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# A POPULATION VARIETY OF FUNGI OF THE SORT *MONILIA* OF THE PHYTOPATHOGEN OF FRUIT CROPS IN VARIOUS NATURAL AND CLIMATIC ZONES OF KAZAKHSTAN

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**Abstract**

*The article presents the results of a comparative study of macro and micro phenotypic characteristics of pathogens Monilinia laxa fruit crops of different eco-geographical zones of Kazakhstan and regions bordering neighboring countries of the CIS.*

**Key words:** *fruit crops, microfunguss of the sort Monilia, population, isolates, diagnostic criteria, sporodochia, conidia, mycelium, colony.*

Because the specific structure of microorganisms in agro-and the phyto environment, depending on a state of environment and climatic conditions, constantly changes, there is a need for carrying out annual phyto-sanitary monitoring for the purpose of collecting bigger quantity of the modified forms of various phytopathogens.

In to - and the postharvest period in the industry of production of fruit around the world concerns to one of the most economically destructive diseases of fruit crops the brown decay caused by different types of a microfungi of the sort Monilia (the simple - an imperfect stage) or *Monilinia* (difficult - a perfect stage) [Aitchojina, Kolokolova, 2002, Barta, 1991, Byrde et al., 2006, van Leeuwen et al.,2000].

Definition of a range of initial pathogenic fungi microorganisms and their modified forms which are causing diseases and sharply reducing quality and a trade dress of fruits of elite grades the pip and drupaceous of cultures (an apple-tree, a pear, plum) taking into account a changing epidemiological situation in various agro- and the phytocenosis, the solution of a question on similarity or distinction of the Kazakhstan and foreign isolates, and also emergence of new biotypes in the course of migration of microfungi (Russia, Europe) and even other continents (North and South America, Africa, Australia) presented to other countries for us great scientific interest.

For the solution of the questions posed phyto-sanitary monitoring, for the purpose of selection of estimated sources of an infection, in various climatic zones of Kazakhstan (Almaty, South Kazakhstan, Zhambylsky and North Kazakhstan areas) and natural and ecological zones (vertical zonality) on the example of Almaty area was carried out. Route inspections of gardens during vegetation were carried out during blossoming and commodity ripeness of fruits. Microbiological researches were conducted on various bodies of fruit plants with symptoms of diseases (decay, necroses, raids) on standard in microbiology, phytopathology methods of researches. For obtaining comparative data on phenotypic characteristics of a microfungi of the sort Monilia studied the Kazakhstan population allocated from fruits of an apple-tree, growing in the Karasaysky region of Almaty area.

The allocated and carefully selected cultures sowed on a potato and glucosic nutrient medium, measured growth rate - diameter of mycelial growth for 3, 7 and 10 days. To the same terms for studying of features of micromorphology and changes in dynamics carried out a viewing through a microscope Leika (Austria) supplied with the computer device[ Bilay et al., 2007, Minkevich and Potlaychuk, 1967, Pidoplichko, 1977, Tchoomakof/\, 1974].

For obtaining comparative data on phenotypic ccharacteristics in dependence on vertical zonality the microfungi of the sort *Monilia* isolated from fruits of an apple-tree, the pear growing in various ekologo-geographical zones (mountain, foothill, and steppe) Almaty area were investigated. The similar isolates emitted from fruits of an apple-tree of the Kurdaysky region of Zhambylsky area, adjoining on the Republic of Kyrgyzstan, the Sara-agashsky region of the Southern Kazakhstan area - with the Republic of Uzbekistan and the North Kazakhstan area – with the Russian Federation (picture 1) were in parallel studied.




Picture 1 - Regions of selection of the struck samples of fruit crops fungi microflora

Identification and specification of a range of the Kazakhstan mushroom microorganisms, causing decayed fruits of elite grades the of pip and drupaceous cultures of cultures, depending on climatic zones of growth in the conditions of Kazakhstan, showed that branches from the Southern Kazakhstan area are surprised *Monilia cydonia* microfungi, and the activator allocated from fruits of an apple fruits from Zhambylsky and Almaty areas is *Monilia fructigena* mushroom. In boundary with Russia northern regions of Kazakhstan (the North Kazakhstan area), sort *Monilia fructigena*. Population composition of many microfunguss is polymorphic, or has phenotypical similar macrophenotypes, therefore most essential is a necessity of work with the clean cultures of microorganisms, distinguished during all period of vegetation of plants from the different regions of Kazakhstan, for their further comparative analysis (table 1).

Table 1-Comparative studying of microfuguss of the sort *Monilia* allocated from boundary with Kazakhstan of regions of fruit growing of Kyrgyzstan, Uzbekistan and Russia

| District sprouting of cultures | Source of selection of micro fungi of sort of *Monilia* | Characteristics of isolates of micro fungi of the sort Monilia for the 10th days of exhibiting | | | | |
|---|---|---|---|---|---|---|
| | | diameter of colony, sm | sizes of conidies, mkm | form | texture | pigment |
| Almaty area Karasai district | garden-stuffs of apple- fruit | 7,5- 7,7 | 18,0-8,7 x 14,6-16,3 | colonies are in a kind concentric circles | fluffy, woolly rollers and more dense | light-cream colors almost |

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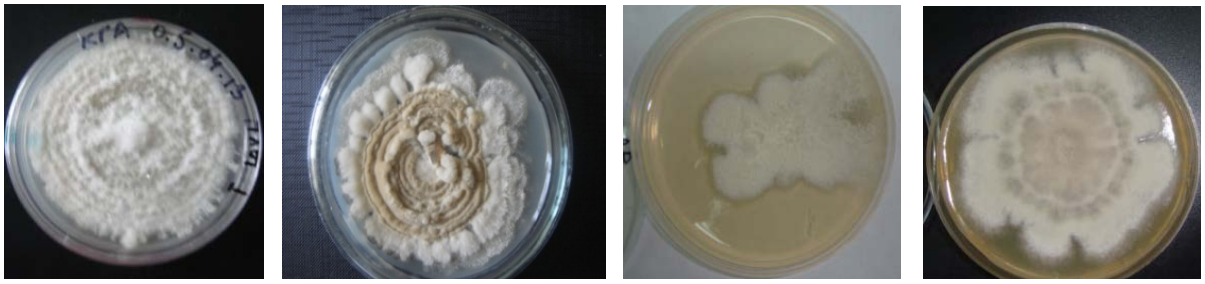
| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | middle | white |
| Jambul area Kurdai district (frontier district with Kyrgyzstan) | garden-stuffs of apple- fruit | 8,7-8,9 | 19,01-9,7 x 15,61-17,65 | colonies as rollers of concentric circles, edges are wavy slightly raised | Mid - dense, fluffy edgesty | middle cream, edges light-cream |
| South-Kazakhstan frea Saryagasch district (frontier district with Uzbekistan) | staggered escapes | 6,0-7,2 | 3,61-5,9 x 10,5-11,51 | colonies of the rounded form, edges are uneven as blades from a center from a bullock walks by us | loose grainy structure | light cream almost white |
| North Kazakhstan area (frontier district with the Omsk area of Russia) | garden-stuffs of apple- fruit | 7,0-7,5 | 17,5-9,9 x 15,0 -17,0 | colonies of the rounded form, edges are uneven as blades from a center from a bullock walks by us | dense woolly | middle grey, edges светло-серые almost white |

It is set as a result of microbiological analyses, that at the selected fungi speed of height on a nourishing potato and glucose environment a 10 twenty-four hours is different. Maximal diameter of colonies at an isolate from Kurday of district ( Jambul population) makes 8,7-8,9 sm. The low-limit of colony at a culture from the Saryagasch district (South-Kazakhstan population) makes no more than 6,0-7,2 sm.

The data obtained at microscopic level testify to an insignificant variation of the sizes of conidia between Almaty and zhambylsky populations. Considerable distinctions on texture and pigmentation of colonies it was observed at isolates of the mushrooms allocated from fruits of an apple-tree, growing on personal plots of the North Kazakhstan area, adjoining on Russia. At the same time apple-tree branches from the Southern Kazakhstan area are surprised other species of fungi of *Monilia cydonia.* The microfungi of the southern Kazakhstan population the sizes of conidia (3,61 - 5,9 x10,5-11,51 mkm), than at *M. fructigena* (19,01-9,7 x15,61-17,65 mk). The careful analysis of macro morphological characteristics of various populations of a fungi of the sort *Monilia* allowed to allocate 4 main types of colonies formed on the used nutrient mediums (Picture 2). It was established that studied strains differed not only on appearance, but also on growth rate inoculum, their pigmentation, texture and a form. From them the greatest interest is represented by Almaty population of a fungi which has the greatest morphological variability: colonies of whitish color with the smooth air sector mycelium darkening by 20 days of cultivation of colonies with average growth rate, multilayered, forms layers of the raised and trimmed mycelium at the expense of what concentric circles are formed. Seldom meeting type of a colony at isolates of the southern Kazakhstan population. The mycelium superficial grows slowly in a type of blades, granular structure.

Some differences are marked at the isolates got from the different sorts of apple-tree: variations in a height, color, closeness of mycelium and also in the terms of appearance of reproductive structures. In most cases a colorless height is marked with weak appearance of conidia. In the populations of fungi from the garden-stuffs of the Jambul area mainly there are types of colonies with dense mycelia a center and compact raised on periphery, often reminding sporodochia on garden-stuffs, especially in the period of winter storage of garden-stuffs. Thus, the conducted comparative study of isolates of microfungi of sort of *Monilia* showed from the frontier regions of Kyrgyzstan( Kurday district of the Jambul area), Uzbekistan (Saryagasch district of the South-Kazakhstan area), Russia (North Kazakhstan area) and Almaty area( Karasay district), that the distinguished cultures of fungi had differentiating macro- and micro- description that in future will be used for

the selection of diagnostic criteria. For the exposure of influence of vertical zonality on macro and micromorphology descriptions of fungi of sort of *Monilia* were selected the staggered garden-stuffs apple-trees sprouting in the next naturally-ecological zones of the Almaty area: before mountains (village "Bolek" Enbekschikazakh district, village "Akjar" the Karasay district), mountain (village " Akbulak" the Talgar district), steppe (village "Dmitryevka" lyski district) and (village "Shallow" Enbekschikazakh of district), (settlement of "Kizyl-Tu" of the Talgar district) - (table 2).



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Picture 2- Mycelial growth of various populations of fungi of the sort *Monilia* on a potato and glucosic agar (10 days) an a) Almaty, b) Zhambyl, c) Southern Kazakhstan, d) the North Kazakhstan

Table 2- Characteristic of isolates of fungi of the genus *Monilia* different naturally-ecological zones of Almaty region

| Sprouting zone | Culture | Diagnostic descriptions | | | | |
|---|---|---|---|---|---|---|
| | | Mycelium height of micro fungi of Monilia on a 10 twenty-four hours of exhibiting | | | | sizes of conidia, mkm |
| | | diameter colonies, sm | form | structure | color | |
| mountain | apple-fruit | 8,0x8,4 | walks concentric circles away from a center. Edges at lifted, poorly wavy. | surface colonies dense, woolly, rollers fluffy | light-cream | 10,58-6,3 x 19,81-8,0 |
| | pear fruits | 7,8x8,5 | similar | similar | light cream, almost white | 11,33-6,0 x 16,72-8,2 |
| before mountains | apple-fruit | 7,9x8,1 | rounded form, with walking away from a center as circles мицелием with poorly wavy edges | dense мицелий, this alternates with the slightly raised fluffy rollers | light-cream | 13,79-5,8 x 16,48-8,4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | pear fruits | 8,2x8,3 | similar | analogical | light-cream | 10,65-4,9 x 18,05-9,0 |
| steppe | apple-fruit | 8,0x8,1 | Mycelium concentric mi by circles from walks from a center with wavy edges | on the surface of environment dense, edges are the rollers raised as fluffy | light-cream | 11,78-6,3 x 16,48-8,2 |
| | pear fruits | 7,9x8,4 | similar | analogical | rom light to darkly cream | 14,0-6,7 x 16,48-8,9 |

Studying of diagnostic characteristics of isolates of a mushroom of the sort *Monilia* of Almaty population and the populations allocated from fruit crops, growing in various climatic zones of Kazakhstan in a section of vertical zonality, didn't reveal an essential difference in macro and micro morphological features. One of diagnostic criteria of definition of specific accessory of microorganisms is appearance the muskoid sporodokhiya depart from the center concentric circles, dense light-cream color, being formed on fruits during vegetation and during storage. Therefore studying macro and the micro phenotypic of distinctive signs of various types of a formation of sporodochia sort *Monilia* fungi were carried out. Four types of manifestation of sporodochia on a surface of the struck fruits of an apple-tree were studied:

No. 1 – sporodochia depart from the center concentric circles, dense light-cream color;

No. 2 - small groups dispute spherical, dense, are randomly located on a surface of a fruit, cream color;

No. 3 – Spore heaps densely pressed to each other, randomly located cream color;

No. 4 – the fluffy, randomly located - small group's dispute, slightly grayish-white color (table 3). The data obtained for the 6th days testify to considerable distinctions in macro and the micro fenotipic changes in colony growth on a nutrient medium, in the rate of formation of conidia on conidiophores. At a micro fungi with the first type of a formation of sporodochia on a nutrient medium in a radius of 1 cm from the center of a colony sporodochia in the form of small pillows on a surface of a vegetative mycelium of the wrong roundish form (similar to an arrangement on a fruit surface) are formed. Small pillows of conidia, at the beginning have whitish coloring, and then become in the beginning light-cream, and later darkly cream.

Table 3 - Macro and micro phenotypic differences of different types of formation of sporodochia on the surface of the garden-stuffs of apple-tree, staggered by the fungi of *Monilia*

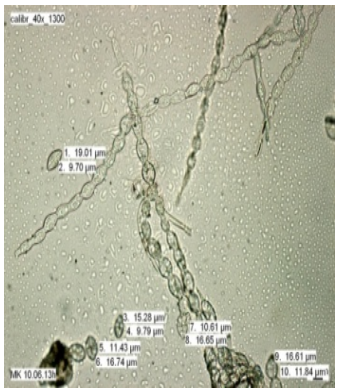
| Type of emergence dispute | Height of culture on a nourishing environment | Micro phenotypic signs on a 6 twenty-four hours, increase 40x1300 |
|---|---|---|





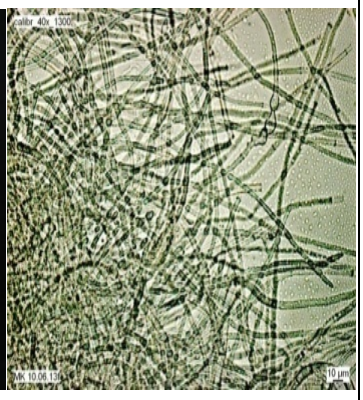
**№ 1**





**№ 3**





**№ 4**

Microscopic researches structures of the mycelial and sporodochia showed that the greatest speed in formation of a conidia is observed at a micro fungi at number - 4. On the 6 - th day in this phytopathogen conidiophores formed secondary growth. Then, as in fetuses with type sporulation number 1 in this period not septate hyphae and conidia formation is not observed. At fungi No. 2 and No. 3 macro conidia on simple and branched the basis for growth of conidia in the form of chains are formed. Macro conidia have an ovoid or ellipsoidal form, their average sizes vary ranging from 2,5-18,9 to 9,7-19,01μm.

Thus, the obtained data on studying of distinctive signs as formation on fruits the muksoid of sporodokhiya (4 types of emergence dispute) testify to considerable distinctions in macro and the micro fenotipic changes in colony growth on a nutrient medium, in the speed of formation of conidia on conidiophores.

As a result of studying of a number of characteristics, including microscopic data, it was established that fruits and branches from the southern Kazakhstan area are surprised *Monilia* cydonia microfungi. A pathogen isolated from apple fruit with Zhambyl and Almaty regions is a fungus *Monilia fructigena*. At the selected fungi growth rate on nutrient potato-glucose medium for the 10th days the various. The maximum diameter of colonies at isolate from the Kurday region of Zhambyl area. The minimum size of a colony at culture from the Saryagash region of the Southern Kazakhstan area. The data obtained at microscopic level testify to an insignificant variation of the sizes of conidia between Almaty and Zhambyl populations.

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