



# Late Blight on Potato

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# Introduction

## Description:

- Phytophthora is a cosmopolitan genus of Oomycete referred to as the "water molds".
- Obligate plant pathogens containing approximately 60 described species.
- Potato late blight is a crucial disease affecting potato.



- Late blight is responsible for the Irish Famine in the middle of the 19th century.
- It affects both potato foliage in the field and tuber in the storage which can absolutely destroy a crop, producing a 100% crop loss.





LIGHT-TO-DARK GREEN, AND CIRCULAR-TO IRREGULARLY-SHAPED, WATER-SOAKED LESIONS, SURROUNDED BY A HALO OF WHITE, DOWNY SPORANGIA.

# Life Cycle

1

**Sporangia, dispersed by wind and water**

2

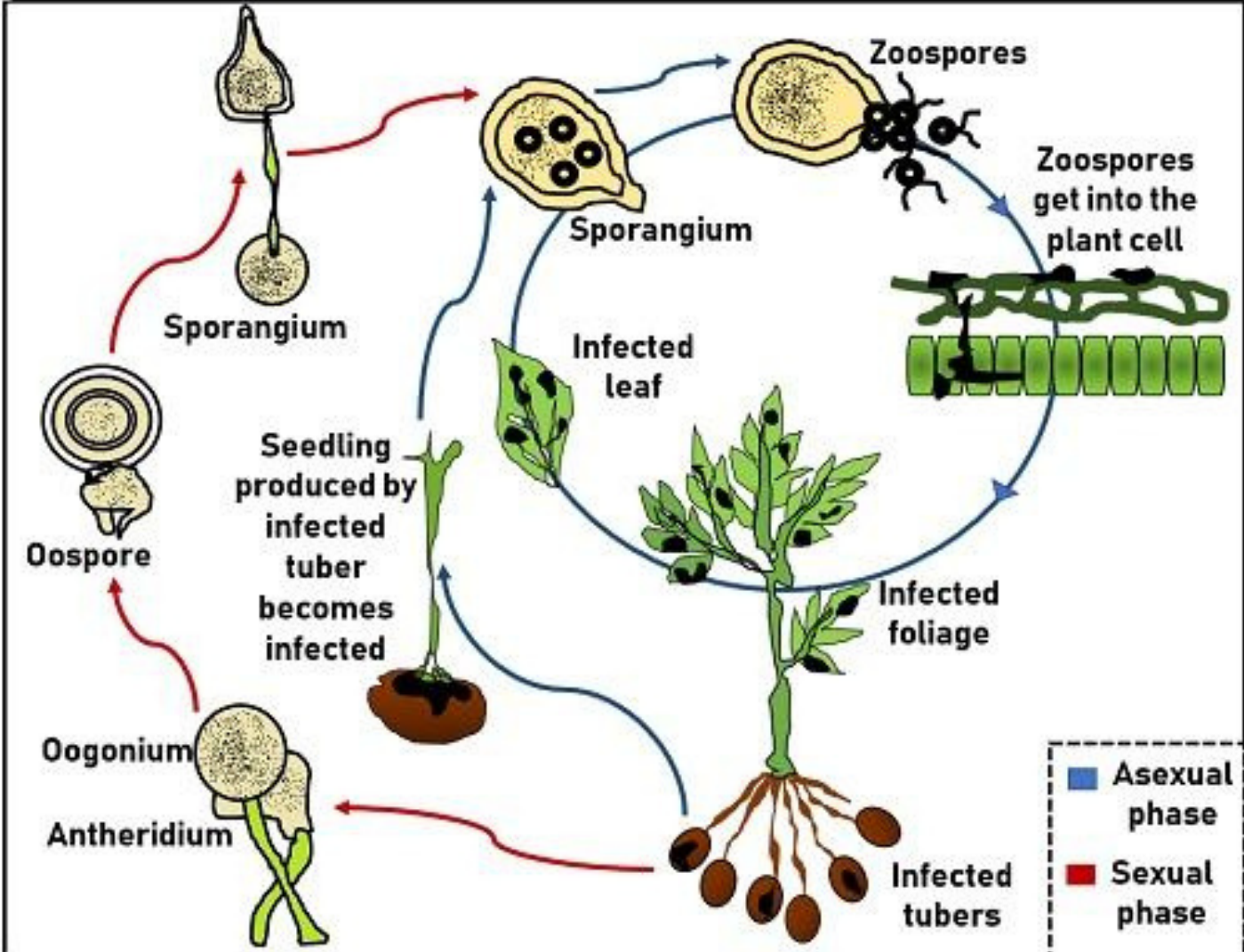
**Sporangia washed off the leaves can infect potato tubers**

3

**Sexual reproduction through oospores contributes to genetic variation**

4

**Depends greatly on the prevailing humidity and temperature**



**Disease Cycle Of Phytophthora infestans**

# ECONOMIC AND GLOBAL SIGNIFICANCE

Late blight has severe economic impact:

- Leading to substantial losses if untreated, echoing historical crises like the Irish famine.
- Estimated worldwide losses exceeding \$5 billion annually.
- Economic losses may be in the form of reduced yield, lower quality of the fruit and increased cost associated with fungicide applications.
- It threatens to global food security as potato is an important cash crop



# Integrated pest Management

- |   |                                       |    |                             |
|---|---------------------------------------|----|-----------------------------|
| 1 | SITE SELECTION                        | 6  | Parasitic Oomycetes         |
| 2 | CROP ROTATION                         | 7  | ANTAGONISTIC MICROORGANISMS |
| 3 | ELIMINATION OF OVERWINTERING INOCULUM | 8  | Predatory Microorganisms    |
| 4 | PLANTING OF PATHOGEN-FREE TUBERS      | 9  | FERTILIZATION               |
| 5 | HILLING                               | 10 | IRRIGATION                  |



**Integrated Pest Management**

# Chemical Control

## Mancozeb

- Contact
- Multi-site Inhibitors
- Organic fungicide
- EPA registered
- Lebanon Prohibited
- endocrine disruptor and toxic to reproduction
- Toxic to aquatic life
- acute toxicity to mammals
- Low to Moderate Toxicity to natural enemies
- MOA: Multi-site inhibitors

## Chlorothalonil

- Contact
- Multi-site inhibitor
- may be a CARCINOGEN in humans
- Slightly toxic to bees
- toxic to natural enemies
- MOA: Multi-site inhibitors

## Cymoxanil

- Translaminar
- acute Toxicity to mammals
- Slightly toxic to bees
- non-toxic to natural enemies
- MOA: inhibits synthesis of nucleic acids

## Dimethomorph

- Translaminar
- Cross resistance between all members of the CAA group
- non-toxic to natural enemies
- MOA: inhibits Cell wall synthesis



# Chemical Control

## Famoxadone

- Locally systemic
- highly toxic to fish
- moderately toxic to bees
- non-toxic to natural enemies
- MOA :inhibition of the
- fungal mitochondrial respiratory chain

## Ametoctradin

- systemic
- low toxicity to mammals
- low toxicity on natural enemies
- MOA: disrupts energy production within the mitochondria of fungal cells

# Chemical Control Study

**TABLE 1** Fungicides and formulation used in 2017 and 2019 field experiments in Nilgiri Hills of India

Fungicide category (Chemical or Biological group)	Active ingredients	FRAC Code	Trade name	Formulation <sup>a</sup>	Manufacturer	Recommended dose by the manufacturer	Dose used in the present study
Dithio-carbamates and relatives	Mancozeb	M3	Indofil <sup>®</sup> M-45	75% WP	Indofil Industries Limited, India	1.5-2.0 kg/ha	2.0 kg/ha <sup>*</sup>
Chloronitriles (phthalonitriles)	Chlorothalonil	M5	Kavach <sup>®</sup>	78.12% WP	Syngenta, India	0.88-1.25 kg/ha	1.25 kg/ha <sup>**</sup>
Cyanoacetamideoxime + dithio-carbamates and relatives	Cymoxanil + Mancozeb	27 and M3	Moximate <sup>®</sup>	8% + 64% WP	Indofil Industries Limited, India	1.5 kg/ha	1.5 kg/ha <sup>**</sup>
Oxazolidine-diones + Cyanoacetamideoxime	Famoxadone + Cymoxanil	11 and 27	Equation <sup>®</sup> Pro	16.6%+22.1% SC	DuPont India Private Ltd, India	500 ml/ha	500 ml/ha <sup>**</sup>
Triazolo-pyrimidylamine + cinnamic acid amides	Ametoctradin + Dimethomorph	CB and 40	Zampro <sup>®</sup>	26.9%+20% SC	BASF India Limited, India	1.0-1.2 L/ha	1 L/ha <sup>**</sup>

Abbreviations: SC, suspension concentrate; WP, wettable powder.

<sup>a</sup>Percentage of active ingredient in commercial product.

<sup>\*</sup>Spray volume was 800 L/ha

<sup>\*\*</sup>Spray volume was 500 L/ha.

# Chemical Control Study

**TABLE 3** Effect of fungicide scheduling against late blight of potato on terminal disease severity

Treatments	Terminal disease severity (%)	Reduction over control (%)	Terminal disease severity (%)	Reduction over control (%)
	2017		2019	
T <sub>1</sub> - Mancozeb-cymoxanil + mancozeb	29.0 <sup>b</sup>	71.0	48.8 <sup>b</sup>	51.3
T <sub>2</sub> - Chlorothalonil-famoxadone + cymoxanil	46.7 <sup>c</sup>	53.3	62.5 <sup>b</sup>	37.5
T <sub>3</sub> - Chlorothalonil-ametoctradin + dimethomorph	32.3 <sup>b</sup>	67.7	57.5 <sup>b</sup>	42.5
T <sub>4</sub> - Resistant cultivar	0.0 <sup>a</sup>	100.0	0.0 <sup>a</sup>	100.0
T <sub>5</sub> - Untreated control	100.0 <sup>d</sup>	-	100.0 <sup>c</sup>	-
<b>F-value</b>	<b>F = 82.03</b>		<b>F = 17.22</b>	
	( <i>p</i> < .01)		( <i>p</i> < .01)	

Note: Values within each column with common letter(s) are not significantly different according to Fisher's Protected LSD (*p* ≤ .05).

# Chemical Control Results

**TABLE 4** Effect of fungicide scheduling against late blight of potato on total tuber number and weight during 2017 and 2019 field experiments in Nilgiri Hills of Southern India

Treatments	Tuber count (n/ha)		Tuber weight (t/ha)	
	2017	2019	2017	2019
T <sub>1</sub> - Mancozeb-cymoxanil + mancozeb	281111 <sup>bc</sup>	199878 <sup>b</sup>	22.3 <sup>a</sup>	16.6 <sup>a</sup>
T <sub>2</sub> - Chlorothalonil-famoxadone + cymoxanil	277407 <sup>bc</sup>	243190 <sup>ab</sup>	16.3 <sup>b</sup>	16.6 <sup>a</sup>
T <sub>3</sub> - Chlorothalonil-ametoctradin + dimethomorph	309259 <sup>b</sup>	255712 <sup>a</sup>	21.5 <sup>a</sup>	17.7 <sup>a</sup>
T <sub>4</sub> - Resistant cultivar	416296 <sup>a</sup>	212117 <sup>ab</sup>	22.7 <sup>a</sup>	18.9 <sup>a</sup>
T <sub>5</sub> - Untreated control	220741 <sup>c</sup>	202392 <sup>b</sup>	5.9 <sup>c</sup>	7.5 <sup>b</sup>
F-value	F = 14.45 (p < .01)	F = 3.45 (p < .05)	F = 21.79 (p < .01)	F = 24.97 (p < .01)

Note: Values within each column with common letter(s) are not significantly different according to Fisher's Protected LSD ( $p \leq .05$ ).



# Conclusion

1

RESISTANT CULTIVAR, KUFRI GIRDHARI

2

CHLOROTHALONIL-AMETOC-TRADIN+  
DIMETHOMORPH(T3)

3

MANCOZEB-  
CYMOXANIL+MANCOZEB (T1)

4

ALTERING THE PLANTING TIME, USE OF  
HEALTHY DISEASE-FREE SEED MATERIAL

5

REMOVAL OF ALTERNATE HOSTS

# Reference:

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# Thank You

In closing, we extend our deepest gratitude.

Thank you for your unwavering attention and thoughtful engagement throughout this presentation.

Should you require further clarification or wish to explore any aspect further, we're just an email away.

Let's continue this journey together!

