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ЗАХИСТ РОСЛИН: НАУКОВІ ЗДОБУТКИ ТА ПЕРСПЕКТИВИ ДОСЛІДЖЕНЬ

Матеріали міжнародної науково-практичної конференції, присвяченої 75-річчю від дня заснування Інституту захисту рослин НААН, 150-річчю від дня народження Поспєлова Володимира Петровича, 100-річчю від дня народження Арєшнікова Бориса Андрійовича, 90-річчю від дня народження Доліна Володимира Гдаліча

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СТІЙКІСТЬ РОСЛИН ПРОТИ ШКІДНИКІВ ТА ХВОРОБ

(рис.). Збільшення СЕТ>8^{0}С у межах 111,0—176,0^{0}С за декаду (В-Г) сприятиме підвищенню інтенсивності льоту шкідника до середнього рівня і складатиме 7,5 ± 2,27 екз./пастку.

Встановлено, що найбільший літ імаго фруктової смугастої молі з чисельністю 15,8 ± 3,15 екз./пастку можливий за таких температурних умов, а саме накопиченні СЕТ>8^{0}С за 10 діб на рівні 176,1—210,0^{0}С (Г-Д). Також слід зазначити, що в межах СЕТ>8^{0}С до 103,0^{0}С за 10 діб буде спостерігатися середній приріст льоту 0,78 імаго на кожні 10^{0}С (А-Б), а при збільшенні суми вище 103,5 до 210,0^{0}С цей показник зростає до 1,96 імаго на кожні 10^{0}С (Б-Д).

Таким чином, прогнозування інтенсивності льоту імаго фруктової смугастої молі можливе за використання показника накопичення СЕТ>8^{0}С за 10 діб. При збільшенні СЕТ>8^{0}С у межах 103,5^{0}С за 10 діб та вище передбачається ймовірність швидкого зростання чисельності виду у насадженнях.

CHANGING IN PHYTOSANITARY STATE IN WINTER WHEAT FIELDS UNDER CLIMATE CHANGE IN LEFT-BANK FOREST-STEPPE OF UKRAINE

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Numerous studies have demonstrated the negative impact of climate change in many parts of the world, especially arid regions, on the potential yields of winter wheat and food security in the world. According to the IPCC (Intergovernmental Panel on Climate Change), the average annual temperature on Earth has increased by 0.74 degrees over the last 100 years (from 1906 to 2005). According to the weather analysis for the last 15 years, the average annual temperature in Ukraine increased by 0.8^{0}C mainly due to the shift of the period of stable cooling and winter conditions mitigation. Annual year temperature in Poltava Breeding Centre (is situated in Left-Bank Forest-Steppe of Ukraine) have been increased from 7.6^{0}C (multiyear average) to 9.5—10.5^{0}C in last years. Ukraine's climate is currently in a trend of global warming, and the rate of increase in average air temperature is slightly higher than the world average. Over the last 30 years, Ukraine has seen an increase in the average annual air temperature at a rate of 0.3—0.4^{0}C every 10 years,

which is gradually spreading from the south to the north. Since 1989, Ukraine has had the longest and almost continuous period of warming.

Agro-climatic conditions of most of Ukraine are favourable for winter wheat growing. However, in recent years there has been a trend of increasing contrast between individual years and climatic zones, as well as growing seasons.

In the period from 1946 to 2016, the date of heading was shifted by 16 days, which indicates the acceleration of the growing period of winter wheat. An early heading date can be an advantage for protection against summer droughts, but it also has the disadvantage of reducing rainfall to the earing phase — a loss of 25 mm when shifting the heading date earlier by 16 days for wheat in arid conditions. Analysis of recent publications indicates an increase in the number of days with daytime temperatures above $+30^0$C and rising temperatures at night.

Increasing the temperature in winter by 1.5—2^0C has reduced the depth of soil freezing to 20—70 cm, which is a favourable factor for the assimilation of winter precipitation and the formation of sufficient soil moisture in spring. However, his leads also to high survival of fungi diseases and insects in soil layer.

Another negative consequence of climate change is the expansion of pests, pathogens and quarantine facilities that are not typical of agro-climatic zones. Increased viability of fungal diseases stored in the soil leads to increased fungal load on weakened plants after overwintering and increases the risk of epiphytotics.

The Poltava Breeding Centre has been carrying out selection work on wheat in the research fields of the university for more than 40 years. In recent years, the presence or increase of atypical for the region fungal and viral diseases, as well as a decrease in the development of diseases typical of the region has been observed.

Decreases in the amount and intensity of damage due to climate change have been observed for powdery mildew. Prolonged autumn, spring and summer droughts in combination with elevated temperatures are not conducive to the development of the pathogen.

There is an increase in the number of *Pyrenophora* and *Septoria* cases, especially lesions of the lower levels of leaves, in years with a prolonged cool spring. Cases of yellow rust have been reported in the experimental field, but the disease has not become widespread. In the 2017—2018 growing year a significant spread of stem rust was recorded, but in recent years it has not been recorded.

Atmospheric moisture is required for most fungal diseases to develop at the early stages. Brown rust (crop damage is recorded every year) and head diseases such as *Fusarium* and *Tilletia* have not changed due to climate change. Changes in weather conditions do not have a significant impact on the development of epiphytotics of the above diseases.

Due to the increase in temperatures at autumn, there is an increase in

the number of pests and an increase in the number of their generations. This leads to a change in the phytosanitary state of winter wheat crops. Rising temperatures, prolonging the warm autumn period and the lack of precipitation increase the number and intensity of insect infections with viral diseases. In the conditions of the Left-Bank Forest-Steppe of Ukraine, phytophagous plants that harm winter wheat crops in the conditions of warm autumn include cereal flies, aphids, cicadas, mites and leafhoppers. The plants also to be affected by soil-borne viruses.

The constant presence of winter wheat in the crop rotation (last 3 years spring wheat too), limited research areas with protective forest belts (which are natural stocks of insects) and low insecticidal treatment of crops allows to create natural conditions for infection of breeding areas with viral diseases. Under conditions of long and warm autumn, the risks of damage to winter wheat plants by viral diseases increase significantly. The difficulty of detecting viral damage to winter wheat plants is due to the similarity of symptoms with symptoms of mineral starvation (color change or lack thereof), physiological response of plants to low temperatures (purple color) or growth retardation in spring due to plant damage in winter. However, in the later stages of growth and development, the differences between abiotic factors and viral diseases become more and more noticeable. The exact presence of viral diseases in crops can be assessed only by enzyme-linked immunosorbent assay. Visual evaluation, which is not as reliable as the ELISA test, but has been and remains an important selection tool for the selection of valuable genotypes.

In the 2019—2020 growing season, the signs of viral diseases were noticed. The results of enzyme-linked immunosorbent assay established the presence of *wheat stripe mosaic virus* (WSMV), *barley yellow dwarf virus* (BYDV-PAV and BYDV-MAV). Early sowing crops were more affected, which directly affected the yield of varieties. In the 2020—2021 growing season, the presence of signs of viral diseases was also recorded in a special experiment on sowing dates. Presence of *wheat stripe mosaic virus* (WSMV), *High Plains wheat mosaic virus* (HPWMoV), *barley yellow dwarf virus* (BYDV-PAV) was confirmed. The highest degree of damage was in the early sowing period (September 1), and the late sowing period (October 1 decade) was much lower. Crops in 2021—2022 also showed signs of viral disease, but much less than in the previous one.

In general, the results of enzyme-linked immunosorbent assay confirm the presence in the agrocenosis of at least three types of viral diseases.

Thus, climate change directly affects changes in the phytosanitary situation in the research fields. The number of diseases that can develop in arid conditions is increasing. The most significant changes occur with diseases transmitted by virus vector insects. There is an increase in infection of winter wheat crops with viral diseases, especially early and even optimal sowing dates.