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Casual organism of bacterial diseases of wheat at impact of abiotic factors

Goal. Determine the sensitivity of pathogens of bacterial burn, spot, basal and black wheat bacteriosis to pesticides. **Methods.** Microbiological, statistical. **Results** The absence of a clear antibacterial effect of the insecticides and herbicides studied on bacterial pathogens of wheat has been established. It is shown that the studied phytopathogenic bacteria exhibit greater sensitivity to pesticides in a liquid nutrient medium than on agar. **Conclusions** Phytopathogenic bacteria exhibit polyvalent sensitivity to pesticides, even within the same species. The action of a pesticide depends on the active substance, its concentration and the nutrient medium. Most of the pesticides studied do not completely inhibit the development of wheat bacteriological pathogens, therefore the necessary condition is further testing of these drugs to detect other possible effects on phytopathogens and their properties.

Key words: wheat, phytopathogenic bacteria, pesticides, antibacterial action.

Phytopathogenic bacteria cause significant economic losses to agriculture. Pathogens are constantly available in the crop and wild species of plants, affecting the seeds and all organs of plants during the vegetation [11, 14]. They violate the normal course of physiological processes in plants, cause necrosis and plant fading, which leads to partial or complete loss of plants. In plants damaged by phytopathogenic bacteria the quality of products deteriorates and yields decrease. Often, there is an overestimation of the crop [13, 15]. However, the most dangerous is the global trend for the spread and homogenization of phytopathogens [14, 16].

In Ukraine, the phytopathogenic and saprophytic bacterial microbiota of the surface and internal tissues of wheat has been investigated by the efforts of the staff of the phytopathogenic bacteria department. It was found that the qualitative composition of dominant saprophytic epiphytic bacteria does not differ from the spectrum of endophytic bacteria. Studies conducted on wheat have been shown a change in the quantitative and qualitative composition of the pathogenic, epiphytic and endophytic microbiota, depending on the phase of growth and development of plants [11, 14].

To protect crops against diseases and other harmful factors, pesticides are used [4, 5, 7, 18]. However, with high efficiency in relation to target objects, the long-term use and persistence of these xenobiotics and products of their disintegration in the environment lead to the development of resistance to phytopathogens and phytophages [1, 6, 17]. In addition, pesticides, in particular fungicides, violate the balance between bacterial and fungal microbiote [1, 9, 19].

The interaction of pesticides and soil microorganisms is devoted to a significant number of studies [1, 2, 8, 16]. Much less attention is paid to the study of the action of pesticides on phytopathogenic bacteria [3, 14, 16, 17].

The purpose of the research is to determine the sensitivity of pathogens of bacterial burn, spot, basal and black bacteriosis to pesticides.

Materials and methods of research. The objects of the studies were *Xanthomonas translucens* 3164, which causes black wheat bacteriosis, *Pseudomonas syringae* pv. *syringae* NCPPB 281 (UKM B-1027T) - bacterial burn or spot, *Pseudomonas syringae* pv. *atropaciens* is a causative agent for basal bacteriosis, a neopotype strain PDDCC 4394 (UKMV-1011T) and strains AF4, K20, 9747, 9780, 9417, 9404, 9400, 912 (UKMV-1014), 8462 (UKMV-1119), 9010 (UKMV-1151), П203 (UKMB-1152), П204 (UKMB-1153). The last three are isolated from the surface of healthy plants of rye (9010) and wheat (P203, P204), they cause

typical symptoms of the disease for artificial infection. For comparison, an epithelium of *Pantoea agglomerans* P324 was used, which may also be involved in the infectious process and lead to bacterial spotting for an artificial infection [10, 14].

23 different pesticides were authorized for use in Ukraine [12]: alpha super, alte, victor, galer, grantar, green fort, delan, express, enzio, zenkor 600 SC, caramba, maxim, polar, rudomil gold ME, fast 250 E, Strobe, Twix, Topaz, Tuxin, Falcon, Folukur 250 Ew, Fundazol, Shaved. The impact of pesticides on the growth of bacteria was determined by their cultivation on potato agar (CA) with investigated drugs in recommended doses for manufacturers 3 days at a temperature of 28 ° C. The presence of colonies on the medium with the corresponding drugs was noted.

To check the sensitivity of phytopathogenic bacteria to fungicides, preparations were used in the recommended manufacturer, increased and reduced by 10 times the norm, since in the literature of previous years there is information about their antibacterial activity [3, 4].

Also studied the growth rates of bacteria in a liquid nutrient medium (potato broth - KB) with pesticides that are used to protect wheat: falcon, follicles, alpha super, twix, grandar. For 2 ml of a suspension of bacteria, they were introduced into 10 ml of KB with preparations cultivated at a temperature of 28 ° C. After 24 hours, 0.1 ml of native and 10-fold dilutions of the suspension were sown on Petri dishes from CA. The control was a suspension of cells of bacteria cultured in BC without a pesticide. The nature of the growth for the undiluted suspension and the number of colonies in the diluted 10 - 6 suspensions were taken into account.

Research results. After 3-day cultivation on the medium with the preparations, growth of culture of strains *P. syringae* pv was observed. atrophic AF4, PDDCC 4394, 9747, 9780, 9404, 9417, 912, P 203, P 204, *P. agglomerans* P324. (Table 1). The investigated pesticides did not show a clear antibacterial effect on these strains.

1. The effect of pesticides on the growth of bacterial pathogens in wheat

Lower growth of strains *P. syringae* pv. *Atrofaciens* 8462 and 9010 were observed on a spacecraft with a desiccant of the greenhouse. This drug and insecticide Twix slightly inhibited the growth of strains *X. translucens* 3164 and *P. syringae* pv. *Atrofaciens* 9400. Growth *P. syringae* pv. *Atrofaciens* K20 was slightly inhibited by the preparations of Victor, Green Fort, Granstar, Senocor, Express, Twix, that is, it was moderately sensitive to most pesticides.

Consequently, phytopathogenic bacteria exhibit polyvalent sensitivity to pesticides, even within the same species. Therefore, to determine the sensitivity to these xenobiotics can not be limited to their individual representatives.

During the examination of fungicides, it was found that the drug rodomil gold (metalaxyl M 40 g / kg + mancozeb 640 g / kg) was detected in the recommended aging medium in the recommended, increased and decreased dose of 10 times (Table 2) for all investigated strains in a clear antibacterial activity.

2. Toxicity of fungicides to bacteriosis of wheat

Antibacterial effects on all strains within the studied concentrations were also detected by delan (dithianon 700 g / kg) and polishes (methirms 700 g / kg), which is associated with high content of the active substance in the preparation and acidification of the medium.

Preparations of shaved (triadimenol 15 g / kg, folpet 700 g / kg), caramba (metconazole 60 g / l), and ali (alpha thiosetyl 800 g / kg) completely suppressed the growth of all bacteria only in a dose, 10 times higher than recommended by the manufacturer.

As an active ingredient of the drug aliection tosetyl aluminum and in the dose recommended by the manufacturer partially inhibited the growth of the studied bacteria, and strains *P. syringae* pv. *syringae* NCPPB 281, *X. translucens* 3164, *P. syringae* pv. *atrofaciens* 9400 - completely. To the 3-component fungicide falcon (tebuconazole 167 g / l + triadimenol 43 g / l + spiroxamine 250 g / l) in the recommended manufacturer dose were selectively sensitive to strains *P. syringae* pv. *Atrofaciens* K20, 9400, *P. syringae* pv. *syringae* NCPPB 281, and strain *X. translucens* 3164 - in part, even in 10 times the reduced concentration. A 10-fold increase in the dose of fungicide affects the growth of all test strains. The drug follicur based on a common falcon substance (tebuconazole, 250 g / l) at the recommended dose (RD) only delayed the growth of strains *X. translucens* 3164 and *P. syringae* pv. *atrofaciens* 9400, and in 10 times

increased - strains *P. syringae* pv. *syringae* NCPPB 281 and *P. syringae* pv. *Atrofaciens* AF 4, K 20, 9747, 9780. The effect of the drug scor (diphenokonazole, 250 g / l) was similar.

Fundazole (benomyl 500 g / kg) in RD diluted the growth of strains *X. translucens* 3164, *P. syringae* pv. *syringae* NCPPB 281, *P. syringae* pv. *atrofaciens* AF4, K20 and 9010. An increase in the dose of the drug 10 times affects all the strains examined, but did not completely disfigure them.

Only a 10-fold increase in the dose of topaz (pencosazol 100g / l) and toxin (thiophanate methyl 700g / kg) resulted in partial suppression of the growth of xenobiotic susceptibilities of *P. syringae* pv strains. *syringae* NCPPB 281, *X. translucens* 3164, *P. syringae* pv. *Atrofaciens* AF4, K20, 9010.

Gastric fungicide (kresoxim-methyl, 500 g / l) and the maxim drug (fludioxonil, 25 g / l) did not affect the growth of phytopathogens even in 10 times the increased concentration. Consequently, the protitrim maxim, acting on the micromycet, can cause the microbionics of the grain to shift towards the bacteria.

The active substances of the drugs are follicles (tebuconazole, 0.4 g / l), falcon (tebuconazole, 0.3 g / l, triadimenol, 0.086 g / l), carambum (metconazole 0.1 g / l), shaved (triadimenol 0, 1 g / l), scor (diphenokonazole, 0.3 g / l), topaz (penoconazole 0.08 g / l) belonging to the triazole class inhibit the growth of phytopathogenic bacteria in a concentration of more than 0.5-1% per 1 liter of nutrient medium.

In the liquid nutrient medium, drugs have shown a clearer effect on the strains examined. During the sowing of the native suspension of bacterial cells on CA on control cups and preparations, they observed continuous growth. However, in the presence of pesticides falcon and follicle, the number of cells significantly decreased.

During the sowing of the suspension prepared by the serial dilution method, it was found that the number of colony-forming units of all the strains examined was significantly reduced with the administration of the drugs follicles, falcon and Twix compared to the control (figure). The calculated number of cells *X. translucens* 3164, *P. syringae* pv. *syringae* NCPPB 281, *P. agglomerans* P324 in the presence of the above preparations did not exceed 1% compared with the control without pesticide. Strain *P. syringae* pv. *Atrophaciens* PDDCC 4394 was less susceptible to these 3 drugs and the control of the amount of CSF was 1.15%, 0.31 and 2.20% respectively. For the preparation of alpha supplements to KB, the survival rate of bacteria of strains *P. agglomerans* P324 and *X. translucens* 3164 did not exceed 1%, while the investigated representatives of the genus *Pseudomonas* - 11% of cells compared with control. To the preparation of the herbicidal action of the granstar, the strain *X. translucens* 3164 - 6.23% of the KMO for the control was sensitive. Strains *P. syringae* pv. *atrofaciens* PDDCC 4394 and *P. agglomerans* P324 can be assessed as mediocre - 28.88% and 38.46% respectively. For *P. syringae* pv. *syringae* NCPPB 281, the number of CCDs in comparison with controls was 80.74%.

Conclusions

Phytopathogenic bacteria exhibit polyvalent sensitivity to pesticides. There is no clear antibacterial action against bacterial pathogens of wheat insecticides and herbicides authorized for use in Ukraine under conditions of their introduction into agarized nutrient medium. Of fungicidal drugs, anti-bacterial action is detected by delan, polyamides, rhodomyl golde in the recommended dose of 10 times, and pesticides, caramba, shaved and alletum - at an increased several times the recommended dose. Other fungicides are weak or do not act at all on bacterial pathogens of wheat. In a liquid nutrient medium, the bacterium *X. translucens* 3164, a black bacteriosis, exhibits high sensitivity to the studied pesticides. Bacterial bacteria (*P. syringae* pv. *Atrofaciens* PDDCC 4394), bacterial burn or spot (*P. syringae* pv. *Syringae* NCPPB 281) are sensitive to falcon, follicur, twix and less susceptible to insecticide alpha super and herbicide granstar, and epiphytic Strain *P. agglomerans* P324 is susceptible to all pesticides studied, except for granastar.

Since, according to our data, most of the studied pesticides do not completely inhibit the development of wheat bacteriostatic agents, further testing of these drugs is necessary to detect other possible effects on phytopathogens and their properties.

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