performance is a more important factor in production, then it is necessary to limit the period of grazing the pen to one day. To increase the productivity of the pasture, it is necessary to graze pens or pasture areas for no more than 3 days to eliminate the risks of overgrazing and damage to the emerging shoots. Pasture rotation is desirable with low energy of plant growth and weak projective cover, especially in winter, as it allows to build up herbage and subsequently absorb more solar energy.

ТҮЙІН

Австралиялық жайылымдарды басқару жүйесі топырақты-климаттық жағдайларға және жерді пайдалану қарқындылығына қарамастан қораларға бөлінген жайылымдардың көп өрісті ауыспалы айналымдарын пайдалануды болжайды. Жайылым айналымы шөптің біркелкі жайылуын қамтамасыз етеді, кең жапырақты арамшөптердің құрамын азайтады, бір жылдық шөптердің үлесін азайтады және жаз-күз кезеңінде топырақ жамылғысын жақсартады. Жануарларды жаңа қораға көшу кезінде тексеру көбінесе қажетті ветеринариялық іс-шаралар мен басқарушылық шешімдердің уақытылы қабылдануын қамтамасыз етеді. Жайылымнан кейінгі өсімдіктердің өсу энергиясы көбінесе жайылымның қарқындылығына және демалу кезеңінің ұзақтығына байланысты. Алайда 6 апта демалу кезеңі қалыпты болып саналады. Жайылым айналымы ротациясының көмегімен жайылым аймағының өз өнімділігімен қатар жануарлардың өнімділігін де реттеуге болады. Егер малдың өнімділігі өндірісте маңызды фактор болса, онда малды қорада бағу мерзімін бір күнге дейін шектеу қажет. Жайылымдардың өнімділігін арттыру үшін малдың шамадан тыс жайылуы мен пайда болған өсінділерге зиян келтіру қаупін жою үшін жайылымдық аймақтарда 3 күннен аспайтын мерзімде жаю қажет. Жайылымды айналымының қажеттілігі өсімдік өсуінің төмен энергиясымен және әлсіз проективті жамылғымен, әсіресе қыста маңызды, өйткені бұл шөп өсіміне және кейіннен күн энергиясын көп сіңіруге мүмкіндік береді.

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Amangeldi N.[1], PhD doctor
Amangeldikyzy Z. [2], PhD doctor
Yerezhepova A.Sh.[1], master of chemical science
Argynbaeva Z.M.[1], master of chemical science
[1]Kazakh National Women's Pedagogical University, 99 Aiteke Bi Street, Almaty, 050040,Kazakhstan
[2] Zhangir Khan University, Zhangir Khan Street, 51, Uralsk, 090000, Kazakhstan

INTERACTIONS BETWEEN *HETERODERA FILIPJEVI* AND *FUSARIUM CULMORUM*

Abstract

Cyst forming nematodes so named due to the fact that in the soil and plant debris there are not adult animals, as in nematodes of the first group, and not eggs, as in nematodes of the second group, but cysts, which are a hardened body of a female stuffed with eggs. Cysts are resistant to low temperatures, drying out of the soil (they remain viable for several months even at 10% relative humidity of the soil) and pesticides. The larvae hatching from the eggs leave the cyst and infect the roots of susceptible plant species. Soil-borne pathogens represent an important, but often over looked, biotic constraint to cereal production worldwide. The plant parasitic nematodes of the genus *Heterodera* attack cereals, particularly wheat, causing costly financial losses due to impact on yield. In particular, over the past ten decades, the changing spectrum of soil borne pathogens in wheat has created challenges for crop rotation practices that were previously able to provide adequate disease control. Yield losses caused by soil borne fungal pathogens have been reported as a serious problem for small grain growers throughout the world. Pathogens such as *Fusarium culmorum, F. pseudograminearum, F. avenaceum, Bipolaris sorokiniana, Gaeumannomyces graminis* and *Rhizoctonia solaniare* responsible for reducing wheat yields [1,2,3]. Substances secreted by nematodes (elicitors), in many cases, can bind to plant cell receptors, and further through the signaling system of the plants to affect the expression of genes determining plant responses. Upon infection of plants are included various signaling systems that sense, and transmitting the multiplied signals from pathogens

in the genetic apparatus of cells where the protective gene is expressed, allowing the plants to arrange the structural and chemical protection.

Key words: *plant parasitic nematodes, soil-borne pathogens, interaction, cereal crops, disease, wheat*.

Diseases of cereal crops with soil infection include root rot and *helminthosporium* leaf spots. On winter and spring wheat, there are *helminthosporium*, fusarial, ophoid, cercosporous and pyotic root rot. On virgin and fallow lands of Northern Kazakhstan and Western Siberia, *helminthosporium* and *helminthosporium*-fusarial root decay are the most common and harmful diseases of spring wheat and barley that occur annually. The main causative agent of the disease is the imperfect fungus *Bipolaris sorokiniana Shoem.* (synonym for *Helminthosporium sativum P. R*. and Bakke) fungi of the genus *Fusarium*. The disease manifests itself in the form of darkening and rotting rootlets, underground interstice stems and lower leaves. Zh. T. Djimebaev points out that the fungus often affects the base of the stem and rarely the root system. Spores of the fungus that remain on plant residues are able to germinate only in the upper layers of the soil and can be introduced into young plant tissues into the base of the stem during full sprouting, before the formation of secondary system of root. In addition, the disease adversely affects the physiological and biochemical processes occurring in plants during their growing season and the quality of the grain.

On barley, root rot was studied in the South-East, Northern and North-West Kazakhstan, and in Western Siberia.

Natural cereal deposits are free from the causative agent of *helminthosporium* root rot. According to VA. Chulkina, on the arable land of the forest steppe of Transuralia and Western Siberia, the contamination of the soil with fungus is 4-17 more than in virgin and fallow their analogs.

The role of plant residues of individual crops on which the infection is reserved in the field is different. E. Chumakov M.V. Gorlenko point out that *N. sativum* is better preserved on fresh, slightly decomposed remains of plants of spring wheat and barley and in soil, sometimes transmitted by seeds.

The Austrian Scientist V. Zwats points out that the basis for an integrated program for the protection of crops from root rot is agro technical measures, in particular, the timing of sowing, the rate of sowing seeds, and the introduction of mineral and organic fertilizers into the soil.

A.V. Malikova, in the forest steppe zone of the Krasnoyarsk Territory, isolated *H. sativum* fungus from wheat, millet and oats. In the mycological analysis of wild cereals, the fungus infection contained wheatgrass, a hedgehog, and a ryegrass pasture.

L.K. Khatskevich and A.A. Benken found in laboratory conditions that vetch, pea, sunflower, and rape are less favourable substrates for the caoprophytic development of the pathogen in comparison with spring wheat and barley.

According to L.M. Gorodilova, in the Akmola region, in the first years of plowing virgin lands, root rot on spring wheat developed insignificantly. Gradually the accumulation of infection in the soil was progressing and the development of the disease was intensified. Even with its weak manifestation, the crop decreased by 11.6%, and with a strong development to 42.5%.

Affected plants lag behind in development, there is a white collar. In some varieties, a dump and a stalk fracture are observed at the base of hard wheat.

In the 70 years in Kostanay region, V.V. Kotova found that a significant decline in the crop begins with the intensity of the disease in the range of 10-15%. The threshold of disease severity varies depending on the agronomist. It is higher when sowing wheat after steam, corn and below when it is grown monoculture for 2-3 years. The harmfulness of root rot of spring wheat increased sharply when plants were damaged by latent stem pests. With a weak manifestation of root rot, the yield of spring wheat decreased by 11.6%, with a strong yield of 42.5%, and when the plants were damaged by hidden pests, losses reached 65.7%.

S.F. Bedina, in the conditions of the meadow steppe zone of the East Kazakhstan region, found that the harmfulness of root rot on spring wheat depends on the type of manifestation of the disease. With the defeat of the underground internodes on the spring wheat cultivar, the Saratov 29 coefficient of severity of the disease was 12.5%, stem base was 15.9%, and both organs were 23%. On grade Kharkivska 46, root rots and a node of tillering with a sickness coefficient of 61-69% were noted.

Experiments by V.V. Kotova showed that when sowing seeds obtained from plants affected by root rot, the yield of wheat is reduced by 10-25% or more.

A research by R.I. Shchekochikhina, conducted in Kostanay, Kurgan and Saratov regions, revealed that the condition of spring wheat influences the severity of the disease. In stunted plants, when they were affected by 1 point, the mass of grain from the ear decreased by 24%, and when affected by 2 and 3 points, it decreased by 36-46%. At the same time, in highly medium sized plants, these indicators decreased significantly.

Kazakhstan, as the second in terms of area and third in terms of agricultural importance in the Soviet Union republic, is of great interest as a base for nematological research due to the unique combination of diverse soil - climatic and agro ecological conditions.

Southern Kazakhstan (primarily Semirechie), as one of the ancient agriculture areas, is part of the south - western Asian Geno center of agricultural crops. It is very likely that this region coincides with the Geno center of some nematodes - parasites of cultures (primarily vegetable ones). At the same time, some crops (for example, sugar beet) were introduced to Kazakhstan in the last 40 to 50 years, which suggests that the recent introduction of sugar beet heteroders, now registered in 5 regions of the republic. The development of cereals for virgin lands in Central and Northern Kazakhstan was accompanied by the spread and growth of the harmfulness of the vicarious cereals. The giant sizes of the fields in these regions have no precedent in world practice and are therefore of particular interest to nematologists. On the other hand, finding on grains of the British Gallic nematode is unlikely to be associated with the introduction of this parasite from Western Europe, where it was previously known and also requires a special study. In a sheltered state farm of the Alma-Ata and Pavlodar oblasts, 50 -70% of the vegetable production is often destroyed by root-knot nematodes. Significant losses in the production of potato in the southern and eastern zones of Kazakhstan are caused by dietary diseases.

Over 80 years, since the first reports of the discovery of parasitic nematodes in Kazakhstan, the common nematode fauna is of the most important cultural plants in the republic, and the most important species parasitic nematodes were separated to fight them. Together with the topic, the results of these studies were not systematically on a modern basis, and could not answer the questions raised by practice.

It was necessary to generalize and supplement the existing information, critically analyse the proposed methods of mathematical calculations and modelling of the dependence of losses of plant products on the density of populations of parasitic nematodes, prediction of the harmfulness of the latter, and develop principles for managing phytosanitary conditions based on the integration of antinematode measures [4].

For the first time in our republic professor A.O Sagitov revealed a new pest of cereal crops - the British root nematode (*Meloidogyne britannica*) on wheat, barley and oats in the East Kazakhstan and Pavlodar regions [5].

Heterodera filipjevi, a species of cyst nematode that is parasitic to cereals, is now widely recognized as a major nematode pest of wheat in cereal production areas especially intemperate climates and semiarid areas in Europe and WestAsia [6]. This species is also recorded in East Asia and Pacific Northwest USA [6,7,8]. In addition, it has been found in association withwild host grasses such as *Avena ludoviciana, A. fatua,Bromus tectorum, Hordeum distichum* and *H. spontaneum* [56]. *H. filipjevi* is a sedentary endoparasite that feeds on root vascular tissues and causes severedamage on crops [9]. For example, in Iran, *H. filipjeviis* the prevailing species of the cereal cyst nematode, where it is widespread in wheat growing areas in eighteen provinces [45,46]. At the highest initial population density (20 eggs and juveniles per gram soil) in field micro plots it caused 48% yield loss in winter wheat [9].

The crown rot fungus F. culmorum limits wheat yields intemperate and semitropical areas of the world. It infects roots and sub crown internodes causing dry rot of crown and roots, browning of the base of the plant. When infected plants are subjected to water stress, severe damage appears as whiteheads shortly before crop maturity [10].

Fusarium culmorum and *F. Pseudograminearum* are generally considered to be the most economically important species of crown rot fungi on wheat. Yield losses from each species have been reported for wheat in many countries and reach up to 30% in the USA [11] and 43% in Turkey.

The development of ecological methods of plant protection requires a detailed study of host-parasite relations. In the parasitological literature, the interaction of partners in the parasitic system, i.e. the influence of the parasite on the plant and the dependence of its development on the physiological state of the plant are rarely considered in combination. The specificity of this parasitic system is manifested in the fact that plant organs, acquiring the status of a biotope for a phyto-helminth, adaptively respond to the presence of nematodes. The latter act on plant tissue and change it, and the plant develops protective reactions in response. [12].

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ТҮЙІН

Топырақтың патогендері бүкіл әлемде дәнді дақылдардың өндірілуіне биотикалық тосқауыл болып табылады. Атап айтқанда, соңғы онжылдықта бидай топырағының патогендерінің спектрінің өзгеруі ауруды бақылауда ауыспалы егіс әдістеріне қиындықтар туғызды. Топырақтың саңырауқұлақ патогендерінің әсерінен дақылдардың шығыны дүние жүзіндегі астық өндірушілерге зиян келтіруде. Бидай өнімділігінің төмендеуіне *Fusarium culmorum, F. pseudograminearum, F. avenaceum, Bipolaris sorokiniana, Gaeumannomyces graminis және Rhizoctonia solania* сияқты патогендер ісер етеді. *H. avenae* мен *F. culmorum* инокуляциялау нәтижесінде дәнді дақылдардың 12,3 және 25,5% - ке төмендеді. *H. avenae* мен *F. culmorum*-ді бір уақытта инокуляциялау 38,4% төмендеуіне әкелді, бұл екі патогендердің әсерінен шығымдылықтың аддитивті әсерін көрсетеді.

РЕЗЮМЕ

Почвенные патогены представляют собой важное, но часто игнорируемое биотическое препятствие для производства зерновых во всем мире. В частности, за последние десятилетий изменение спектра почвенных патогенов пшеницы создало проблемы для методов севооборота,

которые ранее были способны обеспечить контроль над болезнями. Потери урожая, вызванные почвенными грибковыми патогенами, считаются серьезной проблемой для мелких производителей зерна во всем мире. Такие патогены, как *Fusarium culmorum, F. pseudograminearum, F. avenaceum, Bipolaris sorokiniana, Gaeumannomyces graminis и Rhizoctonia solania*, являются причиной за снижение урожайности пшеницы. Взаимодействие между *Heterodera avenae* и *Fusarium culmorum* на компоненты роста и урожайности твердой пшеницы сорта. *Sham 3*, размножение *H. avenae* и степень тяжести гнили кроны изучались в эксперименте. Снижение урожайности зерна, вызванное обработкой только *H. avenae* и *F. culmorum*, составило 12,3 и 25,5% соответственно. Одновременная инокуляция *H. avenae* и *F. culmorum* привела к снижению на 38,4%, что указывает на аддитивный эффект потерь урожая из-за двух патогенов.

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Amangeldi N. [1], PhD doctor
Amangeldikyzy Z. [2], PhD doctor
Yerezhepova A.Sh.[1], master of chemical science
Argynbaeva Z.M.[1], master of chemical science
[1]Kazakh National Women's Pedagogical University, 99 Aiteke Bi Street, Almaty, 050040,Kazakhstan
[2] Zhangir Khan University, Zhangir Khan Street, 51, Uralsk, 090000, Kazakhstan

SURVEYING WHEAT GROWING AREA IN KAZAKHSTAN FOR PLANT PARASITIC NEMATODES WITH A MAIN FOCUS ON THE CEREAL CYST AND ROOT LESION NEMATODES

Abstract

Nematodes - one of the most abundant and widespread of multicellular animals on our planet: they account for about 4/5 of the entire biodiversity of the animal world! Representatives of about half of the species of nematodes are found in the soil or in water, but others lead a parasitic life, presenting a big problem for agriculture. Conducting surveys in the major cereal crop growing areas of Northern Kazakhstan – Shortandy, at A.I.Baraev research centre was taken 90 soil samples, by the result was the first time found 24 cyst forming nematodes, in western Kazakhstan, Uralsk experimental station was taken 90 soil samples, found 9 cyst forming nematodes in the South - Eastern Kazakhstan, Kaskelen research development stations were taken 90 soil samples of the soil samples was found 150 cyst forming nematodes. *Heterodera spp* - for microscopic identifications intercepted nematodes, the following types of parasitic nematodes have been identified. From wheat growing areas of west and south – east part of Kazakhstan was taken 180 soil samples from both regions, by doing microscopically identification from 64 soil samples we found free living nematodes and plant parasite nematodes. Performing microscopic identification of intercepted nematodes, the following species of plant parasitic nematodes were identified – *Aphelenchus spp* – 260 pieces, *Aphelenchoides spp* – 290 pieces, *Tylenchus spp* – 50 pieces , *Filenchus spp* 30 pieces, *Pratylenchus spp* - 30 pieces, *Parapratylenchus spp* – 10 pieces, *Ditylenchus spp* – 100 pieces at the province of Ural; also at the province of Almaty were identified - *Aphelenchus spp* – 303 pieces, *Aphelenchoides spp* – 570 pieces, *Tylenchus spp* – 110 pieces, *Filenchus spp* – 30 pieces, *Pratylenchus spp* – 170 pieces, *Parapratylenchus spp* – 90 piesec, *Ditylenchus spp* – 90 pieces.

Key words: *plant parasitic nematodes, cyst forming nematodes, cereal crops, spreading, wheat.*

Nematodes, or roundworms, - one of the most abundant and widespread of multicellular animals on our planet: they account for about 4/5 of the entire biodiversity of the animal world! Representatives of about half of the species of nematodes are found in the soil or in water, but others lead a parasitic life, presenting a big problem for agriculture [1].

Nematodes are the second group of species diversity after the animal kingdom insects. Plant parasitic nematodes morphologically differ little from each other, except that the size (0.5 to 5.0 mm).