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Main diseases in Russian vineyards and modern methods of combating them

INTRODUCTION

Diseases cause significant damage to the crop and vines in Russian vineyards each year. Affected berries become unsuitable for consumption fresh and for processing in the wine industry. The development of diseases

on leaves and shoots leads to disruption of the most important physiological processes of a vine, such as photosynthesis and respiration. In epiphytotic years, in the case of sensitive varieties, you can lose both the crop and the vines themselves completely. This threatens wineries with large economic losses and sometimes bankruptcy. The main (dominant) diseases can be considered those leading to the loss of more than 50% of the crop and perhaps the death of vines. Following many years of research, A I Talash (PhD in agricultural science) identified four diseases of the fungal etiology which dominate in the Krasnodar region — Russia's main wine region. These are anthracnose, mildew, oidium, and grey rot. Other diseases do not cause widespread damage to the region's viticulture. Four main methods of combatting grape disease can be distinguished. The organisational and economic method includes the selection of terroir and varieties. These parameters determine the vineyard's potential susceptibility. The agrotechnical method enables you to adjust the amount of possible primary infection, as well as the temperature and humidity conditions in the vine's crown. Chemical and biological methods involve applying pesticides to grape vines for the prevention and treatment of disease. This essay will examine the four abovementioned dominant vineyard diseases - anthracnose, mildew, oidium and grey rot - as well as modern methods of dealing with them.

One of the main vine diseases leading to crop loss and reduced vine productivity is anthracnose, which causes the fungus Gloeosporium ampelophagum (Pass.) Sacc. Melanconiaceae family, Deuteromycota group. It should be noted that this disease only affects young vine tissue, such as non-lignified shoots, leaves and berries. Light brown spots appear on the leaves in the form of blurry dots, which crack and brown, and then

fade and fall off. Brownish spots with a dark purple tint and a dark border form on the berries. Light brown rectangular spots appear on the shoots; these gradually expand, deepen and darken. Droplets of liquid and an air temperature above 3°C are needed for infection to start and the pathogen spores to begin germinating. The incubation period depends on temperature (10–12°C for 12 days, 24–25 °C for 3-5 days) and leaf age. Hence, it is crucial not to miss starting treatments with chemical fungicides based on inorganic copper, mancozeb or metiram, such as Abiga-Pik, WS 7–8 l/ha, Poliram DF, WDG 1.5–2.5 rg/ha (contact fungicides), followed by Ridomil Gold MC, WDG 2.0–3.0 kg/ha (systemic fungicide). Following hail, processing must be carried out as soon as possible. However, there is a risk of resistance to the chemical control method if you do not alternate contact products with systemic ones, as well as with active substances from different classes. When establishing a vineyard in areas with high groundwater or regions with high rainfall from April to September, it is crucial to select varieties that are not sensitive to anthracnose. It is also necessary to prune those parts of the vines affected by anthracnose regularly and remove them from the vineyard, because the pathogen can remain in the soil for up to 10-12 years.

Mildew is a common disease that can destroy 50% or more of berries. It is caused by the fungus Plasmopara viticola of the Peronosporaceae family of Oomycota. It affects leaves, shoots, inflorescences and berries, which grow to less than half their normal size. Oily spots appear on the upper side of affected leaves, while a white coating appears on the underside. Then the spots merge and cover the entire leaf, which then deforms, shrivels and falls off. Conidiophores appear on buds, flowers, ovaries and young berries in the

form of powdery mould spores; then the affected organs turn brown and shrivel. Spores (i.e. conidiophores) no longer appear on larger berries; they rather turn purple, wrinkle, shrivel and fall off. The incubation period depends on temperature and leaf age, and lasts from 3-4 to 13-15 days. Favourable conditions are temperatures of 21–25°C with 95–100% humidity. However, development of the disease stops at temperatures above 30°C. Thus, epiphytotic development of this disease can be expected in years with hot, calm weather with frequent precipitation (the presence of droplets of water for two hours), especially in the first half of the growing season. Mildew is a great risk if flowering takes place in rainy weather. Products based on inorganic copper, mandipropamide and mancozeb, for example Pergado M, WDG 0.3-0.5 kg/ha, Ridomil Gold MC, WDG 2.5 kg/ha, are very effective. The number of fungicide treatments varies greatly depending on the variety's susceptibility: 0–1 for resistant varieties and 4–7 for susceptible varieties (according to A I Talash). Thus, selecting resistant varieties is an important method of preventive protection, thereby reducing pesticidal load, reducing the winery's budget and preserving the environment. High trellising and regular canopy management will also impede the disease's development, by ensuring better aeration and sunlight penetration into the vine's crown.

Oidium (Oidium Tuckeri Berk., Moniliaceae family, Deuteromycota group) is one of the most dangerous fungal pathogens for a vine. It affects all the green parts of the plant: leaves, inflorescences, berries and shoots. Disease symptoms usually manifest as white or grey-white spores. Necrotic spots develop on severely affected leaves, which usually age prematurely and fall off. The berries are covered with a clearly visible grey coating, often dense and felt-like with underlying dotted necrosis. Heavily

affected berries split. When oidium attacks green shoots, the first symptoms are similar to those on the leaves, followed by epidermal necrosis forming dark, irregular, often star-shaped spots. Onset of infection occurs at 5°C and 60–80% humidity. Nevertheless humidity is not critical to the spread of this disease. It is generally accepted that if there is hot, dry weather during the growing season, epiphytotic development of oidium can be expected. However, the disease loses its grip on the leaves when the air temperature exceeds 28°C and on the berries at above 30°C. Global experience has established that excessive use of nitrogen fertilisers, which stimulate the growth processes of the vine's vegetative mass, contributes to increased damage by oidium; thus, this must be taken into account when adjusting the nutrition system. Sulphur, triazole or strobilurin-based fungicides should be used as part of the fight against this disease. Sulphur is one of the best fungicides, with sulphur-based products such as Tiovit Jet, WDG 5.0-8.0 kg/ha having a preventive, therapeutic and mycelium-killing effect. However, the disadvantage of such fungicides is that the gas phase is only effective above 18°C. The combined use of the above techniques will ensure effective defence against this mycopathogen.

Grey rot (Botrytis cinerea Pers., Moniliaceae family, Deuteromycota group) has long been considered the dominant fungal pathogen. Crop losses from this disease can be over 80%. The fungus infects leaves, inflorescences, berries, green shoots and woody part of a mature vine. At the beginning of the growing season (April, May), brown spots form between the leaf veins, sometimes with a grey fluffy coating on both sides, which forms along the edges of the leaf blade. Inflorescences are covered with a grey bloom of spores; they then turn brown and crumble. Individual berries or their

clusters turn brown and become watery. The skins split, the berries are covered with an abundant grey-ash coating, and green shoots are covered with grey-ash pubescence, which is easily rubbed off. Whitish spots appear on a mature vine during rain; there is no clear border between them and healthy tissue. Ideal conditions for the onset of infection are 12°C with over 95% humidity. Protective measures should be aimed primarily at protecting a ripening crop. Practice has shown that if there is cold, damp weather in September, then intense development of grey rot on the berries is to be expected. Moreover, the disease will affect the berries more severely if they have already been damaged by hail, strong winds or harmful organisms, such as oidium, anthracnose or moths. Hence, comprehensive protection from grey rot is only possible in conjunction with protective measures against other diseases and pests. The pathogen's biology means that an open canopy as well as the avoidance of excessive yields is advisable for highly susceptible varieties. One to four treatments with fungicides based on cyprodinil or fludioxonil, such as Switch, WDG 0.8-1.0 kg/ha, Horus, WDG 0.6-0,7 kg/ha, are carried out depending on the variety's susceptibility to grey rot and the prevailing weather conditions. These need not be carried out if previous protective measures were effective and no treatment is necessary.

Conclusion

The problem of protecting vineyards from diseases in both Russia and around the world is becoming increasingly acute each year. However, accumulated experience and the availability of various methods of combatting vine diseases means that it is unforgivable for winegrowers to lose their crop and even entire vineyards due to "failures" in protective

systems. Sometimes even moderate disease events can significantly reduce a vineyard's productivity. A crop displaying signs of disease is considered defective and is disposed of. Each disease prevention method referred to in this essay contributes to crop protection. However, international scientists and practitioners have long demonstrated that only the combined use of various vine protection methods ensures the optimal biological and economic result. The ratio of each disease prevention method in the vineyard management system may well also depend on budget, winery size and technical equipment. Producing high-quality wines from wine grape varieties and selling table grapes at a high purchase price are only possible with effective protection against disease.

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