



# HOW TO BECOME A PLANT DOCTOR

Eric Boa, CABI

## 6. BEING A DETECTIVE

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## CAUSES







## BIOTIC

## PESTS AND DISEASES



fungus



water moulds



bacteria



virus



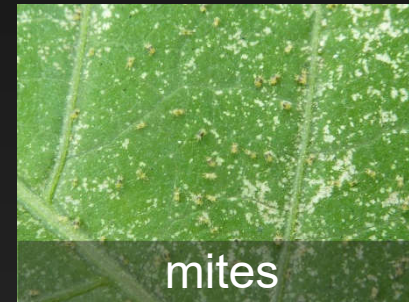
phytoplasma



nematode



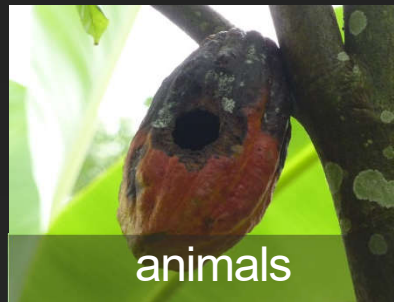
insects



mites



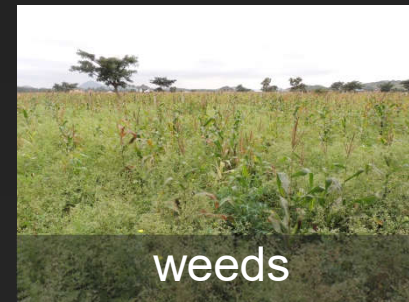
birds



animals



parasitic plant

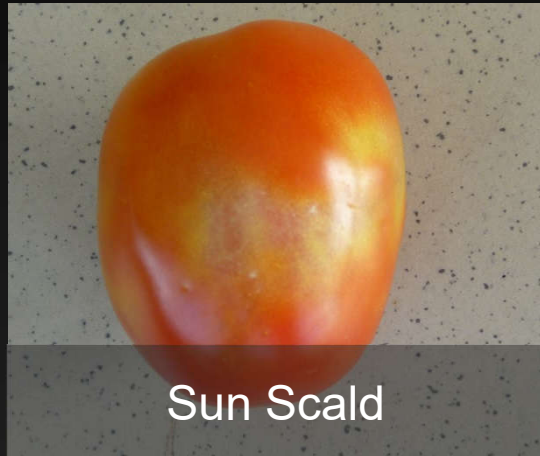


weeds





## ABIOTIC



Sun Scald



Physical damage: tools,  
people



Soil type, structure



Soil fertility



Water: too much /  
not enough



Climate: wind,  
temperature, storms

## OTHER CAUSES





(Exeto) ABIOTI

1. Suelo
2. Nutrientes.
3. Agua.
4. Viento
5. Heladas
6. Granizos.
7. Temperatura
8. Sequia.
9. Inundación

→ Clima





## ELIMINATION 1

BIOTIC

ABIOTIC

Leek  
UK





## ELIMINATION 2

BIOTIC

ABIOTIC



**Chinaberry, Persian lilac**  
Nepal

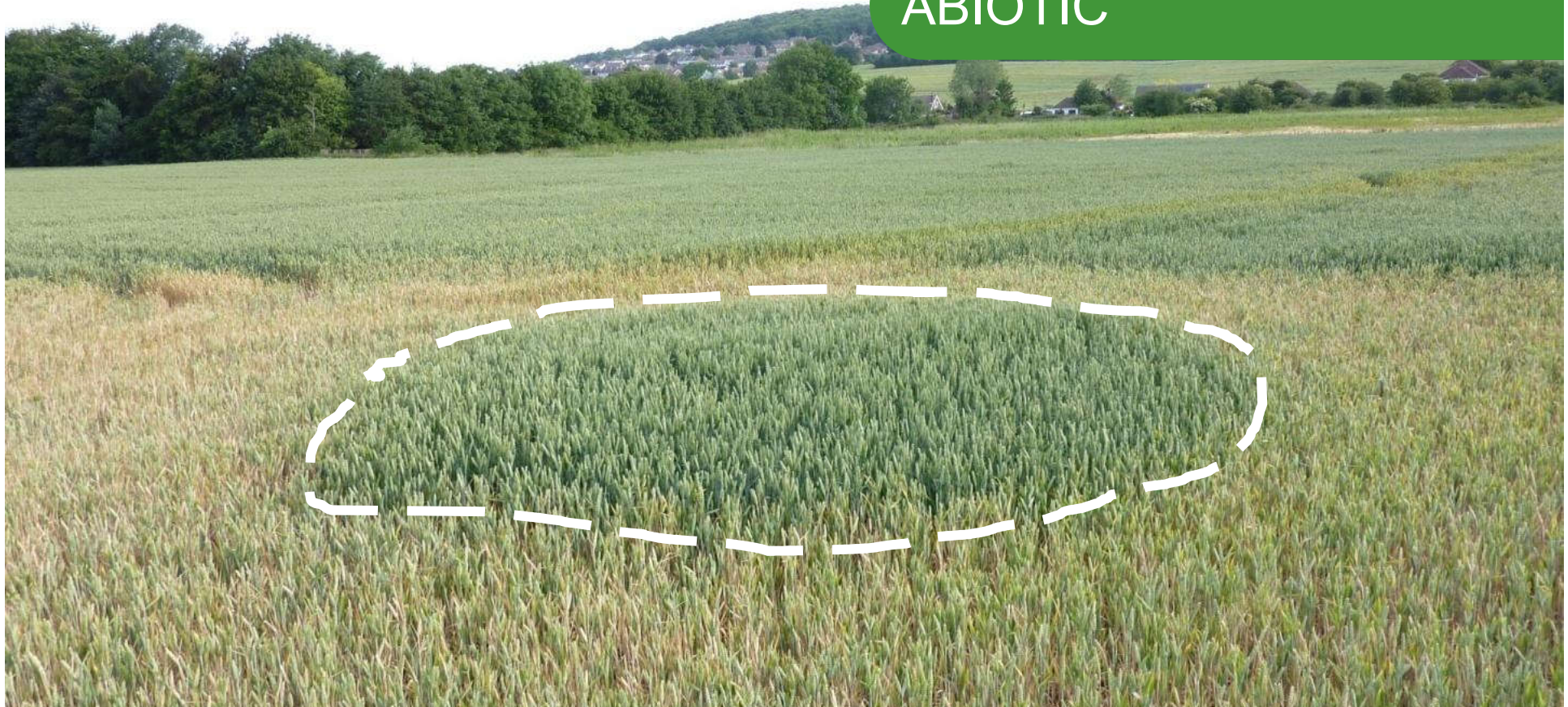




## ELIMINATION 3

BIOTIC

ABIOTIC



Winter Wheat  
UK





## ELIMINATION 4

BIOTIC

ABIOTIC

Onion  
UK





## ELIMINATION 5

BIOTIC

ABIOTIC



Sorghum  
Malawi





## ELIMINATION 6

BIOTIC

ABIOTIC

Winter Wheat  
UK





## ELIMINATION 7

BIOTIC

ABIOTIC

**Kohl rabi**  
Vietnam





## ELIMINATION 8

BIOTIC

ABIOTIC

Winter Wheat  
UK





## ELIMINATION 9

?

BIOTIC

ABIOTIC

**Cashew**  
**Nicaragua**





## ELIMINATION 10

?

BIOTIC

ABIOTIC

**Maize**  
**Malawi**





## FIELD DIAGNOSIS 1

**NOT INSECT or MITE**

No holes or other evidence eg webbing

**NOT NEMATODE**

Don't cause this type of symptom

**NOT VIRUS**

Don't cause this type of symptom

**NOT PHYTOPLASMA**

Don't cause this type of symptom

**NOT ANIMAL or BIRD**

No feeding damage

**NOT LACK OF NUTRIENT**

Doesn't cause this type of symptom

**NOT PHYSICAL or HERBICIDE**

Doesn't cause this type of symptom

**BIOTIC:** Active disease process,  
clear border between healthy and  
diseased area

**? BACTERIUM**

Unlikely – expect wilt

**? FUNGUS OR WATER MOULD**

Possible – known to produce necrosis

# ELIMINATE THE NEGATIVE





## FIELD DIAGNOSIS 2

**NOT INSECT or MITE**

No holes or other evidence eg webbing

**NOT NEMATODE**

Don't cause this type of symptom

**NOT VIRUS**

Don't cause this type of symptom

**NOT PHYTOPLASMA**

Don't cause this type of symptom

**NOT ANIMAL or BIRD**

No feeding damage

**NOT LACK OF NUTRIENT**

Doesn't cause this type of symptom

**NOT PHY'CAL or HERB'IDE**

Doesn't cause this type of symptom

**BIOTIC:** Active disease process,  
clear border between healthy and  
diseased area

**? BACTERIUM**

Produces leaf spots but not sporulation



**? FUNGUS**

Possible – but wrong kind of sporulation

**? WATER MOULD**

Yes! correct sporulation and leaf spots

# ELIMINATE THE NEGATIVE





## FIELD DIAGNOSIS 3

**NOT INSECT or MITE**

No holes or other evidence eg webbing

**NOT NEMATODE**

Don't cause this type of symptom

**NOT VIRUS**

Don't cause this type of symptom

**NOT PHYTOPLASMA**

Don't cause this type of symptom

**NOT ANIMAL or BIRD**

No feeding damage

**NOT LACK OF NUTRIENT**

Doesn't cause this type of symptom

**NOT PHY'CAL or HERB'IDE**

Doesn't cause this type of symptom

**BIOTIC:** Active disease process,  
clear border between healthy and  
diseased area



**? BACTERIUM OR WATER  
MOULD** Look for fruiting bodies

**FUNGUS !**

Small black dots: fruiting bodies found!  
Known to produce these symptoms

# ELIMINATE THE NEGATIVE





## FIELD DIAGNOSIS 4

**NOT FUNGUS or BACTERIA**  
Don't cause this type of symptom

**NOT NEMATODE**  
Don't cause this type of symptom

**NOT VIRUS**  
Don't cause this type of symptom

**NOT PHYTOPLASMA**  
Don't cause this type of symptom

**NOT ANIMAL or BIRD**  
No feeding damage

**NOT LACK OF NUTRIENT**  
Doesn't cause this type of symptom

**NOT PHY'CAL or HERB'IDE**  
Doesn't cause this type of symptom

?VIRUS

Mosaic appears too small

INSECT or MITE ?



**MITES !** Use a handlens

# ELIMINATE THE NEGATIVE





## ELIMINATION 11

FUNGUS

WATER MOULD

BACTERIA

VIRUS

PHYTOPLASMA

NEMATODE

INSECT

MITES

ANIMALS & BIRDS

NUTRIENTS

PHY'CAL & HERB'IDE

**Cassava (Uganda)**





## ELIMINATION 12

FUNGUS

WATER MOULD

BACTERIA

VIRUS

PHYTOPLASMA

NEMATODE

INSECT

MITES

ANIMALS & BIRDS

NUTRIENTS

PHY'CAL & HERB'IDE

**Cucumber**  
**Nicaragua**





## ELIMINATION 13

FUNGUS

WATER MOULD

BACTERIA

VIRUS

PHYTOPLASMA

NEMATODE

INSECT

MITES

ANIMALS & BIRDS

NUTRIENTS

PHY'CAL & HERB'IDE

**Citrus**  
**Grenada**<sub>[S Rambadan]</sub>





## ELIMINATION 14

FUNGUS

WATER MOULD

BACTERIA

VIRUS

PHYTOPLASMA

NEMATODE

INSECT

MITES

ANIMALS & BIRDS

NUTRIENTS

PHY'CAL & HERB'IDE

**Eggplant**  
Vietnam





## ELIMINATION 15

FUNGUS

WATER MOULD

BACTERIA

VIRUS

PHYTOPLASMA

NEMATODE

INSECT

MITES

ANIMALS & BIRDS

NUTRIENTS

PHY'CAL & HERB'IDE

**Capsicum**  
**Grenada** [T Peters]





## ELIMINATION 16

FUNGUS

WATER MOULD

BACTERIA

VIRUS

PHYTOPLASMA

NEMATODE

INSECT

MITES

ANIMALS & BIRDS

NUTRIENTS

PHY'CAL & HERB'IDE

# Cowpea

## India

[P Kumar and M Sharma]





## ELIMINATION 17

FUNGUS

WATER MOULD

BACTERIA

VIRUS

PHYTOPLASMA

NEMATODE

INSECT

MITES

ANIMALS & BIRDS

NUTRIENTS



PHY'CAL & HERB'IDE

Papaya  
Nicaragua





## ELIMINATION 18

FUNGUS

WATER MOULD

BACTERIA

VIRUS

PHYTOPLASMA

NEMATODE

INSECT

MITES

ANIMALS & BIRDS

NUTRIENTS

PHY'CAL & HERB'IDE

**Avocado**  
**Nicaragua**





## ELIMINATION 19

FUNGUS

WATER MOULD

BACTERIA



VIRUS

PHYTOPLASMA

NEMATODE

INSECT

MITES

ANIMALS & BIRDS

NUTRIENTS

PHYSICAL OR HERBICIDE

**Tomato**  
**Nicaragua**





## EXERCISE

**CENTRO DE  
DIAGNOSTICO  
RECIBO DE MUESTRAS**



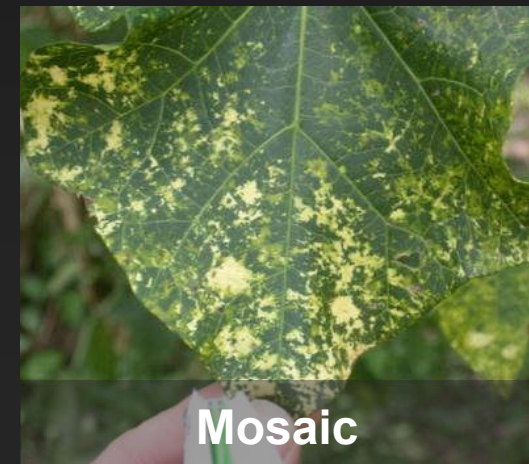
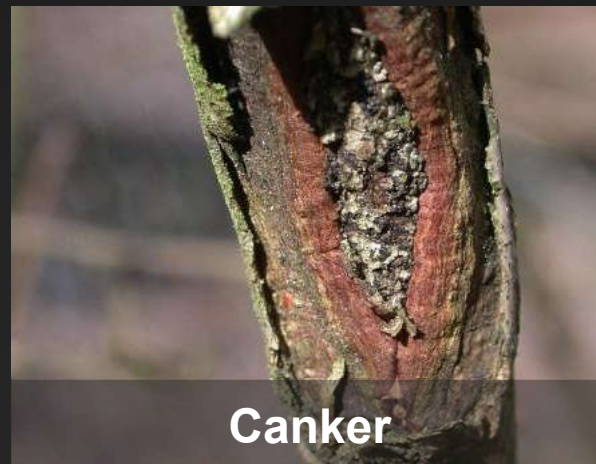
**C1-4**

**Common symptoms caused by pests (part 1)**





## SYMPTOM EXAMPLES







## C1-4 ANSWERS

Symptom	Fungus	Water mould	Bacteria	Virus	Phyto-plasma	Nematode	Insect	Mites	Animals & birds	Nutrients	Physical & herbicide
Wilt	Y	Y	Y	N	N	Y	Y	N	N	N	Y
Leaf spot	Y	Y	Y	N	N	N	Y	N	N	Y	Y
Witches broom	Y	N	N	N	Y	N	N	Y	N	N	Y
Canker	Y	N	Y	N	N	N	N	N	N	N	N
Mosaic	N	N	N	Y	N	N	Y	Y	N	Y	N





## C1-4 ANSWERS

When at a plant clinic what are the most likely causes:

Symptom	Fungus	Water mould	Bacteria	Virus	Phyto-plasma	Nematode	Insect	Mites	Animals & birds	Nutrients	Physical & herbicide
Wilt	Y	Y	Y	N	N	Y	Y	N	N	N	Y
Leaf spot	Y	Y	Y	N	N	N	Y	N	N	Y	Y
Witches broom	Y	N	N	N	Y	N	N	Y	N	N	Y
Canker	Y	N	Y	N	N	N	N	N	N	N	N
Mosaic	N	N	N	Y	N	N	Y	Y	N	Y	N





## EXERCISE

**CENTRO DE  
DIAGNOSTICO  
RECIBO DE MUESTRAS**



**C1-5**

**Common symptoms caused by pests (part 2)**





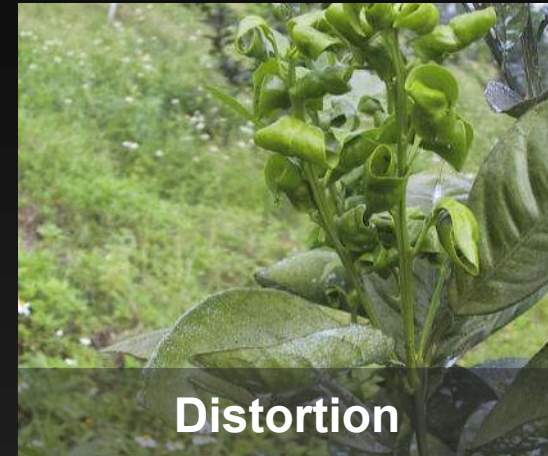
## SYMPTOM EXAMPLES



**Yellowing**



**Galls**



**Distortion**



**Small leaves**



**Necrosis/drying**





## C1-4 ANSWERS

Symptom	Fungus	Water mould	Bacteria	Virus	Phyto-plasma	Nematode	Insect	Mites	Animals & birds	Nutrients	Physical & herbicide
Yellowing	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
Distortion	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
Small leaves	N	Y	N	Y	Y	N	N	Y	N	N	Y
Galls	N	N	Y	N	N	Y	Y	Y	N	N	N
Drying necrosis	Y	Y	Y	N	N	Y	Y	N	Y	Y	Y





## C1-4 ANSWERS

When at a plant clinic what are the most likely causes:

Symptom	Fungus	Water mould	Bacteria	Virus	Phyto-plasma	Nematode	Insect	Mites	Animals & birds	Nutrients	Physical & herbicide
Yellowing	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
Distortion	N	Y	N	Y	Y	N	Y	Y	N	Y	Y
Small leaves	N	Y	N	Y	Y	N	N	Y	N	N	Y
Galls	N	N	Y	N	N	Y	Y	Y	N	N	N
Drying necrosis	Y	Y	Y	N	N	Y	Y	N	Y	Y	Y





**Thank you**





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