TWO-THIRDS LIFE SIZE *ONION PLANT* × ⅛

1 ONION *diagram* 1A Plant
2 'SPANISH' ONION 3 ONION 'BLOOD RED' 4 SPRING ONION 'WHITE LISBON'
5 CHIVES 6 WELSH ONION

167

Onion Downy Mildew

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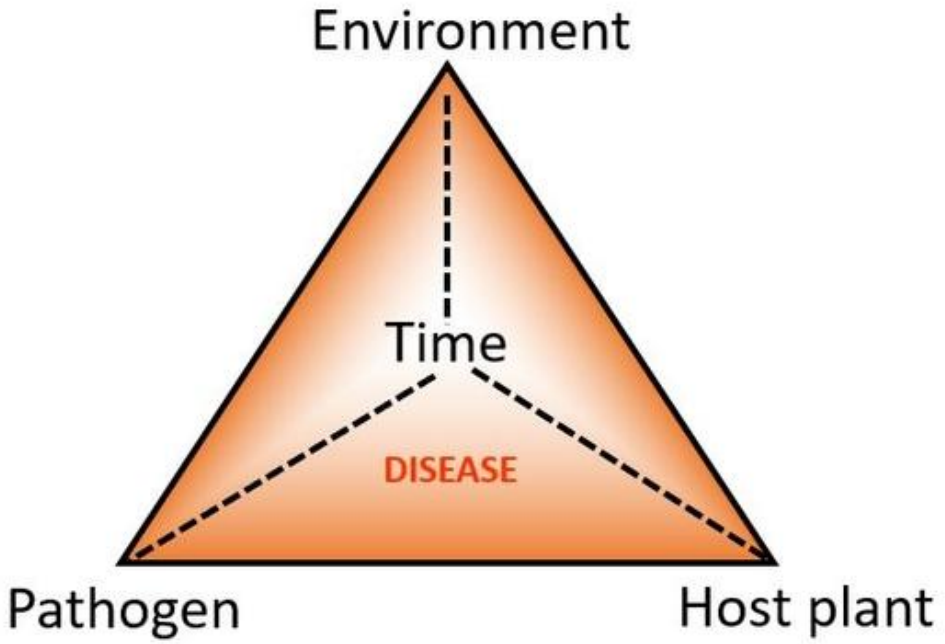
UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

Disease Triangle



Plant disease is prevented when any one of these three components is eliminated!!

The pathogen

Pathogen

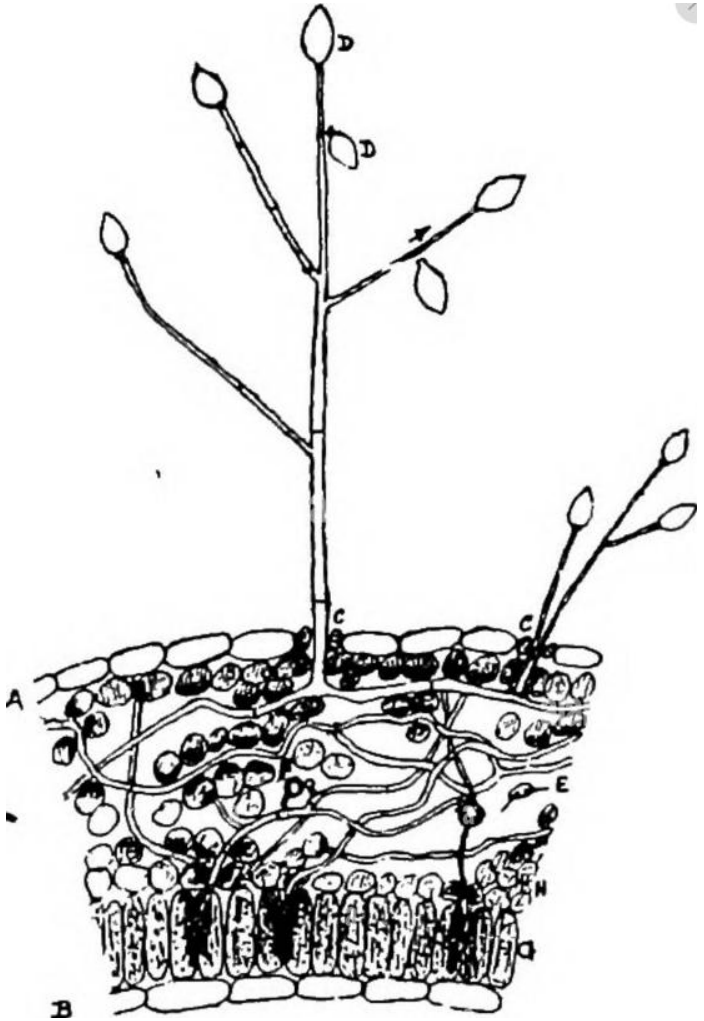
Preferred Scientific Name

- *Peronospora destructor* (Berk.) Casp. ex Berk.

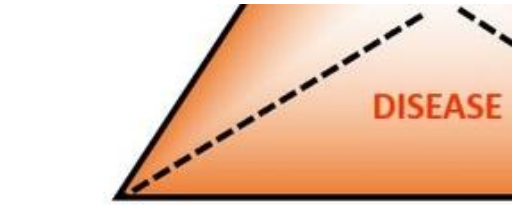
International Common Names

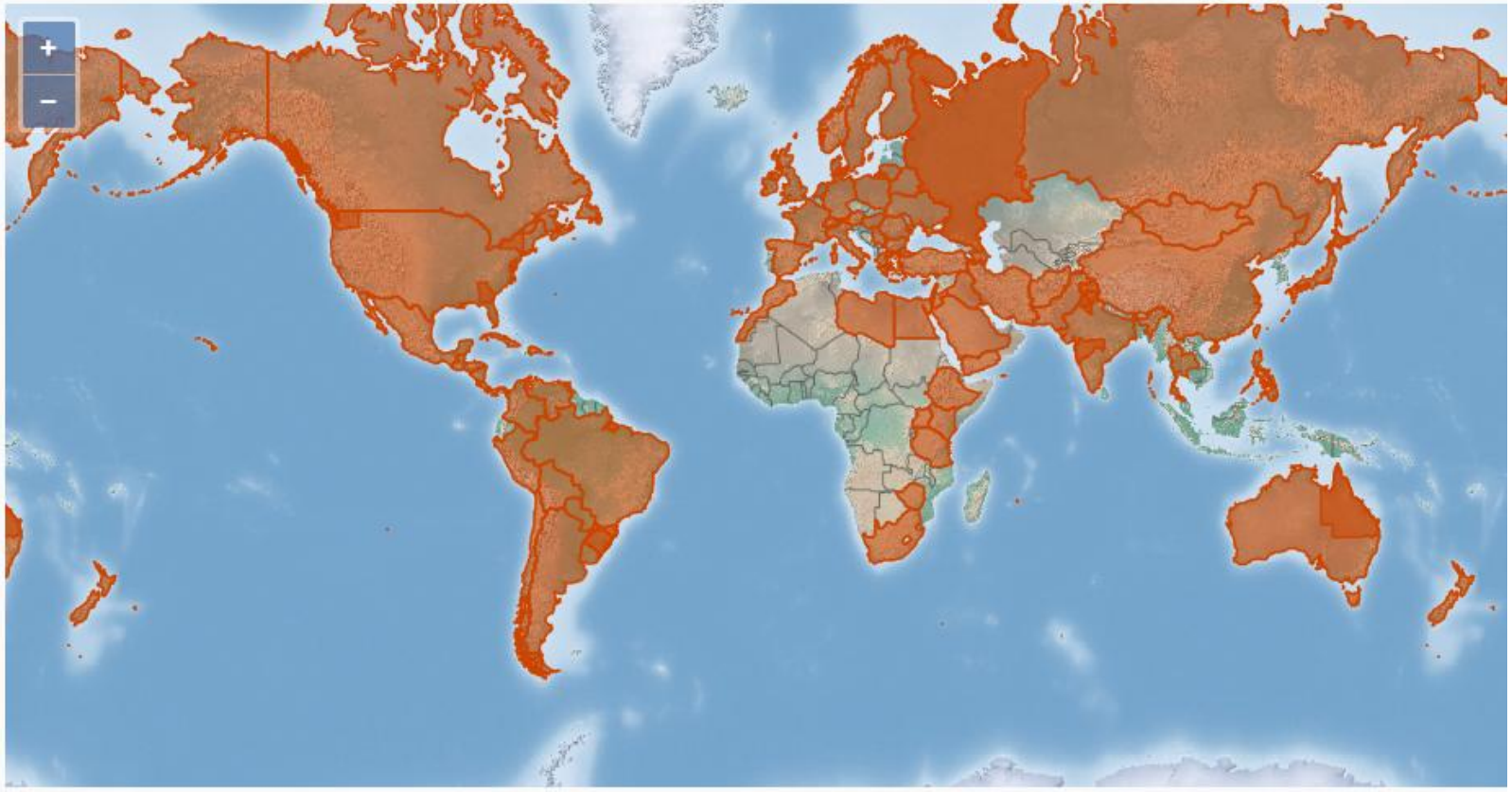
- English: onion downy mildew
- Spanish: mildiu de las cebollas

IT IS A WATER MOLD (OOMYCETE) - NOT A TRUE FUNGUS!



The pathogen



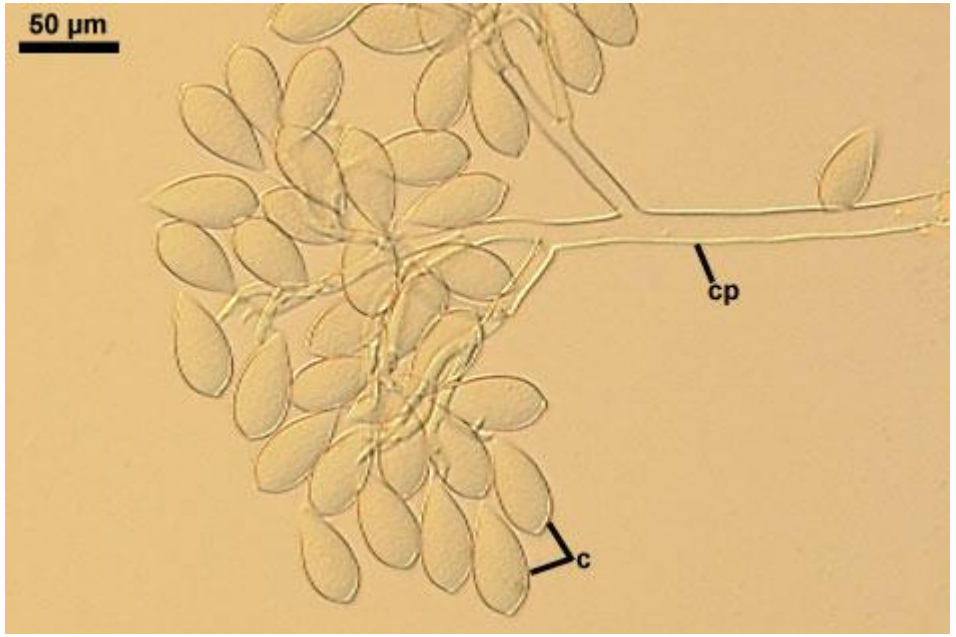


The pathogen is present worldwide

The pathogen

Pathogen

Obligate biotrophic oomycete



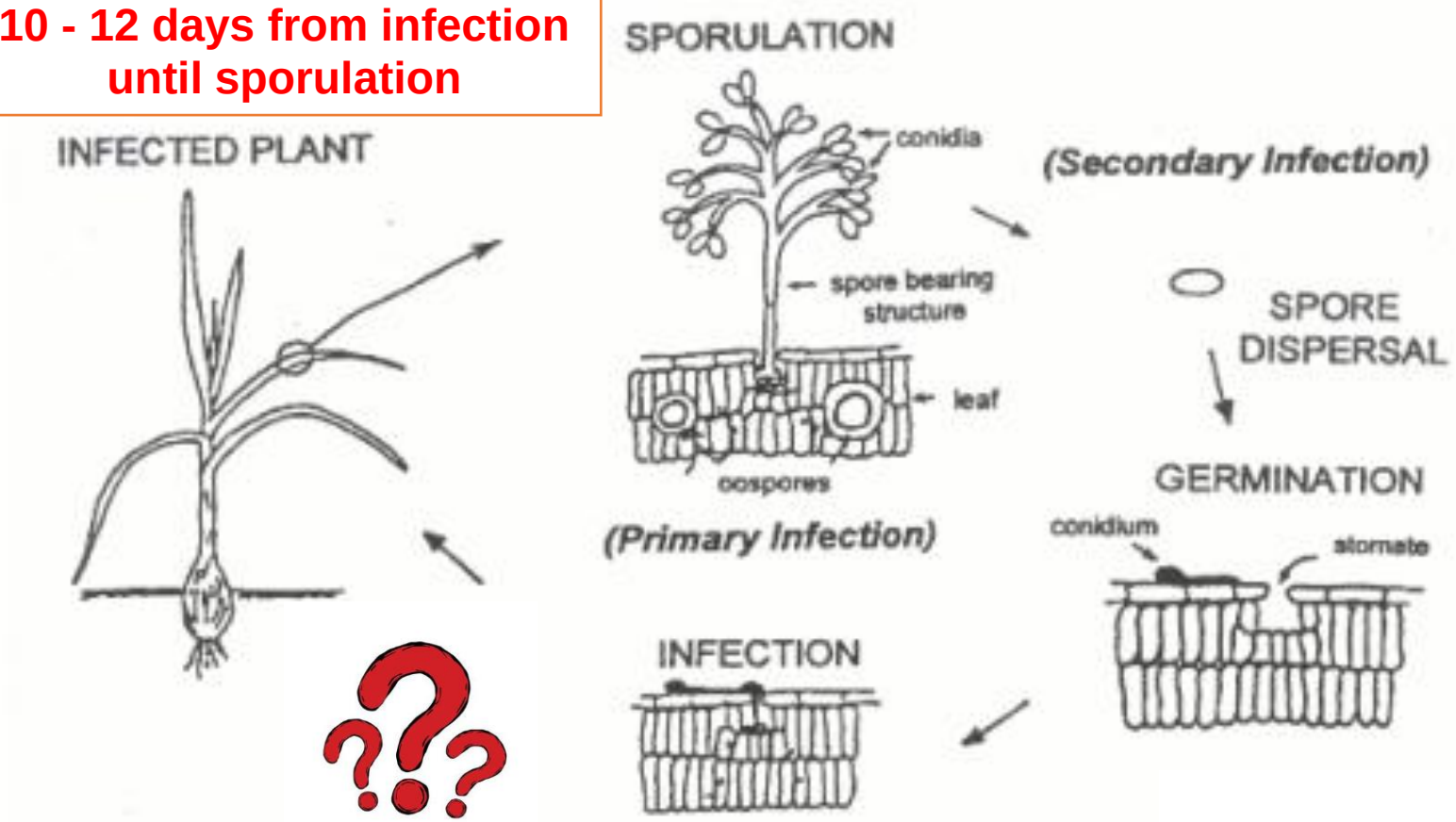
Asexual cycle that produces numerous sporangia

Pathogen Disease Cycle

Figure 1.1 Life-cycle of *P. destructor* (Ryley, 1989) (Conidia = sporangiospores).

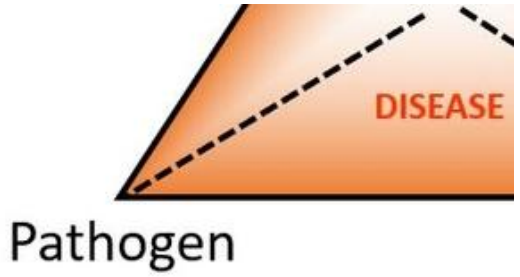
10 - 12 days from infection until sporulation

IT GROWS SYSTEMICALLY IN THE PLANT, BUT NO SYMPTOMS UNTIL IT SPORULATES!



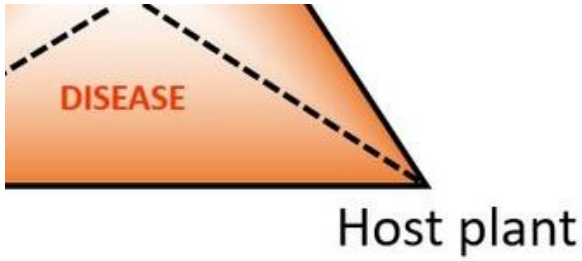
3 – 4 CYCLES CAN DESTROY A CROP

What is the primary infection?



- Dormant bulbs → rare, because this practice is not very used
- Seeds → not demonstrated
- Soil containing oospores → it is demonstrated that they can survive several years in certain conditions, but:
    - Do they survive the summers in our desert conditions?
    - There is no clear evidence that oospores present in soil can lead to infection
- Infected plant debris remaining in the fields
- Volunteer infested onions
- Infested perennial weeds acting as alternate host plants

Hosts




Leek


Welsh Onion


Chives


Spring Onion

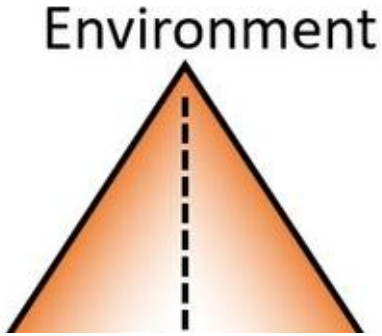

Shallot


Red Onion


White Onion

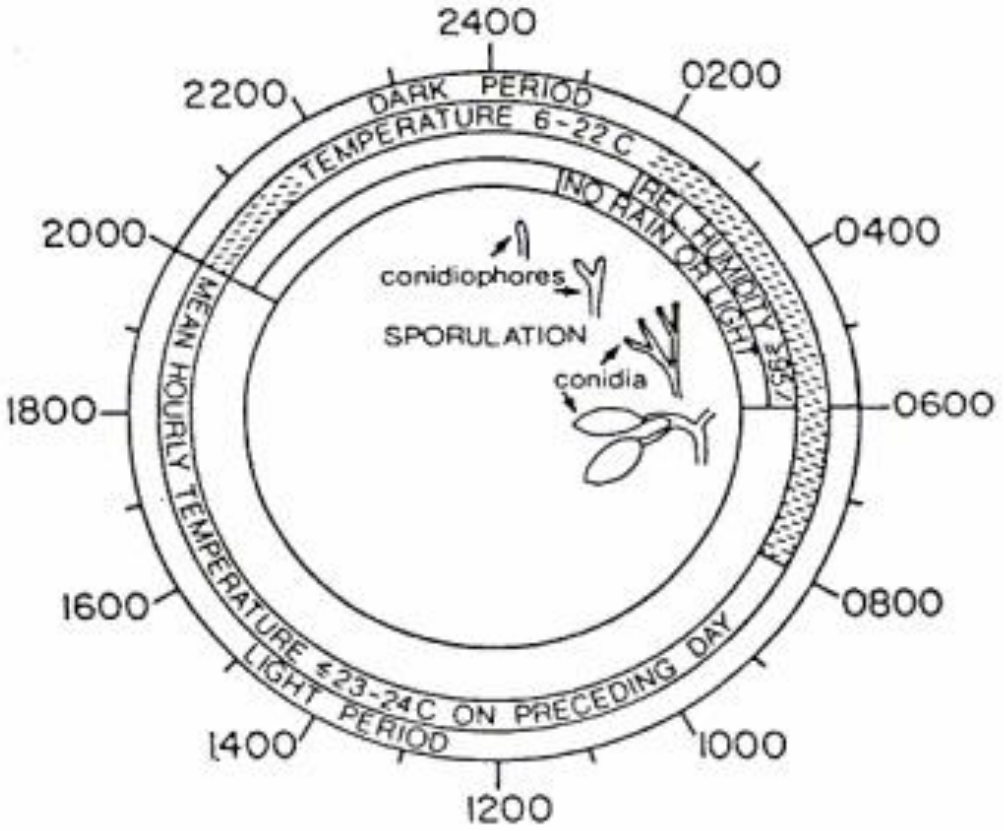

Yellow Onion


Garlic Bulb



Favorable Environment for Sporulation

Figure 1.2 Environmental requirements of sporulation of *P. destructor* on onion leaves (Sutton and Hilderbrand, 1985).



DOWNCAST forecaster:

- Dichotomic output (0 or 1).
- Sporulation of *P. destructor* is predicted when:

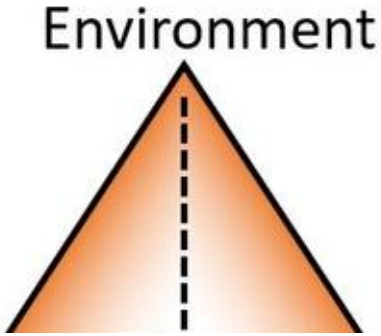
(1) the mean temperature is below 24°C (75.2ºF) between 08:00 and 20:00 the previous day;

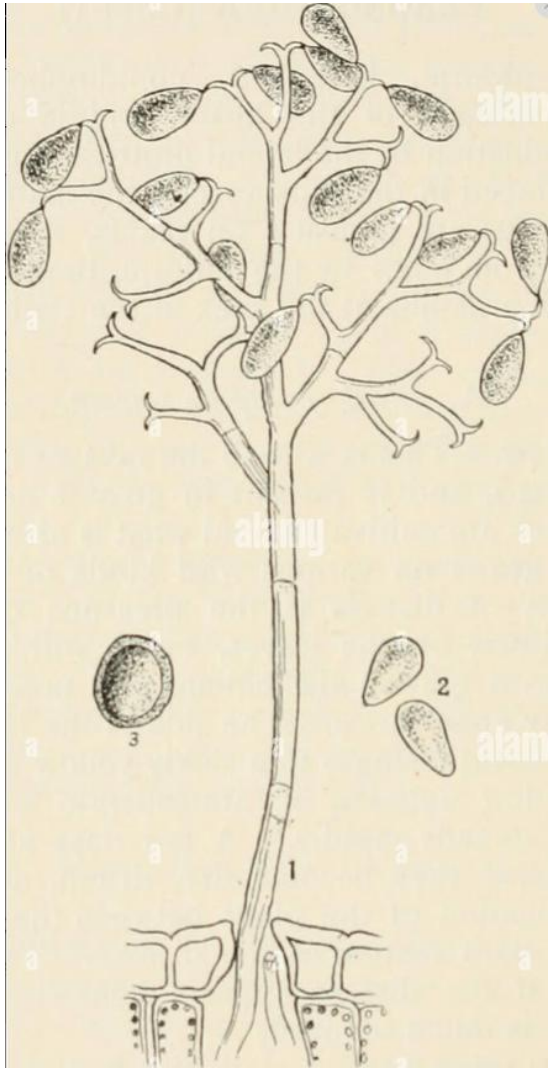
(2) the average night temperature is between 4°C (39.2ºF) and 24°C (75.2ºF);

(3) the relative humidity is greater than 95% between 02:00 and 06:00; and

(4) no rain should occur after 02:00

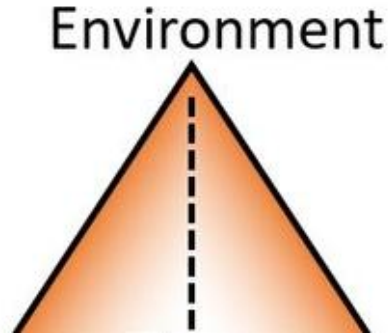
Favorable Environment for Infection





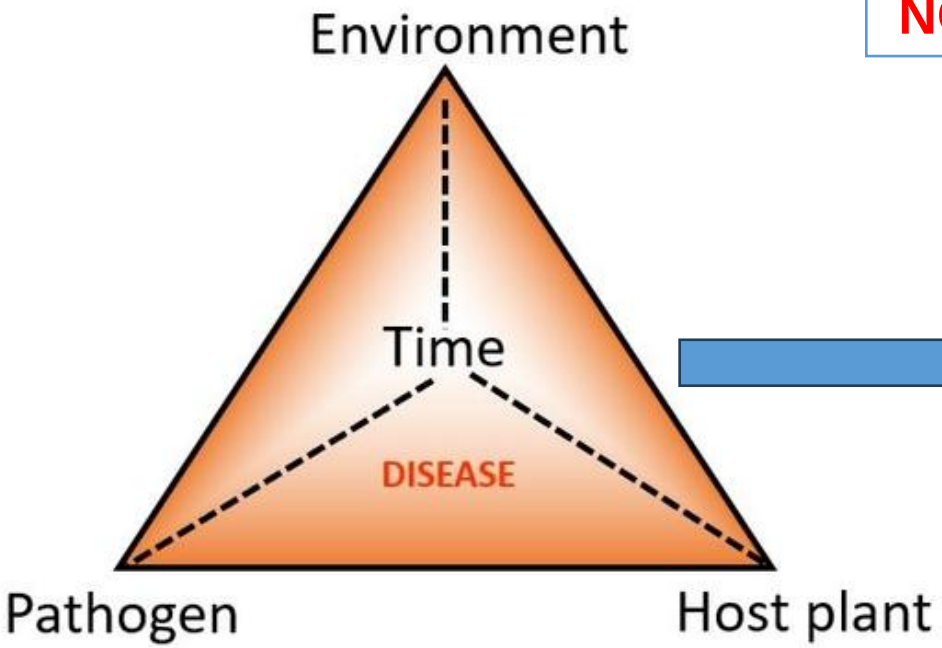
- Spores survive for 1-3 days after sporulation
- Infection occurs when there is water on the leaves
- Occurs in 3-6 hours, temp 38 - 78ºF (4 - 26ºC)

Favorable Environment



- Other models such as Onimil, Zwipero, DownCast-deVisser and Milioncast were also developed to predict the risk of *P. destructor* sporulation or infection, or both
- Temperature and humidity to be considered are the ones inside the foliage
- Temperatures over 81ºF (27.5ºC) inhibit sporulation

Disease Triangle



NO SYMPTOMS UNTIL SPORULATION OCCURS

Takes an average of 10 to 12 days from infection until sporulation

Symptoms

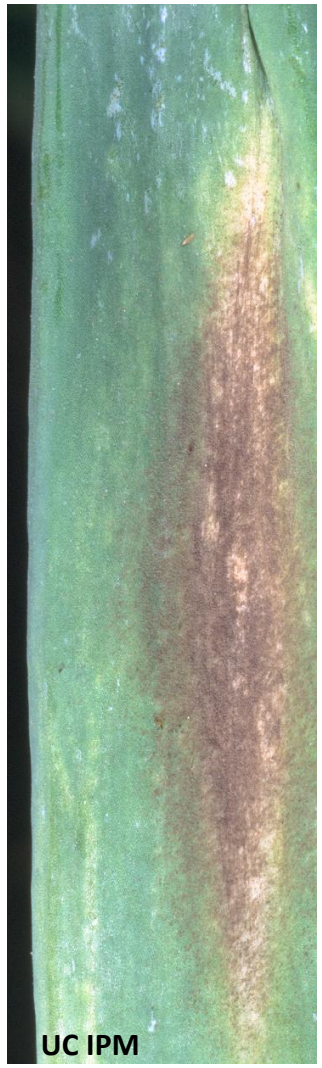
Bleaching of leaf tips and small and irregularly shaped chlorotic blotches

Chlorotic blotches enlarge and coalesce into extensive lesions

Lesions can girdle the leaf, causing them to bend over and collapse.

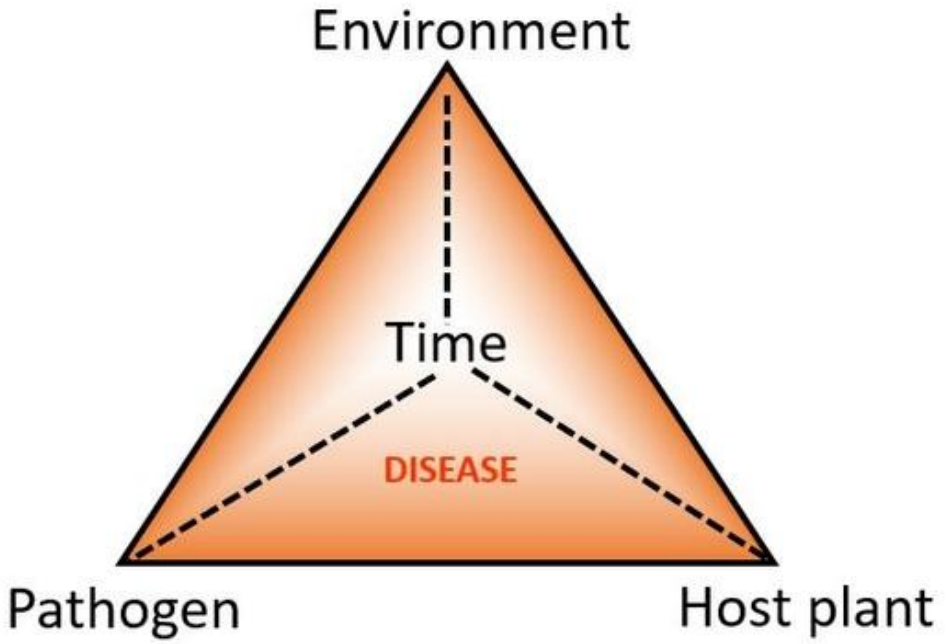
Symptoms

Characteristic purple, fuzzy sporulation grows on the affected lesions and such growth often has concentric zones.



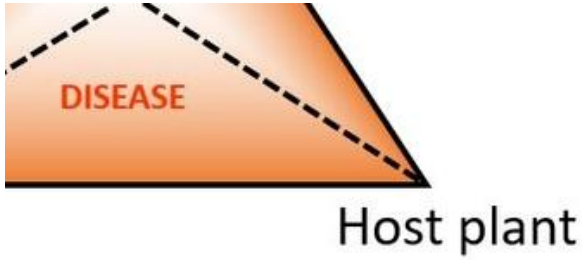
If severe during bulb formation, final bulb yields can be significantly reduced.

Management Strategies



Plant disease is prevented when any one of these three components is eliminated!!

Management - Host



EARLY YELLOW

- **Frontier**
- **Highlander**
- **Norstar**
- **Powell**
- **Quick Start**
- **Sweet Uno**
- **Talón**
- **Yankee**

SPANISH VARIETY, RED

- **Monastrell**
- **Purple Haze**
- **Seminis (SV4643NT)**
- **Tannat**

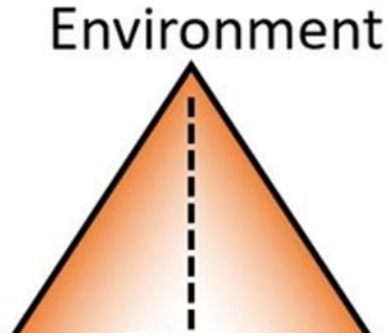
BUNCHING VARIETY

- **Feast**

Information is from seed catalogs for 2018, 2020 and 2022

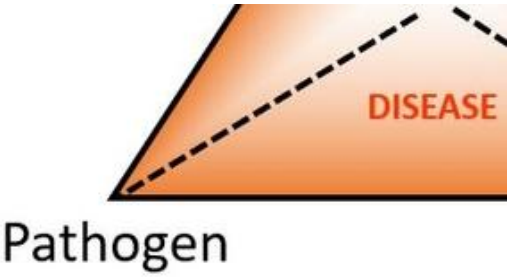
https://www.vegetables.cornell.edu/pest-management/disease-factsheets/disease-resistant-vegetable-varieties/disease-resistant-onion-varieties/

Management - Environment



- Plant in areas with good airflow.
- Maintain proper spacing between plants.
- Avoid overhead irrigation.
- Maintain proper soil moisture.

Management - Pathogen



- Destroy plant debris and volunteers.
- Rotate away from susceptible crops (3+ years), excluding all allium crops and considering neighboring fields.
- Use decision support systems linked to computer models that analyze prevailing temperature, rainfall, and relative humidity and predict the need to apply control treatments.
- The use of nighttime overhead irrigation as a supplementary control measure suppresses spore production by the pathogen and can be integrated with foliar spray programs – has been reported as used in Australia.
- The correct use of fungicides can reduce the disease to negligible levels and minimize the risk of resistance to fungicides.

Onion Downy Mildew

Peronospora destructor

Orondis Ultra (Syngenta)
[oxathiapiprolin (49) and mandipropamid (40)]

Ridomil Gold Bravo (Syngenta)
[mefenoxam (4) and chlorotalonil (M5)]

Reason 500 SC (Gowan)
[fenamidone (11)]

In Rotation

Quadris Top (Syngenta)
[azoxystrobin (11) and difenoconazole (3)]

Luna Tranquility (Bayer)
[fluoryram (7) and pyrimethanil (9)]

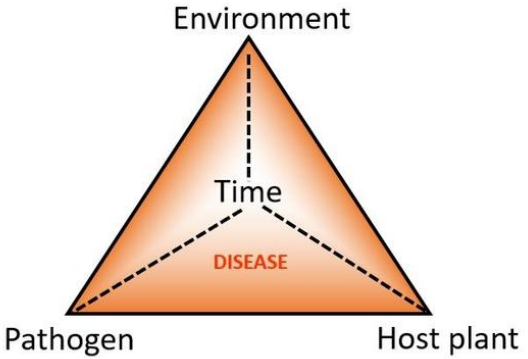
Mancozeb (M3)

Bravo Weather Stik (Adama)
[chlorotalonil (M5)]

Zampro (BASF)
[ametoctradin (45) and dimetomorph (40)]

Hoepting, 2015
Hoepting, 2016
Edemfield, 2019
McDonald, 2023

IPM Strategies



- **TIMING IS THE MOST IMPORTANT!!**

- Disease/Weather Forecasting could be useful to apply fungicides at the correct time.

- If the weather is hot and dry, downy mildew will not be the problem → better to watch out for Stemphylium leaf blight and/or Purple blotch.

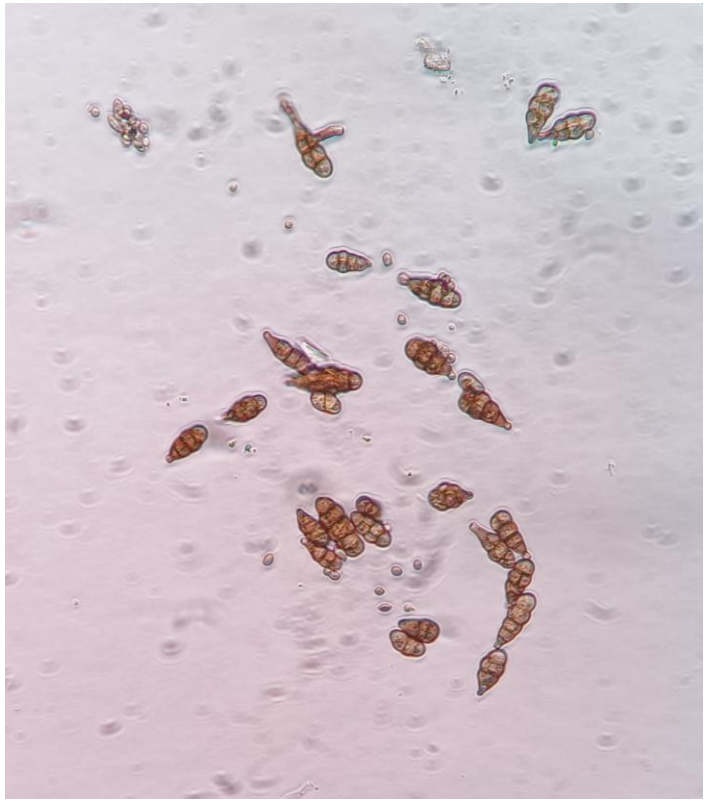
Imperial Valley, April 2024

Opportunistic pathogens

- *Stemphylium vesicarium* → Stemphylium leaf blight

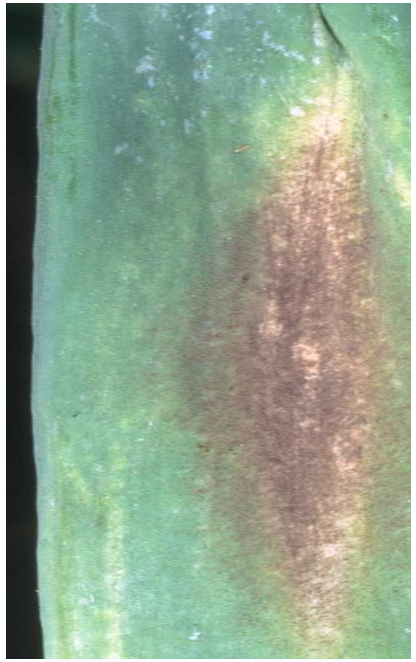
Opportunistic pathogens

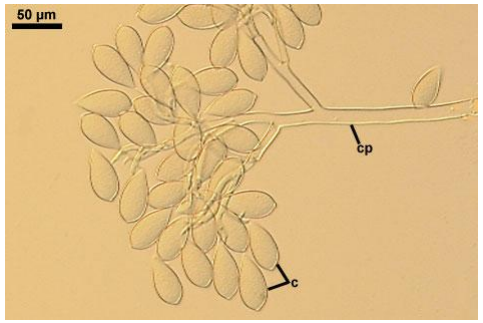
- *Alternaria porri* → Purple blotch



Onion Downy Mildew

Peronospora destructor

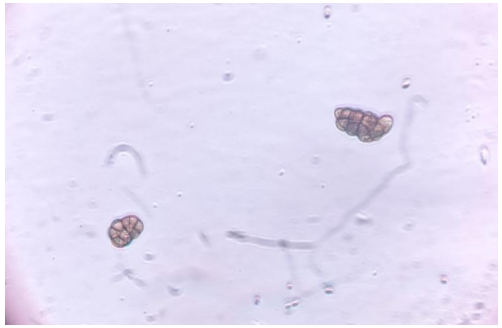




Obligate biotrophic oomycete
Sporangia are ovoid and colorless

Stemphylium light blight

Stemphylium vesicarium



Purple blotch

Alternaria porri

Necrotrophs fungi
Conidia are multicellular, dark, and septate

Onion Downy Mildew

Peronospora destructor

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Bravo Weather Stik (Adama)
[chlorotalonil (M5)]

Zampro (BASF)
[ametoctradin (45) and dimetomorph (40)]

Target Downy Mildew

Stemphylium light blight

Stemphylium vesicarium

Tanos (Corteva)
[famo… …ne (11) and cymoxanil (27)]

Merivon (BASF)
[fluxa… …oxad (7) and pyraclos… …n (11)]

FRAC 2,3

Quadris Top (Syngenta)
[azo… …robin (11) and difenoconaz… …(3)]

Luna Tranquility (Bayer)
[flu… …am (7) and pyrimet… …il (9)]

Mancozeb (M3)

Primary fungicide program do not target Downy Mildew

Hoepting, 2015
Hoepting, 2016
Edemfield, 2019
Stricker et al., 2020
Hay et at., 2021
McDonald, 2023

If you've reached this point, please consider taking a brief survey (1-2 minutes) to help me improve my program. Thank you!

https://surveys.ucanr.edu/survey.cfm?surveynumber=43617

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