What’s new at Plant products

PLANTPRODUCTS®

Dave Ritchie
Plant Products
Oct 2025



Agenda

- New Building in Leamington
- New Products
- Technology- Entomatic
- Chemical Resistance Presentation
- New Vegetable Seed Varieties (Nunhems-BASF)
- Strawberry diseases and pests

New Head Office and Warehouse in Leamington







Opening: Fall 2026

New Products



- AquaGro L with PsiMatric — https://plantproducts.com/ca-en/products/aquagro-l-with-psimatric-10-l
- Compass 50WG — https://plantproducts.com/ca-en/products/compass-50wg-454-g-1
- NoFly Bio Insecticide — https://plantproducts.com/ca-en/products/nofly-bio-insecticide-912-g
- Intra Hydro Pure — https://plantproducts.com/ca-en/products/intra-hydro-pure-20-l-1
- Intra Multi-Des GA — https://plantproducts.com/ca-en/products/intra-multi-des-ga-20-l-2

New Products



- Intra Eco Shield — https://plantproducts.com/ca-en/products/intra-eco-shield-1-l-1
- Lalguard M52 250ml — https://plantproducts.com/ca-en/products/Lalguard-m52-od-250-ml

Technology- New Bio Dispensers

Entomatic



Entomatic Handheld



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ENTOMATIC™ HANDHELD DISPENSER



biobest.com

ENTOMATIC™ HANDHELD DISPENSER

Components of a versatile solution for all growing systems





INTRODUCING THE ENTOMATIC™ HANDHELD

HOW DOES IT WORK?



Gentle distribution of BCA's

Entomatic™ generates a gentle airflow to allow beneficial insects and mites to move through the system without being harmed.

Highly accurate dosing

The highly accurate dosing rotator ensures a continuous and homogeneous supply of beneficial insects and mites. You can set your dose rate on the control unit.

Versatile use

Entomatic™ Handheld can be used to blow over the surface of a crop and to deliver on the spot in linear crops.

Ergonomic design

The design is made to be manoeuvrable in different crop circumstances. And the hip belt in combination with the entostick enables user to reach high places comfortable and ergonomically.

WORKING WITH THE ENTOMATIC™ HANDHELD

Filling and refilling

- Hopper 3L
- Optimum filling 1,5 to 2L
- Lid can be used as a stand for easy and quick filling





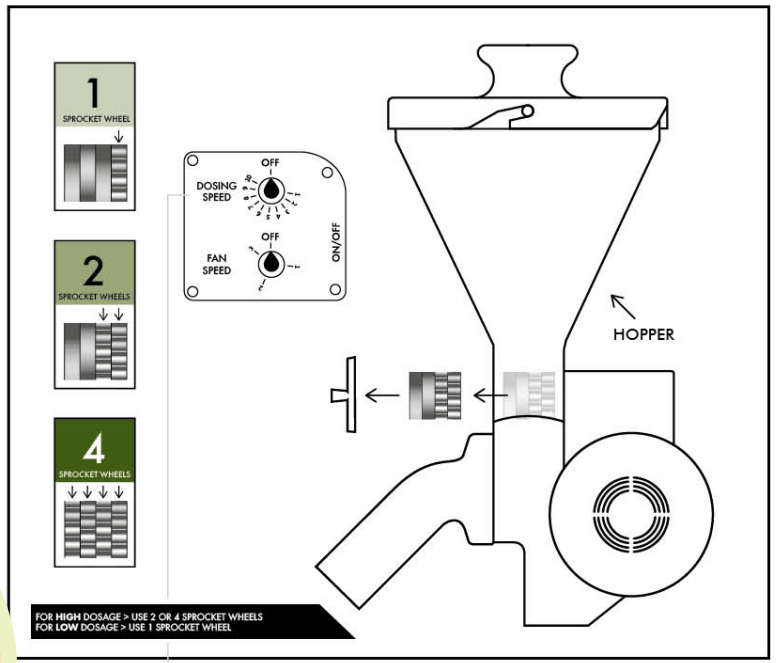
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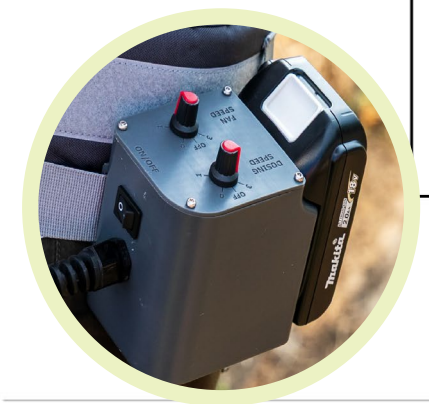
One bag of 5 litres used in 2 fillings, leaves you some space to mix a bottle of *Persimilis*.

WORKING WITH THE ENTOMATIC™ HANDHELD

Setting your dose rate

3 CONFIGURATIONS POSSIBLE





TABLE

1 SPROCKET WHEEL | 2 SPROCKET WHEELS | 4 SPROCKET WHEELS

Mites/m²		Amblyseius-System				Amblyseius-Breeding-System
		5L - 250000	5L - 125000	5L - 500000	5L - 800000	5L - 125000
Dosage achieved	10	2	3			3
	20	3	7			5
	40	4	3			3
	50	8	5	3		5
	100	5	4	8	6	4
	150	7	7	3	7	7
	250	5	9	6	3	9
	300	7		7	4	

Mites/m²		Phytoseiulus-System	Montdorensis-System		Andersoni-System
		1L - 20000	5L - 125000	5L - 250000	1L - 25000
Dosage achieved	4	1	1		2
	6	2	2		3
	10	2	3	1	5
	15	8	4	2	7
	20	9	8	3	4
	25	4	9	2	5
	30	6	4	4	6
	40	7	6	8	8
		DOSING SPEED	DOSING SPEED	DOSING SPEED	DOSING SPEED

WORKING WITH THE ENTOMATIC™ HANDHELD

Wide distribution or row distribution



When using the snout, we target linear distribution



When **not** using the snout, we target broad distribution

BENEFITS OF ENTOMATIC™ HANDHELD

Uniform and fast distribution of mites and insects in your crop

Improved BCA protection compared to manual distribution

Highly versatile and easy to operate device, can be used in most greenhouse crops

Entomatic handheld™ is **adaptable to different growing systems** and can be used where large machines cannot reach

Entomatic handheld™ is **designed to be easy to use**, your personnel will like the ergonomics

Entomatic handheld™ is **low maintenance**





HOW TO USE THE ENTOMATIC™ HANDHELD

Introducing the Entomatic™ Handheld: Precision pest control at your fingertips

Entomatic Bio Dispensers

Entomatic Handheld

https://youtu.be/J-Uk07CPVyM?si=XHphGJIRLk7b6Qmo



Entomatic Machines in Different Configurations

https://youtu.be/je-KHu0E1nY?si=3y24oYzJrpQR0lPP



MANAGING CHEMICAL RESISTANCE IN KEY PESTS: APHIDS, SPIDER MITES & THRIPS

Active Ingredients, Chemical Groups and Best Practices

Dave Ritchie

Plant Products

July 29, 2025

Agenda

1. Why resistance management matters
2. Common Pests & Challenges
3. Know the average life cycle
4. AI resistance for Aphid
5. AI resistance for Spidermite
6. AI resistance for Thrips
7. Thrips: What can we do to avoid resistance?
8. Best Practices for resistance management.
9. Practical IPM integration
10. Key Takeaways
11. New Information



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Why Resistance Management Matters

- Repeated use of the same chemical class selects for resistant pest populations.
- Resistance can lead to control failures, crop losses, and higher input costs.
- Integrated Pest Management (IPM) is critical for sustainable control.

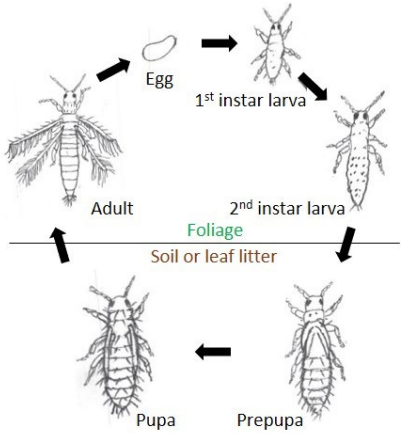
Common Pests & Challenges

Pest	Key Issues
Aphids	Rapid reproduction, virus transmission, multiple generations.
Spider Mites	High reproduction, short life cycle, quick resistance development.
Thrips	Small size, cryptic feeding, vector for viruses.



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Know the average life cycle



Key factors

Temperature & humidity: Warmer temps generally speed up lifecycles.
Host plant & nutrition: Good nutrition shortens development time.
Control timing: Understanding these windows helps with timing biological controls or sprays.

Pest	Average Lifecycle (egg to adult)	Notes
Green Peach Aphid (Myzus persicae)	18-25 days; can be 10-12 days in greenhouse environment	Can reproduce both sexually and asexually; multiple generations/year
Two-Spotted Spider Mite (Tetranychus urticae)	7–14 days	Highly temperature dependent; faster in hot, dry conditions
Western Flower Thrips (Frankliniella occidentalis)	12–18 days	Pupate in soil or sheltered sites
Thrips parvispinus (Thrips parvispinus)	13-14 days	Similar to WFT but slightly slower; sensitive to temperature

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Active Ingredients for Aphids

AI	IRAC Group	Resistance Concerns
Intercept Imidacloprid	4A	High resistance risk globally
Tristar Acetamiprid	4A	Cross-resistance with other 4As
Beleaf Flonicamid	29	Some documented resistance
Altus Flupyradifurone	4D	Some local resistance reported
Ference Cyantraniliprole	28	Overuse can lead to resistance
Kontos Spirotetramat	23	Resistance in some aphid species
Rycar Pyrifluquinazon	9B	Resistance can happen when over-used



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Active Ingredients for Spider Mites

AI	IRAC Group	Resistance Concerns
Avid Abamectin	6	High resistance potential
Floramite Bifenazate	20D	Resistance reported in greenhouses
Forbid Spiromesifen	23	Some resistance developing
Tetrasan Etoxazole	10B	Resistance seen with repeated use
Fujimite Fenpyroximate	21A	Resistance possible
Shuttle Clofentezine	10A	Cross-resistance possible

Active Ingredients for Thrips

AI	IRAC Group	Resistance Concerns
Success Spinosad	5	High resistance risk in greenhouses
Ference Cyantraniliprole	28	Some emerging resistance
Avid Abamectin	6	Cross-resistance with mites possible
Delegate Spinetoram	5	Cross-resistance with spinosad
Pylon Chlorfenapyr	13	Effective but at risk





Parvispinus thrips spray schedule example

Table 1. Control product rotation suggestions for *Thrips parvispinus* management in Ontario greenhouses

CROP STAGE (pest stage)	Application/Option 1	Application/Option 2	Application/Option 3	Application/Option 4	Application/Option 5
Cutting Dips (adults & larvae)	**Application notes:** Dip at receipt and again before potting. Oils tend to be more tolerated after cuttings have rooted; always check for phyto before using and adjust rate as necessary. Only WP formulations of microbials are registered for cutting dips.				
Chemicals	5ml/L (0.5%) Kopa soap + 2.5 g/L BotaniGard WP	5ml/L Kopa soap (**OR** 0.1-0.5 ml/L of Suffoil - X) + 2.5 g/L BotaniGard WP			
Propagation (larvae) - Sprays that are safe for cuttings (e.g. avoids Pylon, Kontos)	**Application timing, 25-35 °C:** Every 5 days (generation time is faster at high temps.; want to target emerging larvae). **Application notes:** 1 application of each chemical should be sufficient until potting. Over-application in propagation can lead to resistance issues.				
Chemicals	**Success (spinosad) + Lalguard M52 (0.5-1mL)**	**Ference (cyantraniliprole) + Lalguard M52 (0.5-1mL)**	**Rimon (novaluron) + Lalguard M52 (0.5-1mL)**	**Ventigra (afidopyropen) + Lalguard M52 (0.5-1mL)**	**Rycar (pyrifluquinazon) + Lalguard M52 (0.5-1mL)**
Chemical Group(s)	5 + NC	28 + NC	15 +NC	9D + NC	9B + NC
Other pests controlled	Other thrips species	Some control of aphids, whitefly	Whitefly	Aphids	Aphids
Production (adults & larvae) - Softer Chemistries (somewhat compatible with TSSM/whitefly bios)	**Necessary Additions:** Add or substitute **Lalguard M52**, **Bioceres EC** or **BotaniGard EC** every 3-7 days (tank mix with chemicals if allowed). EC formulations are more effective for Parvispinus.				
Chemicals	**Rimon (Novaluron)**	**Ference (cyantraniliprole)**	**Success**	**Suffoil-X (1%)**	**Rycar**
Chemical Group	15	28	5	NC	9B
Persistence	Unknown	Safe for most bios except delphastus	Most bios: 2 wks (up to 8 weeks on predatory mites for thrips)	When dry	Unknown
Notes - Parvispinus control	Good control of larvae	Suppression of larvae only	Adult and larval control	Suppression of adults, larvae	Fair control of adults & larvae
Other pests controlled	Whitefly	Some control of aphids, whitefly	Other thrips species	Aphids, mealybug, mites	Aphids, whitefly
Production (adults & larvae) - Chemical Control Options	**Application notes:** Base applications on significant pest pressure/plant damage. Overuse of chemicals at this point will lead to resistance near finish, when the use of adulticides is critical. **Application timing, 20-25 °C:** 5 to 7 days apart. **16-18 °C:** 10-14 days apart (products take longer to work at cooler temps., but generation time is also slower.)				
Chemicals	**Kontos (Spirotetramat) - drench**	**Success (Spinosad) + Avid (Abamectin)**	**SpearT (GS-omega/kappa-Hxtx-Hv1a)**	**Pylon (Chlorfenapyr)**	**Rycar (Pyrifluquinazon)**
Chemical Group(s)	23	5 + 6	32	13	9B
Persistence	Less toxic to bios as a drench	Success- 2 wks (up to 8 wks for thrips predatory mites); Avid - 8 wks	Unknown	3 weeks	Unknown
Notes - Parvispinus control	Good control of larvae	Good adult and larval control	Fair control of adults & larvae	Good adult and larval control	Fair control of adults & larvae
Other pests controlled	Aphids, whitefly	Spider mite	Spider mite, whitefly	Spider mite	Aphids, whitefly
Finishing / Clean Up (adults & larvae)	**Application notes:** Pesticides selected because they work quickly and generally target adults and larvae. Persistence/safety with bios not a consideration at this point. **Application timing, 25 °C+:** 5 to 7 days apart.				
Chemicals	**Success (Spinosad) + Avid (Abamectin)**	**Rimon (Novaluron)**	**Pylon (Chlorfenapyr)**	**Lalguard Met52**	
Chemical Group	5	15	13	NA	
Notes - Parvispinus control	Good control of adults and larvae	Good control of larvae	Good control of adults and larvae	Fair control of adults and larvae	

*check phytotoxicity on labels before spraying
** check number of applications allowed per crop

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Thrips: What can we do to avoid resistance?

- **Start early**, with preventative sprays using oils (SuffoilX) & biorationals (Lalguard, Botanigard, NoFly) at the beginning of production. This helps suppress thrips once the pesticide residues from cuttings wear off - typically around 13 weeks. Continue to use oils and biorationals for preventative sprays throughout the crop cycle.
- **Dip cuttings:** Cuttings that are susceptible to Parvispinus, should be dipped in SuffoilX or BotaniGard to help reduce thrips populations early on.
- **Add beneficial nematodes** (Steinernema carpocapsae), S. carpocapsae have shown to be particularly useful in propagation areas.
- **Add Atheta** (aka Dalotia) – a soil dwelling predators that will help against Parvispinus pupae.
- **Add Orius** as a preventative (if not using biorationals) once the pesticide residues grow out of the plants (around 13 weeks)

These controls are supportive tools that can reduce pest pressure and potentially delay the need for more expensive chemical sprays like Pylon or Success.



Best Practices for Resistance Management



- ✅ Rotate chemicals with different IRAC groups.
- ✅ Use threshold-based applications, not calendar sprays. (Monitoring, Scouting)
- ✅ Integrate biological controls (nematodes, predatory mites, parasitoids).
- ✅ Incorporate cultural practices (sanitation, weed control).
- ✅ Add Bio-rationals, soaps and oils into program. (Botanigard, Lalguard, Kopa, SuffoilX, NoFly etc.)
- ✅ Record keep & monitor pest populations and resistance trends.

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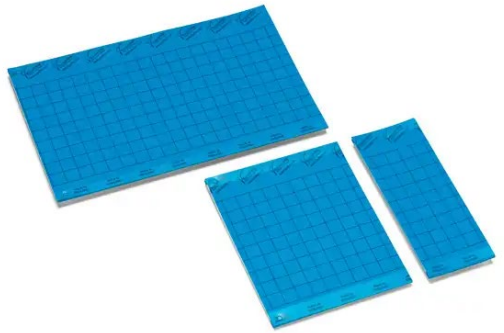




Practical IPM Integration

- Scout weekly with sticky traps and plant inspections.
- Use Bio-rationals weekly to avoid pest pressure from spiking
- Release beneficials and nematodes preventatively.
- Spot-treat hotspots when needed.
- Keep records of applications and resistance shifts.







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Key Takeaways/Overview

Resistance is inevitable but manageable.

Know your active ingredients and modes of action.

Rotate wisely and combine chemical, cultural, and biological tools.

Always follow label recommendations and local guidelines.

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New Information as of Early October from Leamington Growers

1. **Cucumbers targeting WFT**

- 3.5 acre farm applied LALGUARD M52 3 times at 1.5L/1000L at a 7 day interval
- 1st app 50% reduction, second 50% reduction, third time also 50% reduction which resulted in a 90% total reduction in western flower thrips
- Customer was able to cut Swirskii and reduce overall IPM budget. Previously botanigard was not working
- April application

2. **Mini Peppers targeting Echino Thrips**

- 30 ac mini pepper farm, applied twice at 1L/1100L, to 5 acres with heavy pressure at a 6 day interval
- All stages of echino thrips present, 5 or even 10+ thrips/leaf
- Applied twice
- 1st app 25% reduction, 2nd app there was another 50-75% reduction
- Total reduction of pest population was 75-85%
- Late august applications

3. **Tomatoes targeting WFT pupae**

- > 50 acres of tomatoes on two different sites in the US
- 1.5 L/1000 L concentration applied to base of plants to hit pupae weekly or bi-weekly during WFT outbreaks

This method avoids direct application to foliage in stressful periods but still helps with reducing pressure



Nunhems Vegetable Seeds & Plant Products

BASF
We create chemistry

nunhems®

High & Low Wire Cucumbers

+12 CGMMV HR varieties

Long English & Minicukes





High Tech Tomatoes

+25 ToBRFV resistant varieties

TOV, Roma, Cocktail, Cherry, Grape.



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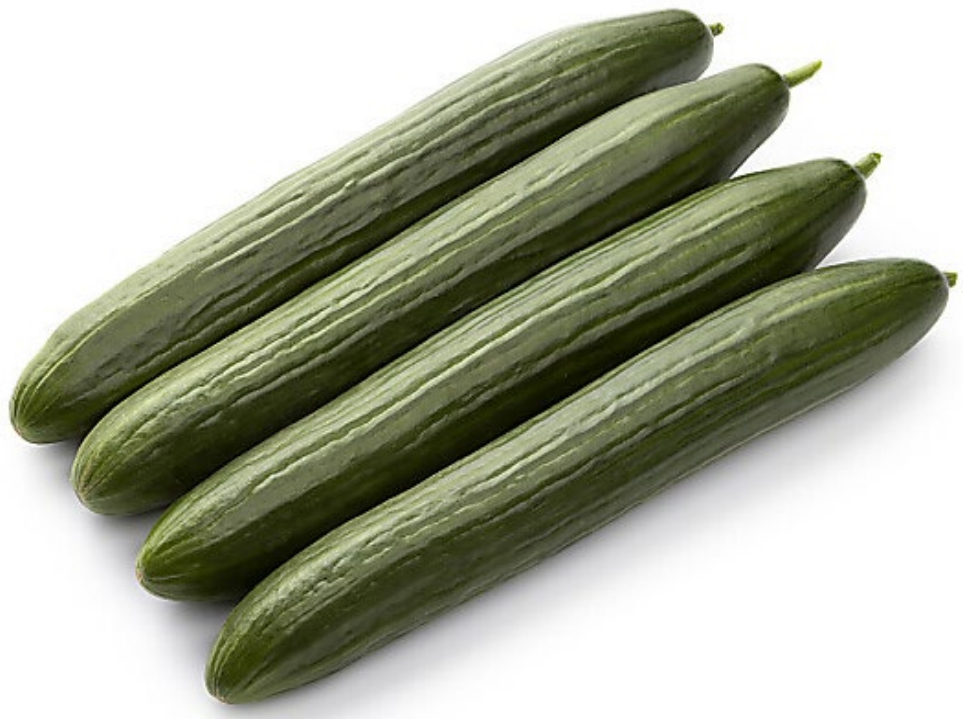
Long English Cucumbers:

Commercial

- Dunavin
- Sequence
- Seiber (High Wire)

Trial 2 - Precommercial

- NUN-63731 HW – Fall/Winter
- NUN-63761 HW – Fall/Winter + LIT



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DUnavin

Quality Meets Speed



- Strong Plant
- Early and Fast-to-produce variety
- Versatile variety suitable for both Low Wire (LW) and High Wire (HW) systems
- Balanced plant type which translates into good production speed, vigor and strength
- Strong against abortion

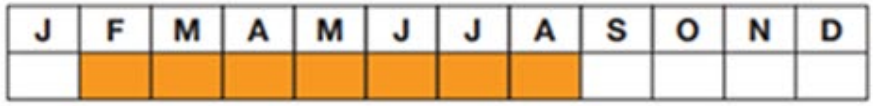
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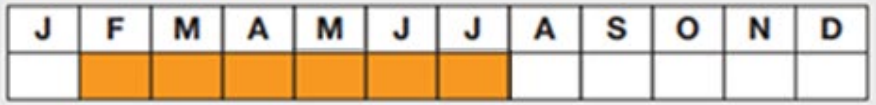
DUnavin

DATA & INSIGHTS	
Cultivation System	Low Wire/High Wire
Plant Type	Strong generative, good against abortion
Gradings	S: 29%, M: 63%, L: 8%
High Resistance (HR)	CGMMV
Resistance (R)	PM

Plant Schedule LW



Plant Schedule HW



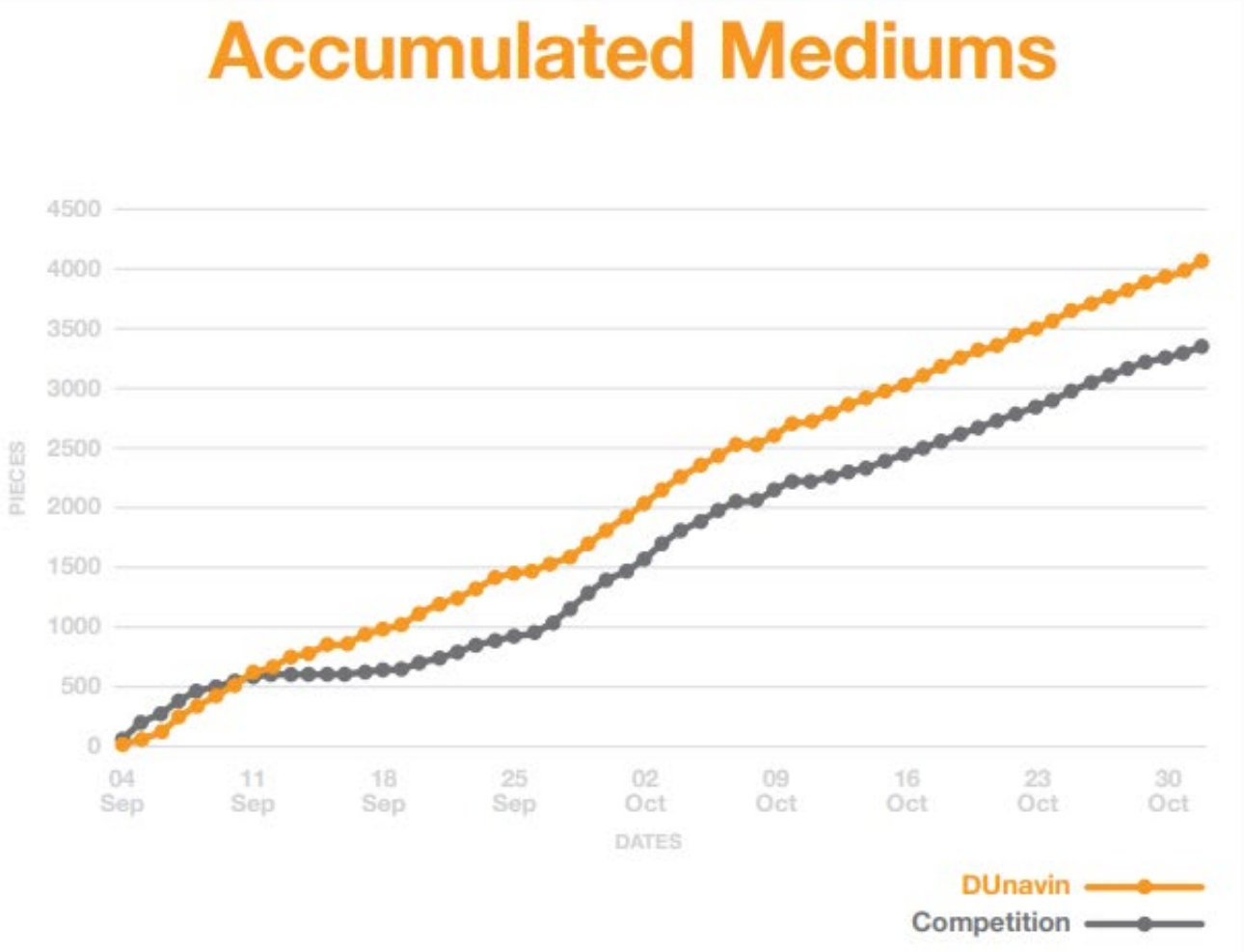
- Consistently High Yields And Good Grading
- Good Fruit Quality
- CGMMV High Resistance
- Well Balanced Plant Type
- Early to Mature
- Fast Lateral Transition

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DUnavin





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SEquence

Quality Meets Vigor



- Resilient variety perfect for the HW spring-summer cycle
- Its versatility permits reduce labor by de-leafing in the head
- High production potential
  - Bonus: it can be used pinched for short crops*

Consistently High Yields And Good Grading

Tolerant In Tough Conditions

Good Resistance Package

DATA & INSIGHTS	
Cultivation System	High wire
Plant Type	Strong; vigorous; good against abortion
Grading	S: 40% M: 55% L: 5%
High Resistance (HR)	Cca, CCu, CGMMV, Px

Plant Schedule *(Non-lighted greenhouses)*

J	F	M	A	M	J	J	A	S	O	N	D
■	■	■	■	■	■	■	■	■			

Plant Schedule *(Lighted greenhouses)*

J	F	M	A	M	J	J	A	S	O	N	D
		■	■	■	■						

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Mini Cucumbers:



Commercial

- Beesan
- Beebond



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Beesan

“Classic Never Dies”



- Efficient and excellent endurance
- High vigor and consistency, ideal for short-medium crops
- Ideal for Low Wire cultivation, with good results under HW.

DATA & INSIGHTS	
Areas of Adaptability	North America; Northern Europe
Fruit Shape	Cylindrical
Fruit Skin	Medium Ribbing
Fruit Length	14 – 16 cm
Fruit Color	Dark Green
Internod Length	Medium Internods
Laterals	Medium Laterals
Openness	Medium Open
Plant Abortion	Low Abortion
Fertility	Very Fertile
Intermediate Resistances	Px, CVYV, CMV, Cca

RESISTANCE KEY: Px: *Podosphaera xanthii* (Powdery Mildew), CYVY: Cucumber Vein Yellowing Virus, CMV: Cucumber Mosaic Virus, Cca: *Corynespora cassiicola* (Target Spot)

High Premium Yield Fruit Quality: Shelf Life, Crunchiness & Taste

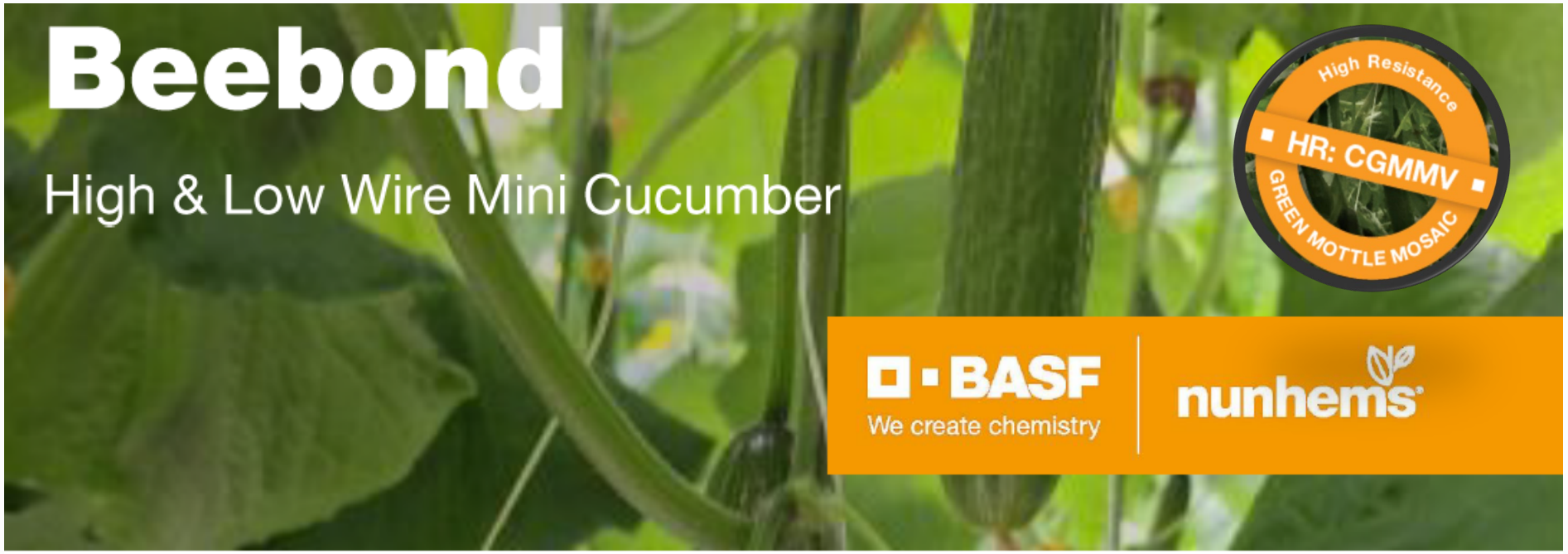
Long Cycles and Endurance

Yield Consistency

Tolerance to Extreme Climates

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Description:

Beebond (NUN 37007) is a generative, fast producing variety with consistent setting and yield potential. The plant type is compact and open, allowing easier harvesting. This variety is able to perform in high wire or traditional growing systems and has reliable lateral production. Beebond can produce multiple fruits per node, with high selectivity and a fast-ripening speed. Fruits are nicely shaped and uniform. Beebond has high resistance against CGMMV, Px and CMV.

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Beebond

New Generation of Performance



- Generative and fast producing variety
- Consistent setting and Yield potential
- Its plant type helps easier harvesting
- Great performance in HW environments, with good feedback in LW
- Multi fruits per node, with high selectivity.

High Production Potential

Suitable Under Artificial Lights

Fast fruit production

Generative laterals

Open plant type

DATA & INSIGHTS	
Cultivation System	High Wire/ Low Wire
Season	Spring, Summer, Autumn, Winter
Plant Type	Generative
Fruit Weight	Approximately 80 – 110 grams
High Resistance (HR)	Px, CGMMV, CMV

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Beebond

New Generation of Performance

High Resistance
HR: CGMMV
GREEN MOTTLE MOSAIC

Total Production (In kilos)								
High Wire		Grower 1*	Grower 2*	Grower 3*	Grower 4**	Grower 5**	Grower 6**	Average
Lit	Competitor's variety	100%	100%	100%	100%	100%	100%	100%
	Beebond	99%	106%	102%	96%	104%	97%	101%
Unlit	Competitor's variety	100%	100%	100%	100%	100%	100%	100%
	Beebond	102%	95%	100%	114%	100%	106%	103%

*Trials conducted in 2024-2025 in Leamington, Ontario, Canada



High Wire Crop Plant Schedule

J	F	M	A	M	J	J	A	S	O	N	D

Low Wire Crop Plant Schedule

J	F	M	A	M	J	J	A	S	O	N	D

RESISTANCE KEY: Px: *Podosphaera xanthii* (Powdery Mildew), CGMMV: Cucumber Green Mottle Mosaic Virus, CMV: Cucumber Mosaic Virus

Lighted
Unlighted

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Tomatoes:

Commercial

- Culturion
- Purion

Trial 2 - PreCommercial

- NUN 09429



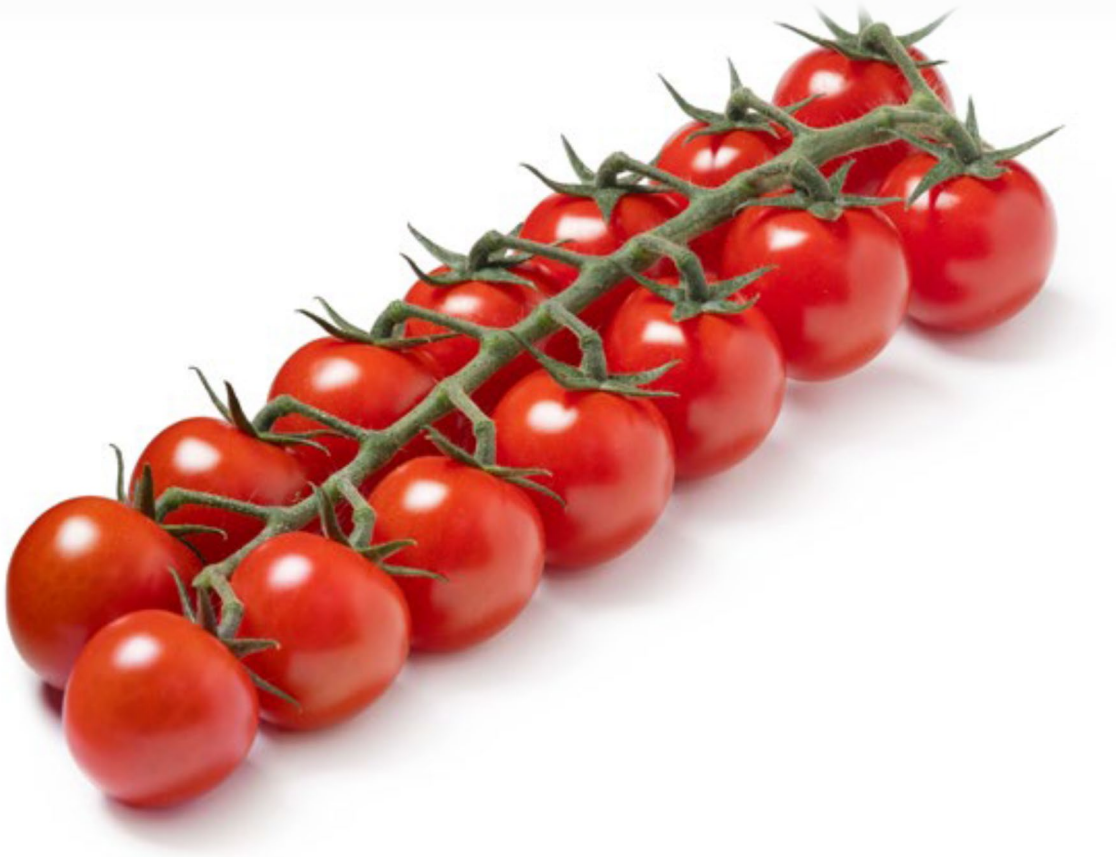
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Culturion

Variety Description

- Dual Cherry for Loose or OTV
- Strong, vigorous and compact plant
- AFW 16 to 19gr
- Long trusses
- High Yielder
- Deep red fruits
- Excellent Fishbone



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Culturion

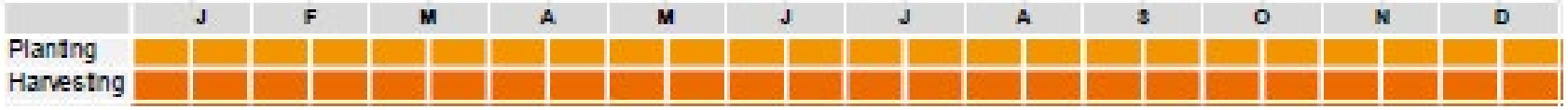
Key Benefits

- Good resistance to ToBRFV
- High Yield
- Premium OTV presentation
- Consistent Fruit weight
- High Brix/Acid ratio

Resistances

- IR: Ma
- HR: ToMV:0-2, Fol:0-1, For, Pf:A-E
- R: ToBRFV





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Purion

Variety Description

- Generative and compact plant
- Suited for Lit and non lit
- AFW 10 to 13gr
- High number of split trusses
- Dimpled fruit shape
- Good flavor



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Purion

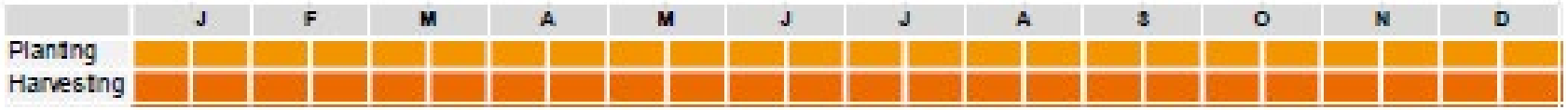
Key Benefits

- Good resistance to ToBRFV
- Shiny and firm fruits
- Stable fruit size
- High production

Resistances

- HR: ToMV:0-2 , For, Pf:A-E
- R: ToBRFV





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NUN 09429

Variety Description

- Strong and vigorous plant
- Lit and non lit
- AFW 160 to 180gr
- Flat cluster shape
- Nice round fruits
- Strong setting in winter crops



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NUN 09429

Key Benefits

- Good resistance to ToBRFV
- High Yield
- Great truss presentation
- Uniform fruits

Resistances

- IR: Va, Pn
- HR: ToMV:0-2, Fol:0-1, For, Pf:A-E
- R: ToBRFV



	J	F	M	A	M	J	J	A	S	O	N	D
Planting												
Harvesting												

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PATHOGEN (SCIENTIFIC NAME)	ENGLISH COMMON NAME	CODE	RACES / STRAINS
VIRUS			
Tomato mosaic virus	Tomato mosaic	ToMV	0, 1, 2
Tomato torrado virus	Tomato torrado	ToTV	–
Tomato spotted wilt virus	Tomato spotted wilt	TSWV	0
Tomato yellow leaf curl virus	Tomato yellow leaf curl	TYLCV	–
Tomato brown rugose fruit virus	Tomato brown rugose fruit virus	ToBRFV	–
BACTERIA			
Pseudomonas syringae pv. tomato	Bacterial speck	Pst	–
Ralstonia solanacearum	Bacterial wilt	Rs	–
Xanthomonas campestris pv. vesicatoria	Bacterial spot	Xcv	–
FUNGUS			
Alternaria alternata f. sp. lycopersici	Alternaria stem canker	Aal	–
Passalora fulva (ex Fulvia fulva) (ex Cladosporium fulvum)	Leaf mold	Pf (ex Ff)	A, B, C, D, E
Fusarium oxysporum f. sp. lycopersici	Fusarium wilt	Fol	1, 2, 3
Fusarium oxysporum f. sp. radicis-lycopersici	Fusarium crown and root rot	For	–
Leveillula taurica	Powdery mildew	Lt	–
Oidium neolycopersici (ex Oidium lycopersicum)	Powdery mildew	On	–
Phytophthora infestans	Late blight	Pi	–
Pyrenochaeta lycopersici	Corky root rot	Pl	–
Stemphylium botryosum f. sp. lycopersici Stemphylium lycopersici Stemphylium solani	Gray leaf spot	Sbl/Sl/Ss	–
Verticillium albo-atrum Verticillium dahliae	Verticillium wilt	Va/Vd	1
NEMATODE			
Meloidogyne arenaria			

Strawberry : Pests and Diseases





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Strawberries – Pests and Diseases

Pests:

- Thrips, Broadmite and Spidermite
- Lygus and Whitefly
- Caterpillars
- Aphids
- Spotted Wing Drosophila (SWD)

Diseases:

- Powdery Mildew
- Botrytis
- Mucor (Fruit Rot)
- Phytophthora Crown & Root Rot (Red Stele)
- Fusarium Wilt
- Black Root Rot
- Neopestalotiopsis



Thrips, Broadmite & Spidermite Control



Thrips & Broadmite Control

Weekly treatments of loose Cucumeris(100-250/m2) and Swirskii (125/m2)

Input Orius for high pressure situations - 2-10/m2 for minimum of 2-3 weeks



Spidermite Control

Weekly Persimilis applications during periods of infestation - 10-20/m2 for a minimum of 3 applications

During high peaks or under long periods of artificial light - Apply 2 blanket applications of persimilis per week. This will help to close the generational gap in the persimilis lifecycle, speeding up control.



Lygus & Whitefly Control

Lygus

- Perform flower cluster checks

Thresholds (15 cluster checks)

Low –Average 3 lygus per cluster

High – Average 5 lygus per cluster

- Remove all weeds indoors and around greenhouse perimeters
- Use sticky cards for early detection and mass trapping
- Targeted pesticides: Beleaf, Altus, Assail 70WP(outdoor)

Whitefly

- Eretmix - .5-2/m2
- Swirskii (Thrips program) typically takes care of young instars







Caterpillars

Leafroller, loopers, Armyworms, cutworms





Aphids

- Strawberry Aphid causes the biggest issues as colonies exist deep in the crown, restricting parasitoids and predators.
- Aphelinus or Lacewing could work well in hotspot or Mothers as preventative, but are relatively slow at controlling a widespread outbreak.

Targeted Pesticides:

- Exirel/Ference
- Beleaf
- Altus/Sivanto Prime









Spotted Wing Drosophila

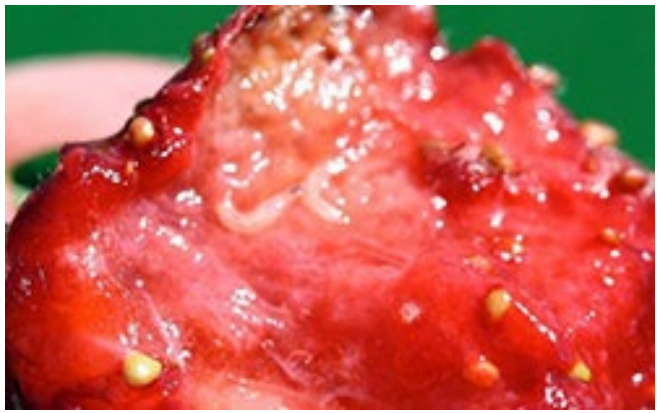
Mass Trap- Use traps baited with attractants. Use a sticky card close by for easy monitoring.

Pick fruit as it ripens and move it quickly to cold storage.

Dispose of cull piles daily

Remove alternate foods sources

Nets of fine mesh (1 mm) can be used to exclude flies









Currently no registered pesticides for greenhouse strawberries

Outdoor labels:

- Exirel
- Delegate
- Success



Control of Powdery Mildew

Small white powdery colonies appear on the undersides of leaves. The spores continue growing until the entire leaf is covered and edges of the leaves roll up.

Purple reddish blotches appear on the upper and lower surface of leaves

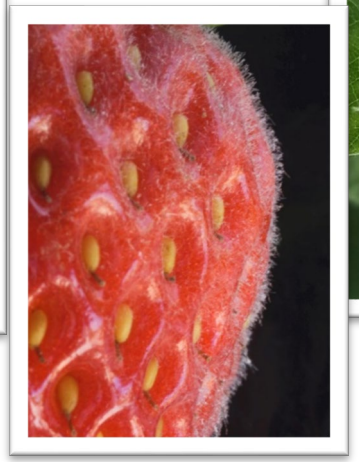
Strawberry plants are highly susceptible to powdery mildew, a short interval between treatments has proven successful, no more than 7 days apart

Infected flowers produce deformed fruit or no fruit at all. Immature fruits become hardened, dry and typically have raised seeds.

Targeted Pesticides:

- Actinovate
- Milstop
- Problad
- Regalia Maxx & RX
- Timorex Gold
- Agroteck Vaporized Sulphur
- Vegol Crop Oil
- Cueva
- Palladium









Botrytis

Management

- Pick fruit as it ripens and move it quickly to cold storage.
- It is critical that all infected fruits and clusters are removed from plants, troughs and floors frequently, as this is a main source of inoculum.
- Dispose of cull piles daily.
- Proper air flow through plant spacing and the use of horizontal fans to increase air circulation and facilitate drying of pla nt surfaces.
- Minimize free water on plant surfaces and standing water on floors
- Disinfect pruning tools

Targeted Pesticides:

- Actinovate
- Diplomate 5SC
- Problad
- Regalia Maxx
- Rootshield HC,
- Timorex Gold
- Oxidate 2.0,
- Biotak,
- Prestop WG,





Outdoor Labels:

- Folpan 80WDG
- Maestro 80 WSP
- Senator 50SC
- Captan 80WSP



Mucor (Fruit rot)

How is it identified?

- Discoloration on fruit and water-soaked spots.
- Nearly mature and mature fruit infected become very soft.
- Fruit will begin to wrinkle and collapse.
- Extensive leaking of fruit juices caused by the fungus secreting enzymes. Liquifies the entire fruit.
- Under high humid conditions the infected fruit becomes covered with a coat of tough/wiry mycelium and black sporulation at the tips of long spore-bearing structures.





Mucor (Fruit rot)
What is it and how does it spread?

- Collective name for different types of fungi (several Mucor species). In the group of fungi called Zygomycetes.
- Can invade fruit through the slightest wound or injury.
- Persistent in agricultural environments.
- Pathogens can spread due to colonizing on dead and decaying plant material.
- Workers who handle fruit that is leaking can transmit the fungus to healthy fruit.
- Pathogens tend to become more active at 65 F or higher.







Mucor (Fruit Rot)

Control?

- No products registered yet! Information is lacking for Strawberry crops.
- Preventative hygiene and sanitation measures.
- Minimizing contact of fruit with soil and water.
- Minimize injury and wounds to fruit during handling.
- Remove dead and dying plant material.
- Often confused with Botrytis and Rhizopus.
- Products known for being used – Switch, Captan and Pristine.



Phytophthora Crown & Root Rot (Red Stele)

- A reddish dark brown, spongy rot inside the strawberry crown. Roots attached to the infected crown appear black at the point of attachment.
- Fungus attacks both the roots and crown
- Interior core or stele of the root appears red surrounded by healthy white cortex tissue.
- Once introduced, red stele is able to persist for years in soil, even when strawberry plants are absent.

Targeted Pesticides:

- Phostrol
- Ridomil Gold 480SL

Outdoor Products: Aliette WDG







Fusarium Wilt

- Soil-borne fungal disease
- Main Identifying symptom of Fusarium wilt consists of wilting foliage, plant stunting, and drying or dying of older leaves, while the youngest leaves in the center of the plant often remain green and alive.
- Symptoms usually first appear well after plants are established. Plants bearing heavy fruit loads or subjected to stress often show the most severe symptoms.
- Plants can eventually collapse and die completely.
- When internal tissues of plant crowns are examined, tissue appears dark to orange-brown. Internal tissues of the main roots are typically not discolored.







Black Root Rot

Black root rot is a general name for several root infections, which can cause similar symptoms. These pathogens are usually implicated together at the infection site, and include following:
Pythium spp., *Fusarium* spp., *Rhizoctonia* spp.,

Main symptoms of Black Root Rot:

- Blackish brown discoloration on the roots and crown
- Plant stunting and small, unhealthy leaf growth
- Plants can collapse rapidly, especially in warmer weather

Scouting Notes

- Black root rot should not be confused with the natural darkening of healthy roots which occurs as the roots age. By fruiting time, most of the older roots on healthy plants have a black surface, but the core of the root is white, and healthy feeder roots are present.





Treatment of Black Root Rot

Rhizoctonia

- Prestop WG

Other potential products:

- Medallion (turf, ornamentals)
- Actinovate (Ornamentals)
- Captan 80 WSP (ornamentals)

Pythium

- Actinovate
- Prestop WG
- Rootshield Plus G Biofungicide
- Rootshield Plus WP
- Phostrol

Other Potential Products:

- Previcur

Fusarium

- Asperello T34 Biocontrol
- Rootshield Plus G Bio Fungicide
- Rootshield Plus WP

- Other potential Products:
- Medallion
- Ridomil



Neopestalotiopsis

What is it and how is it Spread?

Neopestalotopis is a fungal pathogen that can be identified mainly from foliar symptoms initially.

For disease to occur, the environment needs to be favorable for infection.

Neopestalotiopsis sp. prefer warm and humid conditions. Ideal temperature for growth is 25°C, but temperatures that range from 15 to 30°C are still favorable for growth and sporulation.

Moisture from high humidity and free water are favorable for infection.

Spores from Neopestalotiopsis sp. are primarily spread via water splashing from overhead irrigation, free water and working when plants are wet.



How is it Neopestalotiopsis Identified?

01

Neopestalotiopsis species can infect all parts of the strawberry plant – fruit, leaves, petioles, crown and roots.

02

Small leaf spots appear with a light center and slightly darker border that expands and becomes irregular in shape.

03

Requires genetic (DNA) characterization for identification. Other species are beginning to be seen today and further investigation is needed.









Fruit Symptoms of Neopestalotiopsis

- Fruit lesions are initially small (2-4mm), light brown and irregular.
- Lesions can grow and form a black coating which are black fruiting bodies of the fungus
- Eventually, the whole fruit may be rotted and mummified.
- Crown and root rot symptoms are similar to what would be seen Anthracnose or Phytophthora species.



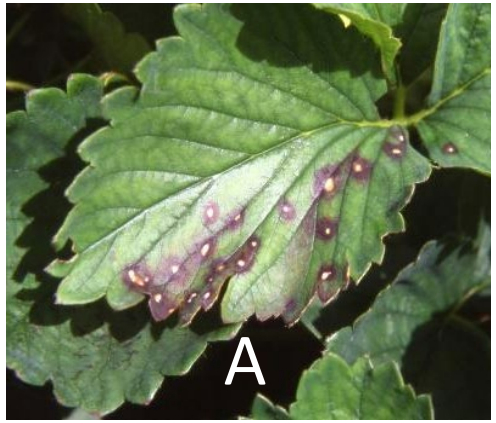


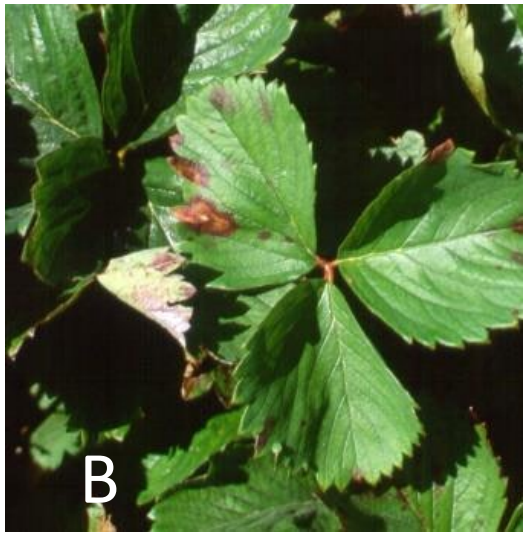




What Neopestalotiopsis can it be confused with?

- The leaf blighting phase of this disease has been often confused with common leaf spot (Mycosphaerella fragariae), the difference is common leaf spot will have a tan center with a darker/purple outer zone.(A)
- Another commonly confused disease is leaf scorch (Diplocarpon earlianum, Marssonina fragariae) but leaf scorch lesions are mainly dark without a tan center.(B)
- Phomopsis leaf blight (Phomopsis obscurans) can often be confused especially when the lesions are larger, but Phomopsis lesions are more reddish-purple lesions with a dark outer zone.(C)
- Of these diseases, only the new Neopestalotiopsis sp. can cause fruit rot if infection is severe.









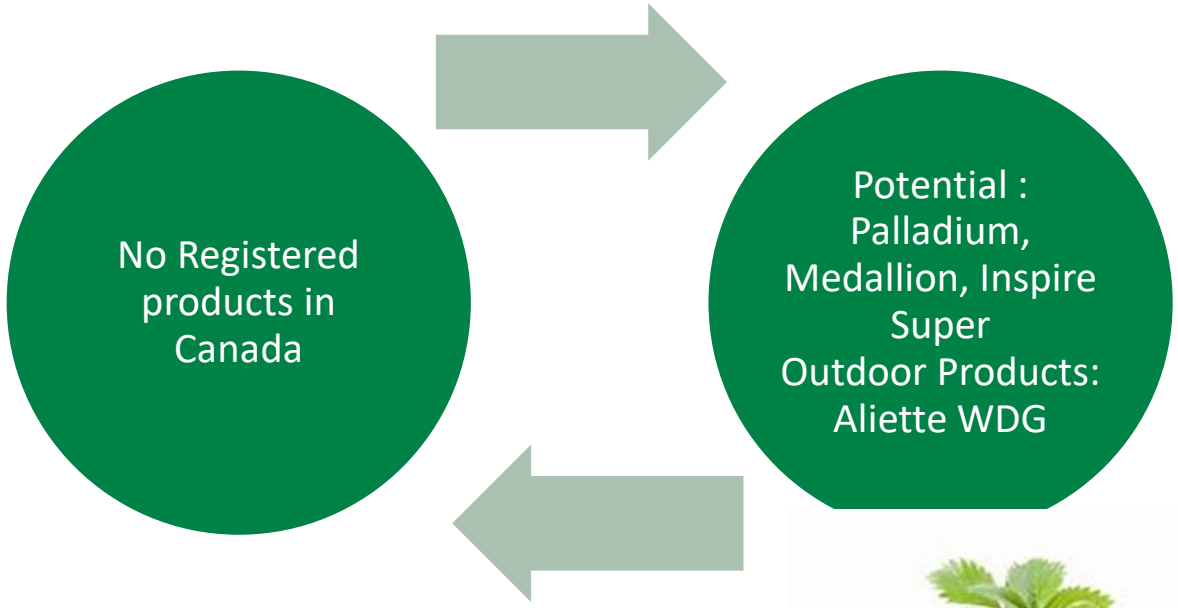
Neopestalotiopsis

Management - Testing!

- First off, test plants to identify what disease you are dealing with.
- Continue regular testing, at least monthly. In most situations, Neopestalotiopsis is not always a stand alone disease.
- Be sure you are targeting the right disease

Management- Cultural Control

- Climate !
- Remove infected debris, and decaying plant material
- Increase airflow
- Maintain optimal irrigation practices
- Minimize free water





Solutions

- Accurate disease diagnosis
- Choosing cultivars that have some disease resistance to minimize chances of being infected with a complex disease profile.
- Use well drained media and avoid over watering
- Starting clean at propagation and maintain crop hygiene throughout production
- Minimizing plant stress
- Prevention is key: With a very limited amount of tools at our disposal, Pre-colonizing the plant root system with beneficial microbes will boost plant vigor and will help keep the harmful diseases at bay





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