

COMMON ROOT AND FUZARIUM FOOT ROT OF WINTER WHEAT IN UZBEKISTAN

Annotation: the occurrence of root and foot rot diseases on winter wheat fields has been surveyed in 16 districts of six regions of Uzbekistan. Reports about wide occurrence of *Fusarium* root and foot rots on wheat fields have been confirmed, and causal agents have mostly been identified. For the first time in Uzbekistan severe infection of winter wheat seedlings with common root rot (caused by *B. sorokiniana*) has been determined on irrigated fields in two districts of Bukhara region. For the first time in the country infection of winter wheat seedlings with a root rot caused by the new for a country incitant of the disease, a fungus *Microdochium bolleyi*, has been determined in the Andijan region. For the first time an infection of winter wheat seedlings with both the cereal cyst nematode belonging to the *Heterodera avenae* group and *Fusarium* sp. has been registered in one field of the Tashkent region.

Key words: winter wheat, root and foot rot, whitehead, *Fusarium* spp., *Bipolaris sorokiniana*, *Microdochium bolleyi*, *Heterodera avenae*.

Winter bread wheat *Triticum aestivum* L. grown on irrigated areas may be considered as a relatively new crop for Uzbekistan because at Soviet times it has been considered as unimportant and had been cultivated exclusively on unirrigated (boghara) drylands, mostly foothills, on limited areas (100 to 250 thousand ha annually). Currently wheat occupies more than 1.4 million ha of irrigated arable lands annually. Unfortunately, crop growing system on these areas envisages dominance of wheat, and this creates favorable conditions for development not only of common diseases of this crop but leads to or appearance of new ones either to increasing frequency and severity of diseases that before were of little significance.

One group of such diseases are seedling blight, root, crown and foot rots of wheat and other cereal crops. Their symptoms include at first appearing of light brown, later becoming dark brown to black spots (necroses) on nodal and seminal roots, crowns, subcrown internodes, lower stem and lower leaf sheets. Infected plants have yellowing leaves and are stunted. At tillering stage one or more shoots can be killed. At heading stage some shoots can be stunted and fail to form ears, or may develop small heads with few or no seeds. Severe infection with aggressive pathogens (e.g., some *Fusarium* spp.) at booting-heading-early ripening stages can cause premature death of plants with spikes, producing symptoms called "white shoot" and "whitehead".

Symptoms of root, crown and foot rots may vary depending on causal fungi. Aetiology of the disease is complicated and it can be incited by dozens of pathogenic fungi (Table 1), or unfavorable weather and soil conditions. Different species of fungi may be involved and dominate in development of infectious root, crown and foot rots of wheat in various countries. The most devastating diseases are take-all, *Fusarium* diseases, common root rot, in some countries or regions – eyespot, *Pythium* root rots, *Rhizoctonia* root rots, snow molds and rots, and brown root rot. Much less important are root diseases caused by weak pathogens such as chytrids, *Microdochium bolleyi*, *Curvularia* spp., *Hendersonia* sp. a.o. (Hill et al., 1983; Bockus et al., 2010; Nicol et al., 2010) [1-3].

Sources: Leslie, Summerell, 2006; Bockus et al., 2010; Nicol et al., 2010 [2-4] a. o.

Note. Species registered in Uzbekistan are marked off with asterisks. Common names of diseases are given in brackets.

Root, crown and foot rot diseases of wheat are little studied in Uzbekistan. The purpose of the current work was to determine occurrence of these diseases on wheat fields in central, southern regions and Fergana Valley of our country and to identify their causal agents.

Table 1.

Fungi that cause seedling blight, root, crown and foot rot diseases of wheat

* <i>Bipolaris sorokiniana</i> (Sacc.) Shoem., anamorphic stage of <i>Cochliobolus sativus</i> (S. Ito et Kurib.) Drechs. ex Dastur (common root rot)
<i>Fusarium</i> spp. (more than 20 species), mainly * <i>F. pseudograminearum</i> Aoki et O'Donnell, * <i>F. culmorum</i> (W.G. Smith) Saccardo, sometimes * <i>F. graminearum</i> Schwabe and others; (<i>Fusarium</i> root, crown and foot rot)
<i>Gaeumannomyces graminis</i> (Sacc.) Arx et D.L. Oliver var. <i>tritici</i> J. Walker, <i>G. graminis</i> var. <i>graminis</i> J. Walker and <i>G. graminis</i> var. <i>avenae</i> J. Walker (take-all)
<i>Helgardia herpotrichoides</i> (Fron) Crous & W. Gams, syns. <i>Pseudocercospora herpotrichoides</i> (Fron) Deighton, <i>Cercospora herpotrichoides</i> Fron, anamorphic stage of <i>Oculimacula yallundae</i> (Wallwork & Spooner) Crous & W. Gams, syn. <i>Tapesia yallundae</i> Wallwork & Spooner (eyespot, or strawbreaker foot rot)
<i>Hendersonia crastophila</i> Sacc., syn. <i>Wojnowicia graminis</i> (McAlp.) Sacc. et D. Sacc. (root rot)
* <i>Microdochium bolleyi</i> (R. Sprague) de Hoog & Hermanides-Nijhof, syns. <i>Gloeosporium bolleyi</i> R. Sprague, <i>Aureobasidium bolleyi</i> (R. Sprague) v. Arx, <i>Aureobasidium pullulans</i> (DB.) Arnaud, <i>Idriella bolleyi</i> (R. Sprague) v. Arx (<i>Aureobasidium</i> decay)
<i>Microdochium nivale</i> (Fr.: Fr.) Samuels & I.C. Hallett, syn. <i>Fusarium nivale</i> (Fr.) Ces. ex Berl. & Voglino, anamorphic stage of <i>Monographella nivalis</i> (Schaffnit) E. Muller, syns. <i>Calonectria nivalis</i> Schaffnit, <i>C. graminicola</i> (Berk. et Br.) Wollenv. (pink snow mold)
<i>Phoma sclerotoides</i> Preuss ex Sacc., syn. <i>Plendonus melioli</i> Dearn. & Sanford (brown root rot)
<i>Pythium</i> spp. (more than 20 species) (<i>Pythium</i> root rot or browning, <i>Pythium</i> snow mold and rot); complex species * <i>P. debaryanum</i> Hesse & Schröet. s.l. is reported to occur in Uzbekistan
<i>Rhizoctonia cerealis</i> van der Hoeven, anamorphic stage of basidiomycete <i>Ceratobasidium cereale</i> Mur. et Burp. (sharp eyespot)
* <i>Rhizoctonia solani</i> Kühn, anamorphic stage of basidiomycete <i>Thanatephorus cucumeris</i> (A.B. Frank) Donk; <i>R. zeae</i> Voorhees, syn. <i>R. oryzae</i> Ryker et Gooch., anamorphic stage of <i>Waitea circinata</i> Warcup et P.H.B. Talbot; other <i>Rhizoctonia</i> spp. with binucleate cells (<i>Rhizoctonia</i> root rots)
<i>Sclerotinia borealis</i> Bubák et Vlugel, syn. <i>S. graminearum</i> Elenov ex Solkina (snow mold, or snow scald)
<i>Typhula idahoensis</i> Remsburg, syn. <i>T. borealis</i> H. Ekstr.; <i>T. incarnata</i> Lasch, syns. <i>T. itoana</i> S. Imai and <i>T. gramineum</i> P. Karst.; <i>T. ishikariensis</i> S. Imai (speckled snow mold)
An unidentified low-temperature basidiomycete
Chytrids: <i>Polymyxa graminis</i> Ledingham, <i>Lagena radicola</i> Vanterpool & Ledingham, <i>Rhizophidium graminis</i> Ledingham, <i>Asterocystis radialis</i> de Wild., <i>Olpidium brassicae</i> (Woronin) P.A. Dang. a. o. (root rot)
* <i>Curvularia geniculata</i> (Tracy et Earle) Boed., anamorphic stage of <i>Cochliobolus geniculatus</i> Nelson; * <i>C. inaequalis</i> (Shear) Boed.; * <i>Curvularia lunata</i> (Wakk.) Boed., anamorphic stage of <i>Cochliobolus lunatus</i> Nelson et Haasis; other <i>Curvularia</i> spp. (root rot)

Results. Samples of infected plants were collected from 33 fields of 16 districts, six regions of the country (Table 2). Symptoms observed were yellowing leaves, stunting, discoloration of roots and crowns, lower stems, death of tillers, and whitehead.

Incidence of the disease varied in different fields, regions and by years. On some fields at tillering (TP, 11-1; AI, A-1, A-2, A-3, A-4; BS, B-1) and booting (KH, 12-1,2,3; BJ, B-2) growth stages incidence of the disease was enough high and it has been distributed in fields more or less evenly; adverse effect of the disease in such fields consisted mainly in death of tillers, often the main shoots of the plants.

Districts of regions:* Andijan region: **AA – Altynkul, **AB** – Buz, **AI** – Izboskan, **AJ** – Jalaquduq, **AK** – Khodjaabad, **AS** – Shakhrikhan, **AU** – Ulugnor; Fergana region: **FF** – Fergana; Bukhara region: **BJ** – Jondor; **BS** – Shofirkon; Kashkadarya region: **KS** – Shakhrisabz; **KY** – Yakkabag; Tashkent region: **TK** – Kibray, **TP** – Pskent, **TY** – Yukari-Chirchik; Khoresm region: **KH** – Khazorasp. No. of fields surveyed are shown in brackets.

[^]*Growth stages* are given after Zadoks et al., 1974 [8].

[†]*Symptoms:* **YL** – yellowing of leaves; **S** – stunting; **DT** – death of seedling tillers; **DS** – death of stems of mature plants; **WH** – whitehead (and white shoot).

[‡]*Incidence on the field:* **Sp** – sporadic; **F** – focal; **E** – more or less evenly distributed. *Soil:* **Sa** – saline; **Ss** – highly saline.

Even distribution of stunting plants and yellowing leaves has been observed also on fields with highly saline soils (AU, 13). At later growth stages (heading-flowering and further) diseased plants were registered, as a rule, in small foci, or more often, sparsely. This has been true especially for whitehead, which has been observed sporadically, with incidence from less than 0.1% to 1-2% (Table 2).

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Table 2.
Incidence of root, crown and foot rot diseases in wheat fields of Uzbekistan.

Year, region & district*	Sample No.	Growth stage [^]	Symptoms observed [†]	Incidence [‡]
2011, TP (1)	11-1	22-25	YL, S, DT	~20%, E
2012, KH (3)	12-1,2,3	45-51	YL, S, DT	<50%, E
2012, KY (1)	12-4,5	55-65	YL, S, DT	~2-3%, F
2015, KS (5)	15-1,2,3	55-65	YL, S, DT	~2-3%, F
2016, TY (1)	16-1,2	37-43	YL, S	~5-6%, F
2019, AI (1)	A-1	22-25	YL, S	S
2019, AI (1)	A-2-1; A-2-2; A-3; A-4	22-25	YL, DT	~5-6%, E
2019, AK (1)	2	55-65	WH	>0.1%, Sp
2019, AK (1)	3	55-65	WH	>0.1%, Sp
2019, AJ (1)	6	55-65	WH	>0.1%, Sp
2019, AS (1)	7	55-65	WH	2-3%, Sp
2019, AB (1)	10	55-65	WH	>0.1%, Sp
2019, AU (1)	12	55-65	DT, WH	~1-2%, Sp, F
2019, AU (1)	13	55-65	YL, S	~50%, E, Ss
2019, AS (1)	14	55-65	YL, S	~0.5%, Sp, Sa
2019, AU (1)	15	55-65	WH	>1-2%, Sp
2019, AU (1)	17	55-65	YL, S	~10%, E, Sa
2019, FF (1)	18	55-65	WH	>0.1%, Sp
2019, FF (1)	20	43-59	WH	>0.1%, Sp
2019, FF (1)	24	43-59	WH	>0.1%, Sp
2019, AA (1)	37	83-85	WH	>0.1%, Sp
2019, AA (1)	40	83-85	WH	>0.1%, Sp
2019, AI (1)	41-1-2; 41-1; 41-2	83-85	DS	>1%, E
2019, AI (1)	42-2-1	83-85	WH	>0.1%, Sp
2019, BS (1)	B-1	23-25	YL, DT	E on 20 ha of 30 ha in total
2019, BJ (1)	B-2	37-39	YL, S	15 to 20%, E

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ЎҚИНГ, ЭЪТИБОР БЕРИНГ

АЛЬТЕРНАРИОЗ КАСАЛЛИГИНИ ОҚБОШ КАРАМ УРУҒИНИНГ ҲОСИЛИГА ТАЪСИРИ

Анотация: мақолада оқбош карамнинг (Тошкент вилояти шароитида уруғлик учун ажратилган майдонларида кенг тарқалган ва уруғни оғирлигига ва сифатига салбий таъсир килган) альтерналиоз касаллигини тарқалиши, ривожланиши ва зарарини ўрганиш бўйича олиб борилган тадқиқот натижалари берилган.

Анотация: в статье представлены результаты исследование развития и степени повреждения альтерналиозом капусты белокочанной (*Alternaria brassicae*). Данное заболевание широко распространен на территории Ташкентской области веденной под семеноводство, которая отрицательно влияет на массу и качество семян капусты.

Annotation: the article presents the results of a study of the development and extent of damage to *Alternaria brassicae* (*Alternaria brassicae*). This disease is widespread in the Tashkent region, conducted under seed production, which negatively affects the mass and quality of cabbage seeds.

Калит сўзлар: оқбош карам, альтерналиоз, замбуруғ, уруғ, касаллик, зарарланиш, доғлар, кўчатлар, мицелий, конидия, губор

Оқбош карамнинг альтерналиоз касаллиги кенг тарқалган ва зарари жиҳатдан олдинги ўринларда турадиган касаллик-

лардан бири ҳисобланади. Бу касалликнинг белгиларини намоён бўлиши уруғ тупроқдан униб чиқишидан бошлаб, бутун