Managing Aphids and Spider mites

Regen Aquaculture

Joe Pate

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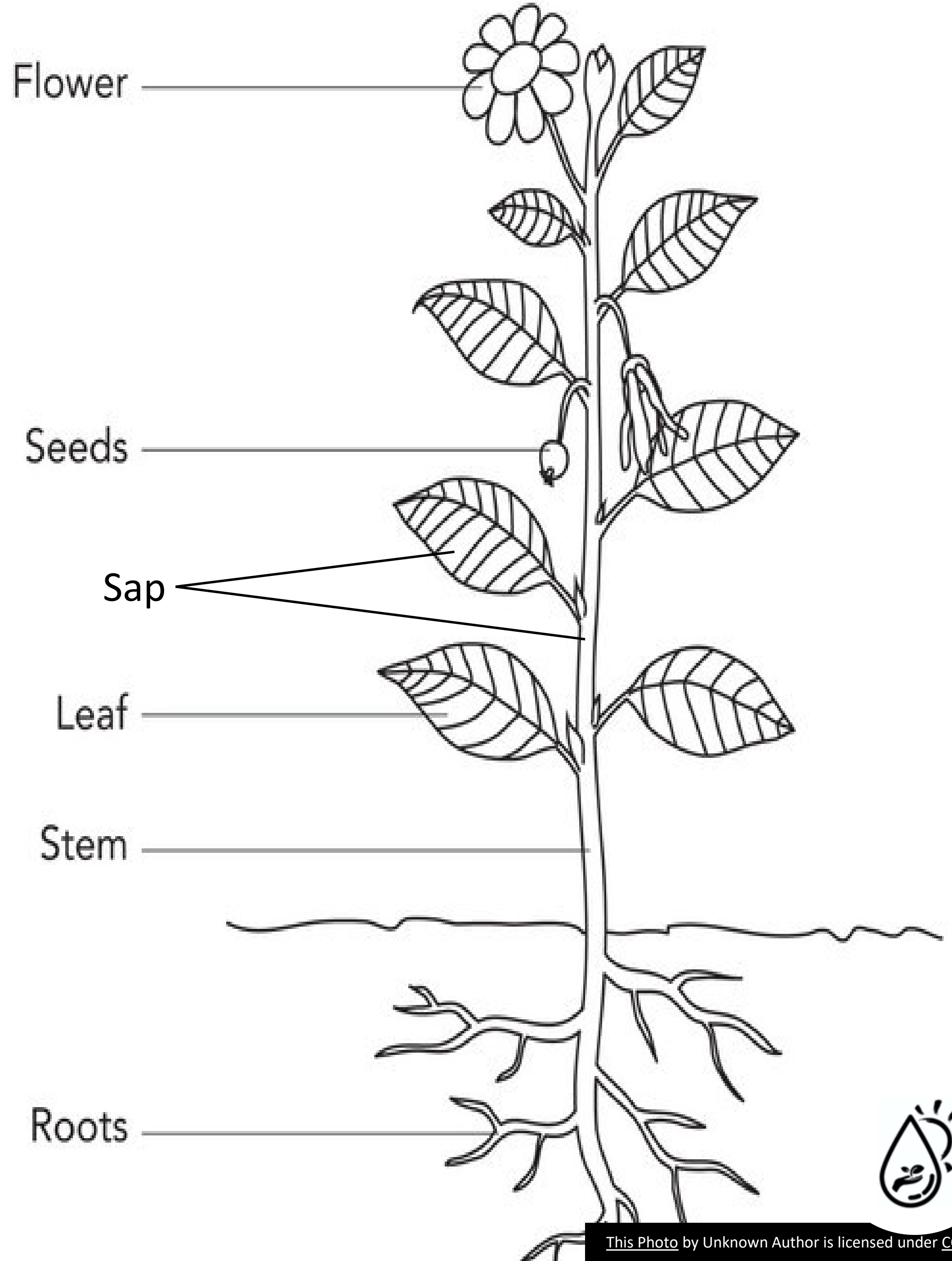
Aquaponic Association 2020

About Me

Plant Eating (Phytophagous) Insects



500,000+ Phytophagous Insects

Order	Main phytophagous taxa	Common name	Feeding stage	Species in taxon	% Phytophagous species
Orthoptera	Tettigonioidea	bush crickets	larvae, adults	5,000	90.00%
	Acridoidea	grasshoppers	larvae, adults	10,000	100.00%
Phasmatodea		leaf, stick insects	larvae, adults	2,500	100.00%
Hemiptera	Sternorrhyncha	aphids	larvae, adults	15,000	100.00%
	Auchenorrhyncha	plant hoppers	larvae, adults	36,500	100.00%
	Heteroptera	sucking bugs	larvae, adults	17,500	60.00%
Thysanoptera	Terebrantia	thrips	larvae, adults	2,500	80.00%
Coleoptera	Chrysomeloidea	leaf beetles	larvae, adults	70,000	100.00%
	Curculionoidea	weevils	larvae, adults	57,000	100.00%
Diptera	Cecidomyiidae	gall flies	larvae	4,000	100.00%
	Agromyzidae	leaf miners	larvae	1,800	100.00%
	Tephritidae	fruit flies	larvae	4,000	100.00%
Lepidoptera		butterflies, moths	larvae	200,000	100.00%
Hymenoptera	Symphyta	sawflies	larvae	5,000	100.00%
	Cynipoidea	gall wasps	larvae	2,300	65.22%

Table 1. The main groups of terrestrial phytophagous insects. Many other groups include some phytophagous species. Adapted from *Foraging and Food Choice in Phytophagous Ir*

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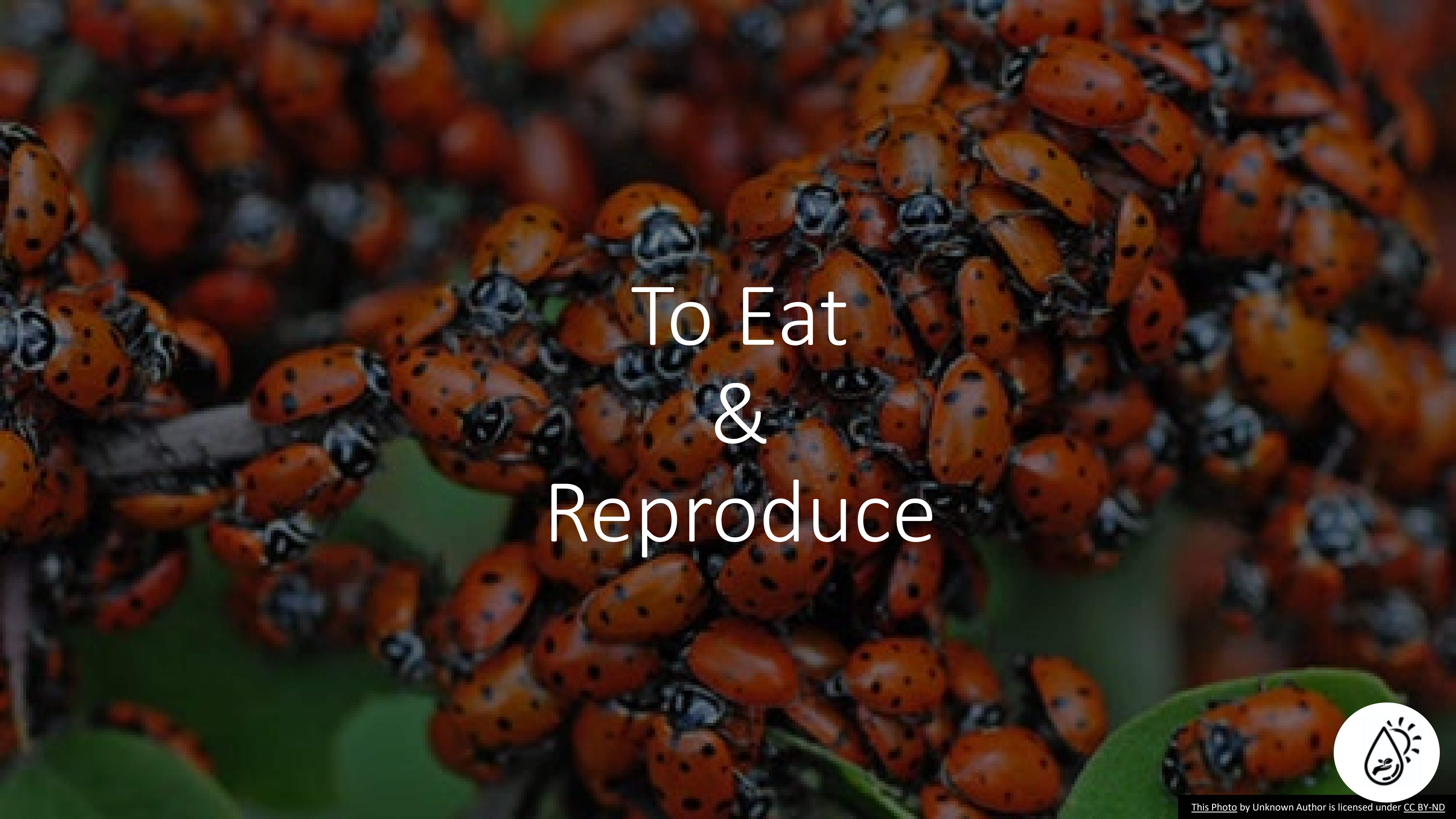
Redefining How We See Pest


Plant eating insects aren’t our enemy.

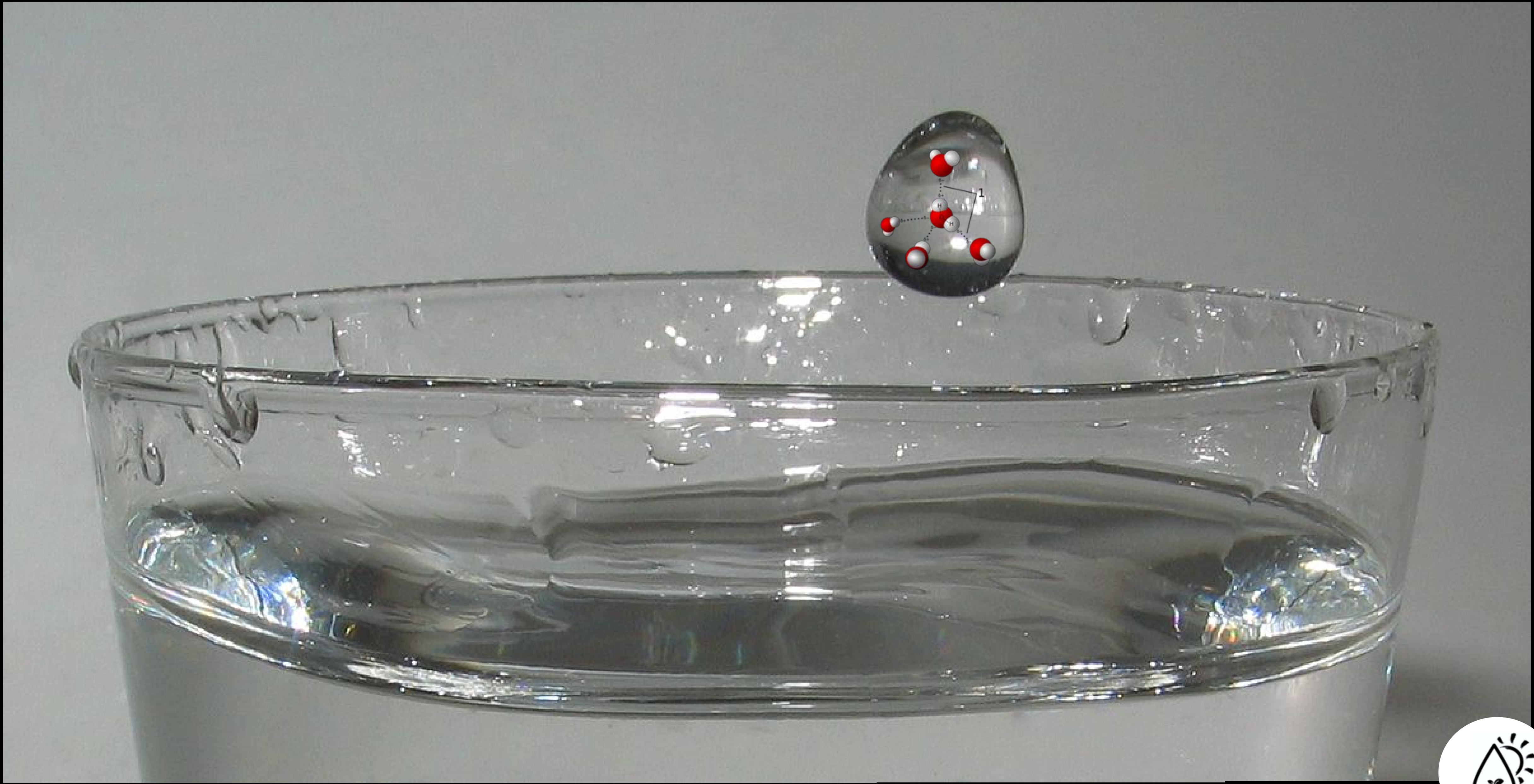
They are natures recyclers.

What do phytophagous insects want?


To Eat
&
Reproduce

How are insects drawn to certain plants?

Tuning Into Nature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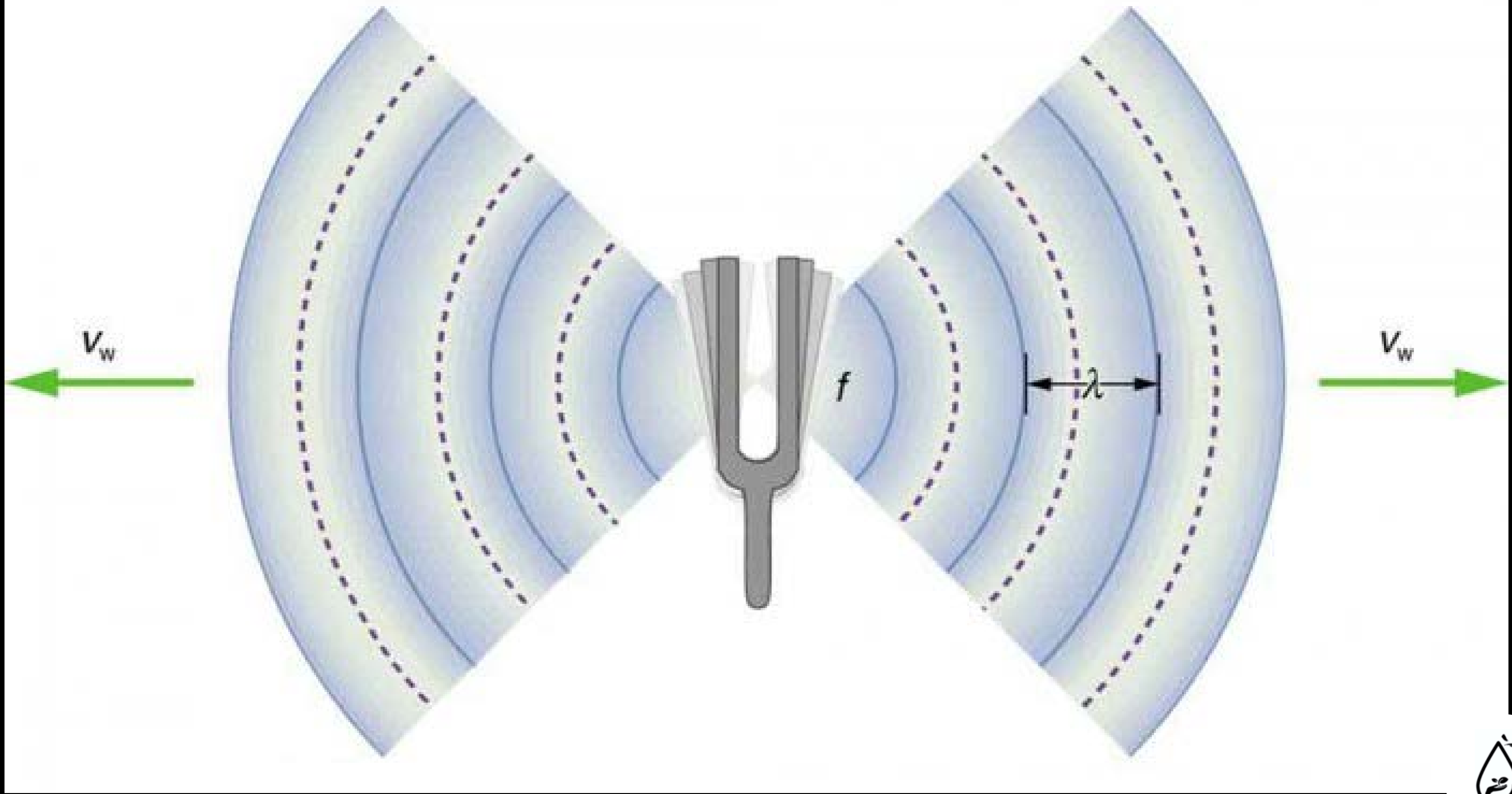
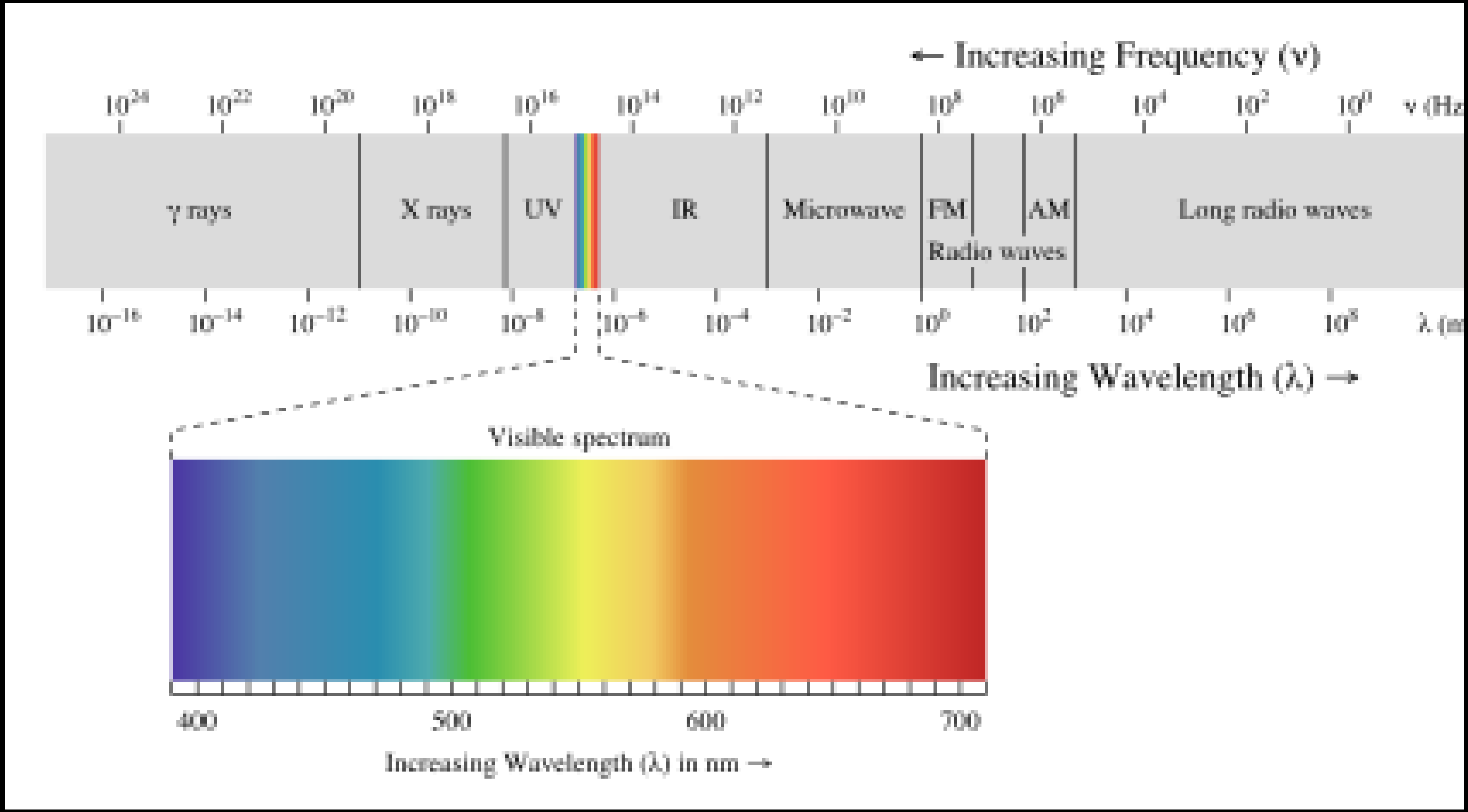
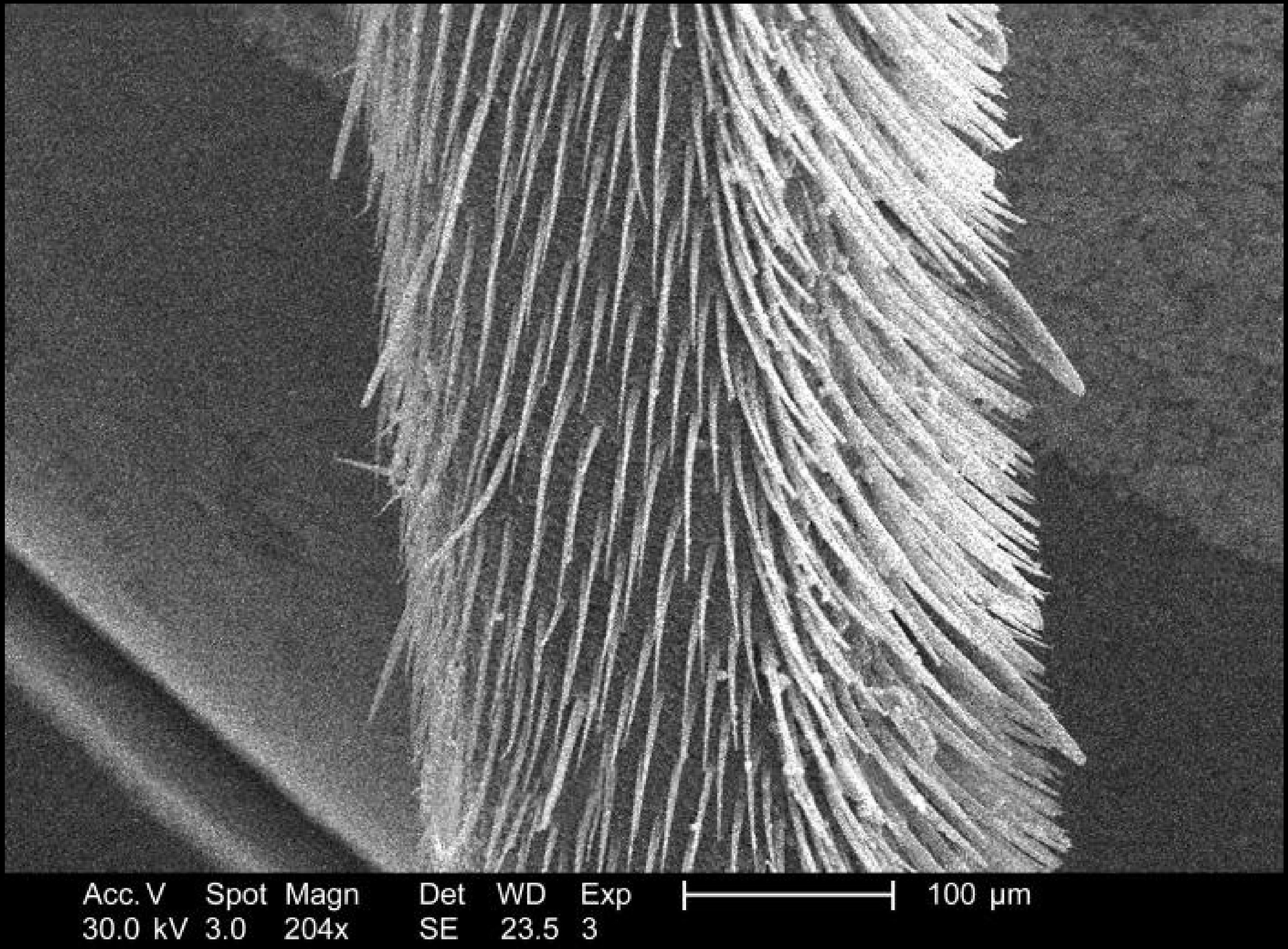
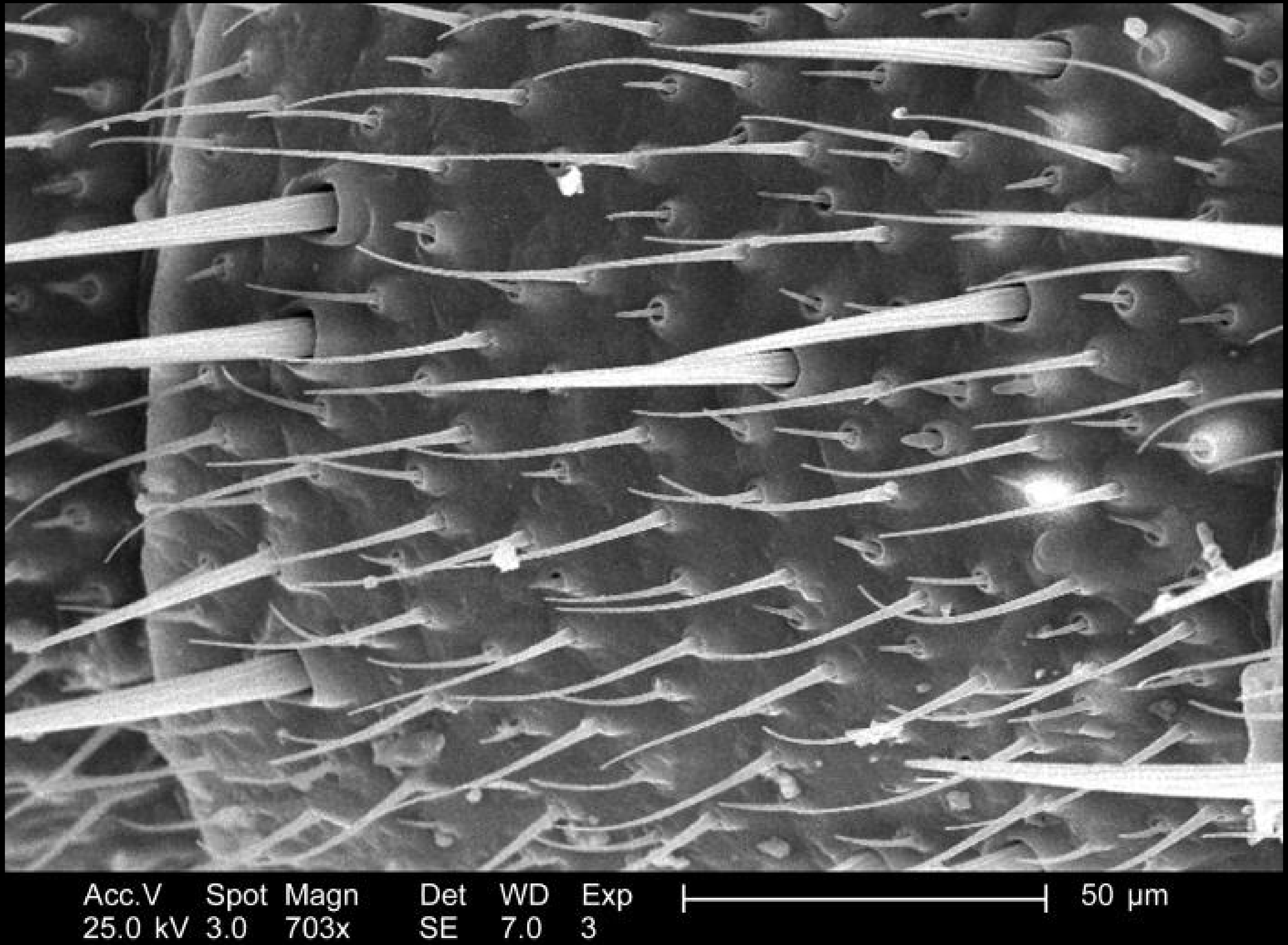


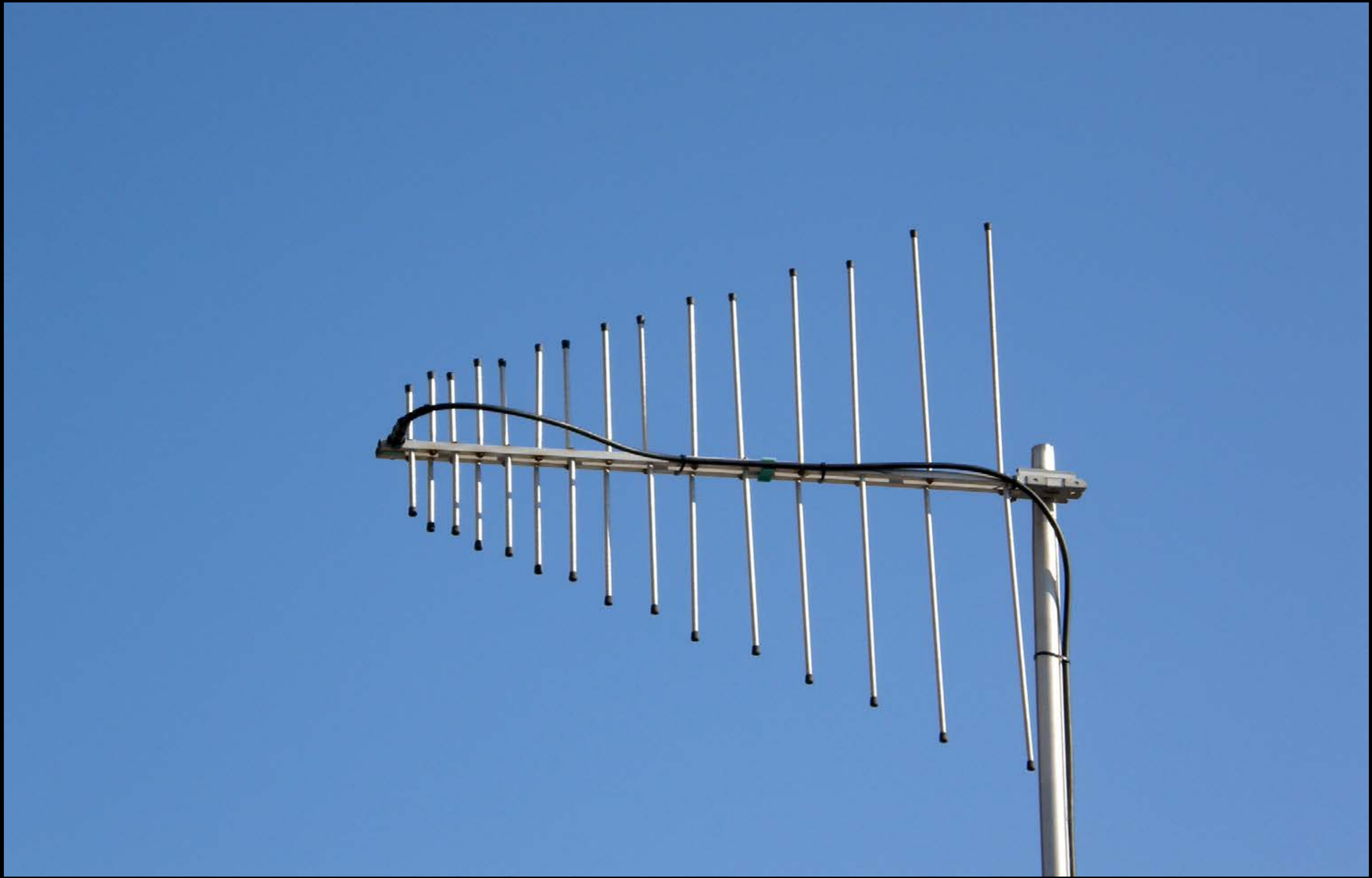
v_w
f
λ
v_w

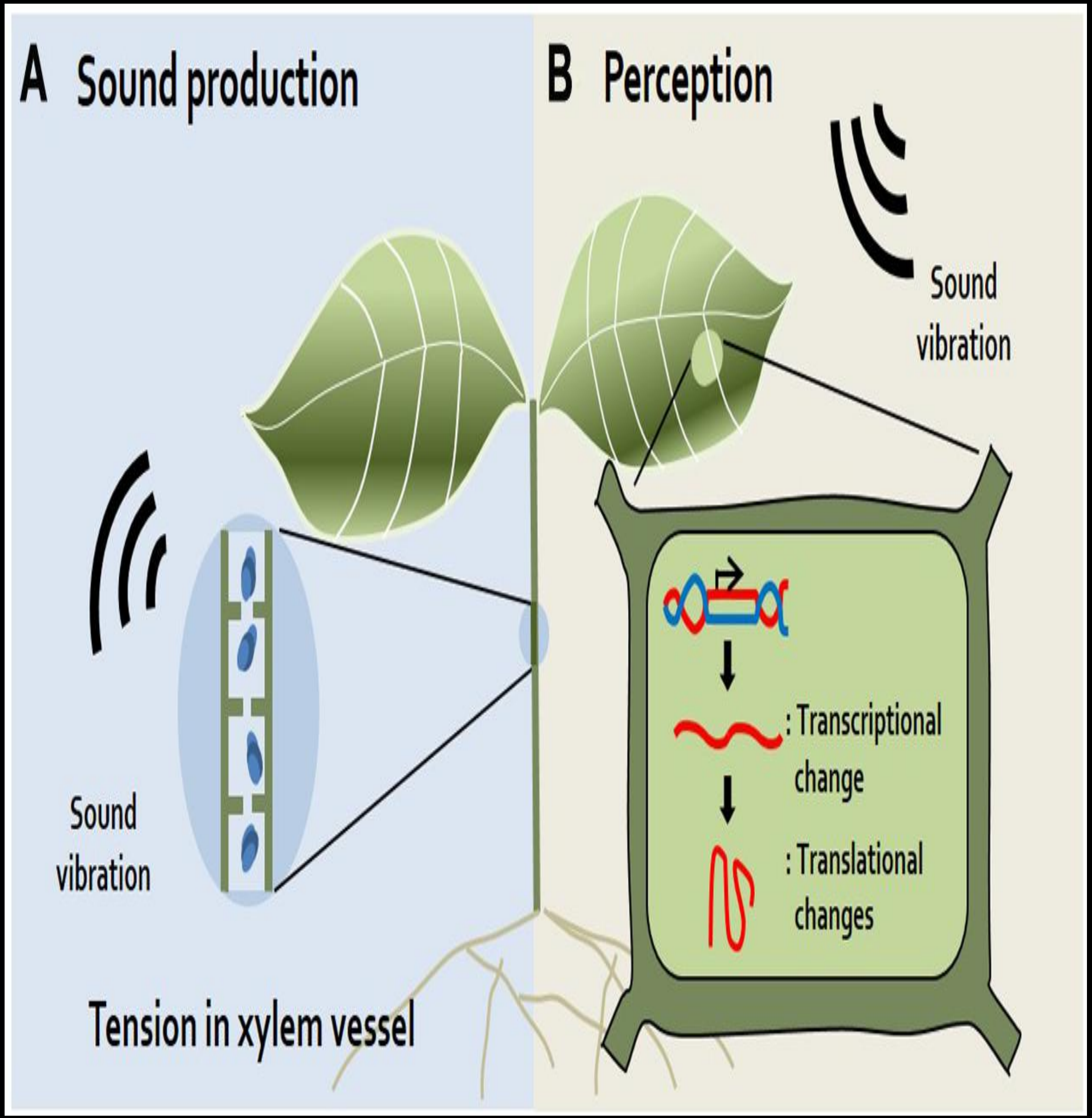

← Increasing Frequency (ν)
10^{24} 10^{22} 10^{20} 10^{18} 10^{16} 10^{14} 10^{12} 10^{10} 10^{8} 10^{6} 10^{4} 10^{2} 10^{0} ν (Hz
γ rays
X rays
UV
IR
Microwave
FM
AM
Radio waves
Long radio waves
10^{-16} 10^{-14} 10^{-12} 10^{-10} 10^{-8} 10^{-6} 10^{-4} 10^{-2} 10^{0} 10^{2} 10^{4} 10^{6} 10^{8} λ (m
Increasing Wavelength (λ) →
Visible spectrum
400
500
600
700
Increasing Wavelength (λ) in nm →

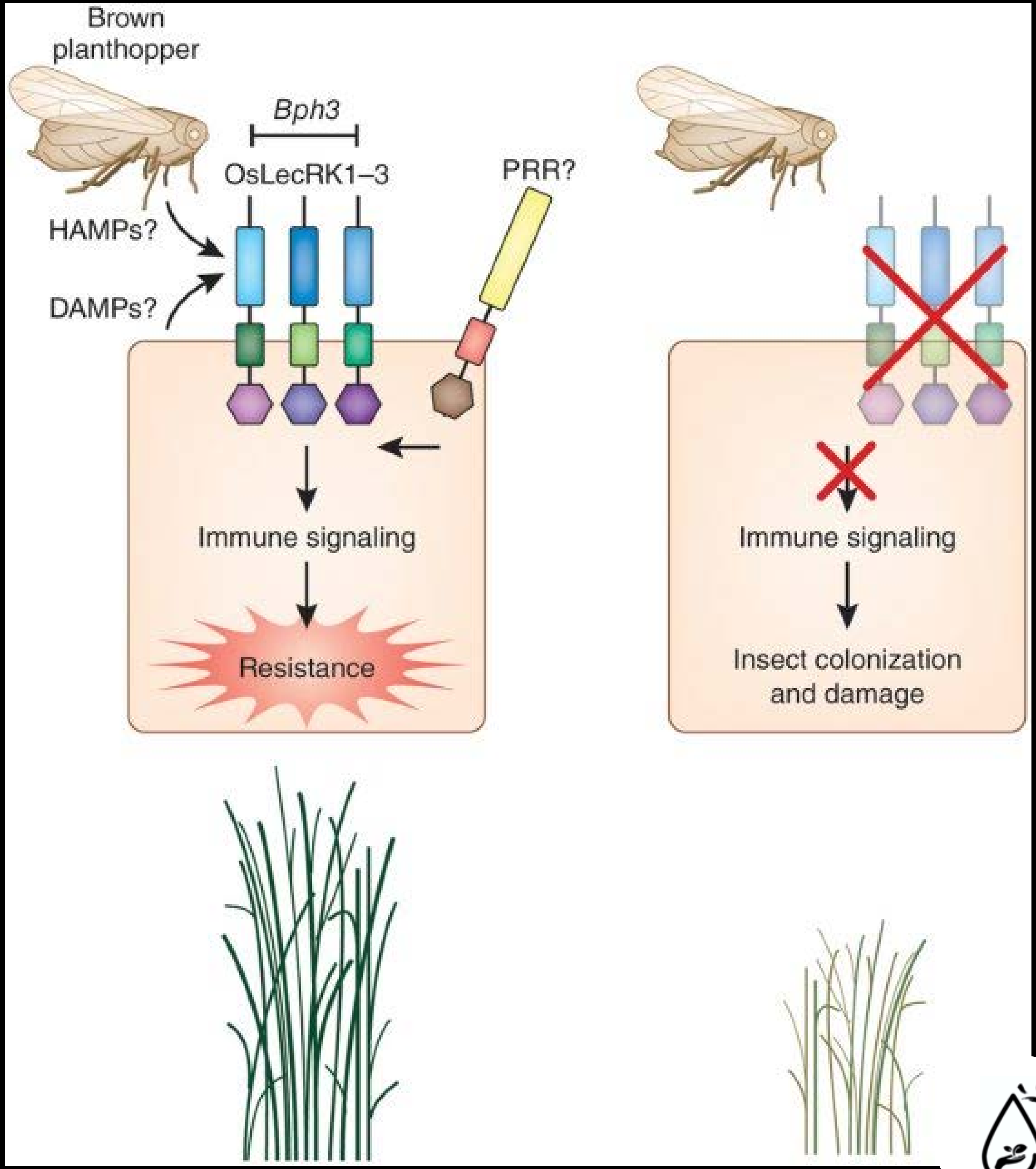


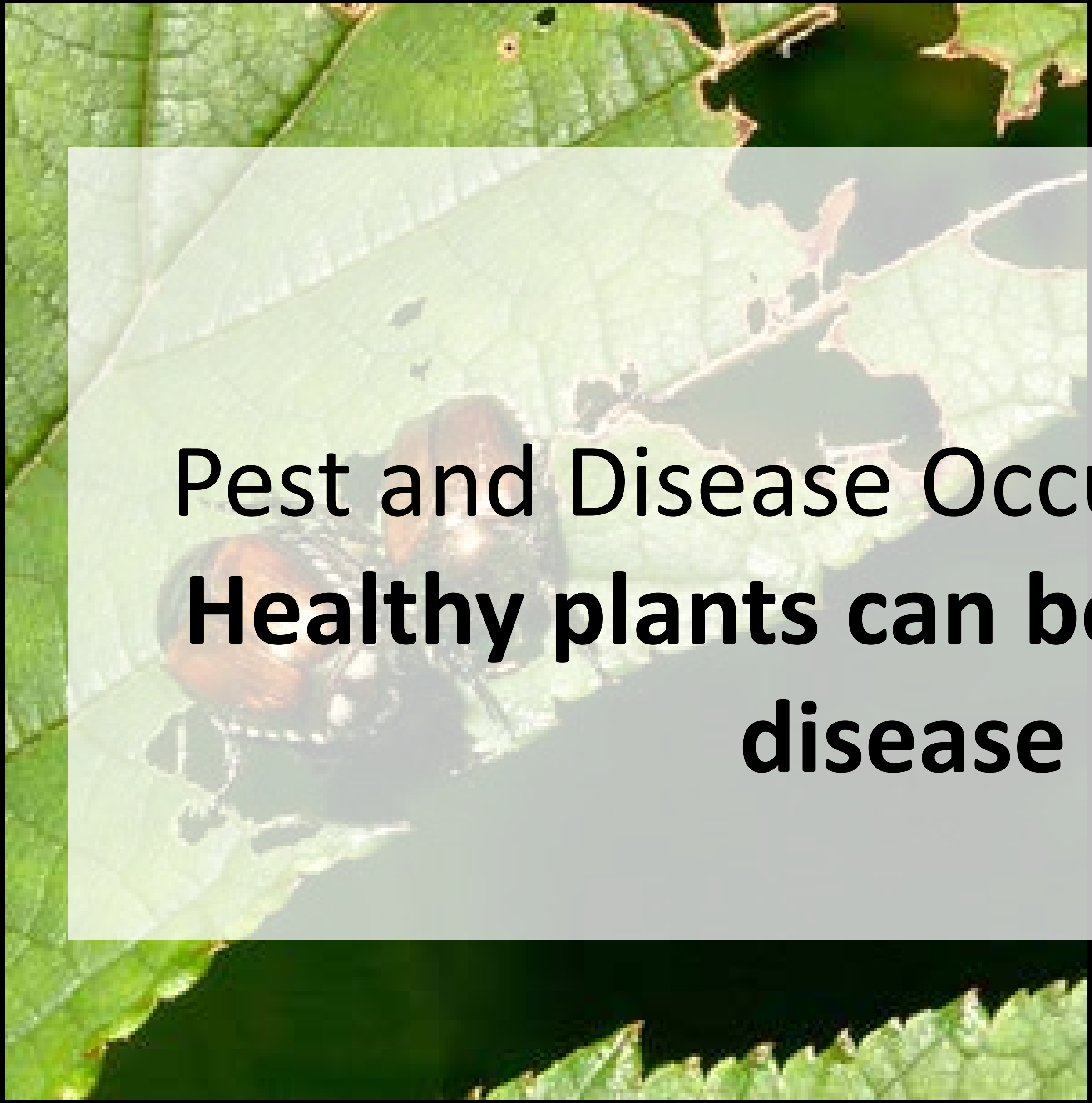
Acc. V Spot Magn Det WD Exp
30.0 kV 3.0 204x SE 23.5 3
100 µm

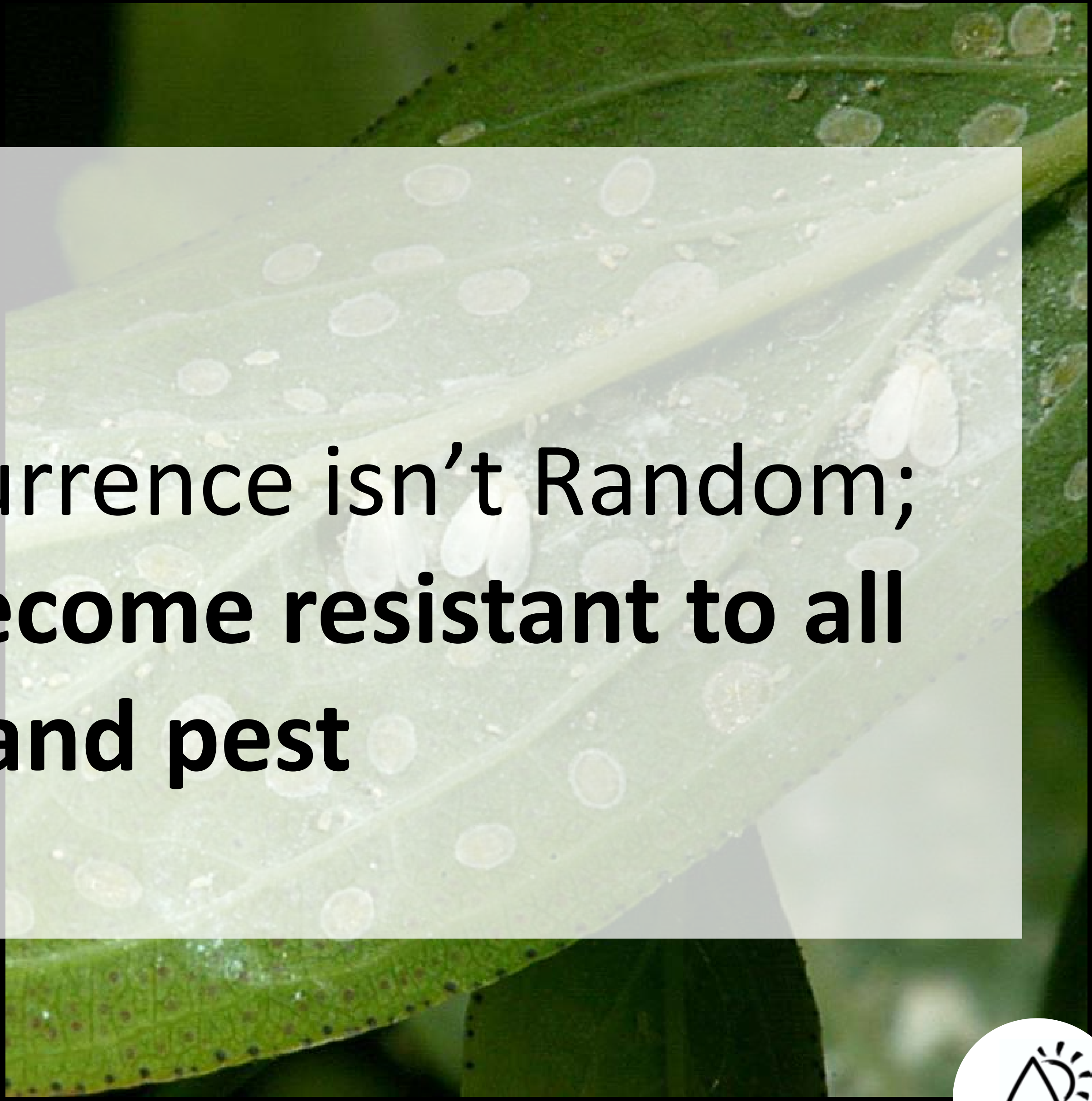

Acc.V Spot Magn Det WD Exp
25.0 kV 3.0 703x SE 7.0 3
50 µm




A Sound production
B Perception
Sound vibration
Sound vibration
: Transcriptional change
: Translational changes
Tension in xylem vessel


Brown planthopper
Bph3
OsLecRK1–3
PRR?
HAMPs?
DAMPs?
Immune signaling
Resistance
Immune signaling
Insect colonization and damage



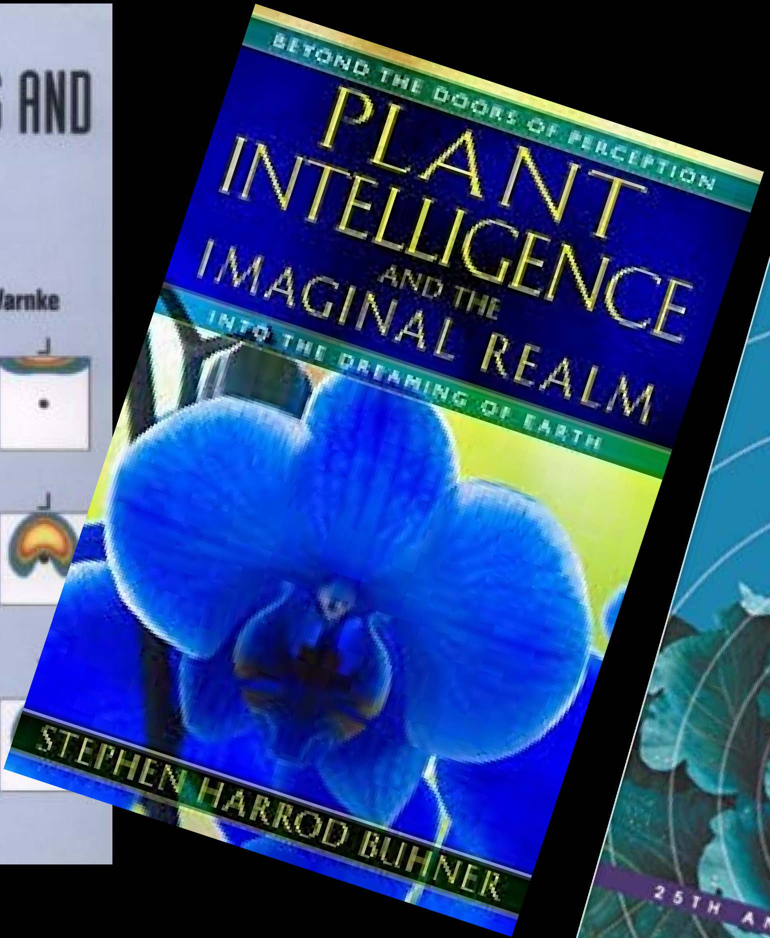


Pest and Disease Occurrence isn’t Random;

Healthy plants can become resistant to all disease and pest


EAT

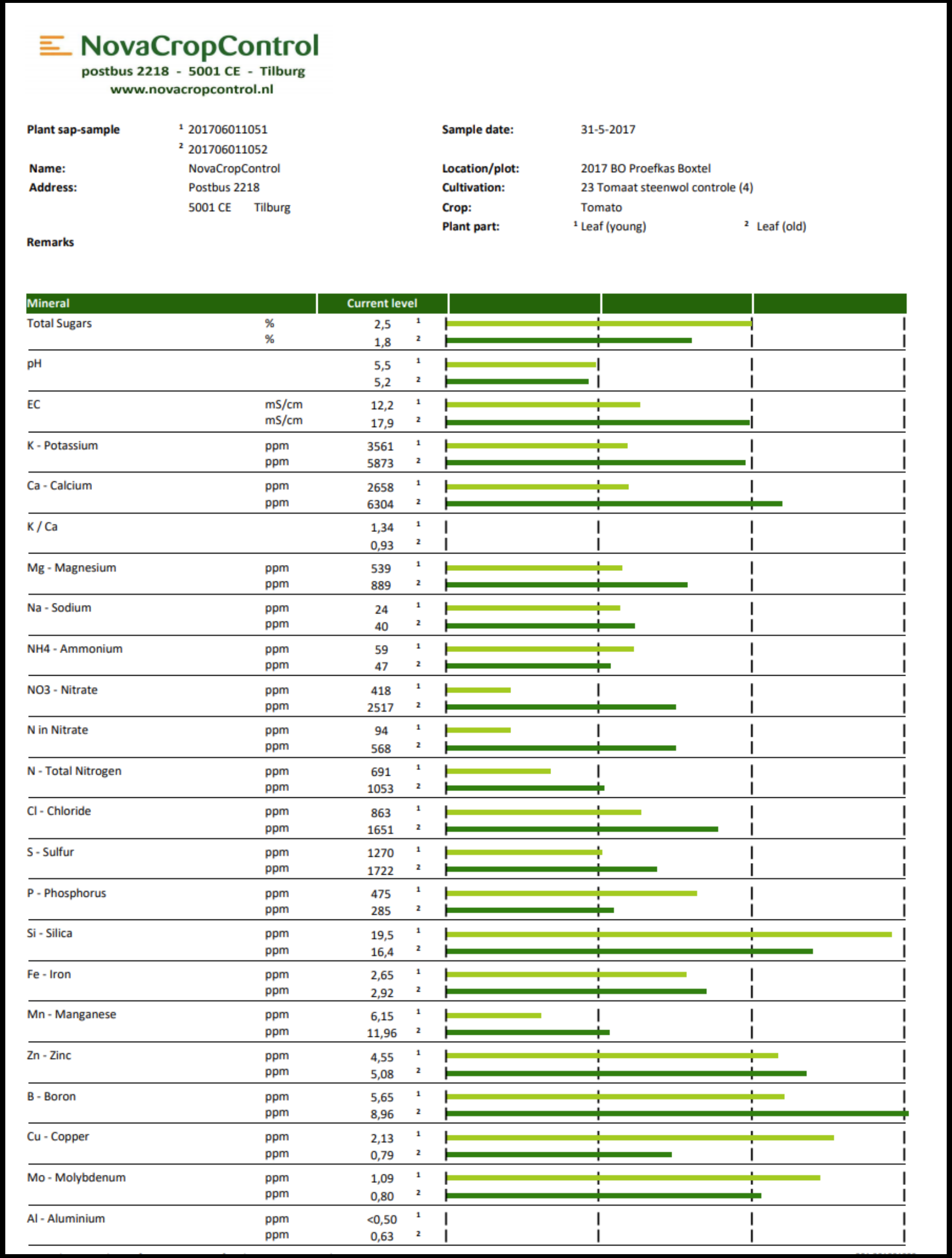
Further resources:




UGA5207026

Plant Sap Analysis

- **Equivalent To a blood Test**
- Measures usable nutrient
- Shows nutrient imbalance long before visible appearance

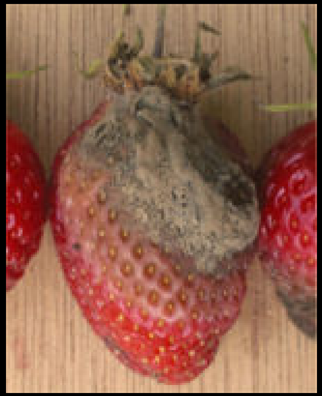


NovaCropControl
postbus 2218 - 5001 CE - Tilburg
www.novacropcontrol.nl

Plant sap-sample	[1] 201706011051 [2] 201706011052	**Sample date:**	31-5-2017
Name:	NovaCropControl	**Location/plot:**	2017 BO Proefkas Boxtel
Address:	Postbus 2218	**Cultivation:**	23 Tomaat steenwol controle (4)
	5001 CE Tilburg	**Crop:**	Tomato
		Plant part:	[1] Leaf (young) [2] Leaf (old)

Remarks

Mineral		Current level	
Total Sugars	%	2,5	1
	%	1,8	2
pH		5,5	1
		5,2	2
EC	mS/cm	12,2	1
	mS/cm	17,9	2
K - Potassium	ppm	3561	1
	ppm	5873	2
Ca - Calcium	ppm	2658	1
	ppm	6304	2
K / Ca		1,34	1
		0,93	2
Mg - Magnesium	ppm	539	1
	ppm	889	2
Na - Sodium	ppm	24	1
	ppm	40	2
NH4 - Ammonium	ppm	59	1
	ppm	47	2
NO3 - Nitrate	ppm	418	1
	ppm	2517	2
N in Nitrate	ppm	94	1
	ppm	568	2
N - Total Nitrogen	ppm	691	1
	ppm	1053	2
Cl - Chloride	ppm	863	1
	ppm	1651	2
S - Sulfur	ppm	1270	1
	ppm	1722	2
P - Phosphorus	ppm	475	1
	ppm	285	2
Si - Silica	ppm	19,5	1
	ppm	16,4	2
Fe - Iron	ppm	2,65	1
	ppm	2,92	2
Mn - Manganese	ppm	6,15	1
	ppm	11,96	2
Zn - Zinc	ppm	4,55	1
	ppm	5,08	2
B - Boron	ppm	5,65	1
	ppm	8,96	2
Cu - Copper	ppm	2,13	1
	ppm	0,79	2
Mo - Molybdenum	ppm	1,09	1
	ppm	0,80	2
Al - Aluminium	ppm	<0,50	1
	ppm	0,63	2



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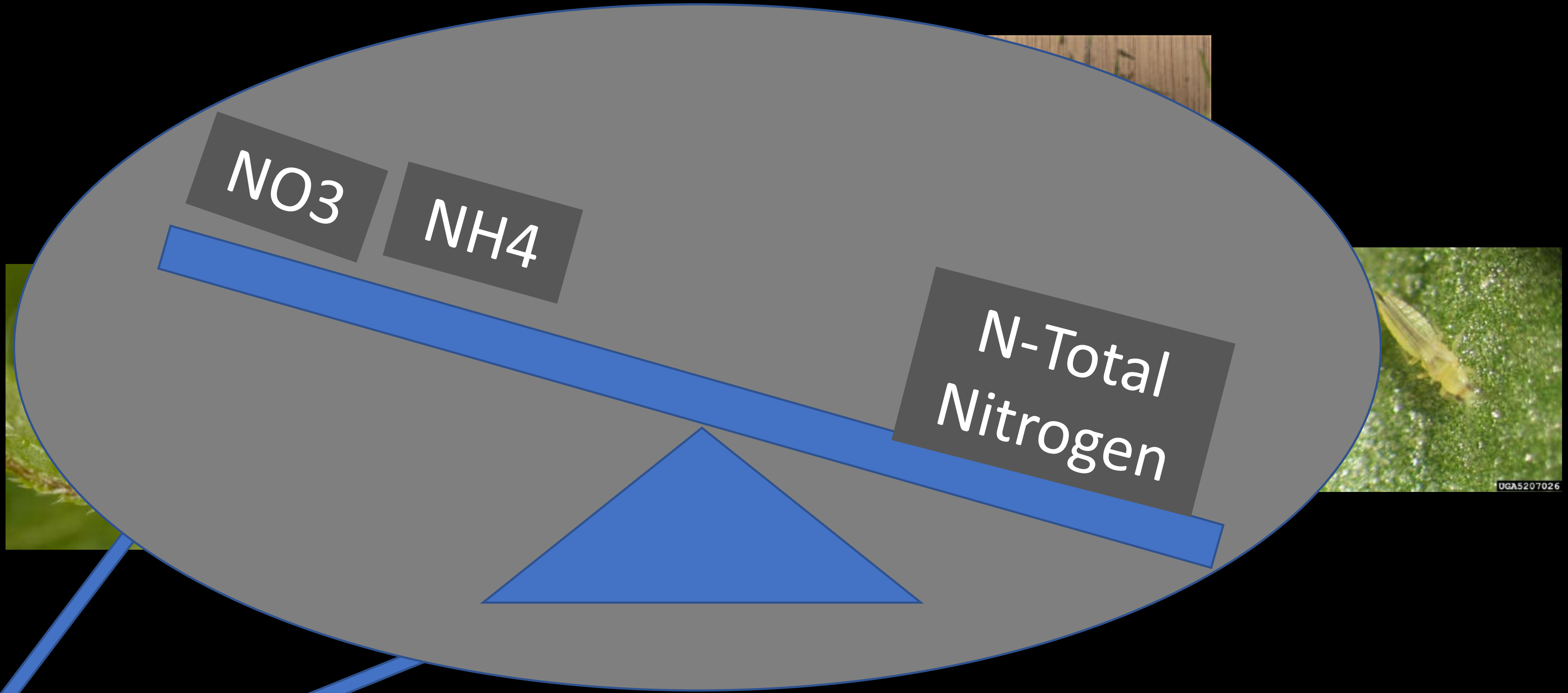

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Luxurious growth

Excess Nitrogen

Large weak cells

↑

Luxurious growth

↑

Excess Nitrogen

low sugar production (Brix)

↑

Large weak cells

↑

Luxurious growth

↑

Excess Nitrogen

Increase susceptibility for insects & fungal disease

↑

low sugar production (Brix)

↑

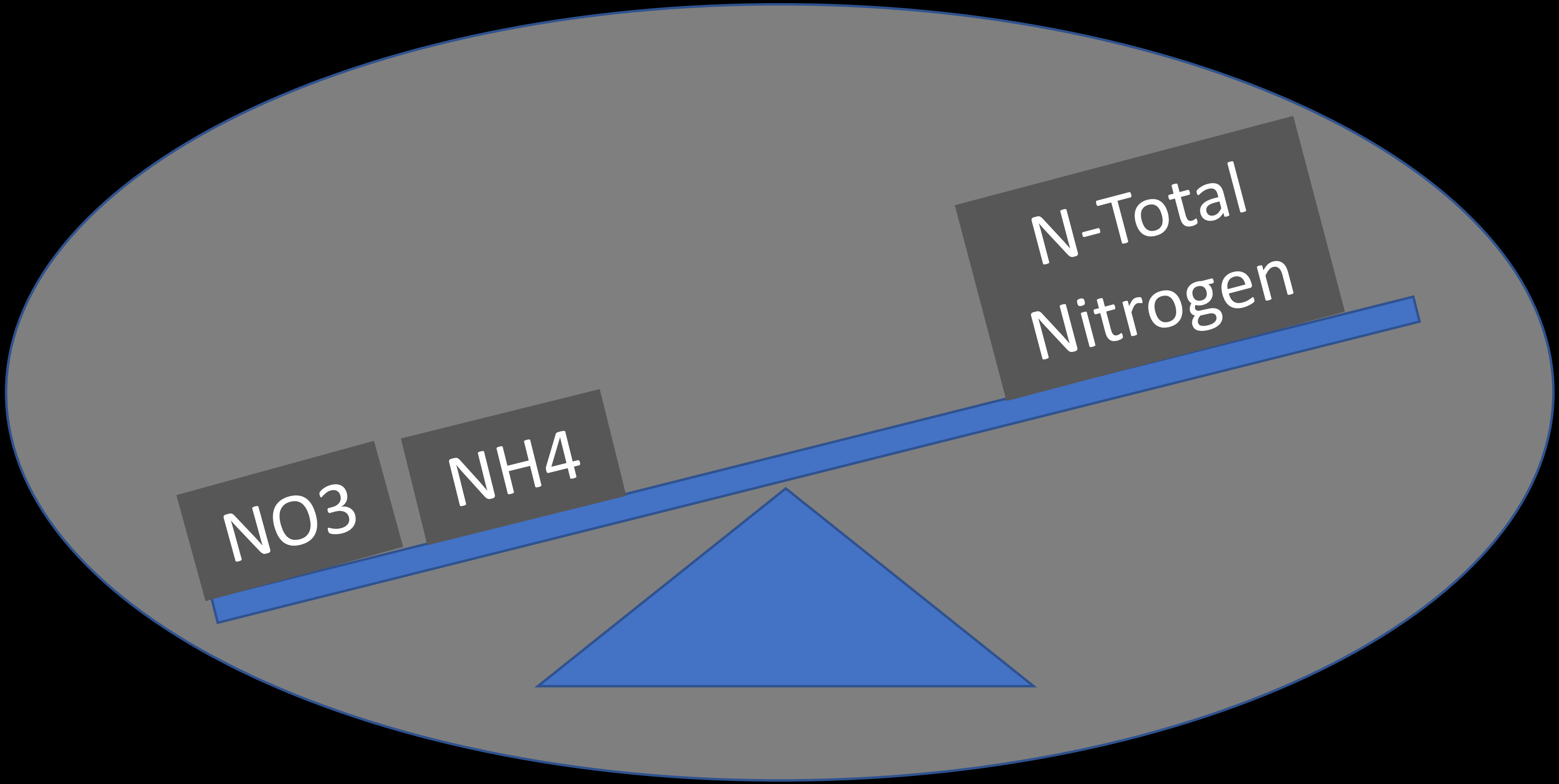
Large weak cells

↑

Luxurious growth

↑

Excess Nitrogen

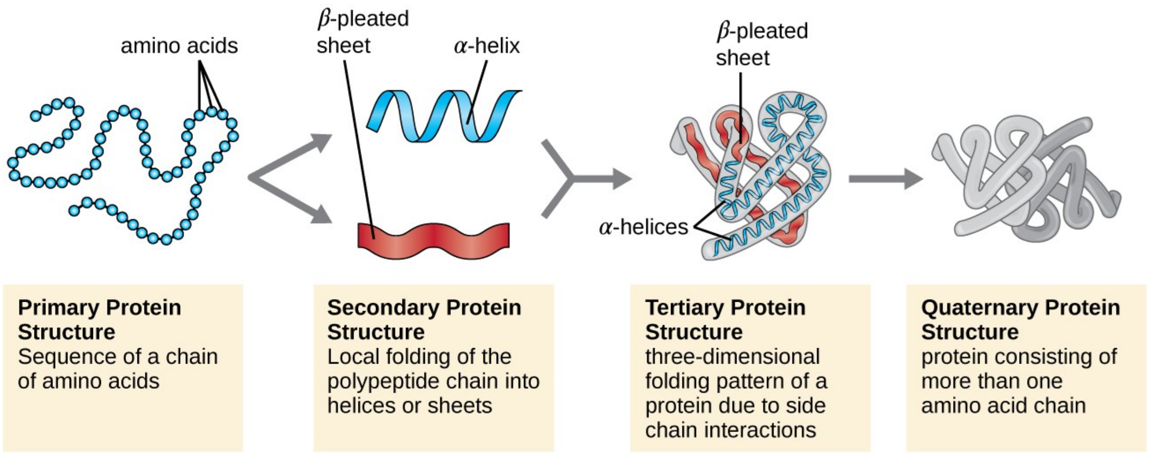


NH4 - Ammonium	ppm	5	1
	ppm	7	2
NO3 - Nitrate	ppm	185	1
	ppm	220	2
N in Nitrate	ppm	45	1
	ppm	65	2
N - Total Nitrogen	ppm	1120	1
	ppm	1250	2


EAT

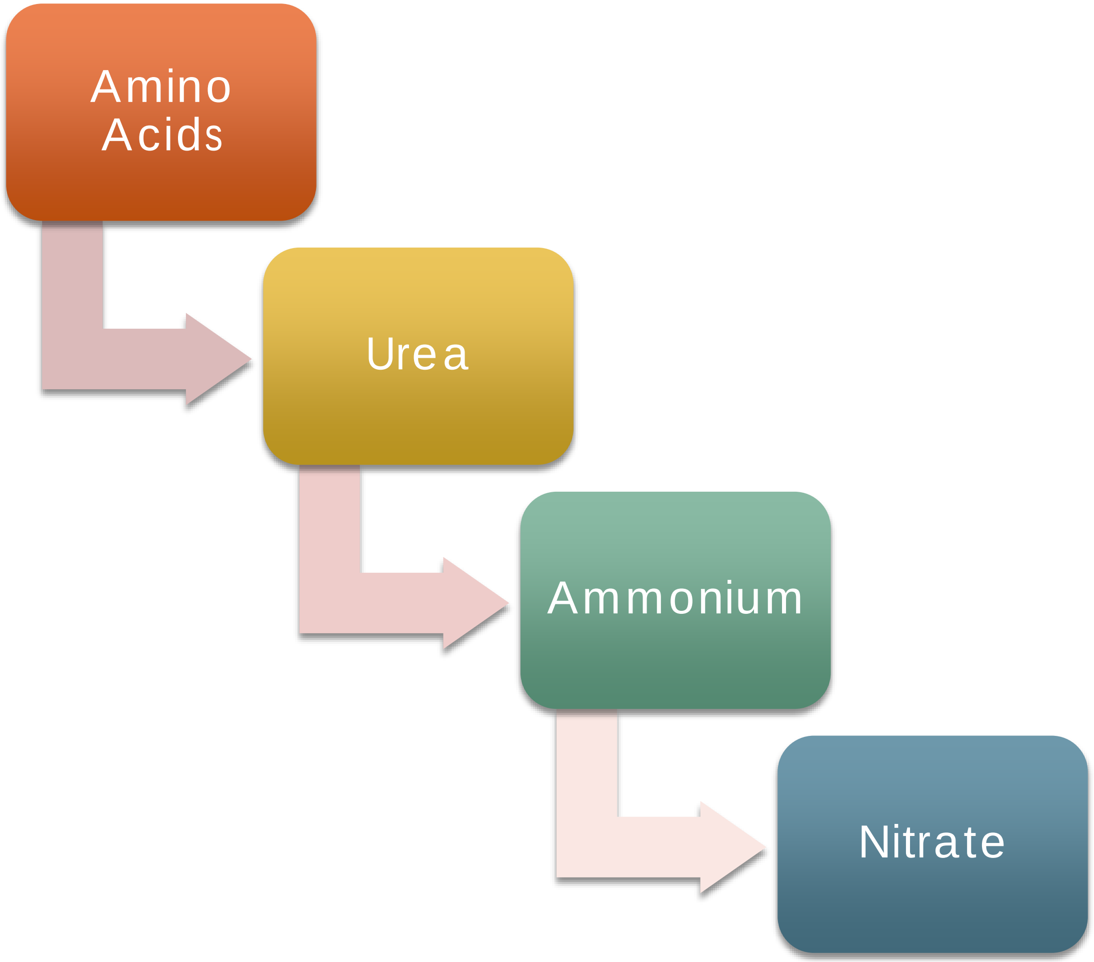
Complete Protein Synthesis

- The complete conversion of basic nitrogen compounds into complex proteins over a 24-hour period



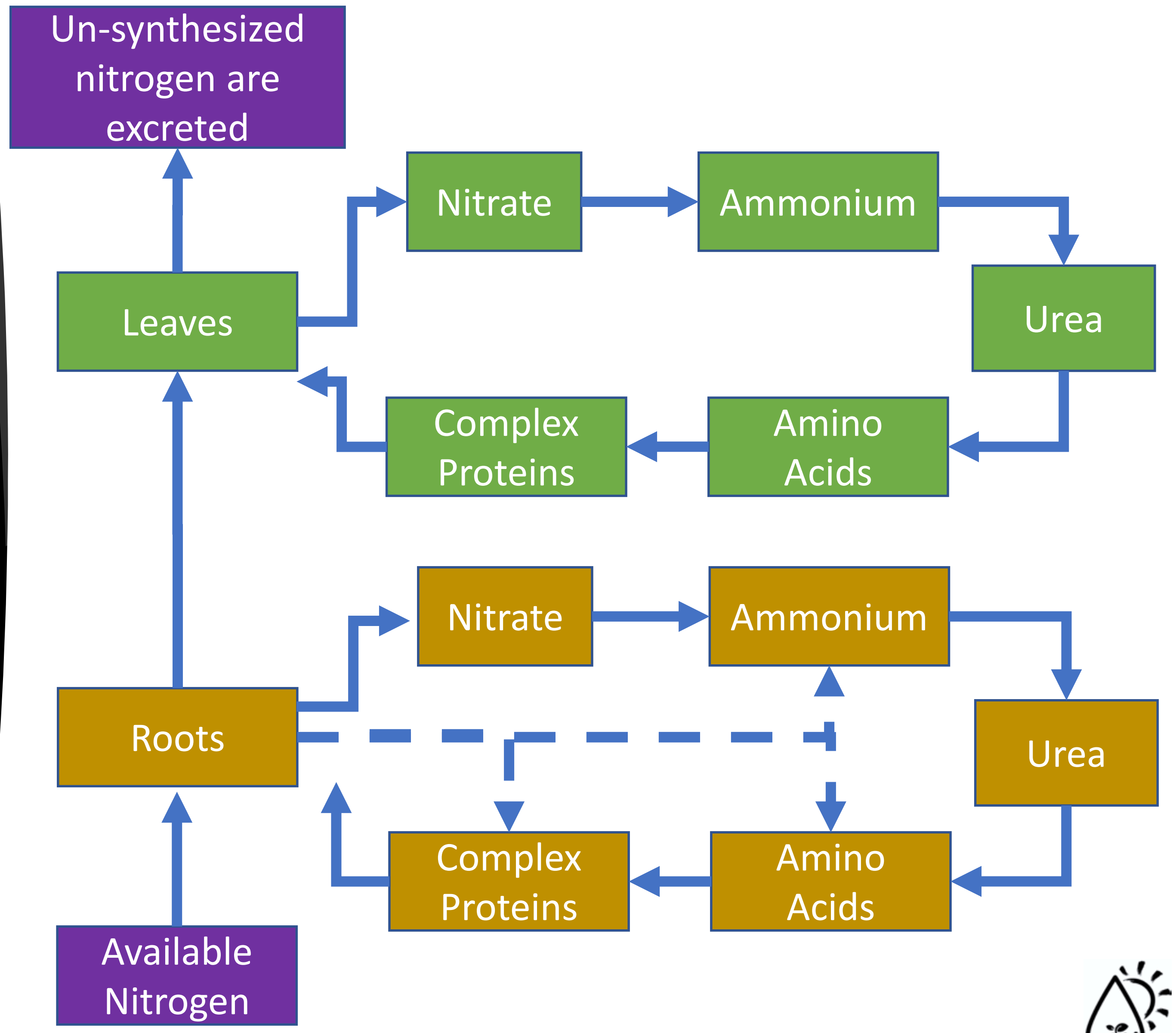
Plant Available Nitrogen

- Preferred sources in most to least preferred



Conversion of Nitrogen Inside Plants

- Ammonium can be processed directly in the root system; **Require Some Energy**
- Excess Nitrate must be transported to the leaves via the xylem for processing; **Requires Extra Energy**
- Amino acids, polypeptides, and complete proteins can be absorbed directly into roots and processed; **Energy Positive**
- **Each step requires enzymes and coenzyme factors**



Factors affecting Protein Synthesis

ENVIRONMENTAL STRESS

CARBOHYDRATE SUPPLY

AVAILABLE NUTRIENTS

Key Minerals for Complete Protein Synthesis

- Molybdenum- Coenzyme factor required for Nitrate Reductase
- Magnesium- Coenzyme factor required for multiple protein synthesis pathways
- Sulfur- Required for sulfur bearing amino acids (Methionine, cystine, and taurine)
- Boron- Increases resistance against soft-shelled insects
- *When stressed additional carbohydrates may be required for protein synthesis

Results of Complete Protein Synthesis

- Plant Sap Analysis will show ZERO Ammonium and Nitrate at the end of a 24-cycle.
- Free-nitrogen are converted into indigestible peptides and complete proteins.
- Plants will develop resistance to soft bodied insects including all insects with a larval stage, spider mites, aphids, whiteflies, fungus gnats, cabbage loopers etc.
- Plants develop some resistance to nematodes.

Summary of Prevention

1. Maximize Photosynthesis
2. Minimize Photorespiration
3. Support Protein Synthesis with proper nutrition

My Request To You

1. If you are **a farm struggling with pest and disease issues** and would like to work together to fix these issues

OR

If **you are a school or individual interested in Plant Sap Analysis**

Email Joe@regenaquaculture.com

2. Please give me your feedback on the talk today; did you enjoy it; are there things you wish for me to improve?

Take the survey at: **https://forms.gle/TKxoQbMSHAYAdMWb6**

Thank You!

Questions?

For more information, follow me on

Or contact me directly at Joe@regenaquaculture.com.