Mycobiota of Seeds in Granaries of South Kazakhstan

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Abstract. In the article the technique and results of researches of mycobiota of seeds are given in granaries of the Southern Kazakhstan. Seeds possess the lowered intensity of exchange processes, and consequently, and low level of the induced immunity. The mushrooms showing pathogenic properties concerning seeds, not always correspond to the types striking plants. Among them the forms relating to typical saprotrophs which aren't capable to enter antagonistic relationship with a plant their presence on seeds of field mushrooms meet is in inverse proportionality from development of mushrooms of storage. In granaries except phytopathogenic mushrooms, great damage to a seed material can cause saprofite mold and storage mushrooms. The strengthened development of mold mushrooms in seed weight is explained by the maintenance of the big range of the hydrolytic enzymes allowing intensively influencing integumentary and reserving fabrics of grain. Authors established specific structure, bioecological properties of mushrooms.

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Keywords: Micobiota of seeds, causative agents of diseases being transferred by seeds, phytopathogenic mushrooms, field mushrooms, storage mushrooms.

Introduction

The legal, economic and organizational bases of implementation of activity in the field of protection of the plants, directed on preservation of a crop and its quality, prevention of harmful effects of pesticides on human health and environment at implementation of phytosanitary actions are defined by the law of the Republic of Kazakhstan # 331-II "About protection of plants" [1]. The following diseases of grain crops: stem rust, brown rust, yellow rust, coronated rust, leaf blotch-helminth-sporadic spottiness are brought by the Resolution of the Government of the Republic of Kazakhstan # 1295 in "The list of especially dangerous harmful organisms" on December 10, 2002 [2].

In this regard development of effective methods of fight against diseases of seeds during storage, these studying of specific structure of fungi on seeds, their biological features, their distribution depending on storage conditions, these studying of features of their development depending on ecological factors and their influence on sowing qualities is necessary [3;4;5;6]. It will allow to regulate modes of storage and to increase terms of quality preservation of a seed material and will give the chance to receive high and steady grain yields and bean cultures [7;8;9;10]. Important practical and scientific value has storage of seeds without decrease in indicators of quality.

All above causes relevance of researches on comprehensive and profound study micoflora of the grain and bean crops striking seeds during vegetation and in the period of storage.

Technique

As objects of researches seeds of grain crops served: wheat, barley, oats, corn, rice, sorghum, millet. Granaries of Almaty, Dzhambul, South Kazakhstan and Kyzyl-Orda areas are investigated.

Tests selected on M.K.Firsova's [11], N.A.Naumova's methods [12], and also in accordance with GOST 13586.3 – 83 [13] by means of the probe only in three levels (from above, in the middle and from below), instead of on all depth of an embankment. Results of the analysis of average test extend on all party of seeds. For specification of the diagnosis of diseases used various methods: macroscopic (external examination of seeds, calculation of mechanical impurity), biological (a greensprouting of seeds in the damp camera and on a nutrient medium), field supervision and anatomic (pathogen definition in tissues of seeds).

L.D.Kursanov's [14], B.D.Ermekova's, etc. determinants and "Flora of sporous plants of Kazakhstan" were used at identification of fungi. At definition of the plants struck with species of fungi "Flora Kazakhstana" was used. For definition of types of the sort *Fusarium* a method of microcultures of V.I.Bilay and I.A.Ellanskaya, for definition of soil fungi - M.A.Litvinov's method, a penicillium - on N.M.Pidoplichko's method have been used.

Experiments by determination of features of infection of vegetative bodies of sprouts of grain crops with *Alternaria alternata* (Fr.) Keissl, and *Macrosporium commune Rabh*. (*Stemphylium botryosum Wallr.*) *Triticum aestivum L* allocated from seeds was carried out on V.I.Bilay's method.

Humidity in seeds defined in accordance with GOST 29144-91 (ISO 711-85) [15]. Temperature determined according to the standard temperatures recommended by the International Seeds Test Association (ISTA). Cultural and morphological signs were described according to the scheme developed by P.Neergard [16]; coloring was determined by A.S.Bondartsev's scale [17].

Authors of species of fungi are taken from "Flora of sporous plants of Kazakhstan" (T.I-X), verified names of plants owners according to S.A. Abdulina [18] and the name of genuses of fungi according to the Ainsworth & Bisby's dictionary [19].

The infected seeds, colonies of fungi are photographed by the Nikon camera, morphology of a mycelium and a sporification are photographed by MBI-6 microscope.

The main part

Due to the analysis of 1545 tests of seeds of grain crops it appeared that in the south of Kazakhstan such seeds of plants as *Triticum aestivum L., Hordeum vulgare L., Avena sativa L., Zea mays L., Oryza sativa L., Panicum miliaceum L., Sorghum vulgare Pers*. are superficially, and subepidermicly truck with field fungi and species of fungi of storage relating to 3 departments, 19 families, 40 genuses, and 122 species. Including we allocated and identified on seeds of grain crops 58 species of the fungi relating to 27 genuses, 13 families, 3 departments. In the south of Kazakhstan on seeds of grain crops 2 species of fungi are allocated for the first time: *Piricularia grisea Sacc*. on seeds *of Panicum miliaceum, Phoma avenae Sacc*. on *Avena sativa* seeds.

In the south of Kazakhstan the general for micobiotes seeds of grain crops are *Mucor mucedo, Rhizopus nigricans, Aspergillus fumigatus, A. flavus, Alternaria alternata.* Besides, on seeds of wheat there are also found *Tilletia tritici* (Bjek) Winter*., Tilletia laevis* Kuhn*., Urocystis tritici* Koern*., Ustilago tritici* (Pers.) Jens., on barley seeds - *Ustilago nuda* (Jens.) Kell. et Sw., *U. hordei* (Pers.) Lagerheim., on oats seeds - *Helminthosporium avenae (Drechslera avenaecea* (M.A.Curtis ex Cook) Shoem.), on corn seeds - *Ustilago zeae* (Beckm.) Unger., *H.sativum (Bipolaris sorokiniana (*Sacc.) Shoem.), and on rice seeds - *H.oryzae (Bipolaris oryzae* (Breda de Haan) Shoem.).

The representatives of saprophyte flora revealed by us - types of genuses *Rhizopus nigricans* Ehren*., R.oryzae* Went. et Prin*., Mucor racemosus* Fres*., M. mucedo* Fres*., Aspergillus fumigatus* Fres*., A.niger* Thiegh*., A.flavus* Link., *Penicillium rugulosum* Thom*, P.chrysogenum* Thom*, P.verrucosum Dierk.* etc. – harm a seed material under the wrong storage conditions. They influence on quality of seeds: grain nature, glassiness, the content of a crude gluten decreases, also reduce viability, and cause death of a germ.

In nature of distribution of families and genuses of micoflora the influence of a patrimonial and specific variety is indicative.

As a result of use of an anatomic method, and also as a result of field supervision it appeared that many species: *Rhizopus nigricans* Ehren*., H.sativum (Bipolaris sorokiniana (*Sacc.) Shoem.), *Macrosporium commune (Stemphylium botryosum* Wallr.)*, Alternaria alternata* (Fr.) Keissl*, Fusarium moniliforme* Sheldon*, Tilletia tritici* (Bjek) Winter., *Ustilago tritici* (Pers.) Jens. are transferred by seeds and cause the corresponding diseases of plants.

In newly gathered grain microscopic field fungi, such as *Cladosporium herbarum* Link., *Botrytis cinerea* Pers., *H.sativum (Bipolaris sorokiniana (*Sacc.) Shoem.), *H.oryzae (B.oryzae* (Breda de Haan) Shoem.)*, H.panici-miliacei (B. panici-miliacei* (Nisikado) Shoem.)*, H.avenae (Drechslera avenaecea* (M.A.Curtis ex Cook) Shoem.), *H.turcicum (Exserohilum turcicum* (Pass.) Leonard et Suggs.), *Alternaria alternata* (Fr.) Keissl*, Fusarium nivale* (Fr.) Ces., *F.sporotrichiella var.poae* Bilai*, F.moniliforme* Sheldon*, F.graminearum* Schwabe*, F.oxysporum var. orthoceras* App. et Wr.*,Ustilago zeae* (Beckm.) Unger., *Tilletia tritici* (Bjek) Winter., *Sorosporium reilianum* (Kuhn.) McAlpin, etc. are revealed. Storage of newly gathered grain is accompanied by reduction of specific structure of field fungi and increase in storage fungi. For dry grain (with humidity in limits or below critical) decrease in total number of micoflora is characteristic.

From the ecological point of view, i.e. the conditions allowing infection of seeds, fungi can be divided into two groups – field and storage fungi (Stock, 1990).

The following types of genuses belong to the first group *Helminthosporium (Drechslera, Bipolaris, and Exserohilum), Alternaria, Fusarium, Tilletia, Ustilago, Uromyces, Sphacelotheca, and Sorosporium,* which infected the seeds developing on plants or remaining after their maturing in the field. The part from them remained and kept in storages.

The other ones belong to the second group *Botrytis, Trichotecium, Cladosporium, Stemphyllium* и *Fusarium* defiant moldings of seeds, and also fungi

of the period of storage types of genuses *Rhizopus, Mucor, Aspergillus*, *and Penicillium.*

Seeds of crops serve as a substratum for micobiotes which some representatives can be a source of a disease of plants during the vegetative period. When studying specific structure of fungi on seeds grain are revealed on seeds of wheat, barley, corn – *Helminthosporium sativum (Bipolaris sorokiniana*); on oats seeds – *H.sativum (Bipolaris sorokiniana), H.avenae (Drechslera avenaecea)*; on rice seeds – *H.sativum (Bipolaris sorokiniana), H.oryzae (Bipolaris oryzae)*; on millet seeds - *H.panici-miliacea (Bipolaris panici-miliacei)*; on sorghum seeds – *H.turcicum (Exserohilum turcicum)*.

The infection remains in the form of the conidium which has stuck to a cover of seeds or a mycelium in struck seeds. All found views, fungi with a narrow temperature interval of growth + 20°C – + 26°C. Sprout conidium on seeds only final cages in the presence of a moisture droplet.

The infected grain and the struck remains of plants in the soil can be a source of an infection of Helminthosporium root decay.

From seeds of species grain (wheat, barley, oats, corn, rice, millet, the sorghum) in culture allocated a species of *Alternaria alternata.* Here *Alternaria alternata* can show parasitic properties at strong weakening of plants. Species of the sort *Alternaria* always are present on seeds of many plants. In many cases fungi presence on seeds of the above plants doesn't affect further development of a plant. However at wheat, barley, oats the disease is shown by grain blackening in the field of a germ. Seldom blackening meets and in other places of grain. The mycelium of infecting agents of blackening of grain is more often than *Alternaria alternata*, rarer *Bipolaris sorokiniana*. The mycelium of *Alternaria alternata* concentrates in a fruit cover of grain, is more often over a germ, and only occasionally gets in endosperms. The infected grains are large, and well executed.

In vitro konidiya of *Alternaria alternata* sprout within temperature from + 4°C – + 26°C and above.

From seeds of grain crops we allocated the following species of the sort *Fusarium*: on wheat seeds - *Fusarium moniliforme, F.sporotrichiella var.poae, F.graminearum, F.nivale;* on barley and oats seeds - *F.moniliforme, F.graminearum;* on corn seeds - *F.gibbosum, F.moniliforme, F.sporotrichiella var.poae, F.graminearum;* on rice seeds - *F.moniliforme, F.sporotrichiella var.poae, F.graminearum;* on millet seeds - *F.sporotrichiella var.poae, F.moniliforme, F.graminearum, F.oxysporum var. orthoceras*; on sorghum seeds - *F.moniliforme, F.sporotrichiella var.poae, F.graminearum.* In the south of Kazakhstan species are widespread as *F.moniliforme*, *F.gibbosum*, *F.avenaceum*. All of them are phytopathogens and cause in plants the various pathological phenomena – decay of roots, seeds, fruits, and also the general oppression and premature withering of sprouts.

Development of fusariosis in naturally infected seeds can proceed at storage in the conditions of the increased humidity and there is a reinfection. Milamentous infection of seeds is the general phenomenon, than sporous. Signs of a mycelium changed depending on temperature. *Fusarium oxysporum* gets pale pinkish coloring at + 14°C, pink at + 26°C and bright red at + 32°C.

In our experiences for fungi *Fusarium nivale* and *Fusarium oxysporum var. orthoceras* on *Panicum miliaceum*, *Fusarium sporotrichiella var.poae* on *Oryza sativa* and *Sorghum vulgare* temperature + 20°C was favorable for infection and development of symptoms of diseases on sprouts. For *Fusarium nivale* fungi temperature + 10°C, + 17°C, + 20°C was favorable for intensive development of a mycelium of light pink coloring.

Destruction of epidermis of grain of the grain happens generally at defeat by their disputes of *Ustilaginales*. The fungi can get into plants through vegetative bodies, sometimes the mycelium reaches grain.

Causative agents of diseases belong to department of *Basidiomycota* of club fungi and generally to the sorts *Tilletia, Ustilago, Uromyces, Sphacelotheca*, and *Sorosporium*. They have a various cycle of development, various signs of defeat, infection sources, etc.

Important factor for infection of plants of the heads to it is the quantity of the infectious beginning. In our researches when studying size of loading fungi smuts for optimum infection of plants it is established that the greatest prevalence of the heads was observed by it in the presence of 300.000 disputes on one grain. It corresponds to loading fungi in 5 gr on 1 kg sorghum grains. At such load of university agrobiological research stations in 1999 every 7th individual of sorghum was struck with *Sphacelotheca sorghi*, every 5th individual of corn – *Ustilago zea.*

Strong distribution of mold fungi is observed in rainy weather at delay with cleaning, especially in the mown bread lying in rolls. Disputes of mold fungi stick to seeds in the open air and at the increased humidity begin the development, getting to storage, without sufficient processing seeds continue to be exposed to molding. In granaries saprophytic mold fungi can cause big damage to a seed material: on seeds of wheat, barley *Rhizopus nigricans, Aspergillus flavus, Trichotecium roseum, Cladosporium herbarum;* on oats seeds –

Stemphylium botryosum, Cladosporium herbarum; on corn seeds – *Penicillium rugulosum, Botrytis cinerea, Alternaria alternata*. Molding of seeds of rice is known in all regions of rice planting. Three types of molding – pink, gray and chartreuse are more often found. Activator of pink molding is *Trichothecium roseum*. Gray molding is caused by a fungi *Botrytis cinerea*. Activators of greenish-yellowish molding fungi are of genuses *Penicillium* и *Aspergillus*. Also species of fungi of genuses can be the reason of its molding *Fusarium*, *Helminthosporium (Drechslera, Bipolaris, Exserohilum)* and *Alternaria*. The seeds struck with saprophytic fungi at storage are capable to re-infect.

Needing a ready organic food, fungi find it in the nature in the form of fossils, or in the form of other live organisms, and eat according to it as saprophytes or parasites. However it isn't possible to draw between them a sharp side as they are connected by transitions and are evolutionarily removed one of another. It is undoubtedly necessary to recognize saprophytic as primary way of a food of fungi which and now is peculiar to the majority of species. At a wide circulation of fossils saprophytic fungi rather easily find in the nature to themselves a suitable substratum as differ mostly rather small legibility to its structure, i.e. the wide amplitude of the adaptation to food sources. According to it narrow specialized forms among saprophytic fungi it is known a little. Much more ample opportunities open upon transition to a parasitic food. Here each live organism represents a number of the features excluding development on it not only all saprophytes, but also the majority of the parasites who haven't been adapted for it specially (for example, *Alternaria alternata*).

The strengthened development of mouldy fungi in seed weight is explained by existence of the big range of the hydrolytic enzymes influencing cellular walls and on contents of cells of the owner.

Micoflora of newly gathered seeds differed small specific structure of storage fungi. Extent of defeat of weevil by them – no more than 10%

The main representatives micoflora of seeds during storage are species of genuses *Rhizopus (Rhizopus nigricans), Mucor (M.racemosus, M.mucedo), Aspergillus, Penicillium*. From seeds of barley 5 types were isolated: *Aspergillus: A.candidus* Link ex Fr., *A. flavus* Link ex Fr., *A. fumigatus* Fres., *A. niger* Thiegh., *A. micheli* Fr.; from corn weevil – 4: *A. candidus* Link ex Fr, *A. flavus* Link ex Fr. *A. fumigatus* Fres. *A. niger* Thiegh. On a surface of seeds fungi of the sort *Aspergillus* form velvet-like colonies, color light brown, citreous, and yellow. At storage on seeds species of the sort *Aspergillus* are widespread.

At storage, by quantity of the infected seeds, fungi of the species of *Penicillium* surpass all other fungi. From seeds of barley and corn 4 species were isolated: *Penicillium commune* Link, *P. cyclopium* Thom., *P.rugulosum* Thom., *P.verrucosum* Dierk. Formed on a surface of seeds of a colony of species of *Penicillium* there are velvety, green, yellowish-green, greenish and olive. Fungi of storage reduce quality of seeds: grain nature, the content of a crude gluten decreases, viability also decreases.

The specific structure of a complex of activators on seeds of separate species of cultural plants isn't constant, but in certain environmental conditions it can remain.

A certain species of defeat can be caused (in most cases) by one prevailing species. Depending on a number of factors (humidity, temperature) list of activators can change. On seeds of wheat soft 20 species of field fungi, 8 species of storage fungi, on seeds of barley ordinary – 12 and 9, on seeds of oats sowing – 12 and 5, on corn seeds – 9 and 9, on seeds of rice sowing – 12 and 10, on seeds millet sowing – 9 and 7, on seeds of a sorghum of ordinary 8 and 4 species of fungi respectively are revealed.

On the impact on fabrics of seeds fungi of this complex of activators are subdivided into destructive and moderate parasites and actually a mold. To the first (which get to itself food by means of destruction of fabrics of the owner) species of the genuses *Helminthosporium (Drechslera, Bipolaris, Exserohilum), Fusarium*, concern to the second (which use in substance food, owing to any reasons, not used by the owner) *Alternaria alternata*. Molding of seeds can cause *Rhizopus nigricans, Trichothecium roseum, Cladosporium herbarum, Botrytis cinerea* and others. Their role in the course of damage of seeds is defined by the developed storage conditions (or conditions of crops before harvesting). For each culture structure of species of fungi and a condition of infection are often various. They individually or in a complex reduce the content of a crude gluten of seeds, cause death of a germ, reduce viability of seeds, strike shoots, vascular system, fruits and seeds.

Development of fungi of storage and their influence on quality of seeds depends on medium factors. We established that the majority of species of the genuses *Penicillium*, and species of *Ustilago zeae, U.hordei, U.nuda* remained in corn and barley seeds with humidity of 12,5% more than 2,5 years. Unlike them *Cladosporium herbarum* eliminates after 7 months of storage. The increase in humidity of seeds to 16,5% caused acceleration of regress of the majority of field fungi – *C.herbarum* eliminates after 5 months. In these conditions of a mold of storage of

Misor of mucedo, Rhizopus nigricans kept high viability.

Humidity of seeds and temperature of the medium have essential impact on specific structure of fungi. At storage of seeds of corn with humidity of 10% and less within 1,5–2,5 years at a temperature + 4°C, + 20°C and + 26°C gradual reduction of the fungi making their initial subepidermal micoflora, and also decrease in extent of defeat of weevils by them was observed. Mold of storage started developing actively in seeds with humidity of 14,5% and more. In barley seeds with humidity of 12% which are storing at a temperature + 20°C, + 26°C types of *Misor, Aspergillus* and field fungi of the sort *Alternaria* developed mainly. Extent of defeat of weevils by them later from the moment of a laying of seeds on storage made 3 months 9%. Our researches showed that the most perspective view of packing container for long storage of collection seeds of barley is the hermetically sealed glass large bottle. The seeds stored of 3 years in this container, were least infected by moulds of storages and had the highest viability.

According to the standard temperatures recommended by the International Seeds Test Association (ISTA) optimum temperature for all fungi coincided or with the lowest standard + 19°C (+ 20°C in our experiences), or with the highest standard + 28°C (+ 26°C in our experiences), or with both temperatures. We put experiments on identification of optimum temperature for growth and development of fungi on seeds in the damp camera: + 26°C, + 20°C, + 17°C, + 14°C, + 10°C and + 4°C.

There are revealed: 1) fungi with narrow temperature (+ 4°C – + 10°C) growth interval. They are: *Stemphylium macrosporioideum, Stemphylium botryosum, Fusarium nivale*; 2) fungi with wide temperature (+ 4°C to + 26°C) and are higher growth interval. They are: *Rhizopus nigricans, Mucor mucedo, Botrytis cinerea, Trichothecium roseum, Aspergillus fumigatus, A.niger, A.flavus, Penicillium rugulosum, Cladosporium herbarum, Bipolaris sorokiniana, Alternaria alternata, Ustilago zea, Puccinia graminis* etc., developing generally within average temperatures, but their optimum is in limits + 26°C and more of degrees. *Alternaria alternata* was observed by sporification, in our experiences since + 4°C to + 26°C and above.

Formation of a succession is influenced by ecological factors – humidity, temperature, abilities of fungi to produce the toxic metabolites, specific interactions of species in community.

On the seeds of barley put on storage (humidity in accordance with GOST 14%) in the damp camera at a temperature + 20°C in a week are revealed a sporification of fungi of *Alternaria alternata* and *Aspergillus niger*. At gradual increase in humidity of filter paper at the bottom of Petri's cup humidity of seeds of barley gradually increased. On seeds humidity of 16% observed a sporification *Aspergillus candidus, Aspergillus flavus.* And at humidity of seeds 17% - *Penicillium cyclopium, P.rugulosum,* and at 18,5-19% of humidity of seeds - *Penicillium commune, Aspergillus flavus, Mucor mucedo, Rhizopus nigricans.* Respectively, under favorable conditions disputes and part of a mycelium of fungi of species indicators started in growth.

At 8% of humidity of seeds of corn for the 20th days of storage at a temperature + 20°C on them prevailed *Alternaria alternata, Aspergillus flavus, A.niger, A.fumigatus, Penicillium verrucosum*. At 15% of humidity of *Mucor mucedo, Penicillium commune, Alternaria alternata, Aspergillus glaucus*. At 20% of humidity to them it is added also by *Penicillium cyclopium*. It should be noted some antagonism between species of the genuses *Penicillium* and *Alternaria*.

Thus, we recommend to store barley and corn seeds in granaries with humidity 13-13,5% recommended to GOST are lower at norm of 14% and temperature + 4°C.

Seeds possess the lowered intensity of exchange processes, and consequently, and low level of the induced immunity. Probably, it led by evolution to selection of forms of the plants which seeds possess the dense cover protecting a germ from possibility of penetration in seeds of various pathogenic forms of microorganisms. Creation of such natural barrier leads to selection among pathogenic forms to seeds of the fungi organisms, capable to destroy a cover of seeds. It brings certain distinctions in classification of the pathogens lodging on seeds and striking vegetans plants. Therefore the mushrooms showing pathogenic properties concerning seeds, not always correspond to the species striking plants. Among them the forms relating to typical saprotrophes which aren't capable to enter antagonistic relationship with a plant their presence on seeds of field fungi meet is in the inverse proportional relationship from development of storage fungi. Completely contamination of seed weight species of the genuses *Alternaria, Helminthosporium (Drechslera, Bipolaris, Exserohilum), Fusarium* doesn't disappear even at very long storage – within several years. All changes of quality of stored seeds are closely connected with extent of defeat by their fungi *Aspergillus, Penicillium, Alternaria, Fusarium*, etc.

Our researches show that as a whole mold and storage fungi in grain weight are quite numerous, and specific structure, intensity of growth and development on seeds of various cultures is various.

Conclusion

Thus, the specific content of fungi on seeds of grain crops of the southern Kazakhstan is presented by 122 species of fungi relating to 40 genuses, 19 families and to three departments. Among them we revealed and described 58 species. The department of *Oomycota* is presented by one family and one species. The department of *Zygomycota* is presented by two families, 3 genuses and 7 species. The department of *Ascomycota* is presented by 15 families and 29 genuses, 88 species. The department of *Basidiomycota* is presented by 3 genuses and 27 species. In the south of Kazakhstan on seeds of grain crops 2 species of fungi are allocated for the first time: *Piricularia grisea Sacc*. on seeds of *Panicum miliaceum, Phoma avenae Sacc*. on *Avena sativa* seeds. The allocated species strike a cover of a seed and its internal parts.

The specific structure of a complex of activators on seeds of separate species of cultural plants isn't constant, but in certain environmental conditions it can remain. On seeds of wheat of soft 28 species, on seeds of barley ordinary – 21, on seeds of oats sowing – 17, on corn seeds – 18, on seeds of rice sowing – 22, on seeds millet sowing – 16, on seeds of a sorghum of ordinary 12 species of fungi.

In granaries except phytopathogenic fungi, big damage to a seed material can cause saprophytic mold and storage fungi, among which species *Rhizopus nigricans, Trichotecium roseum, Botrytis cinerea, Cladosporium herbarum, Stemphylium macrosporoideum, Alternaria alternata,* and also species of genuses *Mucor, Aspergillus* и *Penicillium*. The strengthened development of mold fungi in seed weight is explained by the composition of the big range of the hydrolytic enzymes allowing intensively influencing integumentary and reserving tissues of grain.

Causative agents of the diseases, being transferred seeds on grain crops: *Rhisopus nigricans, Oospora verticulloides, Piricularia grisea, Cladosporium herbarum, Helminthosporium sativum (Bipolaris sorokiniana), H.oryzae (B.oryzae), H.panici-milacea (B.panici-miliacei), H.turcicum (Exserohilum turcicum), H.avenae (Drechslera avenaecea), Macrosporium commune (Stemphylium botryosum), Alternaria alternata, Fusarium sporotrichiella var.poae, F.moniliforme, F.oxysporum var. orthoceras, Phoma avenae, Tilletia tritici, Ustilago tritici, U.hordei, U.zeae, U.levis, U.avenae, Sorosporium reilianum, Sphacelotheca sorghi, S.cruenta, S.holci.*

Standard of humidity in accordance with GOST seeds as *Triticum aestivum* – 14%, *Hordeum vulgare* – 14%, *Avena sativa* – 14%, *Zea mays* – 14%, *Oryza sativa* – 14%, *Panicum miliaceum* – 13,5%, *Sorghum vulgare* – 13,5%; *Pisum sativum* – 14%, *Phaseolus vulgaris* – 15%, *Glycine sativum* – 12%. For the majority of grain crops at storage the most admissible standard of humidity in accordance with GOST makes 14,5-15,5%; (corn, a sorghum, millet – 12,5-14%). In the conditions of South Kazakhstan it is expedient to store seeds (barley, corn, a sorghum, millet, peas, and haricot) with humidity below recommended to GOST at a temperature + 4°C.

Fungi are with narrow temperature (+ 4°C – + 10°C) and growth interval. They are: *Stemphylium macrosporoideum, Stemphylium botryosum, Fusarium nivale*. Fungi with wide temperature (+ 4°C to + 26°C) and are higher growth interval. They are: *Rhizopus nigricans, Mucor mucedo, Botrytis cinerea, Trichothecium roseum, Aspergillus fumigatus, A.niger, A.flavus, Penicillium rugulosum, Cladosporium herbarum, Bipolaris sorokiniana, Alternaria alternata, Phoma avenae, Ustilago zea, Puccinia graminis*, developing within average temperatures, but their optimum is in limits + 26°C and above degrees.

Findings

Studied micobiota of Kazakhstan makes about 3500 types, presented in the appropriate volumes "Florae of Sporous Plants of Kazakhstan", and also in researches of staff of laboratory of a mycology and algology of Institute of botany and a phytointroduction of the Ministry of Education and Science of the Republic of Kazakhstan [20, 21, 22].

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