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Plant diseases of Green Zone in Astana

Abstract: According to the results of the first year of the survey, abiotic and biotic diseases of trees and shrubs of the Green Zone around the city of Astana are shown. Surveys of green belt forest plantations were carried out during the whole vegetation period of 2018. The overall condition of the green belt forest plantations (vital and phytopathological) is generally good. Abiotic diseases of forest plantations associated with soil and local climatic conditions are more common in the western and north-western parts of the green belt. Diseases of a biotic nature are rarely observed in all forest farms, and their occurrence depends mainly on the moisture factor of locality, species and plant species in specific areas.

Keywords: green areas, green belt, phytopathogenic organisms, morphometry, monitoring, identification.

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From the day of moving the capital of the republic to Akmola, by a new name Astana, the priority task was to rebuild the former mediocre city into a modern, with original architectural structures, surrounded with green not only from the inside, but also from the outside. For the record time according to the historical standards, Akmola has changed beyond recognition, in its place a new Eurasian city appeared - the pride of the nation, a symbol of sovereign Kazakhstan. The master plan for the development of Astana, developed under the direct control of the country's president, included a project to create a green belt around 100 thousand hectares around the Capital until 2020. This year, the area of man-made forest around the city exceeded 85 thousand hectares. We can say with confidence that the man-made forest has practically surrounded our young capital. In the future, the task will be to combine a man-made forest with the natural forest Borovoe and Shortandy [1,2].

Today, more than 9 million trees and about 2 million shrubs grow in planted forests. Currently, a real forest has already formed in the Green Zone. Creation in the steppe, in the conditions of a sharply continental climate of an artificial forest on such a huge area is a unique case. The experiment that first appeared utopian has now become a reality - in just 20 years a large forest has appeared in Sary Arka. This is a great result of a large team of specialists and workers headed by General Director of RSE "Zhasyl aimak" ZH.O. Suyundikov. Every year, pheasants, roe, deer and other are released into this man-made forest, and the forest is inhabited by the local fauna (hares, foxes, birds) representatives. In the green belt "Safari Park" is opened on an area of 300 hectares for the rest of the townspeople and visiting tourists. The green tracts already have their beneficial effect on the microclimate of the capital, and the strength and frequency of gusting winds have decreased. In 2014 2016 the implementation of the second phase of this unique project has begun (planting 1.1 million pieces of new seedlings) [1,2].

It should be noted that the implementation of the given unique project provides not only planting the necessary species of plants, but also appropriate care for them. Among the latter, of considerable importance is the prevention and control of pests of forestry [3,4]. At the same time, it is necessary to take into account the fact that in the creation of the forest belt, forest species are used not only in this region, but also in non-regional ones, which is fraught with introducing unusual new pathogenic organisms for the area. The latter, in combination with native species, can form a new complex of forest pests.

Harmful organisms (pests and diseases) have a negative impact on the vital condition of the host plant, reduces its resistance to adverse environmental factors, reduces the age and ultimately leads

to premature death. If timely measures are not taken to eliminate or treat such diseased plants, they, in turn, themselves become sources of infection and the spread of disease. Therefore, it is extremely important to conduct a phytosanitary assessment of the state of forest plantations of the Green Zone of Astana, for the creation of which a lot of financial resources and human labor were invested.

Research methods. The study of the phytopathological state of greenery in the green belt of Astana was carried out by route surveys during the entire vegetation season, and disease development was monitored in model parts. Locations of parts with diseased plants were noted with the help of GPS, and photographing of the affected plant organs was carried out using a Canon digital camera.

Identification of identified pathogenic organisms was carried out on the basis of their morphometric characteristics.

The descriptions of isolated phytopathogenic organisms were carried out on the basis of their morphometric characteristics using an Olympus BH-2 microscope with a built-in Canon camera and displaying an image on a computer screen, as well as measuring objects in the MS Exsel dialog box with Camera data.

Problem overview. Fungal diseases (powdery mildew, rust fungi, shyutte pines, black, blotchiness, scab, deformation, mosaic, necrosis of the bark, cancer, wilt, rot, witches' brooms, burns) are most common on woody and shrubby plants, bacterial and viral.

The causes of noncommunicable diseases can be environmental factors that adversely affect the growth and development of plants. These include adverse meteorological and soil conditions, environmental pollution, recreational loads and other anthropogenic factors.

Common Schutte (the causative agent is the *Lophodermium seditiosum* mushroom) usually affects seedlings and pine seedlings up to 6 years of age. In the spring, the affected needles turn red, and the sporulation of the fungus forms in the form of numerous small black strokes. In summer, the fruit bodies of the pathogen appear on the needles, having the appearance of oval black pads, often connected by ends [4].

Outbreaks of other various diseases, among which *bacterial carcinoma* are the most dangerous, make a significant contribution to the weakening of plantings. Currently, this disease of birch forests is widespread in many regions of the European part of Russia and Belarus [6]. In Kazakhstan, only small foci were noted earlier, but after 2010 the disease became widespread, and the course of the disease became quite aggressive, which was allegedly triggered by drought, which greatly weakened the plant defense mechanisms. In Kazakhstan, this disease began to be studied by Mironenko O.N. and Kabanova S.A., since huge areas of birch stands were under the threat of death [6].

Bacteria cause spotting, rot, necrosis and vascular diseases. Examples of widely spread bacterial diseases of tree species are transverse oak cancer, lumpy pine cancer, wet poplar ulcer cancer [7,8].

Viral diseases affecting woody plants are not of great economic importance [4].

Results and discussion. The route surveys of the Green Zone were carried out throughout the growing season. Forest plantations of all 7 forest areas were surveyed, the area of each of which is on average 10 12 thousand hectares, and the total - more than 85 thousand hectares. The survey routes were coordinated with forestry workers so that the selected blocks would be, by all parameters, representative forest plantations of the respective forest area.

The survey was started with forest plantations along the «Astana-Karaganda» highway near the villages of Koigeldy, Volgodonovka, Arnasay, Babatay and Shoptikol. In general, the common state of forest planters in the surveyed area is good. Due to the abundant rainfall in spring and the first half of summer, the moisture in the soil was sufficient for the growing season. It should be noted that planting are properly taken care of, the unoccupied plantings of the strip between the edges are plowed and kept as steam. Chemical treatments are carried out against the moth caterpillars, the mass outbreaks of which in the current year took place in the Vyacheslavskoe forest area in spring on the feathered and branchy elm. The damage from this pest would have been much more significant if not for the urgent measures taken by forestry workers in chemical treatment of the affected area.

Kyzylzhar forestry: The total area is 12090 hectares. On the territory of the forest there are old forest plantations 50-60 th of the last century. New plantings were started from the day of the organization of the RSE "Zhasyl aimak".

Dogrose doggy. Some wild rose bushes are strongly affected by rust to a great degree. Leaves, branches with a strong curvature and deformation are affected. It turned out that in such bushes 85-90% of branches were affected.

Uredinia on the affected organs of plants of yellow-rusty color, merging, powder, completely covering the stems, integumentary tissues of plants in such places are torn. Crowded mass of urediniospores deposited on healthy parts of plants give the bush a fiery yellow color. In 40-45% of affected plants, rust pustules were found only on the leaves, the stems remained unaffected. Urediniospores are round, slightly oval, 15-20 microns in diameter, the spore shell is dark, even, without thorns.

The result of the identification of the causative agent of the disease - *Phragmidium disciflorum (Tode) Jams.*- rust fungus, often affecting wild roses in the conditions of Central Asia.

Siberian pine. Young landings. 40-50% of plants from surveyed are affected. Individual plants are affected with an intensity of up to 70% or more and die. On young branches needles from light brown to rusty brown. Needles are struck, mainly at the base of branches, on individual branches all needles are struck, without exception. There are plants partially affected (separate sections of branches) or completely. The preliminary diagnosis is *shutte.*

Arshala forestry. The total area of forest landings are 3363 hectares. Plantings were made in 2012-2013.

Elm pinnate and branchy. In 40% of the plants, 80% of the leaves are affected by the *caterpillar of the moth variegated - Calospilos sylvata Scop.* The leaves are wrinkled, as if charred. Chemical treatments against pest insecticides are held.

The rest of the trees and shrubs in the planted forests are in good condition, no diseases were found on them.

Vyacheslav forestry. The total area of forestry is 13,369 ha. Plantings were made from 2004 to 2017.

Pinnate and branchy elm. (section 140). Strongly affected by the *moth.* On individual plants 70-80% of leaves are affected. The general condition of such plants is highly depressed.

*Common Maple (*section *140).* 20-30% of the leaves are completely yellowed, on the surface of such leaves are many dark brown spots with a black bordering rim. Sizes of spots 1-2 mm, scattered, in groups, sometimes merging. Microscopic examination of fungal structures is not detected. Spots, possibly of bacterial origin. On the green leaves spots are not marked.

*Currant golden (*section *140).* 10-15% of leaves are spotted with dark green endings or with a wide dark rim, oval and angular shape, 2-3x3-3,5 mm, possibly of mushroom origin.

Astana forestry. The total forest area is 9636 hectares. Plantings were made in 2003 (inter-wing plantings – in 2016), in 2009–2012 and 2016–2017.

*Kazakhstan poplar (*section *7).* At the base of small branches of clusters of crowded, shriveled leaves, 10-13 times smaller than normal, normal (green) and dark brown colors. At the end of such branches, starting from the middle, normal, normal-sized leaves are developed (3,5-5,5 cm in diameter). The preliminary diagnosis is *"witch's broom".*

*Hawthorn the greenish (*section *7).* Mass damage of leaves and fruits. Brushes from fruits affected by 80-90%, turned into black, are shriveled and are not developed formations. On such branches, the leaves are completely dried, yellowish brown. The diagnosis of a bacterial burn (pathogen - *Erwinia amylovora).* The eroded areas of the leaf at the edges are light yellow, surrounded by a dark brown rim. No other abnormalities are found.

In the row of *birch* (section 12) there are many dead plants. The causes are possibly related to abiotic habitat factors (frostbite in winter, lack of moisture, aggressive groundwater). The biotic factor in the death of adult plants (2010, planting) is not visually observed. In some plots in the row of birch, individual plants grow normally, although even here there are plants with partially dead branches.

Common birch (section 12). On 4-10% of the leaves yellow-brown spots are marked, occupying up to 40-75% of the leaf surface. There is no obvious pattern in the location of the spots: they occupy either one half of the leaf from the main vein, or the upper half of the leaf blade, including both sides of the main vein, etc. Fungal structures are not found.

Black currant (section 12). 70-80% of the leaves, starting from the edges of the lamina, going to the middle, are eaten by insects.

In a *pine* (section 32) in places, in a number of plants, individual branches entirely or the lower part of branches are dried, needles easily fall off. An external examination of the needles of an infectious nature is not observed. The upper (3/4) part of the plant develops normally, while maintaining intense green color.

In *willow* (section 33), in some areas, 10-15% of the leaves of the plants yellowed, possibly associated with abiotic environmental factors. There are plants with dried lower branches. In separate scenes among the *poplars*, 45-50% of the plants died, there are rows with completely dead poplars. No signs of infection are observed on such dried plants. On the *sucker narrow-leaved* in separate rows on yellowed leaves there are dark, dark brown spots, and in other rows of the plant without signs of damage. In this quarter, there are areas with completely dead plantings of poplars and willows, and next to planting willows in good condition, which clearly indicates the mosaic pattern of the soil conditions of the area.

Loch narrow-leaved (section 33). 40-60% of the leaves of the loch are spotted with gray-brown spotting, arranged in groups or randomly. In the locations of the spots the leaf tissue is light yellow. Microscopic examination of the presence of obvious fungal structures was not detected.

The Forest Batis. The total area of the forest area is 10088 ha. Plantings were made in 2007-2010 and 2016-2018. Interculse landings were made in the last 3 years: 2016 (951 ha), 2017 (1042 ha) and 2018 (342 ha).

Willow (section 3). In separate wings series IV, mainly (90%) dies; for a poplar branch single yellowed leaves on the stem are bacterial canker. The status of the other breeds normal. In a protective strip, along the road to Kustanai, in connection dryness.

On birch (section 3) 40-50% of leaves are completely or partially yellowed. In many scenes the whole row or separate sites in a row with a birch completely were lost. The same pattern, although to a lesser extent, is observed in the Tatar honeysuckle, and occasionally, maple. In General, in this quarter in some places there are large areas with entirely dead plants of abiotic nature. This shows that the soils of these places are clearly not suitable for planting the above-mentioned species, perhaps, and other trees. Apparently, in this section of the quarter aggressive groundwater lies close to the surface of the soil. This is indicated by the fact that all plants have taken root during planting and even for several years grew normally until their roots reached the salt ground water. This can be seen in their height and volume of the crown. Then all at once died. This suggests the need for this area of land agrochemical analysis of the soil, to address the issue of re-planting.

In quarter 4 marked area where the area of 20x700 m. all plantings were dead. This is the same case as in the 2nd quarter of the forestry.

In section 6 separate areas in the birch noted marginal yellowing of leaves. There are scenes, where it sometimes all the planting died. In quarter 7 the condition of plantings were very good.

In section 18, there are places where there are bald areas with a partially dead maple.

Ereymentau forestry: Total area of forest 6381,6 hectares, of which forests occupied 5803 ha. Forest area is divided into 49 blocks. Plantings were made in 2012, 2014 and 2015.

Acacia yellow (section 2). The leaf surface on the lower side is covered by 70-75% dark brown institutions. Epidermis of plants are broken, spots convex, 0,2-1 mm. in diameter. On the branches there are large, single, merging pustules. On the upper side of the leaf blade there are single pustules or pustules missing. Urediniospores are light brown, rounded, slightly oval, ovoid. Teliospores (18.09.18) were detected. Diagnosis: rust of acacia, the causative agent – the fungus *Melampsora ribesii purpureae Kleb.*

Poplar Kazakhstan (section 7). Landing in 2015. In this series, the majority of plants in the upper part, mainly died, but from the root of the recovered shoots. The cause of death-perhaps freezing, or due to soil.

Poplar pyramidal (section 7). On individual leaves on both sides of the leaf, along the veins of the fabric painted in whitish-gray color. Spots on them are depressed, the surface of the spots is felt-like, dark. On the underside of the leaf, along the veins, on the yellowed areas of inclusions of

many small, dark, almost black, powdering spots. Diagnosis: rust of poplar leaves, the causative agent-variegated rust of the genus *Melampsora:* M. *larici-tremulae* and *M. Pinitorqua*

Honeysuckle Tatar (section 9). Plantings are in 2014. Part of a Bush with brightly yellowed leaves, on some bushes the tips of branches with curvatures downwards and with numerous small whorls of leaves of the "witch's broom"type. These small leaves are shriveled, dried up, completely blackened. Preliminary diagnosis: viral or bacterial infection. On the healthy branches of some plants, the upper side of the leaves, starting from the tip, is covered with a dense soot mass, occupying up to 80% of the interventricular surface. Identification of the causative agent continues.

Loch narrow-leaved (section 10). Plantings are in 2015. On some plants, the upper branches on the yellowing leaves are blurred dark brown spots. On the green areas of the leaf blade, on the upper side of the leaf there are many small, white, slightly convex, filmy spots (0.1-0.2 mm.) of various shapes.

Maple ash-tree and poplar pyramidal (section 16). In a large area of planting, the plants dried out, perhaps from soil salinity.

Broad-leaved elm (section 16). On the lower side of the leaves are dark brown, almost black, indistinct spots (0.4 - 3-4 mm.) with compacted, whitish, isolated spots in the center. Such spots are located on the edges of the leaf, bordering the entire leaf. The inner parts of the leaf surface are healthy.

Black currant (section 20). On the lower side of the leaf blade, mainly at the base, red, as aging brownish, blurred spots. Large spots merging, sets of small spots (2-3 mm.) single. On some large spots the Central part is occupied by rounded, oval, compacted, necrotic, convex, whitish-yellowish, rather large spots. On individual leaves areas with spots occupy up to 50-70% of the leaf surface.

Shortandy forestry. The total area of forest are 12374,9 ha. Forest area is divided into 49 blocks. Landings are made since 2003. Examined planting 7, 8, 10, 17, 30 quarters.

Loch narrow-leaved (section 7). Plantings of 2006. In some plants the tops, and especially the side branches are dry, and some plants are completely dead, the leaves are wilted, there are many different sizes of spots on the green leaves.

In the quarter there are 17 plantings of pine trees of 50-ies of the last century. Among them there are ground-based mushrooms, buttermilk and cheese-eaters. Separate branches of pines with completely yellowed and dried needles, which are easily separated from the branches, fall off. Near, on the same plants normal healthy branches. Yellowing needles begins with the tip, spreading to the base. The latter are weakly attached to the branches, easily separated (fall off).

Ordinary Birches (section 17). On yellowed and green leaves there are rounded, slightly oval spots of dark brown color with clearly defined edges. Green areas of the leaf are preserved around the spots with a narrow strip. Spots are located on the upper side of the leaf, translucent on the lower side of the leaf cloudy color. Affected leaves 1-6 spots on a leaf, size of 2-4 mm. These spots have three colored zones: green exterior, medium dark and the inner grayish-black. Microscopic examination does not detect fungal and other structures.

In conclusion, it should be noted that the general condition of forest planting in Green zone is satisfactory, and if we take into account the complex soil and climatic conditions of the zone location area, it can be estimated very good.

In all forest areas there are landings, where some plants of some species are sick and even die, mainly from abiotic environmental factors. There is an occasional sickness and biotic nature. The General picture is that the diseases of forest planting of abiotic character are more in the Western and North-Western parts of the green zone. As for biotic diseases, their occurrence depends on the humidity factor of the area and on the species or species of plants in specific conditions.

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Астана қаласының Жасыл белдеміндегі өсімдік аурулары

Аннотация: Мақалада Жасыл белдемнің фитосанитарлық ахуалына баға берілген, ондағы ағаш-бұталарды зақымдайтын ауруларды және олардың түрлері анықталған. Жасыл белдемнің барлық 7 орман шаруашылығының жасыл отырғызылымдары фитопатологиялық тұрғыда тексерілді. Жасыл белдемнің жалпы жағдайы толық қанағаттанарлық. Абиоттық аурулар (топырақтық, термиялық, ылғалдылық жағдайларға байланысты) жасыл белдемнің батыс және солтүстік-батыс бөлігінде көбірек те, ал биотикалық сипаттағы аурулардың кездесуі, негізінен, белдем учаскелерінің ылғалдылық деңгейіне және ондағы өсімдіктердің түрлеріне тікелей байланысты.

Түйін сөздер: жасыл желек, жасыл белдем, фитопатогенді организмдер, морфометрия, мониторинг, идентификация.

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Болезни растений в Зеленом поясе города Астаны

Аннотация: По результатам первого года обследования показаны абиотические и биотические болезни древесно-кустарниковых растений Зеленого пояса вокруг г. Астаны. Обследования лесонасаждений Зеленого пояса проводились в течение всего вегетационного периода. Общее состояние лесопосадок Зеленого пояса (жизненное и фитопатологическое) в целом хорошее. Болезней лесопосадок абиотического характера, связанных с почвенными и местными климатическими условиями больше в западной и северо-западной частях зеленого пояса. Болезни биотического характера изредка отмечаются во всех лесных хозяйствах и их встречаемость зависит, в основном, от фактора влажности местности, пород и вида растений в конкретных участках.

Ключевые слова: зеленые насаждения, зеленый пояс, фитопатогенные организмы, морфометрия, мониторинг, идентификация.

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