been identified and presented for production. The use of resistant varieties (hybrids) has a positive effect on minimizing plant protective measures, as a result of which chemical preparations become economical, which is very beneficial from an economic and environmental point of view. The influence of endophytic fungi on onion yield and disease resistance has been studied and identified. In the fight against pests and diseases of onions, new insecticides and fungicides were tested for the first time, and recommendations were given on the use of drugs with high biological and economic efficiency. In the southeast of Kazakhstan, highly effective, environmentally friendly, cost-effective methods for controlling onion pests and diseases have been developed and recommended for production.

Relevance to scientific development directions or state programs: the dissertation work is intended for the commercialization of the results of research work under the grant program 2018-2020. for the Group of Senior Researchers (GSNS) and the Group of Junior Researchers (GMNS) within the framework of the project "Stimulating productive innovations" of the Science Committee of the Ministry of Education and Science of the Republic of Kazakhstan was carried out within the framework of project No. APP SSG-16/0894P-GSNS "Commercialization of the first domestic biological product Ak kobelek s.p. against shield-winged pests."

Description of the doctoral student's contribution to the preparation of each publication: the main research results were published in 9 scientific papers, of which 1 article was published in a journal included in the Scopus database with a non-zero impact factor (percentile - 41), 3 articles - in recommended publications

of the Committee for Control in the Sphere of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan and 5 articles - in the materials of international and republican conferences, from which 2 acts of commissioning were separately obtained.

Scope and structure of the dissertation: the dissertation work consists of an introduction, the main part - a review of the literature, objects and methods of research, an experimental part (research results), a conclusion and the literature used. In addition, there are applications. The dissertation is presented on 122 pages, 11 figures, 31 tables are provided. The number of literature used is 124.