



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ



Inovace studijních programů AF a ZF MENDELU směřující k vytvoření mezioborové integrace CZ.1.07/2.2.00/28.0302

Tato prezentace je spolufinancovaná z Evropského sociálního fondu a státního rozpočtu České republiky

Protection of grapevine against diseases and pests

- Cultivated varieties of grapevine must be chemically treated
- Requirements for more environmental friendly protection: shift from conventional protection and production to integrated
- Objective: Minimize use and impact of pesticides on the environment
- Integrated protection system prefers preventive measures:
 - Good air flow at the site
 - Growth optimization
 - Harmonious nutrition

- Mechanical elimination of infection and pests (removal of infested plant parts)
- Gradual introduction of resistant varieties
- Biological protection
- Minimization of use and proper selection of environmentally friendly pesticides, preferably organic products
- Excellent application is a significant aspect of efficient protection and is affected by a type and setting of equipment and application devices

- Interrows should not be bare, mechanical and herbicidal removal of weed from rows (weed transmits diseases and pests)
- Application of pesticides remains a part of the integrated protection, but must be administered in compliance with chemical protection guidelines

Physiological diseases

- Iron deficiency

- Symptoms: yellowish green, smaller leaves, tissues among veins tend to dry out, venation remains green. Heavily infested vines have weak annual shoots, short internodes
- Causes: Iron deficiency, heavily calcareous soil



- Degree of harmfulness on high-risk locations – use of improper rootstock
- Outbreak of disease is enhanced by:
 - Poorly disintegrated and overly irrigated soil
 - Low temperatures
- Protection: Preventive cultivation measures
 - Location selection
 - Selection of rootstock and varieties
- Optimization of nutrition:
- Spraying on the leaves – supply of iron in chelate form
- Copperas - slow and significantly lower efficiency

Virus diseases of grapevine

- Most common viroses:
 - Grapevine leaf roll virus
 - Grapevine mosaic virus
 - Grapevine fanleaf virus
 - Grapevine vein banding virus
- Harmful due to:
 - No cure for infested vines
 - Long life of the plantations

- Harmfulness varies significantly and depends on:
 - Virulence of the agent
 - Sensitivity of the host
 - Plantation conditions
- Viroses affect essential physiological processes
 - Yield decrease
 - Quality decrease (low sugar content)
 - Growth reduction
 - Worse wood maturity – more prone to frost-damage
 - Shorter life of the vines

Protection against viroses

- Consistent phytosanitary selection in nursery plants
- Planting of certified, virus-free planting stock material

Grapevine leaf roll virus

- Symptoms:
 - Leaf margins tend to roll since the end of June
 - Heavily infested vines – bud break is delayed
 - Poor growth
 - Poor blooming

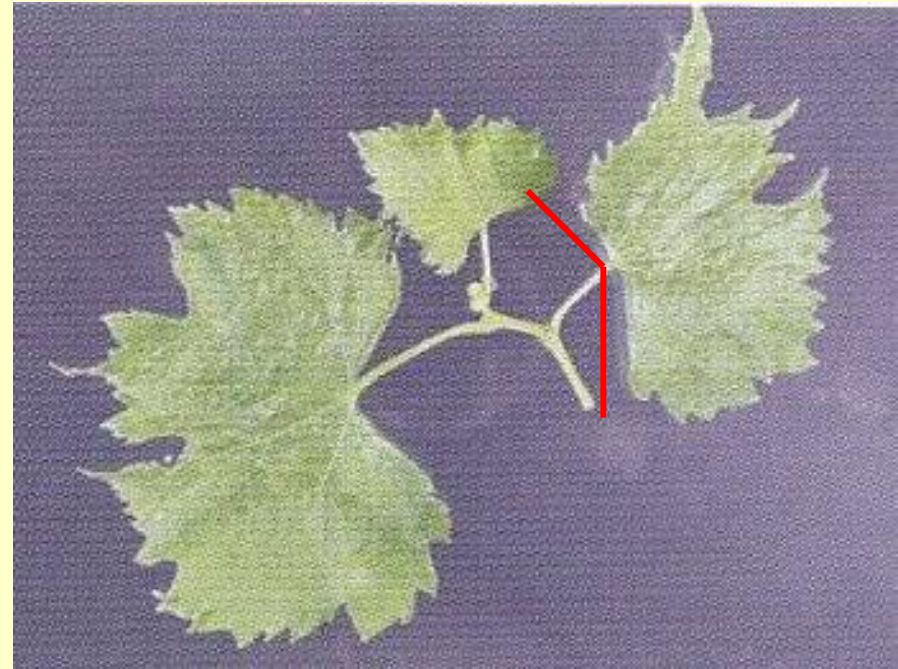


- Harmfulness: Decrease in amount and quality of the yield
- Susceptible varieties:
 - Pinot Blanc, pinot Gris, Pinot Noir
 - Chardonnay
 - Müller Thurgau
 - Green Veltliner
 - Chasselas Blanc, Chasselas Rosé

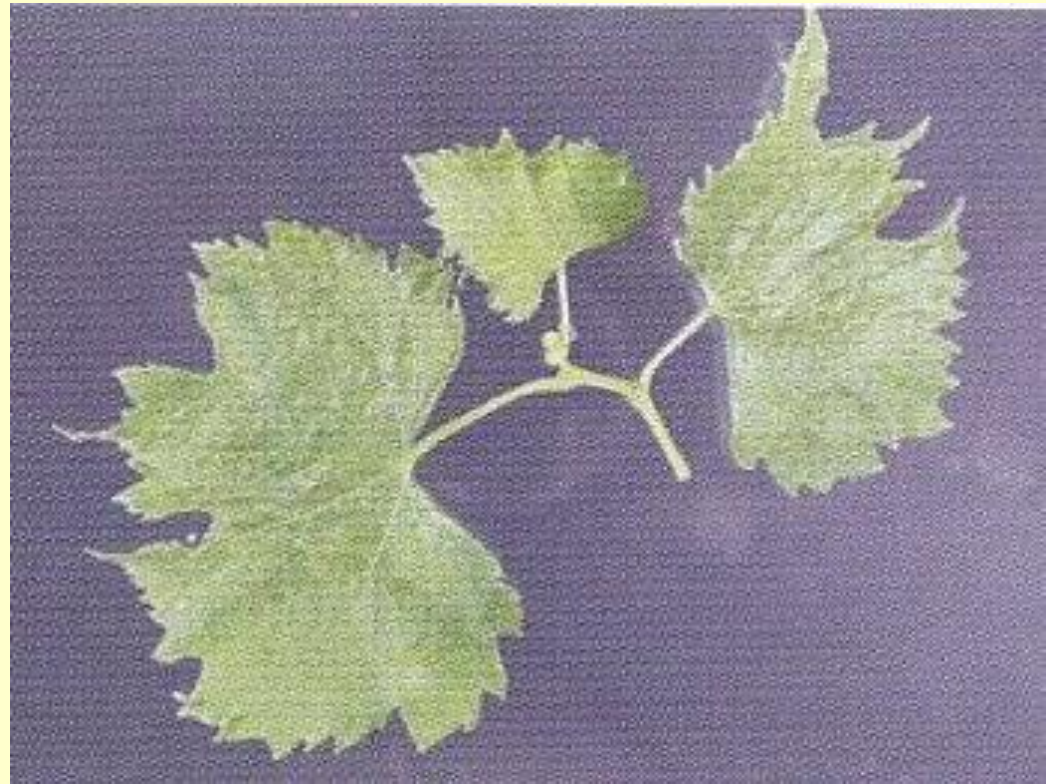
Grapevine fanleaf virus

- Symptoms:

- Leaf blades have a wide petiolar angle
- Irregular and sharp dentate leaf margins
- Irregular venation
- Significant reduction of grapes development – blossom loss, poor berry set

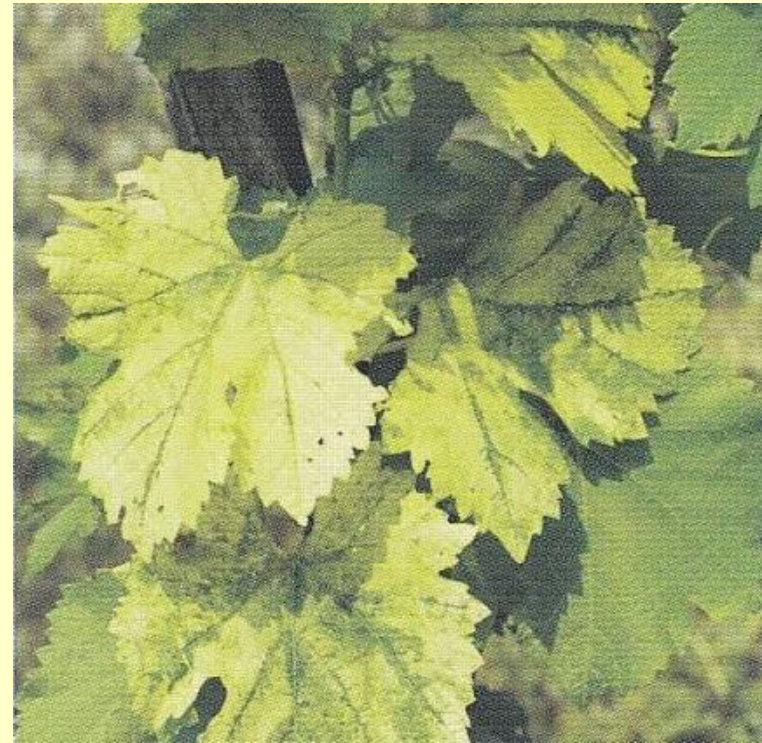
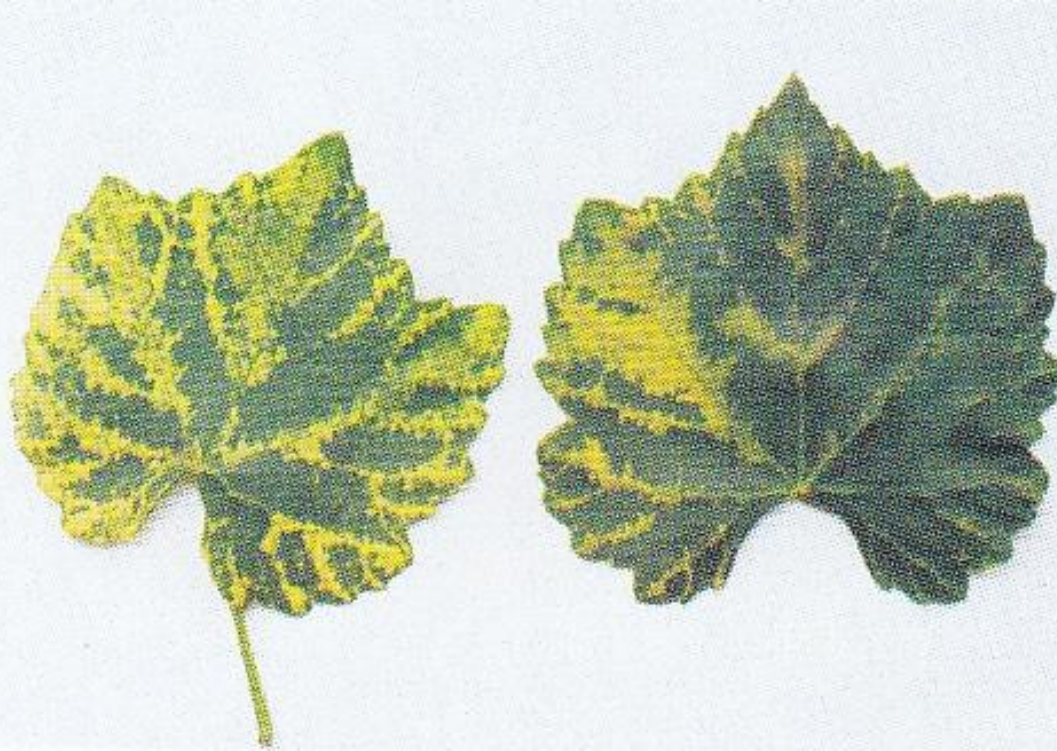


- **Harmfulness:**
 - Decrease in amount and quality of the yield, may even completely terminate productiveness of the vine
 - May be transmitted by parasitic nematodes
- **Susceptible varieties:**
 - Welschriesling
 - Silvaner
 - Pinot Blanc



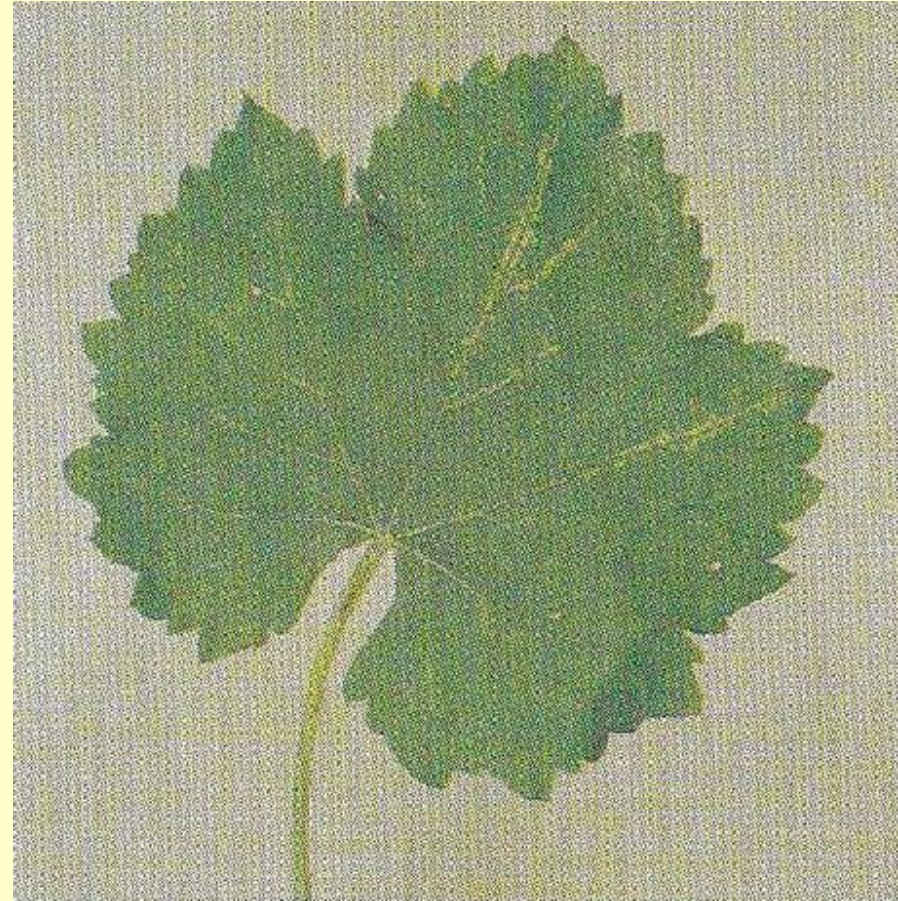
Grapevine vein banding virus

- Symptoms on leaf blades:
 - Yellowish green to yellow stripes, close to the main veins
- Harmfulness: Decrease in grape yield and quality
- Susceptible varieties: Gewurztraminer, Silvaner, Müller Thurgau, Neuburger

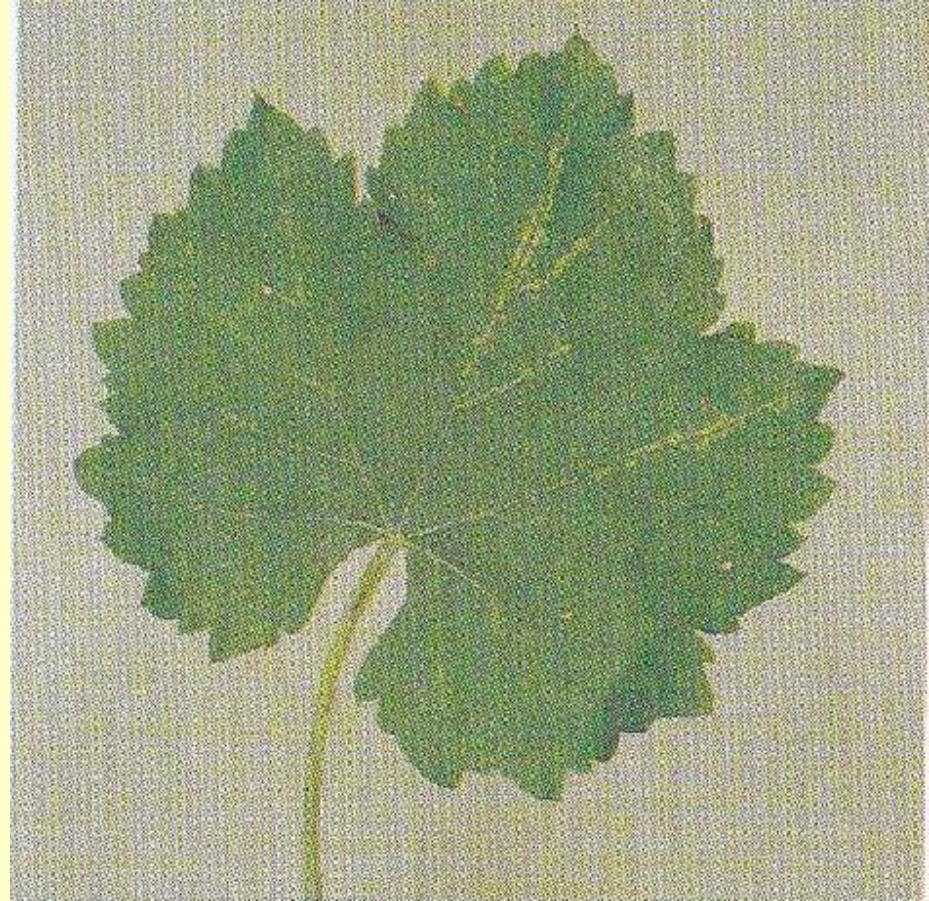


Grapevine mosaic virus

- Symptoms:
 - Light green to yellowish green veins
 - Less obvious symptoms, may infest individual leaves only



- Very common virus in Czechia
- Very little harmfulness
- Affects grapevine, rootstock of the grapevine
- Certain varieties are completely infested
 - Aurelius
 - Müller Thurgau
 - Neuburger
 - Pálava
 - Gewurztraminer



Agrobacterium vitis

- Symptoms show mostly on the plant head and the trunk
 - Tumours of various sizes
 - Formed at the end of spring and early summer



- Harmfulness:
 - Infested vines: poor growth
 - Lower yields, worsened quality
- Warm and moist weather promotes the infection
- Protection:
 - Elimination of infested parts of the plant
 - More acidic soil

Grapevine downy mildew (*Plasmopara viticola*)

- Yellowish green, oily stains on the leaves
- Infested spots necrotize, heavily infested leaves fall
- Inflorescence and young grapes may also be affected

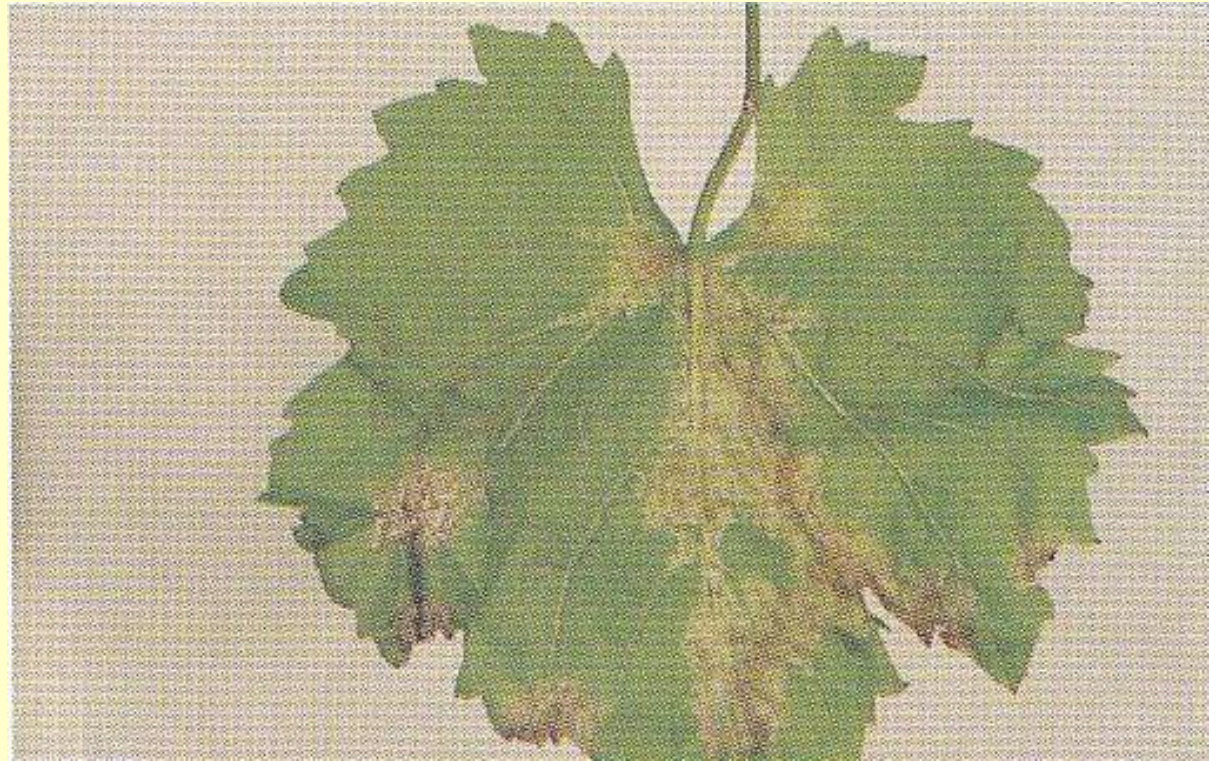


Harmfulness:

- Heavy leaf damage reduces assimilation surface
- Negative impact on amount and quality of the yield
- Oospores in infested leaves tissue overwinter in the soil
- Oospores germinate in spring and summer

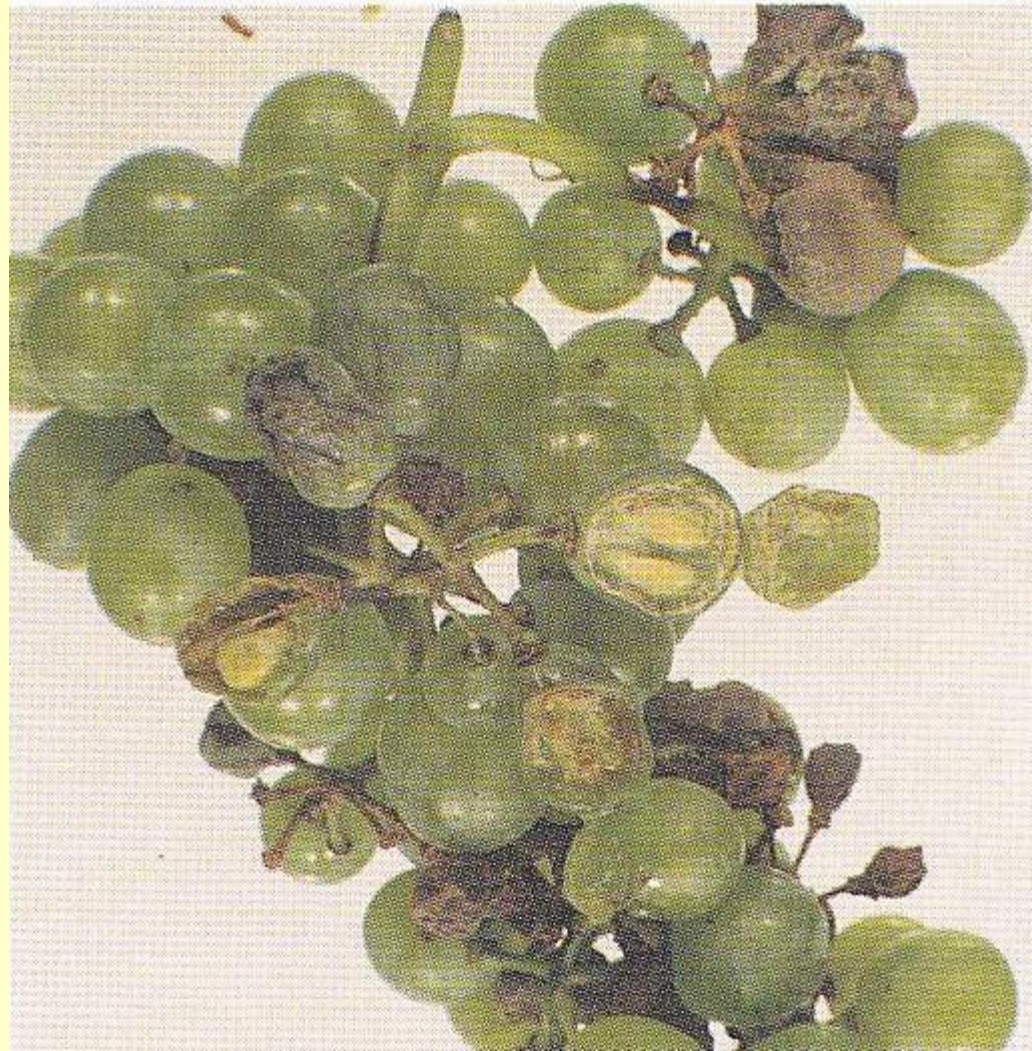


Sporangiofory a sporangia na květenství



Sufficient moisture is necessary for the germination

- Min. 10 mm precipitation within 24 h
- Temperature: Min. 8 °C and mean daily temperature above 12 °C



- Incubation period depends on temperature, lasts 3-4 days if temperature ranges from 22-26 °C
- The lower the leaves grow, the higher the risk of primary infection
- Young leaves are prone to infection after they have fully developed
- Zoosporangia spread in rain and air flows on significantly long distances
- If zoosporangia get on a wet, susceptible part of the vine, they germinate, zoospores are released and cause infection

Protection:

- 1. Preventive cropping techniques
 - Selection of a proper vineyard site
 - Optimum organization of the site and vine management
 - Timely and duely performance of all canopy management tasks
 - Optimum vine nutrition
 - All measures aim for optimum air flow in the vineyard and quicker drying, which enhances natural resistance of the vines

2. Chemical protection

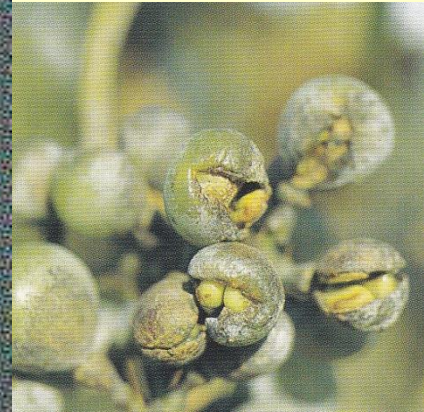
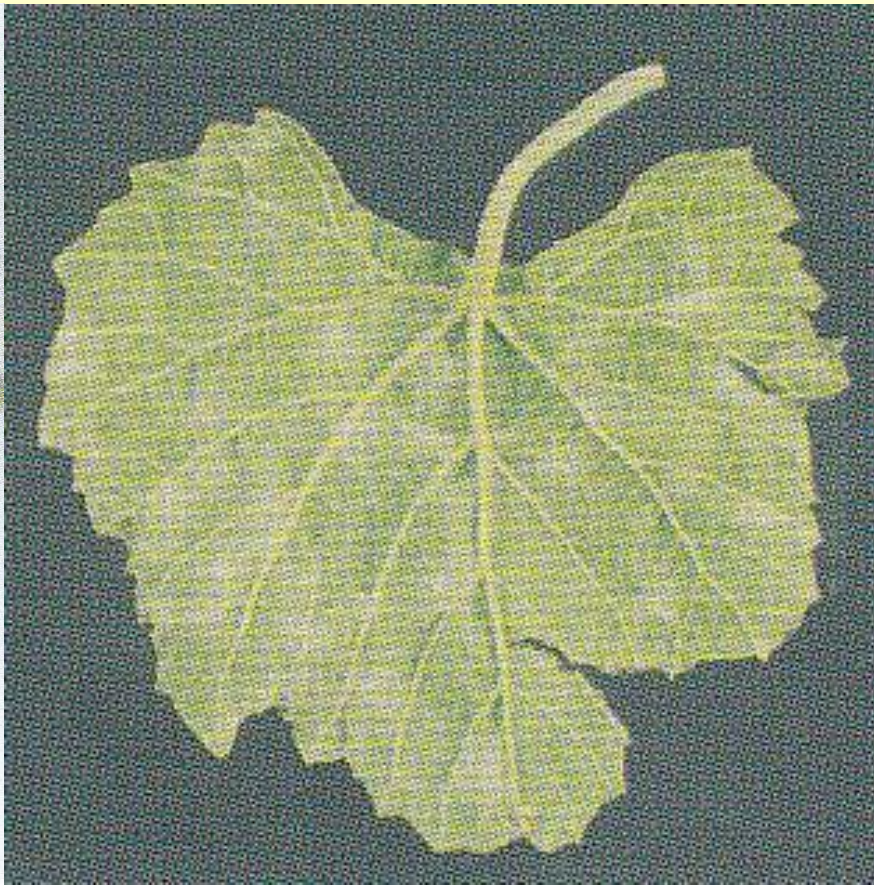
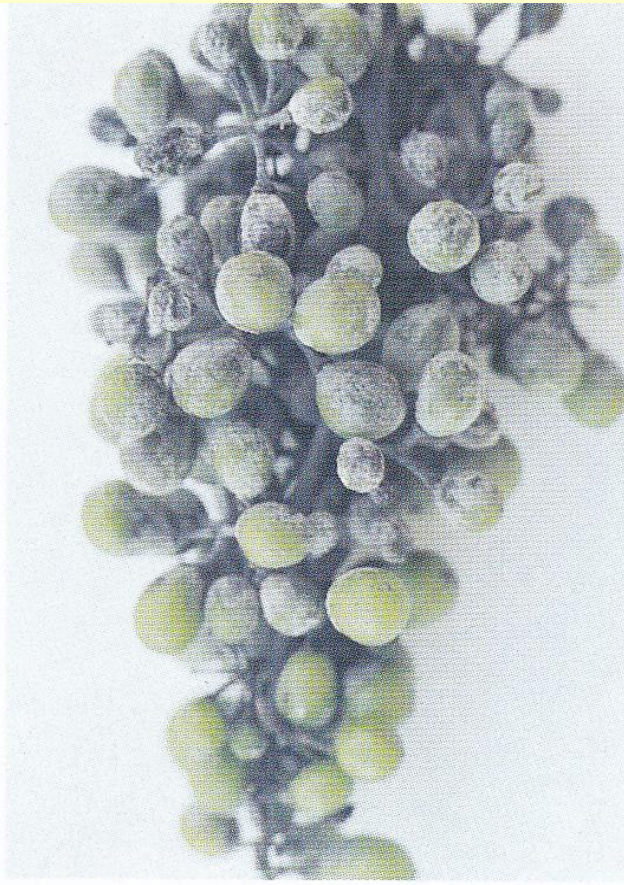
- Timing of the application is a decisive factor in protection – susceptible varieties must be treated prior to blooming (May)
- Fungicide selection
- Treatment quality
- Use of contact-preventive fungicides:
 - Copper-based (Kuprikol 50)
 - Mancozeb-based (Dithane M 45)
 - Folpen-based (Folpan 50 WP)
 - Metiram-based (Polyram combi)
 - Captan-based (Captan 50 WP)
 - Tolyfluanid-based (Hattrick)

- Fungicides with contact-preventive and short-term curative operating effects (Curzate M)
- Fungicides with contact-preventive, system and curative operating effects (Aliette Bordeaux, Ridomil, Mikal M)



Grapevine powdery mildew (*Uncinula necator*)

- Infests leaves, annual shoots, blooms and unripe grapes with white to greyish coatings
- Impedes growth and causes deformities (inflorescence loss, cracking)



- Harmfulness: Decrease in amount and quality of the yield
- Biology:
 - Mycelium overwinters in buds
 - Whitish mycelium covers young annual shoots in spring
 - Inflorescences are underdeveloped, fall and dry out



- Overwintering mycelium is susceptible to winter frosts
- Benefits from:
 - Warm weather
 - Higher or fluctuating relative air humidity
- Degree of infestation depends on:
 - Weather, microclimate of the location
 - Soil susceptibility
 - Growth intensity and nutrition
- High susceptibility – nitrogen excess, potassium deficiency

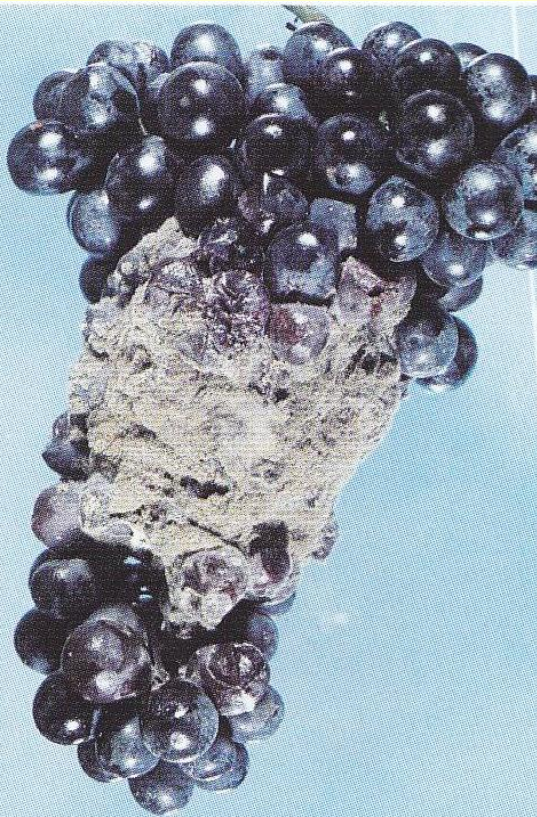


- Susceptible varieties:
 - Blauer Portugieser
 - Müller Thurgau
 - Pálava
 - Aurelius
 - Neuburger
 - Welschriesling
 - Limberger
- Protection:
 - Preventive countermeasures:
 - Sufficient air flow in plantings and vines
 - Vine growth optimization

- Optimum timing of chemical protection
- Regular infestations: 2-3 applications before blooming
- Other endangered sites: At the onset of infestation (end of June, early July)
- Products:
 - Contact and preventive sulphur-based products (Sulikol K)
 - Local system products (Bayleton 25 WP)
 - Strobilurin products (Discus)

Grey mould (*Botryotinia fuckeliana*)

- Infests all above-ground parts of the grapevine
 - Especially – young grapes after blossom loss which then dry out; infested tissues quickly decompose
- Adequate moisture promotes development of grey coatings of conidiophores and conidia on infested vine parts



- Harmfulness:
 - Most damage is caused by infestation of ripening and ripe berries
 - Propagation material in nurseries (grey mould infests young annual shoots)
- Overwintering:
 - Mycelium overwinters in infested tissues
 - Sclerotia

- Benefits from rainy weather
- Weather and location microclimate define degree of infestation
- Susceptible varieties:
 - Müller Thurgau
 - Neuburger
 - Silvaner
 - Aurelius
 - Frühroter Veltliner
 - Blauer Portugieser
 - St. Laurent

- Preventive countermeasures include:
 - Treatment of susceptible varieties:
- When berries start to touch
- Repeated treatments
- Products
 - Dicarboximides fungicides (Ronilan 50 WP)
 - Folpet-based fungicides (Folpan 50 WP)

White rot of grapevine (*Metasphaeria diplodiella*)

- Affects berries especially
- Trunks may also be infested
- Rarely - leaves, annual shoots and stalks



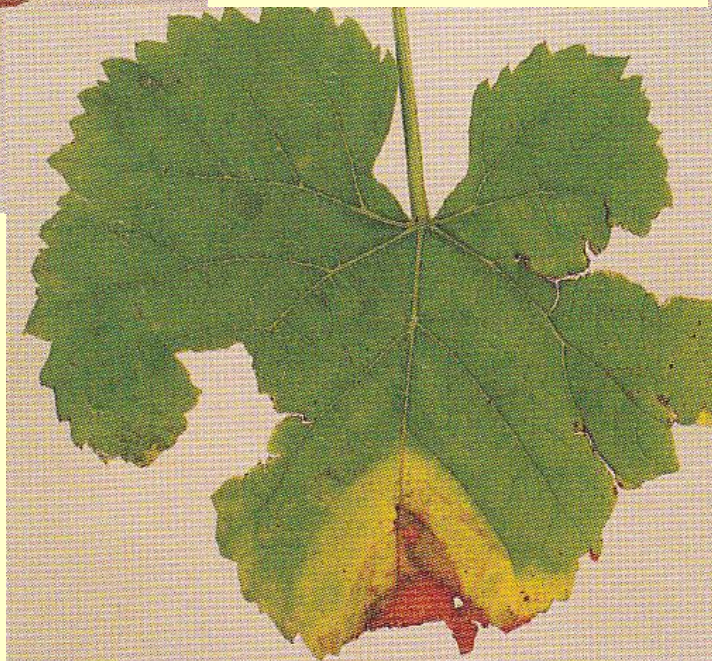
- Berries wilt and dry out due to damage of the vascular tissues
- Under beneficial conditions, grey coatings of conidiophores grow on infested areas and conidia is later formed
- Harmfulness:
 - Infested berries dry out and fall
 - Yield is decreased
 - Berries have lower sugar content

- Biology: Pycnidia in tissues of infested vines overwinter
- Infestation: June till harvest
- Benefits from moist and warm weather
 - Rainy weather after a period of prolonged drought is dangerous as the berries crack

- Protection:
 - Prevention of infestation of grapes with powdery mildew and grapevine moths
 - Fungicides are applied only sporadically due to difficulties with emergence predictions
 - Especially endangered locations
 - After berries have been damaged with hail storm (24 h after damage: Folpan 50 WP or Discus)

Grapevine red fire (*Pseudopeziza tracheiphila*)

- Causes yellow spots on white wine varieties and red spots on blue varieties; spots necrotize, heavily infested leaves dry out and fall

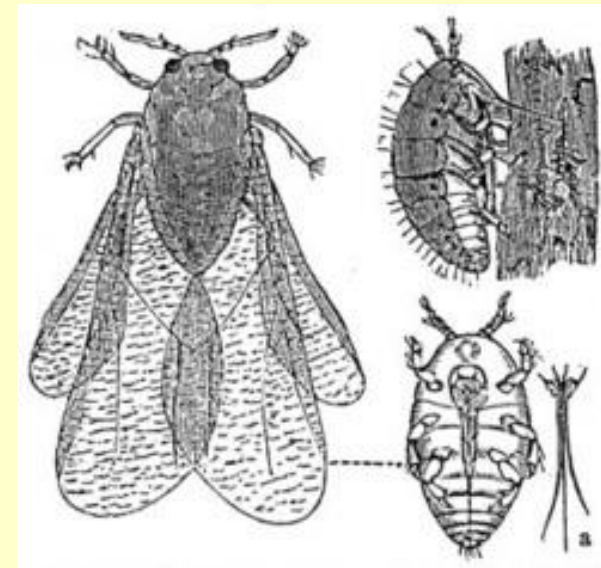


- Harmfulness:
 - Premature leaf fall causes decrease in amount and quality of the yield as well as worsens wood maturation
- Biology:
 - Fungi overwinter in tissues of the infested leaves where ascospores develop – these are the source of primary infection
 - Benefits from warm and rainy weather

- Protection: preventive countermeasures
 - Vineyard site selection
 - Organization of the vineyard site
 - Training systems
 - Canopy management
- Fungicides are applied on locations with regular outbreaks
 - Timing and quantity of fungicides are defined by actual degree of endangerment
 - Suitable products:
 - Mancozeb-based (Dithane M 45)
 - Strobilurins (Discus)

Grapevine phylloxera (*Dactulosphaira vitifoliae*)

- One of the most dangerous pests for the grapevine
- Older Czech literature used an incorrect name of *Phylloxera vastatrix*
- Imported together with grapevines for cultivation in Europe
- North America: Only leaves were infested, Europe: Disease developed and started to infest the root system of grapevine
- Nymphs feed on the roots, which results in a formation of the so called nodosities which cause rotting and weakening of the root system, vine is later killed



- 1855: Disease was described for the first time in American vines, infested the whole North American continent
- 1860: Disease recorded in the vicinity of Bordeaux harbour, later spread throughout all European vine regions; probably imported from America together with ornamental fox grape (*Vitis labrusca*)
- The disease destroyed one million hectares of French vineyards within 20 years and caused decrease in gross national income by 900 million francs