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Control of foliar pathogens in wheat during the stem elongation – heading period

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During the 2018/2019 season, the crop is developing under extreme climatic conditions, the phytosanitary environment is highly dynamic, full of surprises, and presents dangers. In this complex situation, high-quality plant protection is the only reliable tool for risk management and a limiting factor for future yield.

The spread and development of foliar pathogens in common wheat are closely related to three main factors – varietal susceptibility, high virulence and aggressiveness in pathogen populations, and suitable climatic conditions. The optimal combination of these factors is a prerequisite for epiphytotic development of foliar diseases in this crop.

The presence of primary infection in the stands is the starting point for defining the strategy for chemical control. In diseases such as brown rust (*Puccinia triticina*) and powdery mildew (*Blumeria graminis*), autumn infection plays an insignificant role in the development of these diseases in spring ***because they are carried over long distances by air currents.*** Therefore, even if there was no infection from these diseases in the stands during autumn, the inoculum may be introduced from other regions with favourable conditions for the development and survival of their pathogens. Naturally, the presence of brown rust and powdery mildew in the stands early in spring creates conditions for their earlier development when favourable conditions are present. The warm and snowless winter of the 2018/2019 growing season created conditions for the preservation of brown rust in the stands, but the extreme drought during the period February – March 2019 in many regions of the country led to the death of the affected leaves, which in turn drastically reduced the amount of primary inoculum, since the pathogen is obligate and can survive only on living tissues.

The extreme drought, as well as the sparse stands, also adversely affected the survival of powdery mildew in the fields, since this pathogen is also obligate and requires the preservation of the vitality of the infected organs. The rains in April and the entry of the stands into stem elongation stage create risks of the occurrence and development of these diseases, as well as of yellow rust (*Puccinia striformis* f.sp. *tritici*).

It is advisable for farmers to periodically monitor the stands for the occurrence of primary infection by rusts and powdery mildew and, upon its detection, to proceed with chemical control. It is important to know that the causal agents of rusts are polycyclic pathogens, i.e. for their mass development it is necessary that several pathogen cycles occur, which, depending on climatic conditions, may have a duration of 8–10 days for brown rust (at a temperature of 18–20^{O}C) and 12–14 days for yellow rust (at a temperature of 14–16^{O}C) – for each cycle.

Considering the fact that the ear, the flag leaf and the two leaves below it provide over 95% of the yield in wheat, the argument that any possible waiting for the occurrence of primary infection in the stands would lead to mass damage is unfounded. ***In many cases, preventive treatment before the occurrence of primary infection leads to reduced efficacy of the products due to a decline in their activity at the time of infection occurrence.***

In the case of early leaf blight (septoria leaf blotch) (*Zymoseptoria tritic*i) and tan spot (*Pyrenophora tritici-repentis*), primary infection is of essential importance for their development and spread. The causal agents of these diseases are pseudothecial fungal pathogens that have the ability to survive in dead plant tissues and crop residues and, under favourable conditions, to produce a large amount of spores. Moreover, the causal agent of early leaf blight develops within a temperature range from 0 to 25 ^{O}C, and depending on the

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temperature, the latent (incubation) period is 15–25 days. ***Therefore, preventive treatment at the beginning of stem elongation, in the presence of infection from the autumn, is recommended!*** The extreme drought up to the beginning of April 2019 and the death of the rosette leaves make the symptoms of this disease difficult to detect, but the pathogen's ability to form pseudothecia creates a real risk of its spread and development.

During the 2018/2019 growing season, we are witnessing extreme conditions for the development of common winter wheat. Based on the scarce amount of precipitation during the period October – March and the lack of snow cover in many regions of the country, we can confidently speak of ***winter drought***. At the same time, the entry of the stands into stem elongation stage, combined with low temperatures, is a prerequisite for the manifestation of the so-called physiological leaf spots. Physiological leaf spots are the result of abrupt temperature changes which, combined with lower soil moisture, lead to the appearance of chlorotic or dark brown spots and, later, to tissue necrosis within them. ***These symptoms resemble those of early leaf blight and tan spot.*** Unlike physiological leaf spots, in the spots caused by early leaf blight, black dots (the pycnidia of the fungus) are observed, while in tan spot a dark dot is observed in the centre of the spot, as a result of sporulation of the fungus. This clarification is made because many farmers may observe similar symptomatology even in stands where fungicides for the control of early leaf blight have been applied.