

NEWS

OF THE NATIONAL ACADEMY OF SCIENCES OF THE REPUBLIC OF KAZAKHSTAN

SERIES OF BIOLOGICAL AND MEDICAL

ISSN 2224-5308

Volume 2, Number 326 (2018), 104 – 108

UDC633.11:582.285.2

N. I. Kalybekova¹, Sh. K. Shapalov¹, M. B. Yunussov¹, G. Z. Turebekova¹, G. A. Issengalieva²,
K. I. Islamova², G. E. Nurmukhanova², G. Sh. Toregeldi¹, Zh. M. Altybayev¹

¹South Kazakhstan pedagogical university, Shymkent, Kazakhstan,

²K. Zhubanov Aktobe regional state university, Aktobe, Kazakhstan.

E-mail: shermahan_1984@mail.ru

DEVELOPMENT AND DISEASES OF WHEAT RUST IN THE CONDITIONS OF KAZAKHSTAN SOUTH-EAST

Abstract. Wheat stem rust (*Puccinia recondita f. sp. tritici Rob. ex. Desm*) damages all vegetative members of grains such as leaf, stalks, spike, spike's grass-blade, sometimes it damages its seed too, it lowers the yield and seed quality, leads to reduction, affection of wheat with yellow rust leads to lowering of yield and seed quality. When it is damaged the water balance deteriorates, transpiration greatens and leads to lowering of photosynthesis process in leaf, metabolism process violates in plant and the height of plant, thickness of stalk and length of spike shorten, the number of small spikes, seed, seed weight decrease, the period of spike generation extends. Resistance of plant to cold lowers, the root system develops poorly, and absorption of water from soil goes down. While using non-resistant varieties in production in the years of epiphytoty the disease, occurred when spring wheat strikes root, can reduce the yield up to 80 percent and during coming into emergence up to 20-30 percent. Efficient conduction of phytosanitary control and appropriate organization of protection actions for forecasts about evolution of disease give a possibility to prevent environmental loss of yield. Over the past few years the phytosanitary condition of grains worsens year by year. It is related to change of climatic conditions, ability of pathogenic mutation and sowing of non-resistant varieties. In this connection the development of wheat stem rust and dissemination in conditions of South Kazakhstan is studied in this article.

Key words: wheat stem rust, monitoring, epiphytotic, yield, plant protection.

Introduction. Wheat stem rust is a harmful disease widespread in all field areas of the world. Wheat stem rust damages the leaf surface, weakens the assimilative action, because of that physiological processes are spoiled, the length of spike shortens, number of small spikes, seeds and weight lowers, quality of wheat and yield decreases [1-4]. Further due to damage the height of plant, thickness of stalk and root development reduces, as a result the absorption of nutrients by root from soil becomes complicated [5-9]. Because of deterioration of physiological processes the endurance to winter is decreased, low molecular weight gluten components are generated in seed, synthetic process and accumulation of starch weakens, in addition the quantity of protein in the endosperm drops off.

When the epidemic is stronger the damaged leaf dies early, growth of plant and seed formation reduces. As a consequence fine seeds are formed; yield decrease reaches up to 70-80%. Sometimes the epiphytoty of this disease leads to complete loss of yield [10-15].

It is noticed in the fields of North Kazakhstan every year. Over the past few years the phytosanitary condition of grain fields worsens year by year. 740 million hectare of wheat field was damaged by stem rust in Kostanai oblast in 2014. This situation is due to change of climatic condition, mutation of pathogenic population, and loss of endurance by varieties consequently [16-20].

Regular efficient conduction of phytosanitary control in the field and correct organization of protection actions for forecasts about development of disease enables prevention of environmental loss, preservation of resistance of varieties to disease, prevention of epiphytoty.

Study methods. For conduction of study the general methods of agricultural phytopathology science were used. Development of diseases and their dissemination was observed in the experimental and production fields of south and south-east of the Republic of Kazakhstan. The phytopathology, herbiology methods, monitoring method and methods determining dissemination of phytopathogenes were used in the research [21-24]. In order to maintain the basic report several fields were distinguished to identify damage of cereals with rusty fungus. During monitoring two indicators will be identified: dissemination (number of plants damaged in the field) and pace (level of damage). In order to get precise outcomes the special scales describing the pace of progress of disease was used. Damage type of plants by the score and percentage of development and dissemination of phytopathogen according to number of sick plants in the sample were determined. Collection of cereals' vegetative members (leaf, stalk) damaged by rust fungus was conducted by the method of N. E. Konavalova and others [7, 25]. The form of monitoring of rust diseases of cereals is shown below.

Study outcomes. Monitoring of stem rust progress and dissemination was conducted during ear formation and milk-wax stage of ripeness in conditions of plots of Kazakh scientific-research institute of agriculture and crop farming. Received materials were used for the purpose of investigation. Among reservoirs of disease excitants the damages of goat grass, brome and wheat grass *Agropyron pectiniforme*, *Aegilops cylindrica*, (*Aegilops squarrosa*), *Winter rye* were registered.

During investigation of the wheat field 20–40% of winter wheat's middle part and surface and common wheat varieties' lower and middle parts were affected by rust disease. The development rate of leaf rust of the wheat varieties was 60-80% in the period of milk-wax stage of ripeness (figure, table).



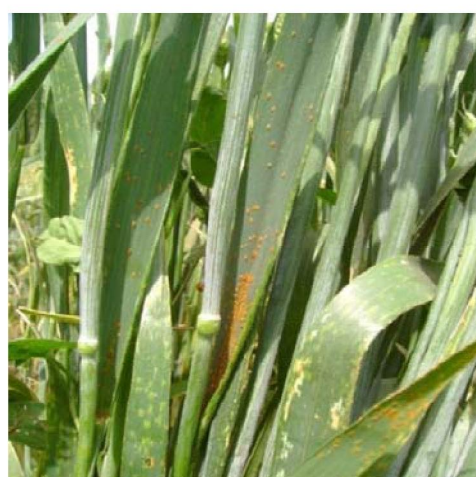
Agropyron pectiniforme



Winter rye



Triticumaestivum



Triticumaestivum

Development of stem rust on field crops

Affection of cereals by stem rust

Crop, variety	Progress of disease in pace, %	
	Phenologic phases	
	ear formation	milk-wax stage of ripeness
<i>Agropyron pectiniforme</i>	20	30
<i>Aegilops cylindrica</i> ,	20	20
<i>Aegilops squarrosa</i>	30	40
<i>Winter rye</i>	50	70
<i>Triticum aestivum</i> *	40	60
<i>Triticum aestivum</i> **	20	80

Many factors on the role of rust fungal diseases of cereals (as an infective reservoir) are shown in the works of research workers [26-30]. Based on the obtained results it was found out that reservoirs of rust diseases widespread in harmful and field areas of Kazakhstan are cereals grown in phytocenosis under natural conditions. In addition according to the results of analysis it is proved that not only wild cereals like Cylindrical goat grass (*A. cylindrica*), Bromus inermis Leyss (*B. arvensis*) but also arable cereals like common barley (*H. vulgare*), common wheat (*T. aestivum*) are natural resource of phytopathogens. The yellow rust overwinters in the form of urediniospore or uredinial mycelium in many cereals and winter wheat. As a result of overwintering of spores and mushroom spawn in autumn sowing the occurrence of rust diseases is observed in early spring.

REFERENCES

- [1] Sagitov A.O., Kochorov A.S. Fitosanitarnyj monitoring i integrirovannaja zashhita pshenicy ot vrednyh organizmov v Kazahstane // Teoreticheskij i nauchno-prakticheskij sel'skohozjajstvennyj zhurnal. A.: Agromeridian, 2006. N 2(3). P. 126-136.
- [2] Hasenov S.S. Aktual'nye problemy zashhity i karantina rastenij v Kazahstane // Materialy mezhdunarodnoj konferencii, posvjashhennoj 90-letiju so dnja rozhdenija Zh. T. Dzhiembaeva «Sovremennye problemy zashhity i karantina rastenij». A.: Alejron, 2005. P. 56-66.
- [3] Chumakov A.E. Osnovnye metody fitopatologicheskikh issledovanij / A.E. Chumakov, I.I. Minkevich. M.: Kolos, 1974. 189 p.
- [4] Metody monitoringa i prognoza razvitija vrednyh organizmov. Moskva-Sankt-Peterburg: RASHN, 2002. 96 p.
- [5] Metodicheskie ukazaniya po monitoringu chislennosti vreditelej, sornyh rastenij i razvitija boleznej sel'skohozjajstvennyh kul'tur. A.: Foliant, 2004. 272 p.
- [6] Peterson R.F., Campbell A.B., Hannah A.E. A diagrammatic scale for estimating rust intensity on leaves and stems of cereals. 1948. Vol. 26. P. 496-500.
- [7] Konovalova N.E., Semenova L.P., Sorokina G.K. Metodicheskie rekomendacii po izucheniju rasovogo sostava vzbuditelej rzhavchiny hlebnym zlakov. M.: VASHNIL, 1977. 144 p.
- [8] Wan A.V., Chen X.M., He Z.H. Wheat stripe rust in China // Australian journal of Agricultural Research. 2007. Vol. 58. P. 605-619.
- [9] Ziyaev Z.M., Sharma R.C., Nazari K., Morgounov A.I., Amanov A.A. Improving wheat stripe rust resistance in Central Asia and Caucasus // Euphytica. 2010. N 24. P. 1-11.
- [10] Kabalkina N.A. Rezervy zashhity rastenij v SSSR i za rubezhom // Selekcija i semenovodstvo. 1990. N 1. P. 6-10.
- [11] Svodka o rasprostranenii rzhavchiny pshenicy // Prodovol'stvennaja i sel'skohozjajstvennaja organizacija Obedinennyh Nacii – 2011. <http://www.fao.org/agriculture/crops/rust/stem..>
- [12] Rzhavchiny na pshenice, rzhi, ovse, jachmene, Biofajl: Nauchno-informacionnyj zhurnal. <http://biofile.ru/bio/6334.html>.
- [13] Dolzhenko V.I. Fitosanitarnye tehnologii vozdeljvanija zemnyh kul'tur // Agrotehnicheskij metod zashhity rastenij ot vrednyh mikroorganizmov: materialy 4-j Mezhdunar. nauch.-prakt. konf. Krasnodar, 2007. P. 13-15.
- [14] Nazarova L.N., T.P. Zhohova T.M. Zashhita semennyh posevov ozimoy pshenicy ot boleznej v Central'nom regione RF // Zashhita i karantin rastenij. 2013. N 5. P. 54-56.
- [15] Peresyppkin V.F., Tjuterev S.L., Batalova T.S. Bolezni zemnyh kul'tur pri intensivnyh tehnologijah vozdeljvanija. M.: Agropromizdat, 1991. 272 p.

- [16] Sanin S.S., Nazarova A.N. Fitosanitarnaja obstanovka na posevah pshenicy v Rossijskoj Federacii (1991–2008 gg): Analiticheskij obzor // Zashhita i karantin rastenij. 2010. N 2. P. 70-78.
- [17] Sorokin N.S., Grin'ko A.V., Kuzjuba T.I. Pesticidy na ozimoy pshenice // Zemledelie. 2009. N 4. P. 26-28.
- [18] Stamo P.D., Kuznecova O.V. Porazhenie zemnykh kul'tur na Stavropol'e narastaet // Zashhita i karantin rastenij. 2014. N 2. P.27-30.
- [19] Chenkin A.F., Zaharenko V.A., Goncharov N.R. Spravochnik agronoma po zashhite rastenij. M.: Agropromizdat, 1990. 367 p.
- [20] Shuljakovskaja L.N., Nenadova T.V., Pavlova L.G. Amistar jekstra – perspektivnyj fungicid dlja ozimoy pshenicy na Severnom Kavkaze // Zashhita i karantin rastenij. 2006. N 6. P. 31-32.
- [21] Shherbik A.A., Kovalenko E.D. Otbor donorov ustojchivosti pshenicy k buroj rzhavchine // Zashhita i karantin rastenij. 2011. N 2. P. 45-46.
- [22] Bozhenko E. Buraja rzhavchina ozimoy pshenicy i mery bor'by s nej, <http://www.scienceforum.ru/2015/1302/16151>
- [23] Shapovalova O.Ju. Monitoring populjacji vzbuditelja buroj rzhavchiny pshenicy na Severnom Kavkaze // Mikologija i fitopatologija. 2002. Vol. 36, vyp. 5. P. 77.
- [24] Pavljushin V.A. Ustojchivye sorta – vazhnejshij jelement v fitosanitarnoj optimizacii agrojekosistem // Nauchnye materialy Pervoj Vserossijskoj konferencii po immunitetu rastenij k boleznyam i vrediteljam. SPb., 2002. P. 16.
- [25] Anpilogova L.K., Volkova G.V. Metody sozdaniya iskusstvennykh infekcionnykh fonov i ocenki sortoobrazcov pshenicy na ustojchivost' k vredonosnym boleznyam (fuzariozu kolosa, rzhavchinam, muchnistoj rose): Metodicheskie rekomendacii. Krasnodar, 2000. 28 p.
- [26] Volkova G.V., Anpilogova L.K. Ocenka ustojchivosti sortov ozimoy pshenicy k kompleksu vredonosnykh boleznej // Materialy mezhdunarodnoj nauchno-prakticheskoy konferencii «Problemy mobilizacii, sohraneniya i izucheniya genofonda vazhnejshih sel'skohozjajstvennykh kul'tur dlja reshenija prioritetnykh zadach selekcii». SPb., 2001. P. 239-240.
- [27] Tyryshkin L.G., Zuev E.V., Kurbanova P.M., Kolesova M.A. Ustojchivost' k listovoj rzhavchine izvestnykh istochnikov rezistentnosti jarovoj mjagkoj pshenicy // Zashhita rastenij i karantin. 2008. N 6. P. 39.
- [28] Singh R.P., Huerta-Espino J., Willam M. Genetics and breeding for durable resistance to stem rust of wheat // Increasing Wheat Production in Central Asia through Asian Wheat Conf. Almaty, Kazahstan, 2003. P. 127-132.
- [29] Shherbik A.A., Kovalenko E.D. Otbor donorov ustojchivosti pshenicy k buroj rzhavchine // Zashhita i karantin rastenij. 2011. N 2. P. 45-46.
- [30] Volkova G.V., Alekseeva T.P. Dinamika genotipov v populjacijah rzhavchinnykh gribov pod vlijaniem fungicidov // Materialy 1-go sezda mikologov Rossii. M., 2002. P. 159-162.

**Ш. К. Шапалов¹, Н. И. Кальбекова¹, М. Б. Юнусов¹, Г. З. Турбекова¹, Г. А. Исенгалиева²,
К. И. Исламова², Г. Е. Нурмуханова², Г. Ш. Төрегелді¹, Ж. М. Алтыбаев¹**

¹Оңтүстік Қазақстан педагогикалық университеті, Шымкент, Қазақстан.

²К. Жұбанов атындағы Ақтөбе өңірлік мемлекеттік университеті, Ақтөбе, Қазақстан

ҚАЗАҚСТАНЫҢ ОҢТҮСТІК-ШЫҒЫС ЖАҒДАЙЫНДА БИДАЙ ЖАПЫРАҚ ТАТЫНЫҢ ДАМУЫ МЕН АУРУЛАРЫ

Аннотация. Бидай жапырақ таты (*Puccinia recondita f. sp. tritici Rob. ex. Desm*) астық дақылдарының барлық вегетативті мүшелерін: жапырағын, сабағын, масағын, масақ қылтанағын, кейде дәнін де зақымдайды, егін түсімін және дән сапасын кемітеді, төмендеуіне әкеледі бидай сорттарының сары таппен зақымдануы егін түсімінің кемуіне және дән сапасының төмендетеді. Зақымданған кезде өсімдікте су балансы бұзылады, транспирация артып жапырақта фотосинтез процесінің белсенділігі төмендеуіне әкеледі, өсімдікте метобализм процесі бұзылып өсімдіктің бойы, сабағының жуандығы және масақ ұзындығы қысқарады, масақтағы масақша саны, дән саны, дән салмағы азаяды, масақ түзу кезеңі ұзарады. Өсімдіктің суыққа төзімділігі төмендейді, тамыр жүйесі нашар дамиды, топырақтан судың сіңуі нашарлайды. Эпифитотия жылдары төзімсіз сорттарды өндірісте пайдаланған жағдайда жаздық бидайдың түптену кезінде пайда болған ауру өнімді 80 пайызға дейін, ал масақтану кезінде 20–30 пайызға дейін кемітуі мүмкін. Егістікке фитосанитарлық бақылауды тиімді жүргізу және аурудың дамуы туралы болжамдар бойынша қорғау шараларын дұрыс ұйымдастыру экологиялық шығындардың алдын алға мүмкіндік береді. Кейінгі жылдары астық дақылдарының фитосанитарлық жағдайы жылдан жылға нашарлап барады. Бұл климат жағдайының өзгеруіне, патогеннің мутациялануға қабілеттілігіне және өндірісте төзімсіз сорттардың егілуіне де байланысты. Осыған орай мақалада Оңтүстік Қазақстан жағдайында бидай жапырақ татының дамуы және таралуы зерттелген.

Түйін сөздер: бидай жапырақ таты, мониторинг, эпифитотия, өнімділік, өсімдік қорғау.

Ш. К. Шапалов¹, Н. И. Калыбекова¹, М. Б. Юнусов¹, Г. З. Туребекова¹, Г. А. Исенгалиева²,
К. И. Исламова², Г. Е. Нурмуханова², Г. Ш. Төрегелді¹, Ж. М. Алтыбаев¹

¹Южно-Казахстанский педагогический университет, Шымкент, Казахстан,

²Актюбинский региональный университет им. К. Жубанова, Актюбе, Казахстан

РАЗВИТИЯ БОЛЕЗНИ ЛИСТОВОЙ РЖАВЧИНЫ ПШЕНИЦЫ В УСЛОВИЯХ ЮГО-ВОСТОКА КАЗАХСТАНА

Аннотация. В Казахстане ежегодные потери урожая от бурой ржавчины составляют 5-15%, а в годы эпифитотий – 45-70%. Для получения максимальной отдачи от затрат на защиту растений требуется четкая организация фитосанитарного контроля за состоянием посевов и проведения обработок в соответствии с прогнозом развития вредных организмов. В последние годы фитосанитарная ситуация на посевах зерновых культур стала ухудшаться. В годы эпифитотии листовой ржавчины наблюдается полная гибель посевов.

Листовая (*Puccinia recondita* sp. *tritici* Rob. ex. Desm) ржавчина пшеницы поражают все надземные части зерновых культур: листья, влагалища, стебель, колосья, где она развивается на чешуйках, осях, иногда даже на зерне. Она нарушает водный режим растений, увеличивая транспирацию, вызывая снижение фотосинтетической активности листьев и нарушает процессы метаболизма в растениях, что приводит к уменьшению роста и запаздыванию фазы колошения. При этом резко снижается засухоустойчивость растений. Корневая система развивается слабо, плохо подает воду. Из-за нарушения функционального состояния устьиц усиливается транспирация и увеличивается физическое испарение воды через прорывы эпидермиса, вызываемые пустулами гриба. Вследствие этого расход воды на единицу сухого вещества резко возрастает. Сильное поражение бурой листовой ржавчиной приводит к преждевременному созреванию посевов и значительному недобору урожая, особенно при недостатке почвенной влаги.

В статье дана оценка развития и распространения листовой ржавчины на посевах зерновых культур селекции поливного и богарного направления.

Ключевые слова: листовая ржавчина пшеницы, мониторинг, эпифитотия, урожай, защита растений.