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How to keep new crops free from infection?

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The harvest is nearing its end, and it is time for farmers to turn their attention to the upcoming sowing. Protecting cereal crops from diseases was difficult during the past season. In such situations, the advantages and disadvantages of the technology, varieties, and fungicides we apply become clearly apparent. Realistically, the consequences of the current season are not yet over, as infection on the seeds can negatively affect the development of the new crops.

A brief analysis of the first half of 2014 can be useful for assessing the current situation. At first glance, the most problematic was yellow rust, which "surprised" us with its early appearance and rapid development. Many producers had not seen and were not well acquainted with the symptoms, as well as the conditions for the pathogen's development. The application of fungicide was delayed, and for this reason, the result was not always as expected. Infestation by the pathogen was found on the upper tiers of the crop and even on the seed glumes.

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Prolonged rainfall and accumulated infectious pressure contributed to mixed infection on the leaves with early leaf blotch (septoria), and after it warmed up, brown rust also appeared. The situation was aggravated due to unsuitable climatic conditions for spraying and lack of access to waterlogged fields. Unusually late and continuous rains created conditions for the development of diseases with typical damage directly on the ear, such as fusarium head blight, glume blotch (septoria), helminthosporiosis, and snow mold. The prolonged harvest, in turn, led to even stronger development of fusarium, secondary parasites, and saprophytes on the ears. The described epidemiological situation inevitably led to a reduction in the quality of grain and seeds for sowing.

What are the main ways diseases of cereal crops are transmitted from one season to the next, and what are the possibilities to prevent this?

For most diseases, seed treatment is the only practically possible solution for their limitation. Key factors for achieving high effectiveness in seed treatment are:

- Well-cleaned and dust-free seeds – dust and foreign matter can absorb up to 30% of the treatment product. Quality and well-calibrated seed treatment equipment – good equipment must provide a constant dose and uniform coverage of seeds with up to 2 liters of solution per 100 kg of seeds
- Correct choice of a quality and broad-spectrum fungicide
- Use of certified seeds from a single lot

Transmission via seeds, soil, and plant residues

Seeds are a primary source of infection, including over long distances to fields not previously affected. Control through sowing certified, quality, and treated seeds is by no means a meaningless phrase that we repeat every year. It is a very useful, relatively easy method, which is also the first step in the overall strategy for dealing with persistent diseases during the growing season.

When mixing different lots of grain, there is a serious risk of spore transfer, so it is recommended to use seeds from a single lot, but if this is practically impossible, it is particularly important to rely on a quality seed treatment product.

Standard diseases transmitted via seeds are:

- Common bunt of wheat (*Tilletia foetida/carries*)
- Loose smut of wheat (*Ustilago tritici*)
- Loose smut of barley (*Ustilago nuda*).

More specific to the conditions of this year and difficult to control are:

Fusarium head blight, seed and seedling blight (*Fusarium graminearum, F. culmorum* and other fungi from the genus *Fusarium*). The disease is very important and is associated with different types of damage

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from germination to harvest, and even during storage of wheat and barley (especially on moister grain). Immediately after sowing, a form of root rot develops, which can eliminate a large part of the seedlings. In spring, this is a prerequisite for more active infection of the ear with Fusarium during flowering. In 2014, there were exceptionally suitable conditions for the development of Fusarium on the ear – rainy weather with moderate temperatures during flowering. Due to the fact that flowering treatments with fungicide are not a common practice in Bulgaria, we can expect an increased percentage of Fusarium-infected seeds for sowing. Diseased seeds are lighter and a large part of them are cleaned out in the combine, but if the lot is for sowing, additional cleaning is necessary. Among varieties, a certain difference in the level of resistance is noted, but the genetic control method is not leading.

Successful control of fusarium root rot requires an integrated approach; each of the listed measures is essential and leads to a lower risk of damage:

- Mandatory flowering treatment of the seed production area with a highly effective fungicide
- Winnowing out infected seeds both in the field via the combine and additionally during procurement
- Storage of seeds at optimal moisture
- Treatment with a highly effective seed treatment fungicide
- Avoiding corn, wheat, and barley as preceding crops
- Avoiding minimal and no-till tillage

Snow mold (*Microdochium (Fusarium) nivale*) The fungus is among the main causes of seedling death and crop thinning in the autumn. Most often, the fungus, similar to fusarium diseases, infects the ears, but unlike them, it does not cause symptoms on the seeds and makes the autumn attack difficult to predict. Seed treatment is a very effective method, but highly effective, systemic products must be used, as the pathogen reaches the embryo. **Take-all and foot rot (*Gaemnanomyces graminis*); Helminthosporiosis (*Bipolaris sorokiniana* (t.p. *Cochliobulus sativus*); Septoria leaf blotch of wheat (*Septoria tritici*); Glume blotch (septoria) (*Stagonospora nodorum*).**

This complex of diseases is observed mainly in situations where we have wheat or barley as a preceding crop. The infection is accumulated in the plant residue and is transferred to the young roots and seedlings. This leads to various severe manifestations of root rot on the tillering nodes or later to whiteheads and death of entire plants.

When a cereal preceding crop cannot be avoided, control should be carried out in two steps:

- treatment of seeds with an effective and broad-spectrum fungicide
- vegetative treatment with a quality fungicide in spring.

Net blotch of barley (*Drechslera teres*)

A primarily domestic disease with increasingly wider distribution. Elliptical-oblong spots with irregular periphery and dark brown color are observed on the leaves, appearing first on the lower tiers of the crop. In susceptible varieties, complete leaf blight and strong yield reduction are observed. The first infections occur already in the

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autumn, with volunteer plants and plant residue playing a major role in the spread of the disease. Infection in the seeds is of essential importance for the transfer of the pathogen to infection-free fields. During the growing season, the infection is transmitted over long distances and by air. In severe attacks, symptoms can be confused with barley stripe, but unlike it, not all tillers are attacked to the same degree.