



***Grapevine infectious diseases  
in Italy***

***Giovanni Granata\****

***\*Dipartimento di Scienze e Tecnologie Fitosanitarie, Sez. di Patologia vegetale,  
Università degli Studi di Catania***

*Grapevine (Vitis vinifera L.) is one of the most widely widespread crops in Italy. Because of the sensitivity to pathogen infections, it is severely exposed to the attacks of the viruses, phytoplasmas, bacteria and fungi. The spreading of the diseases in vineyards is supported by the vegetative propagation of this crop.*

**Among grapevine pathogens in Italy are:**

**Fungi:** powdery mildew; downy mildew; grey mould; “esca” complex;; root rot and other fungal agent wood diseases.

**Bacteria:** crown gall.

**Phytoplasmas:** Flavescence dorée (FD); Bois noir (BN ).

**Viruses:**

**Infectious degeneration (GFV - grapevine fanleaf);**

Infectious malformation

Yellow mosaic

**Grapevine leafroll (GLRaV 1-2-3-4)**

**Rugose wood complex**

Rupestris stem pitting (GRSPaV)

Kober stem grooving (GVA)

Corky bark (GVB)

LN 33 stem grooving

**Fleck disease**

Grapevine fleck (GFKV)

Grapevine red-globe virus

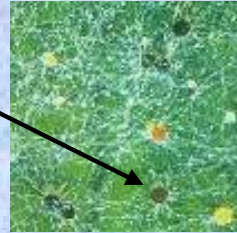
Rupestris vein feathering

**Virus-like diseases:** Enation disease; Vein necrosis.

**Powdery mildew:** the most recurrent and dangerous disease, favoured by the climate of Southern areas

**causal agent:** *Erysiphe necator* (Schweinitz) Burrill (sin. *Uncinula necator* (Schw.) Burr.)

the Ascomycete overwinters as



or as mycelium in basic buds

**symptoms:** flag shoots



(early infection at vine-budding)

**whitish grey spots**



(after flowering)

**brownish spots on green shoots**



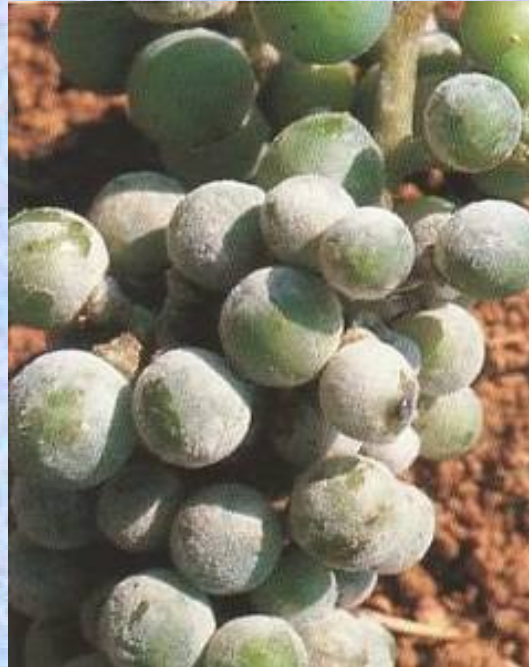
**symptoms  
on  
grape:**

**white dusty mildew on  
berries and pedicels**

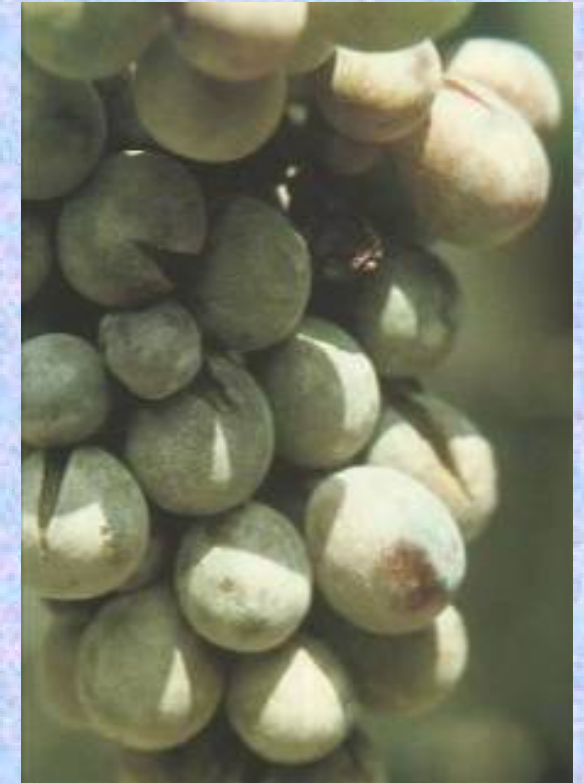
**split unripe berries**



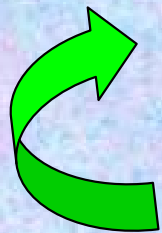
**(fruit set)**



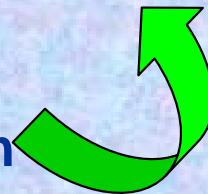
**(veraison)**



**(late infection)**



**grapevine susceptibility to  
powdery mildew increases  
from fruit-setting to veraison**



**disease can show an epidemic  
development**

# **Control of the Powdery mildew**

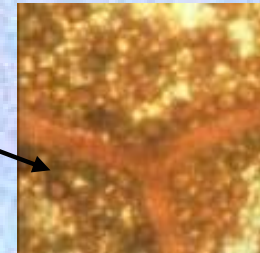
## **Chemical treatments**

- before flowering: by the use of pulverulent or wettable sulphur.**
- from fruit set to veraison: by the use of IBS fungicides applied alone or mixed with a sulphur spray or Dinocap or by azoxystrobin and quinoxyfen at 10-12 day intervals (until pre-ripening).**

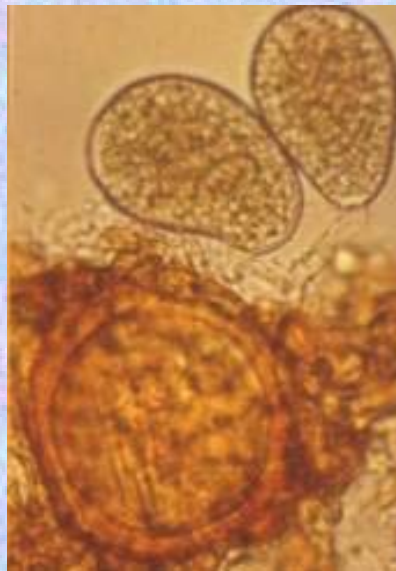
**Downy mildew:** the disease become epidemic only in rainy years

causal agent: *Plasmopara viticola* (Berk. et Curt.) Berl. et De Toni

the fungus- like organisme overwinters as oospores



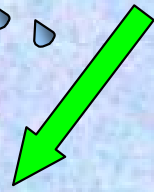
the warm and dry climate  
can delay or stop the  
maturation and germination  
of oospores



the first oil-spots occur much  
later than indicated by the rule  
of the “ three 10s”



(late May-June)

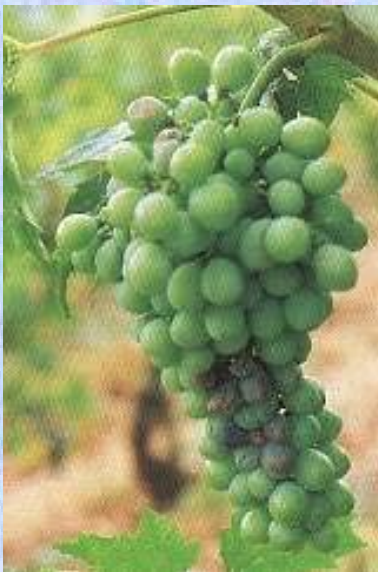


**primary infection can usually originate 2 or 3 secondary infections until the middle of July**



**symptoms:**

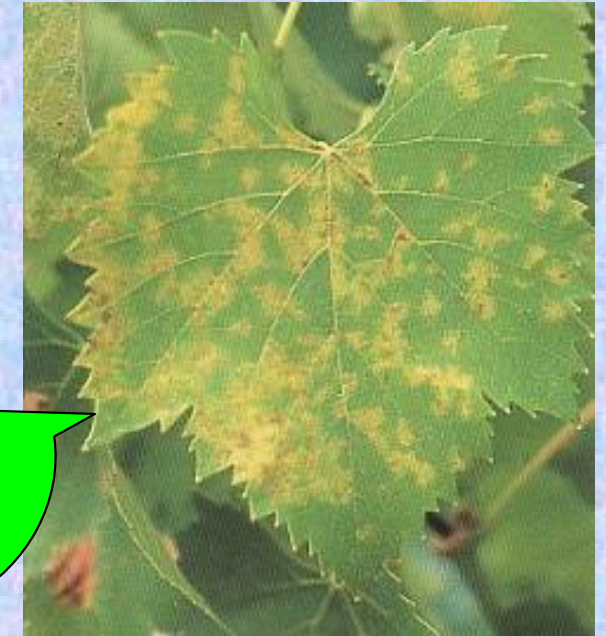
**brown rot on grape (concealed mildew)**



**oil-spots and beginning of necrosis on leaves**



**mosaic spots**



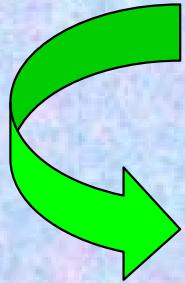
**autumnal rainfall**



***P. viticola* sporulation & spreading stop in summer**



when abundant and frequent spring rains occur, even if they are still sporadic,  
downy mildew becomes an epidemic and highly destructive disease



early occurrence of primary infections, going on for 2 or 3 months  
(until the beginning of June) and so they can be added to the  
secondary ones

### symptoms:

reddish-brown on a  
young crooked cluster



*P. viticola* sporulation on  
the underside leaves blade



infected cluster with  
pedicels and berries  
covered by white mould



# Control of downy mildew

Italian growers usually effect 1 or 2 chemical treatments before and after flowering using copper products, carbammates or systemic fungicides at the occurrence of first oil-spots

## more rational strategy

control of the downy mildew should be based on a careful monitoring of both climatic and epidemiological conditions



correlation with

development of gametic and agamic structures of pathogen in our region



make possible to forecast the probable date of primary infections

suggesting immediate treatment by protective or systemic compounds

**Grey mould:** infections occur after the late summer-autumn rains, especially in covered vineyards

**causal agent:** *Botrytis cinerea* Pers. (anamorph of *Botryotinia fuckeliana* de Bary)

the pathogen overwinters as mycelium in shoot bark or buds, as sclerotia on vine shoots or self-sown plants

**symptoms:**

**brownish necrotic area on leaf**



**rainy spring**

**dried inflorescence**



**berries covered by grey mould (late attack)**



**high rainfall during “green berry” to veraison and on**

# **Control of grey mould**

**late attacks: 1-2 applications in coincidence with summer rainfalls by  
the use of benzimidazoles or dicarboximides**

**&**

**careful and adequate agronomical techniques**

**“Esca” disease:** the main wood disorder increasing incidence in young table grapes since the 80s

**causal**

***Phaeomoniella chlamydospora*** (W. Gams, Crous, M.J. Wingfield & L. Mugnai) Crous & Gams

**agents:**

***Phaeoacremonium aleophilum*** Crous, W. Gams, M.J. Wingfield & van Wyk

***Fomitiporia punctata*** (Fr. & Karsten) Murrill

**chronic “esca” syndrome:** occurs in late spring and increases during summer

**chlorotic/necrotic spots on leaves**



**pink-brown areas**



**xylematic dark brown areas and white rot**



**acute “esca” or apoplexy: occurs at the beginning of July**



**only preventive measures for “esca” control:**

- use of healthy/vigorous cuttings
- no excessive forcings of plants
- chemical disinfection of wounds
- immediate removal of infected woody parts

**Root rot:** increasing incidence on old and young plants

**causal agent:** *Armillaria mellea* (Vahl ex Fr.) P. Karst

it is easily identified by white mycelium under the root bark and rhizomorpha attacks on plants stressed by high temperatures and drought

striations of  
white  
mycelial mat



detail of  
rhizomorpha



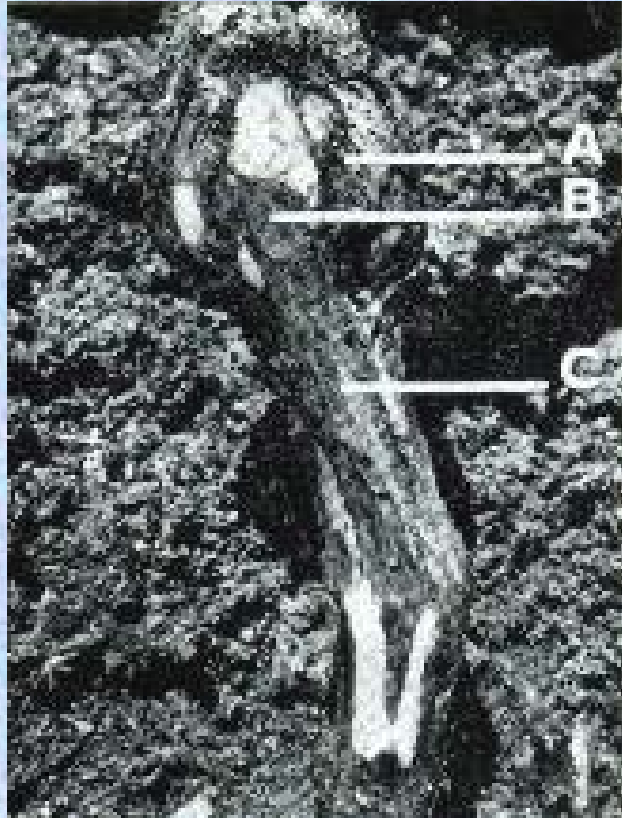
white mycelial  
mat and plant  
reaction (growing  
roots)

**preventive measures:**

- no hydric stagnation
- no re-planting in infected areas
- eradication of infected plants

## Other fungal diseases

### a. *Phoma glomerata* (Corda) Wr. et Ho.



A = graft union

B = wound by spur removal

C = necrotic area

**measures to prevent decline:**

**removal of rootstock spurs (late winter)**

**disinfection of caused wounds**



b.

***Fusarium oxysporum***

(Schlecht.) Sn. et H.

***Cylindrocarpon destructans***

(Zins.) Scholten



**bark flaking and  
wood necrosis**



**vine yellowings  
and wiltings**

### c. Decline or grapevine blight

recorded at the end of the 80s on Moscato Bianco

now epidemic on different cultivars

causal agent: *Nattrassia mangiferae* (H. & P. Sydon) Sutton and Dyko

#### symptoms:

leaf chlorosis turning  
into necrosis



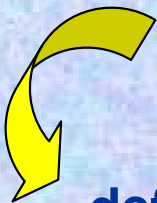
cambium chromatic  
alteration



#### control:

adequate cultural  
practices

elimination of  
infected/dead plants



defoliation → shoot drying → plant death

# BACTERIA

causal agent: *Xylophilus ampelinus* (Panagopoulos) Willems *et al.*  
(ex *Xanthomonas ampelina* Pan.)

sympoms (early spring) :

delayed and stunted  
budbreak



necrosis on node and  
petiole



longitudinal cracks on  
shoot and marginal  
necrosis on leaf



**preventive control** (rational agronomic practices)

## **Bois noir (BN) and Flavescence dorée (FD) :**

**Are yellow diseases and similar on symptoms each other but caused by different stolbur group phytoplasma. Insolia and Chardonnay cultivars are more sensitive.**

**causal agents are Phytoplasma belonging to :**

**stolbur group 16 Sr XII for BN and elm yellows subgroup 16Sr V for FD**

**Symptoms on  
white berried varieties:**

**Leaf yellowing of the  
veins**





**Leaf yellowing and necrosis  
on local wine cultivar Insolia**

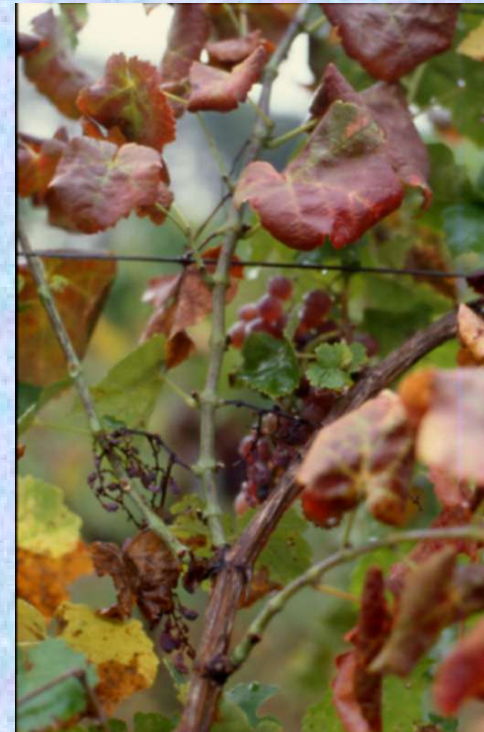


**Shoot showing a lack  
lignification**



**Rolled leaves, withered and dried clusters on Chardonnay grapevine**

**symptoms on red berried varieties:**



**Reddish areas and necrosis along the main veins and dried clusters**

**Control:** Chemical spays against vectors are advised

# Grapevine Fanleaf Virus(GFLV)

Fanleaf is one of the most important and widespread virus disease of the grapevine. Now the disease is know to occur worldwide.

**causal agent:** Nepovirus with polyhedral particles of about 30nm in diameter

**Symptoms:**

Two distinct syndromes caused by different strains of the causal agent characterize this disease



## A) Infectious malformations

Leaves are variously malformed, asymmetrical open petiolar sinuses



## **A) Infectious malformations**



**Shoot are also  
malformed showing  
double nodes**

**Shoot with fasciation**





## **A) Infectious malformations**

**Bunches are smaller and fewer in number, berries ripen irregularly, are small-sized and set poorly**



## **B) Yellow mosaic**

**Induced by chromogenic virus strain.**



**Leaves bright chrome yellow discoloration  
also shoots, tendrils and inflorescences**

## C) Vein banding

Consist of chrome yellow flecks localized along the main veins of mature leaves



**Transmission** Different nematodes: *Xiphinema index* and *X.italiae* are more efficient

**Control:** Use of healthy rootstocks and *Vitis vinifera*

# **Grapevine leafroll Virus (GLRaV)**

**Leafroll is no less important than fanleaf for economic importance and is probably the most widespread virus disease of grapevine.**

**causal agent:** To date, nine different viruses with filamentouse particles; GLRaV, have been found in leafroll-infected vines:  
GLRaV1-3-4-5-6-7-8-9 are Ampelovirus  
GLRaV 2 Closterovirus

**Symptoms: In red-berried cultivars.**



**Reddish spots develop on the leaves in summer**

**In autumn the leaf is almost red-purple, except for a narrow band along the primary and secondary veins. Rolling the leaf blade.**





The cluster shows a pale color due to irregular and delayed ripening; they are inferior in quantity and quality and low in sugar.

**Infection on rootstocks is symptomless**

**Transmission:** Leafroll is graft-transmissible which is largely responsible for its spread. Natural field spread of leafroll disease is transmitted by pseudococcid mealybugs: *Heliococcus bohemicus* and *Phenacoccus aceris* for GLRaV 1. Mealybug vectors of GLRaV 3 are *Planococcus ficus*, *P. citri*, *Pseudococcus longispinus*, *P. maritimus*; GLRaV 5 and 9 are transmitted by *Pseudococcus longispinus*

**Control:** Use of clonally selected and sanitized propagation material

# Rugose wood complex

The rugose wood complex includes four different and several diseases:

- 1) Grapevine Rupestris stem pitting
- 2) Grapevine Kober stem grooving
- 3) Grapevine LN33 stem grooving
- 4) Corky bark

causal agent:

**Grapevine Rupestris stem pitting associated with Foveavirus (GRSPaV);**

**Grapevine Kober stem grooving associated with Vitivirus A (GVA)**

**Corky bark associated with Grapevine Virus B (GVB)**

## Symptoms



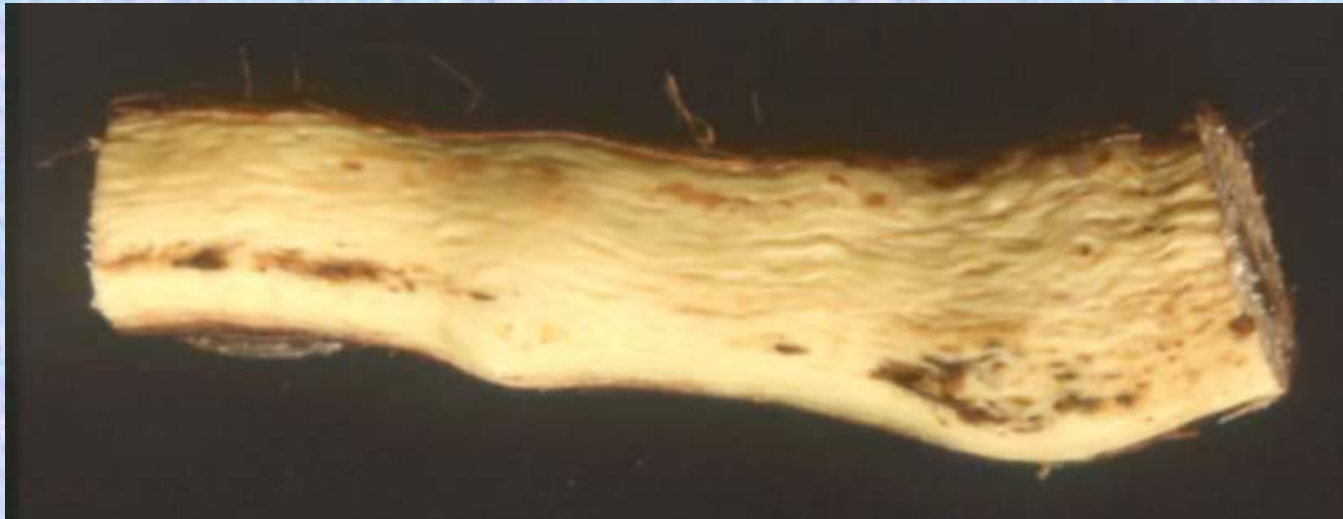
**Grafted vines show a swelling above the bud union and marked difference between the relative diameter of scion and rootstock (bottle neck). The bark, on certain cultivars, above the graft union is exceedingly thick and corky (corky rugose wood).**

**The wood cylinder showing pits and or grooves which correspond to pegs and ridge like protrusions on the cambial face of the bark**





## Rupestris stem pitting



**Pitting in *Vitis rupestris*. No symptoms on LN33 and Kober 5BB**

## Corky bark



**Stanting on LN33 with redding of the leaves and clusters.**

**Internodal swelling**



## LN33 stem grooving

Grooves occur on the stem of LN33 but no symptoms on *Vitis rupestris* and Kober 5BB

### Transmission:

Grapevine *Rupestris* stem pitting (GRSPaV) not known vector

Grapevine Kober stem grooving (GVA) and Grapevine Corky bark (GVB) by *Planococcus citri*, *P. ficus*, *Pseudococcus longispinus*, *P. affinis*

### Control:

Use for propagation of virus-free scionwood and rootstock.

# Fleck disease (Grapevine fleck-GFKV)

Fleck causes latent or semi-latent infectious in *Vitis vinifera*, most American *Vitis* species and rootstock hybrids.

Its presence influences on vigor of the grape infected.

**causal agent:** Maculavirus (GFKV). It is not seed transmitted.



The symptoms are expressed in *Vitis rupestris*: Clearing of the vein on leaves, leaf malformation and upward curling of the blade

**Control:** Use of healthy rootstocks and *Vitis vinifera*

# Enation disease

Latent or semi-latent grapevine disease, persistent in propagative material and transmitted by grafting

**causal agent:** its agent is still unknown

**Symptoms:** Shoot with short internodes and zig-zag growth. Leaves are dwarfed, misshapen and present typical lamellar proliferations on the lower surface of the blade along primary and secondary veins



**Control:** Use of healthy material propagation



# Vein necrosis

The disease is very spread on sicilian grapevines cultivars but latently

**causal agent:** its agent is still unknown

**Symptom:**

Vein necrosis of different orders on the lower face of the leaf blade on rootstock *Vitis rupestris* x *Vitis berlandieri* 110 Richter



**Control:** Use of healthy material propagation