



UK PARSNIP PRODUCTION

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UK PARSNIP PRODUCTION



Agenda

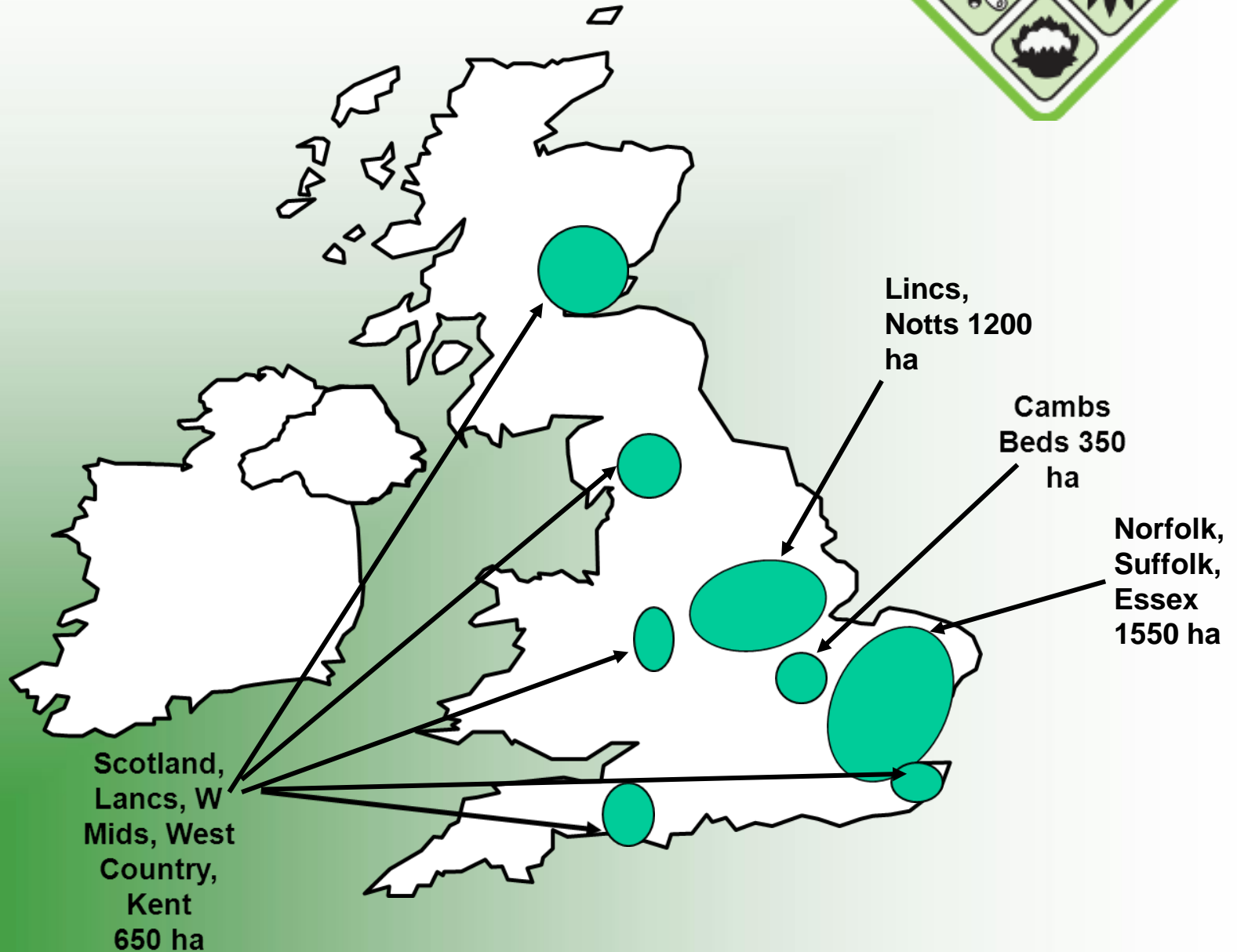
- Introduction
- Rotational planning
- Production cycle
- Storage
- Future?

UK Production



	PARSNIPS
Hectares	3800
Saleable tonnes	120,000
Pre-pack	55%
Wholesale (Markets)	20%
Processing	20%
Export	5%


UK Parsnip Production




Parsnip Production Sequence



Production	Month																								
	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May			
1st Early																									
2nd Early																									
Maincrop																									
Late																									

 = Drilling

 = Harvest

Parsnip Production Specification



Specification	Pre-Pack	Processing
Crown diameter (mm)	35-70	50-90
Root length (cm)	15-18	<20
Root colour	White to cream-white	NA
Defect tolerances	2% (varies with contract)	<20% mild defects (varies with contract)
Comments	Smooth skin, minimal root tip bleeding. No soil trapped within the crown	Sugar levels may be applicable.

Parsnip desirable traits



- Strong foliage
- Vigorous
- Resistance to disease (i.e. Powdery mildew/*itersolinia*)
- Bayonet shape
- Shallow crown
- Large core (strength)
- Good internal and external colour
- Smooth skin
- Uniform shape
- Flavour, sugars?
- Dry matter?

Parsnip Varieties 2023

Variety	Season	Source	Shape	Crown depth	Colour	Root disease tolerance	Market	Uniformity 0 - 10	Comments
Pacific	Early	Elsoms Seeds	Wedge	Medium to deep	Creamy white	Moderate	Pre-pack/processing	6.5	Vigorous foliage. Soft on shoulder. High yields.
Gladiator	Early to maincrop	Tozers	Wedge	Deep	Creamy white	poor	Pre-pack/processing	6	Early, good vigour. Can be rather soft. High yields.
Viking	Early to maincrop	Tozers	Bayonet	Shallow	White	poor	Pre-pack/processing	7	Smooth white roots. .
Warrier	Early to maincrop	Tozers	Bayonet	Shallow	White	poor	Pre-pack/processing	7	Smooth white roots. Vigorous foliage.
Victor	Early to maincrop	Agri Saaten	Bayonet	Medium	Creamy white	Moderate	Pre-pack	6.5	Early bulking. Medium firmness
Vulcan	Early to maincrop	Agri Saaten	Bayonet	Shallow to medium	Creamy white	Moderate	Pre-pack	6.5	Smooth roots.
Pegasus	Early to maincrop	Elsoms Seeds	Bayonet	Shallow	Creamy white	Good	Pre-pack/processing	7	The whitest in the Elsoms range. Good uniformity and handling. Improved canker resistance. Smooth skins.
Palace	Early to maincrop	Elsoms Seeds	Bayonet to Wedge	Shallow to medium	Creamy white	Moderate	Pre-pack	6.5	High yielding, smooth, uniform. Good for pre-pack. Can be prone to more tip bleeding in the spring..
Javelin	Early to maincrop	Tozers	Wedge	Medium to deep	Creamy white	Moderate	Pre-pack/processing	6.5	Industry standard. Flexible variety servicing all markets. Average yields.
Picador	Maincrop	Elsoms Seeds	Wedge	Shallow	Creamy white	Moderate	Processing	7	V good vigour. Shallow crown. High yields but prone to lateral roots.
Phantom	Maincrop	Elsoms Seeds	Bayonet	Shallow	Creamy white	Good	Pre-pack	7.5	Good uniformity and handling. Improved canker resistance.
Viper	Maincrop	Agri Saaten	Bayonet	Shallow to medium	Creamy white	Moderate	Pre-pack	7	Smooth roots with high splitting tolerance.
Artic	Maincrop	MRL Seeds	Wedge	Shallow to medium	Creamy white	Moderate	Pre-pack/processing	6	A little bulbous. Average yields.
Panorama	Maincrop	Elsoms Seeds	Bayonet	Shallow	Creamy white	Moderate	Pre-pack/processing	7	Smooth white roots. Can grow long.Claimed good disease tolerance.Vigorous foliage. High yields.
Pearl	Maincrop	Elsoms Seeds	Bayonet	Shallow	Creamy white	Moderate	Pre-pack	7	Suited to longterm storage
Saber	Maincrop	Tozers	Bayonet to Wedge	Shallow to medium	White	Good	Pre-pack	7	Very vigorous foliage. Slow to discolour.



Rotational Planning

Preceding crops



Good

- Veg brassicas (unless significant *sclerotinia*)
- Cereals (clean entry but note SU's used)
- Alliums (especially onions)
- Green manures (microbial boost)
- Biofumigant mix (**caution!**)

Poor

- Potatoes (volunteers)
- Sugar Beet (Soil structure % VRR risk)
- Maize (*Pratylenchus* & SU risk)
- Rape (Volunteers and *sclerotinia*)
- Lucerne (*Pythium* risk)
- Umbelliferous herbs
- Grassland (wireworm risk)

Organic amendments



Good

- High C:N ratio Compost (PAS100 cert)
- Green manures (microbial boost)
- Mushroom compost
- Biochar
- AD liquid or solids?

Poor

- Poorly composted FYM
- High N poultry manure (fanging risk and soft development)
- Pig Slurry (Fanging risk)
- Tufted grass lays/green manure. (Destoning problem)

Rotation targets ;

Polythene covered crops:
Maincrop (autumn harvest):
Strawed covered/winter crops:

min 6 years
min 7 years
min 10 years

Rotation targets



i.e: Take opportunities to manage potential production issues within the rotation as a whole

Weed

- Target Potato, *matricaria*, *senecio vulgaris*, *poa annua*, *alopecurus myosuroides* and *umbelliferous* species.

Pest

- Target Wireworm, FLN control

Disease

- Target *itersonilia*, *Pythium* and *Fusarium* control

Fertiliser

- Parsnips demand and remove large amounts of potash. Ensure that this does not disadvantage the following crops. Consider higher doses in previous crops.
- Allow extra nitrogen (80kg/ha) to be applied to chopped mulching (storage) straw.

Site Selection



- Soil Type:** Implications on skin finish and colour. High calcium soils tend to suit late production
- Aspect:** Exposure vs Carrot Fly risk/foilage disease,
Proximity to nearby *umbelliferae* crops, esp. straw covered
- Rotation:** min 1 in 6, consider rotational management
- Weed burden:** Avoid sites with excessive perennial weeds, Vol potatoes, Fools Parsley and AMG etc.

Parsnip Drilling Specifications



Pre-pack:

Harvest Period	Drilling Period	Seed/ha	Seed/acre
Late June	November	370,000	150,000
Mid July	January/February	400,000	160,000
August - October	March - May	490,000	198,000
November - April	May – early June	450,000	182,000

Processing: Mostly do not exceed 420,000/ha



PRODUCTION SEQUENCE

Land Preparation



Aim: level seedbed with 25-30cm friable tilth.

Ensure **good drainage** – i.e.
subsoil as necessary



Ensure land is **free of established large weed**
spray and /or plough



Ridge and
destone



Bed form



Drill

Sub-soiling – Winged legs



Ensure land is sprayed/ploughed before weeds
set seed.....



Ridging – before destoning



De-stoning (Web)



Tillerstar De-stoner



Bed-forming



Profiling (Poly crop)



Drilling



Seed depth: 15-20mm

Spraying



Polythene laying



Major Nutrient Uptake



Parsnips

Type	Variety	Av T/ha	Product analysed	Uptake & Offtake (Kg/ha)								
				DM%	N		P ₂ O ₅		K ₂ O		MgO	
					kg / fresh tonne	kg/ha	kg / fresh tonne	kg/ha	kg / fresh tonne	kg/ha	kg / fresh tonne	kg/ha
Early	Javelin	40	ROOT	21%	1.4	56.0	1.4	56.0	3.8	152.0	0.4	16.0
			FOLIAGE	15%	3.0	120.0	1.2	48.0	4.4	176.0	1.2	48.0
Maincrop	Javelin	50	ROOT	23%	1.6	80.0	1.5	75.0	4.2	210.0	0.5	25.0
			FOLIAGE	23%	3.7	185.0	1.4	70.0	5.1	255.0	1.4	70.0

Base fertiliser (subject to soil nutrient levels)

P ₂ O ₅ (Olsens)			K ₂ O			Mgo		
46-70 mg/l (3)	26-45 mg/l (2)	16-25 mg/l (1)	241-400 mg/l (3)	121-240 mg/l (2)	61-120 mg/l (1)	101-175 mg/l (3)	51-100 mg/l (2)	26-50 mg/l (1)
0	50kg/ha	100kg/ha	0	150kg/ha	250kg/ha	0	0	100kg/ha

Nitrogen		
Early	120	Subject to organic amendments , placement options and mineralisation potential.
Maincrop	160	

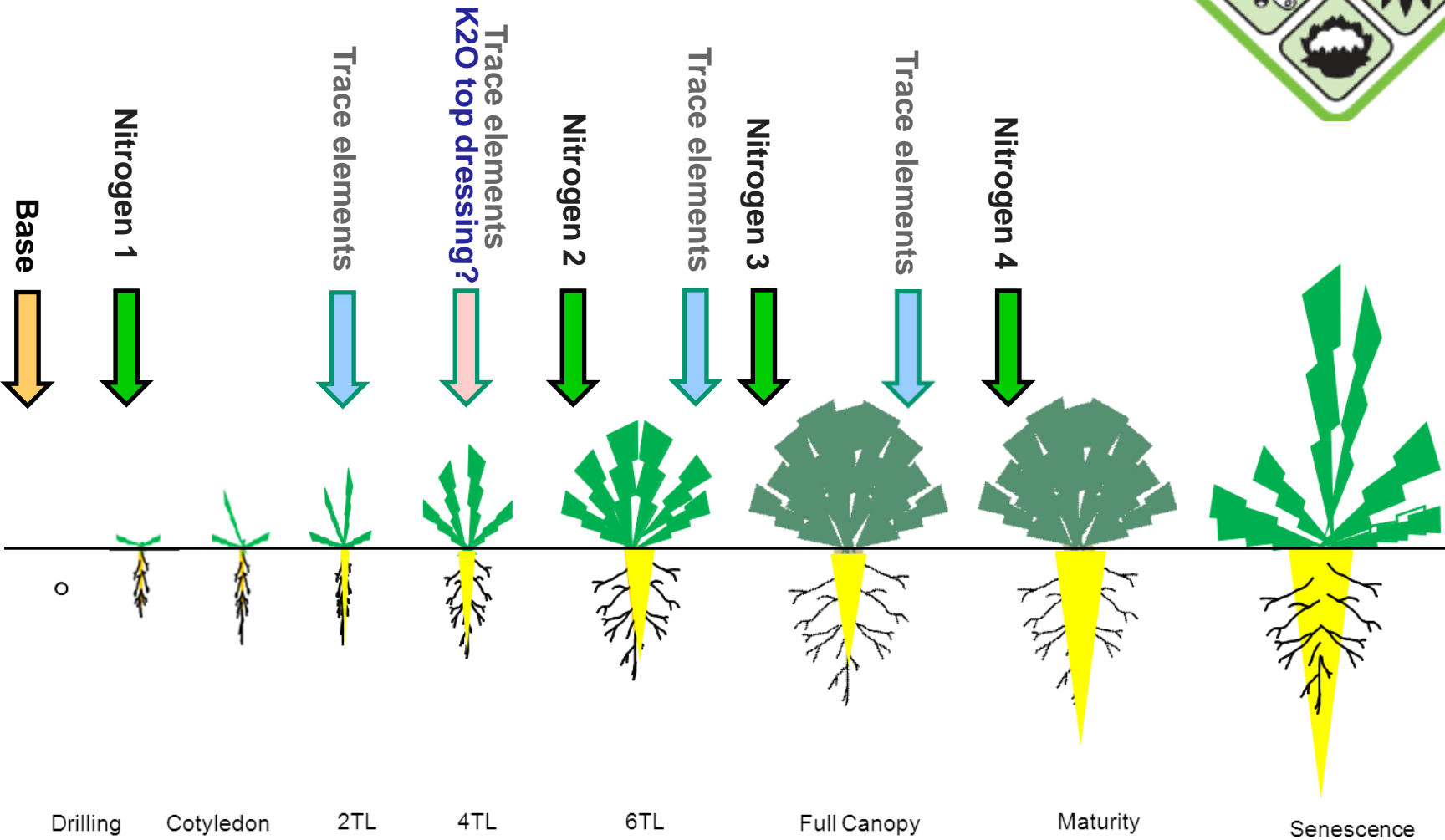
Trace Elements



Critical Nutrient Concentrations; sampled on fully expanded full leaves

Dry Weight Analysis	Deficient	Range:	
		Low	High
N	3.5%		
P	0.35%		
K	2%		
Mg	0.2%		
S	0.2%		
Fe	30 ppm	50	>300
Mn	20 ppm	40	>40
Zn	15 ppm	20	>30
Cu	3 ppm	5	>20
B	20 ppm	30	>50
Mo	0.1 ppm		
Al	20 ppm		>300

Fertiliser application timings:



Closer Monitoring of Soil Nutrients



Development probes

Sentek

NO_3^-



JI Probe



LAQUAtwin



Stenon

pH, NO_3^-
/ NH_4 , P, K^+ ,
Mg, SOM,
Soil
moisture



Configurations: Beds



In 1.83 or 2.03m centre beds

- **PARSNIPS**
 - 4 twin line rows
 - 6 single line rows

Ground Cover



4 TL, 20% GC



6 - 7 TL, 40% GC



9 - 12 TL, 90% GC



Wind Blow Protection



**Barley
Cover
crop**



**Polymer
application**

Irrigation



- To assist establishment
- To stabilise the soil
- To assist residual herbicide action
- To promote rapid foliage development
- Cutworm and scab control
- To bulk the crop
- To assist harvesting

Soil Moisture Monitoring



**Diviner
“Capacitance Probe”**



Tensiometers



Delta T probes

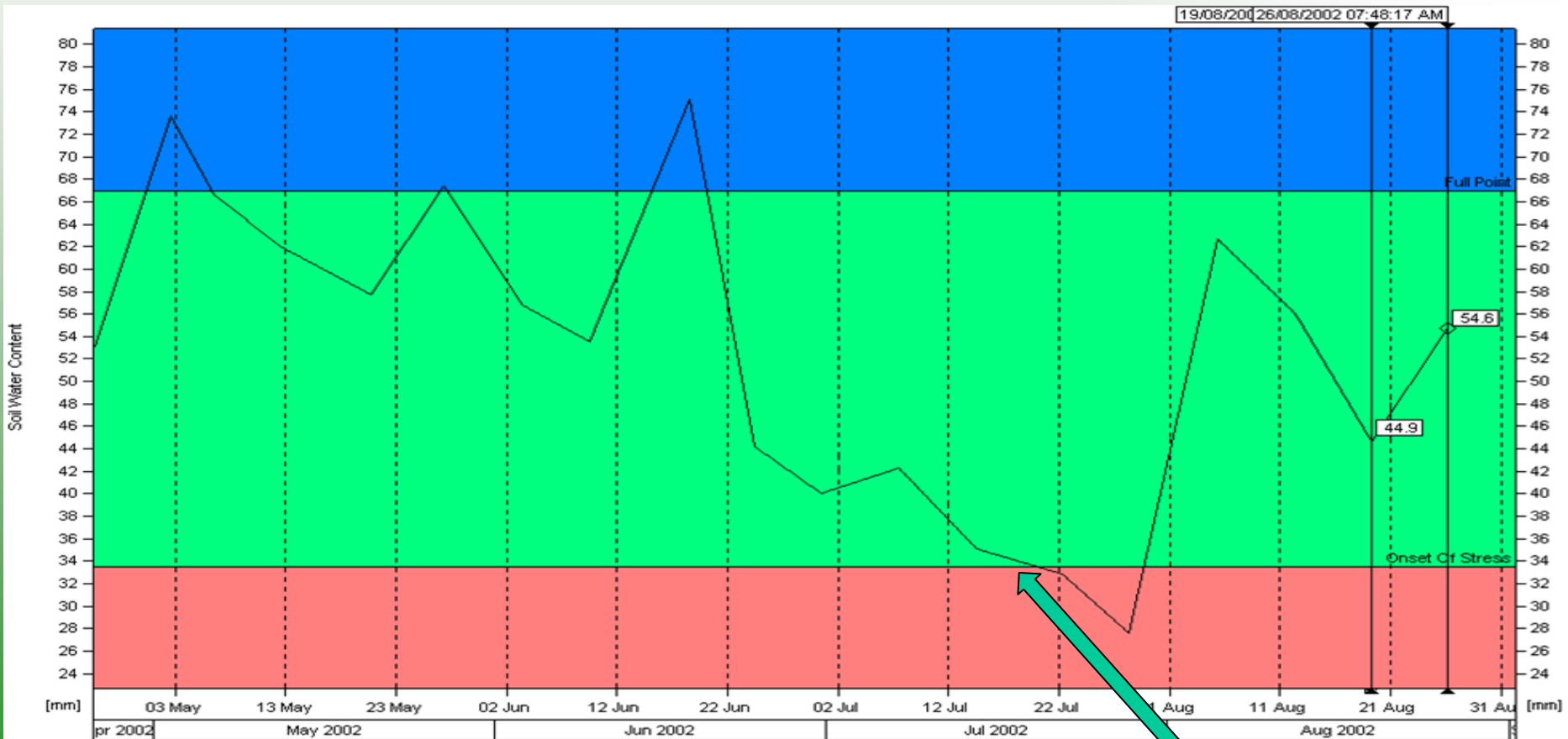


**GSM “Capacitance
Probe”**

Irrigation Scheduling



The starting deficit will depend on the growth stage and purpose

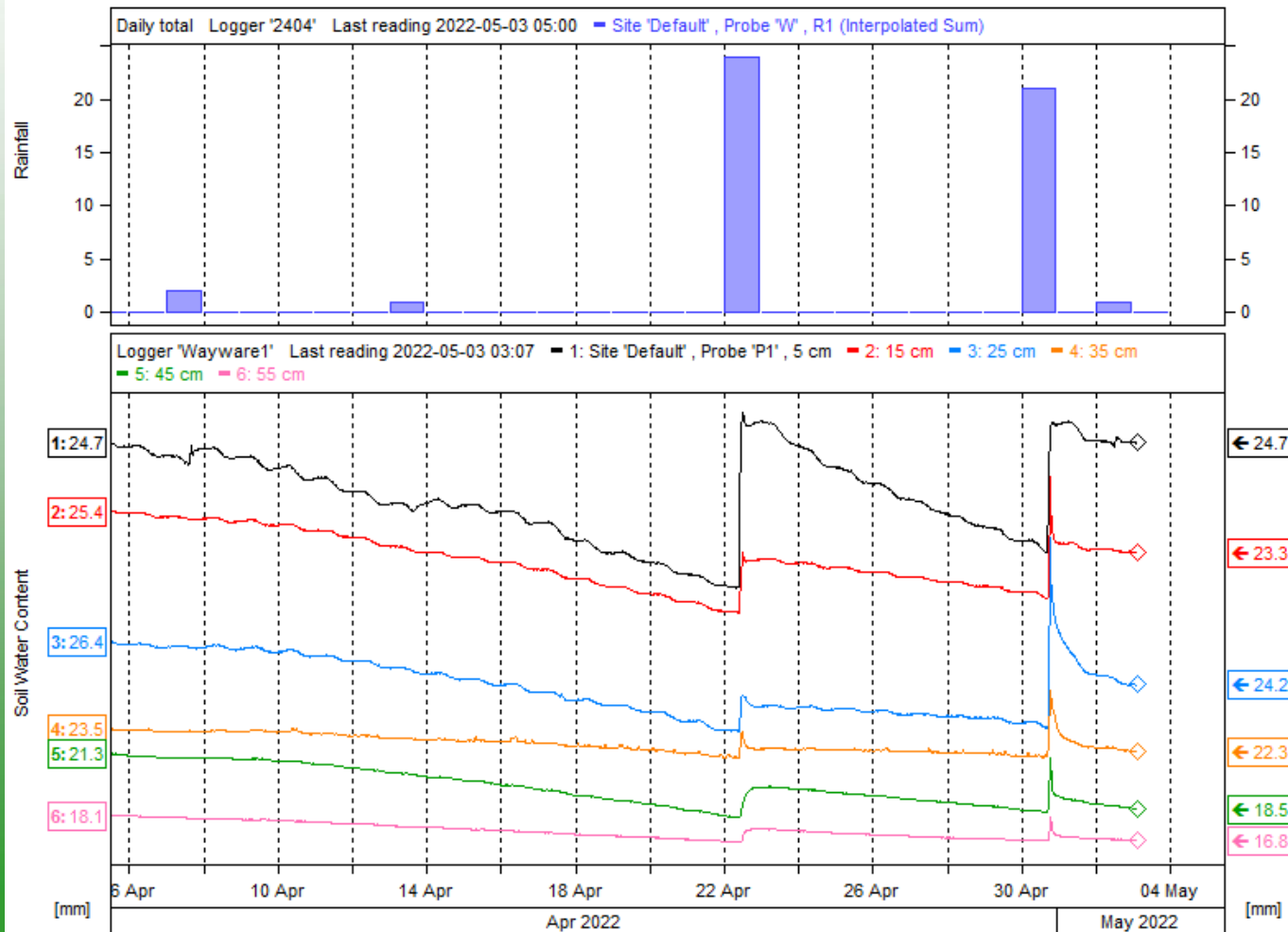


Onset of stress

Typical soil moisture profile



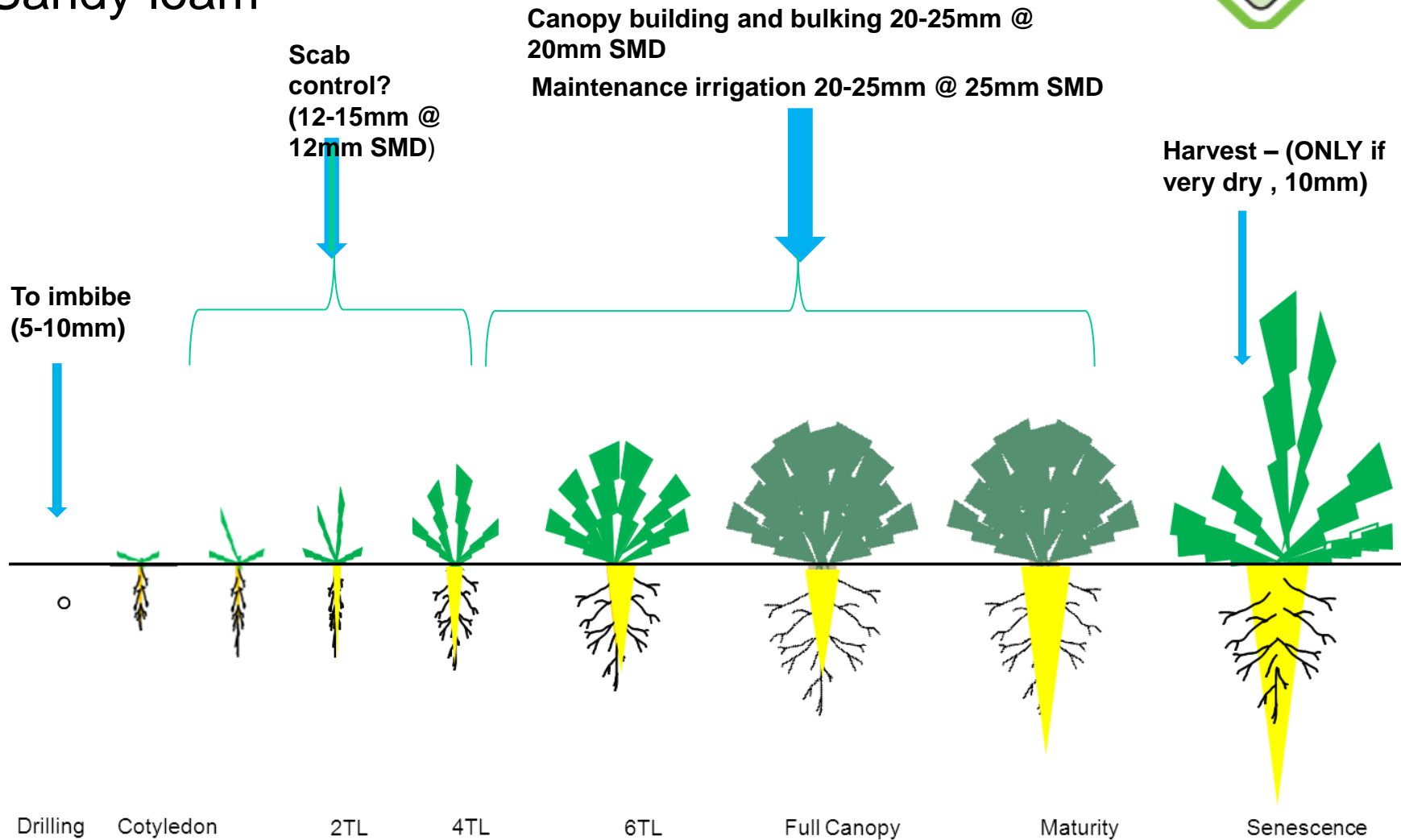
Readings at 10cm depths. Parsnips encouraged to draw down to 60cm



Irrigation Scheduling: MC Parsnips



Sandy loam



Irrigation Bacterial and Viral Risk



Irrigation water risks

- Irrigation water can contain viruses and bacteria which can cause food poisoning.
- Regular water samples taken through the irrigation season can be used to assess risk. An online risk calculator can be found at www.safeproduce.eu
- Crops can be split into 3 risk categories :
 - Category 1 (high risk) crops eaten raw with no protective skin that is removed before eating (eg. CARROTS).
 - Category 2 (medium risk) crops which could be eaten raw or but have a protective skin or grow clear of the ground (e.g. bulb onions)
 - Category 3 (Low risk) crops which are always cooked (eg. PARSNIPS)

Weed Control



- Parsnips are deep rooted and therefore generally good competitors.
- Weed control strategy must reflect the soil type, weed species and crop growth stage.
- Strike a balance between protecting the soil, controlling difficult weeds early and minimising the number of pesticide applications.

**Options: Cultural / Mechanical
Agro-chemical**

In practice –consider both options to devise the most environmentally acceptable and sustainable approach.

Weed Control: Cultural considerations



Annual weeds:

- Stale seed bed techniques
- Modify row arrangements to minimise competition
- Modify drilling periods to avoid problem weeds, eg *matricaria* sp, *senecio vulgaris*, *alopecurus myosuroides* and *Umbelliferous* species

Perennial weeds:


- Site selection!
- Repeat shallow summer cultivation (eg couch)

Volunteer Potatoes:

- Do not follow potatoes!
- Ensure potato harvesters crush waste potatoes.
- Shallow cultivate during winter months to expose vol. potatoes to frost.
- Destone with the smallest, practical web

Agrochemical Weed Control



- 
- 1) Target control of problem weeds with a rotational strategy ie in previous crops
 - 2) Apply a broad residual herbicide after drilling, ai and rate to match the soil type.
 - 3) Selective contact and residual herbicides to be applied as key weeds are establishing.

Agrochemical Weed Control: Application Approach



Generally:

- **< 2TL/graminicides & cotyledon weed**

150-200 L/ha 04, 110 degree Flat Fan nozzle @ 2.5 - 3.0 bar

Eg: Defy, Amistar

- **>2TL / BLW**

250-300 L/ha 06, 110 degree Flat Fan @ 2.5 - 3.0 bar

Or, 300L/ha 06, 65 degree Syngenta Veg nozzle

NB. Forward speed – effect on working pressure and air turbulence



Band Sprayer

Band Spraying: Before and after



Before



After

Mechanical



**Brush
Weeder**



Cage Weeder

Mechanical: Tractor hoes



Garford Laser Hoe



Weed Wiping

Mechanical: Topping weeds



Spot Spraying- The future..



Ultra-High Precision Spraying to
enable reduced pesticide use.



Ecorobotix evaluation and development



In principle;

- An ai precision spot sprayer
- Capacity 2-4ha/hr
- 94-97% accuracy
- 2 parallel algorithms for crop and weeds
- Sprays according to a pre-set safety zone

Ecorobotix evaluation and development



VCS role:

- To help develop algorithms suitable for different soil types, crops and weeds.
- To specifically develop the algorithm for Carrots and Parsnips
- To develop selective and non selective herbicide programs for an integrated approach to weed control in onions, carrots and parsnips.
- To formulate precision fungicide /insecticide/foliar feed programs along side herbicide regimes.
- To potentially help design data collection strategies.

Ecorobotix evaluation and development



Key elements



Ability to detect **sub-centimeter weeds and plants**



High resolution, fast image **sensing** (1/2,000 s exposure time) with **powerful flashes**



Plant classification with **cutting-edge onboard supercomputers** (180 Teraflops)⁽¹⁾



6 x 6 cm spray accuracy at 2 m/s machine speed



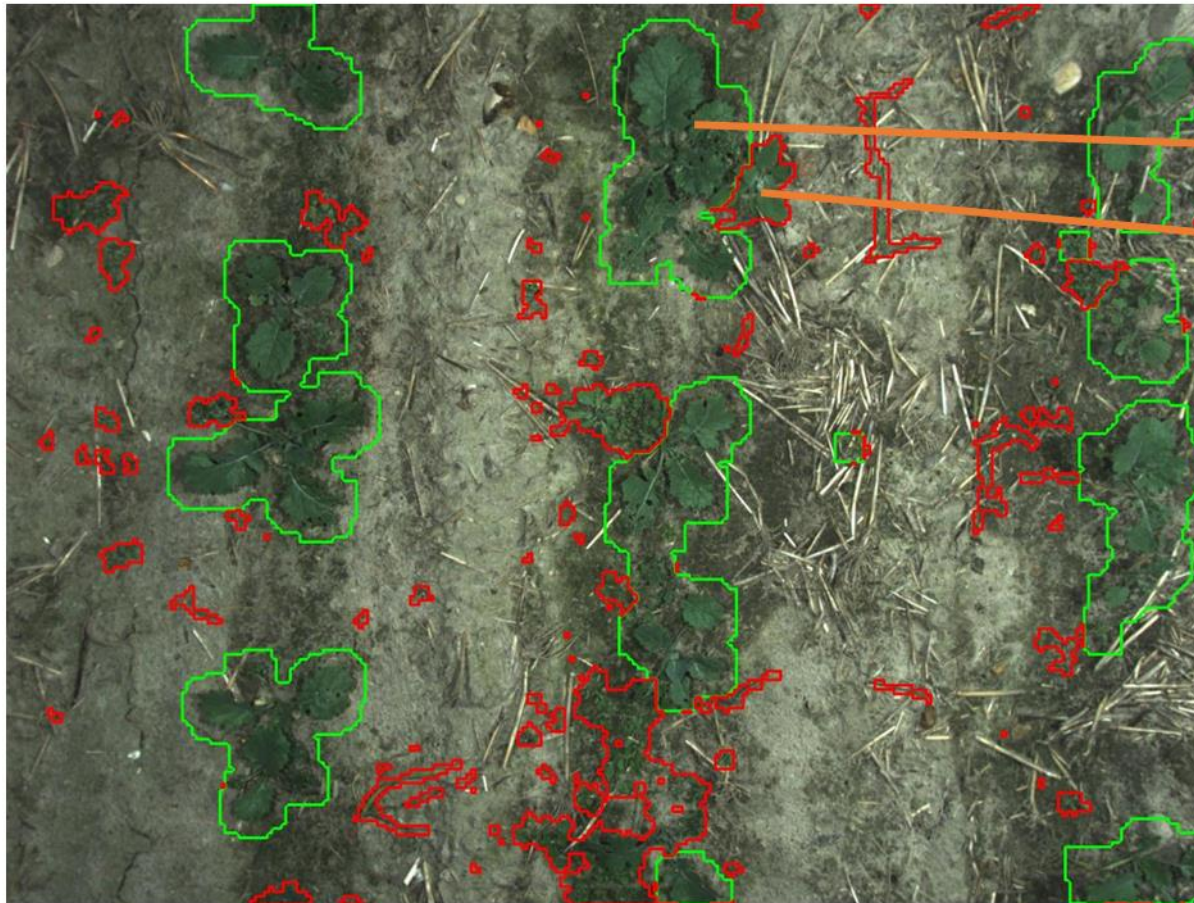
¼ second from camera flash to spray with **1/1,000 sec. synchronization**



Ecorobotix evaluation and development



“Decision” technology



Crop

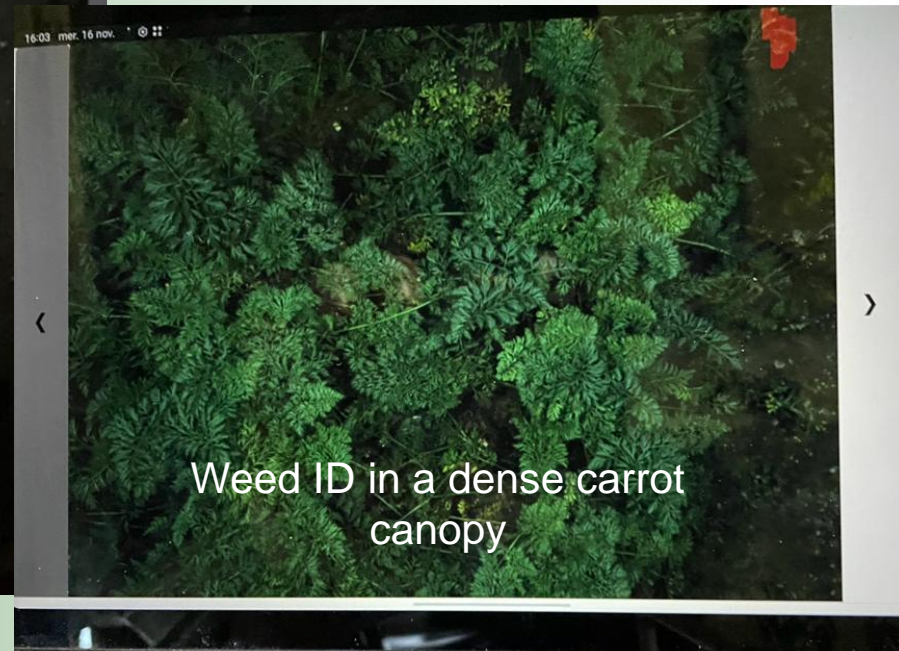
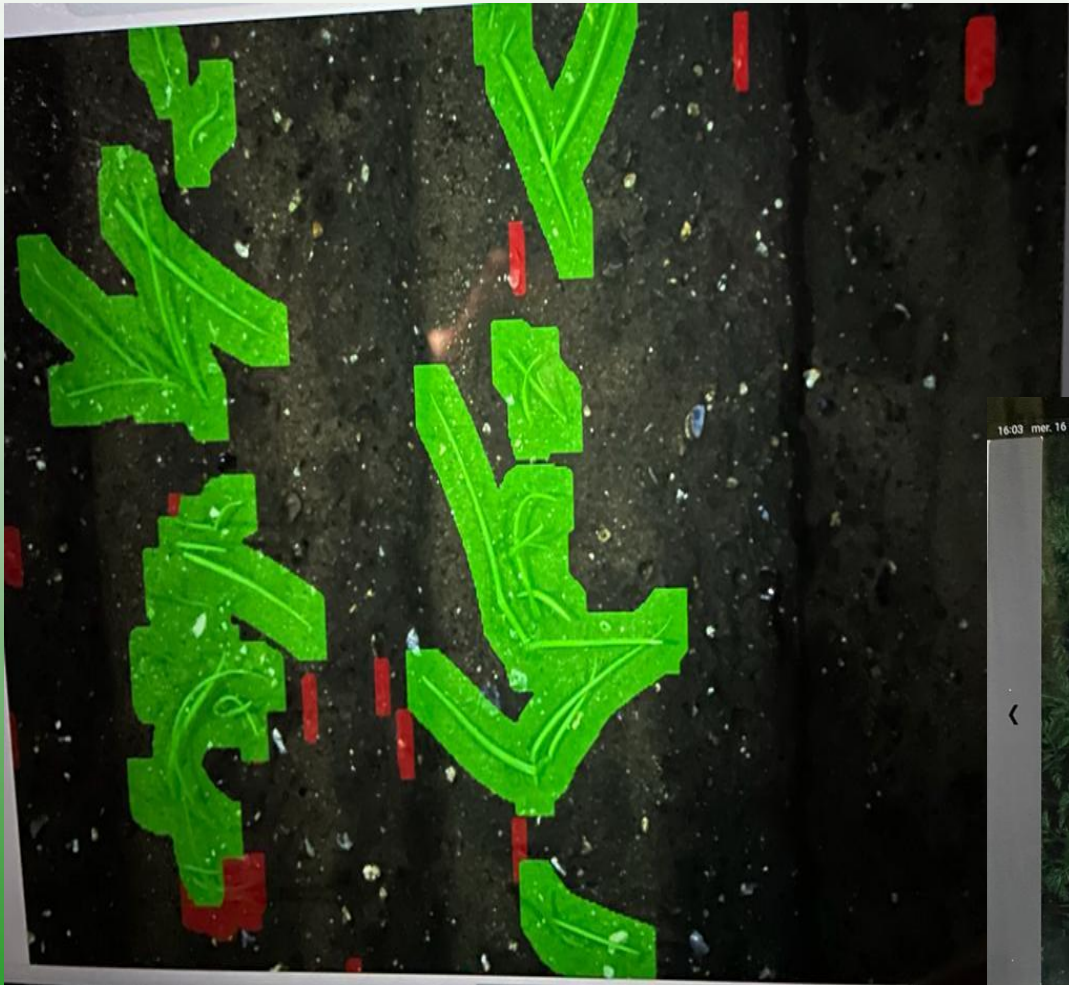
Weed

- **Not impacted by soil type, light or rain.**
- **Large weed library**

Ecorobotix evaluation and development



- Crop safety zone
- Weed identified $>5\text{mm}$ diameter
- Split tank /dual system to allow simultaneous crop and weed applications



Weed ID in a dense carrot canopy

Ecorobotix evaluation and development



Vegetable Crops supported

- Onions, **garlic**
- Spinach
- String and Dwarf Beans
- Endive
- Chicory
- Lettuce
- Cabbage
- **Carrots and Parsnips**
- **Herbs**



Ecorobotix evaluation and development



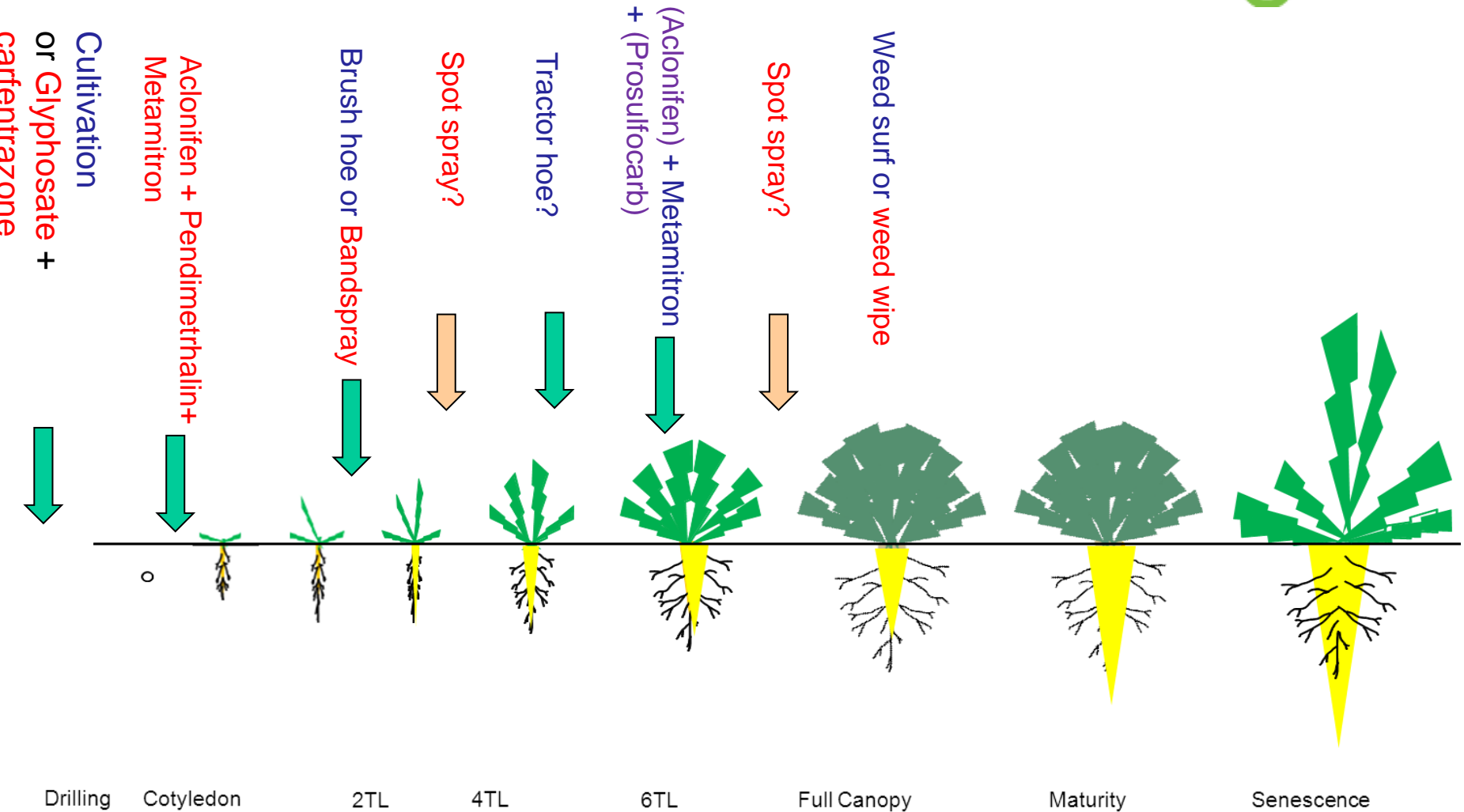
Potential:

- To reduce herbicide use significantly.
- To control all weed species.
- To avoid crop “check.”
- To allow simultaneous crop and weed treatments
- To also reduce fungicide and insecticide use
- To collect data for growth modelling /yield predictions

Herbicides approved in the UK

Active Ingredient	Example Product*	Type of	LERAP	HI	MRL	Expiry Date	Max	Max	Max	Application	Other
		Approval	Category	Latest application.	Mg/Kg	MAPP no.	indiv.dose	No. apps	total dose	interval	application info
Aclonifen	Emerger	EAMU 1101 / 20	ABZ 6m DRT 3*	Pre emergence	0.1	31-Jan-26 MAPP 19056	1.75 L/ha	1	1.75 L/ha		
				Post emergence up to 2 TL	0.1	31-Jan-25 MAPP 19056	0.65 L/ha	Not stated	0.65 L/ha		
Carfentrazone-ethyl	Shark	Full	n/a	1 month before planting	0.01	09-Sep-99 MAPP 18700	0.333 L/ha	1			
Clethodim	Centurion Max	EAMU 3641/19	n/a	40 days at 9TL	0.5	09-Nov-23 MAPP 17911	2.0 L/ha	1			Apply from BBCH 12 - 19 2TL - 9TL
Metamitron	Goltix 70 SC	EAMU 0280/22	n/a	Pre-emergence	0.1	31-Mar-24 MAPP 16638	2.0 L/ha	Not stated	5.0 L/ha	7 days	
Metamitron	Goltix 70 SC	EAMU 0279/22	n/a	Pre 3 TL	0.1	31-Mar-24 MAPP 16638	0.40 L/ha	2		6 days	NOT TO BE USED IF PRE EM GOLTIX APPLIED
Metribuzin	Sencorex Flow	EAMU 3102/19	B	28 days	0.1	31-Jan-26 MAPP 18895 & 16167	0.875 L/ha	2		21 days	
Glyphosate	Roundup Biactive	Full	n/a	Before planting	0.1	09-Sep-99 MAPP 10320	5 L/ha	Not stated	5.0 L/ha		
	Round Up Energy INTER ROW	EAMU 0354/13		28 days		09-Sep-99 MAPP 12945	1.20 L/ha	Not stated	4.0 L/ha	21 days	Apply between Mar & Sept
Pendimethalin	Stomp Aqua	Full	B	Pre -emergence	0.7	09-Sep-99 MAPP 14664	2.90 L/ha	1			Apply ASAP after drilling
		EAMU 3526 /09		Pre emergence 49 days		09-Sept-99 MAPP 14664	1.55 L/ha 1.75 L/ha	1 1	3.30 L/ha Pre + Post emergence		
Flumioxazine	Sumimax	EAMU 1475/20	B	28 days	0.02	31-Dec-24 MAPP 18884	0.10 L/ha		0.10 L/ha		Do not mix with other herbicides or adjuvants
Prosulfocarb	Defy	EAMU 1354/13	B	84 days BBCH 11 (1st TL unfolded)	0.08	30-Apr-24 MAPP 16202	5.0 L/ha	Not stated	5.0 L/ha		
Cycloxydim	Laser	Full	n/a	42 days	0.9	30-Nov-25 MAPP 17339	2.25 L/ha	1			Apply from 2TL until close of canopy
Isoxaben	Flexidor	EAMU 0020/18	n/a	Pre -emergence	0.05	28-Feb-27 MAPP 18042	0.150 L/ha	1			
Fluazifop-P-butyl	Fusilade Max	Full	n/a	49 days Before 50% groundcover	0.5	30-Jun-26 MAPP 19013	2.0 L/ha	1			
Pelargonic acid	Finalsan	Full & EAMU 1665 / 20 INTER ROW	B	Pre-emergence	na	28-Feb-2026 MAPP 13102	83.0 L/ha	4			May 1st-Sept
							170.0 L/ha	8			

Weed Control: MC Parsnips



Pests and Control Options



Key Problem Nematodes



- ❖ *Trichodorus sp* (Stubby Root)
- ❖ *Tylenchorhynchus sp* (Stunt)
- ❖ *Paratylenchus* (Pin)
- ❖ *Pratylenchus penetrans* (Lesion)
- ❖ *Meloidogyne hapla* (Root Knot)

Nematodes



Stunt Nematode: (*Tylenchorhynchus spp.*)
Stubby Root Nematode: (*Trichodorus spp.*)

**Similar
symptoms –
“fanging”**



Nematodes

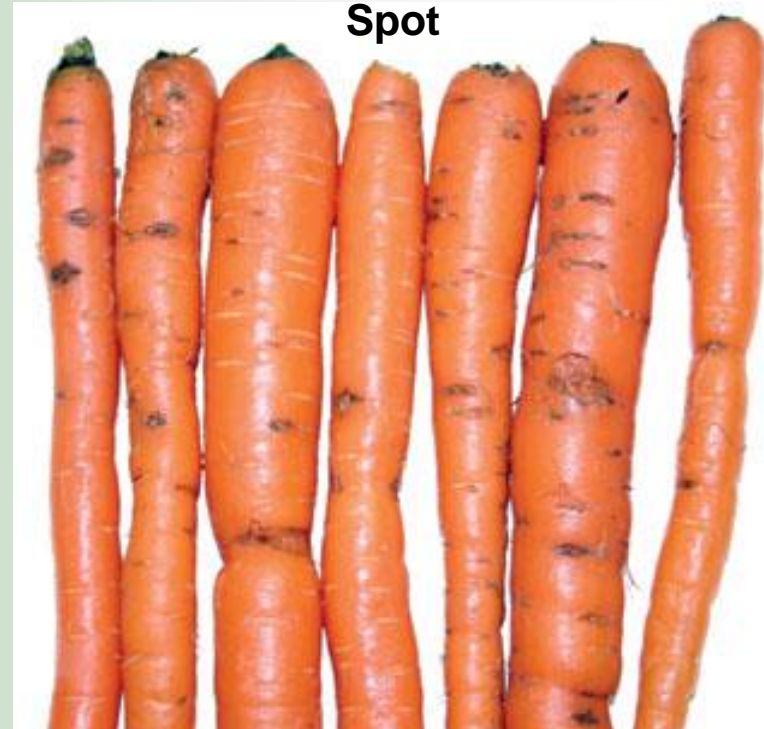


Root Lesion Nematode: (*Pratylenchus* spp.)



Feeding injury

May cause lesions similar to Cavity Spot



Nematodes



Root Knot Nematode: (*Meloidogyne* spp.)

Meloidogyne javanica



Meloidogyne hapla



Nematodes



Nematode control Strategies;

- ❖ **Crop Rotation** –Avoid good hosts of the most damaging species eg Legumes and *Meloidogyne hapla*. Good crop hygiene.
- ❖ **Consider biofumigants** - eg *Tagetes Patula* for *pratylenchus penetrans* control, oil radish, mustards
- ❖ **Increase crop early vigour** – ie seed treatments, starter fertiliser etc
- ❖ **Catch crop** (Oil radish Contra) + Black fallow
- ❖ **Anaerobic disinfestation**
- ❖ **Agrochemical control** eg Fluopyram (Velum Prime)
- ❖ **Biological treatment** eg Garlic granules?

Key Problem Insects



Carrot Fly (*Psila rosae*)

Aphids:

- *Cavariella aegopodii*.
- *Myzus persicae*
- *Cavariella theobaldi*



Wireworm (*Agriotes* sp)



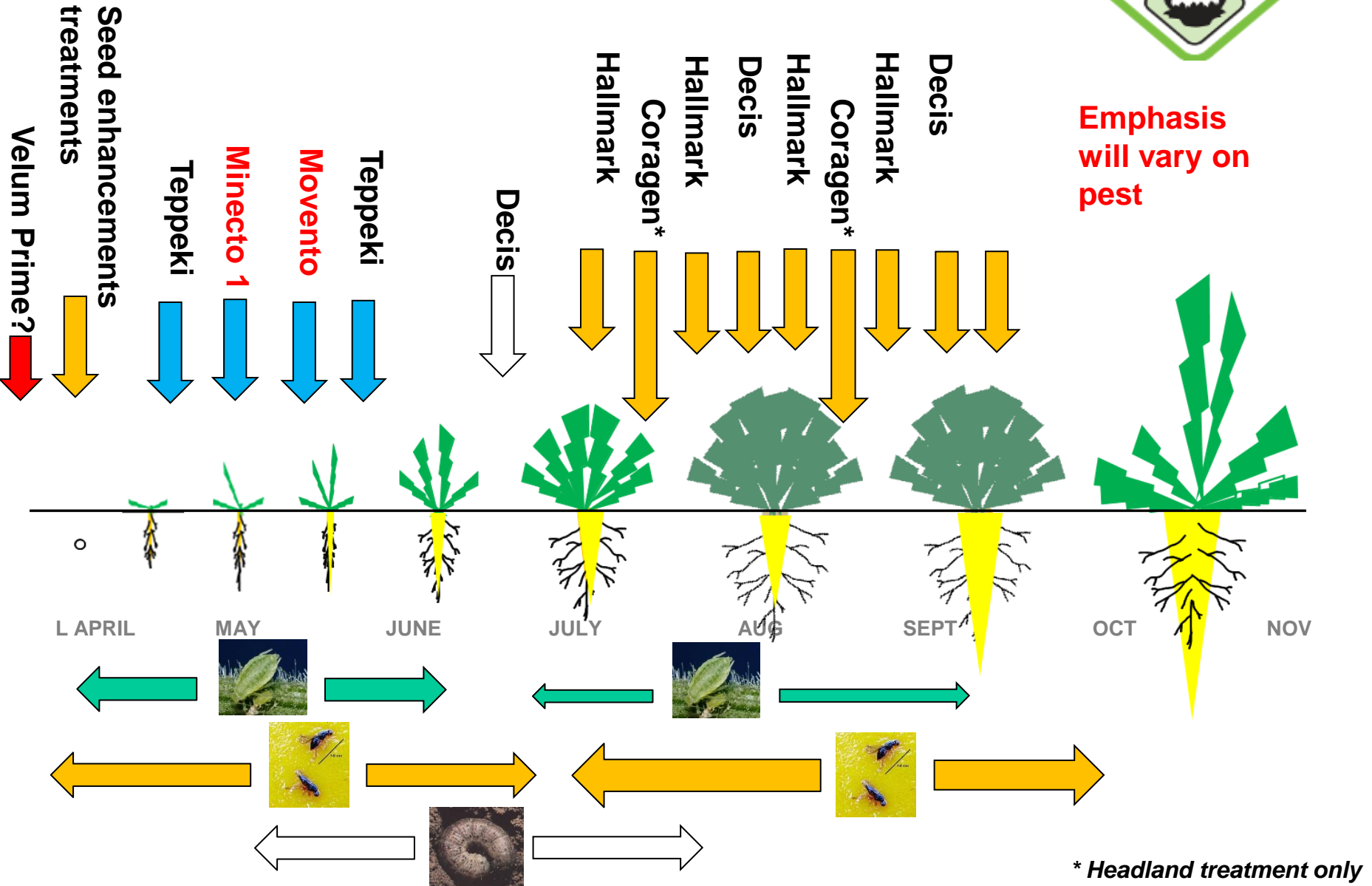
Cutworm (*Agrostis* sp)



Insecticides/ nematocide approved in the UK

Active Ingredient	Example Product*	Type of Approval	LERAP Category	HI	MRL Mg/Kg	Expiry Date	Max indiv.dose	Max No. apps	Max total dose	Application interval	Other application info
				Latest application.		MAPP no.					
Bacillus thuringiensis var kurstaki	Dipel DF	EAMU 3037/19	n/a	1 day	none	31-Oct-25 MAPP 18874	1 Kg/ha	8		7 days	
Cypermethrin	CythrIn 500 EC	Full	ABZ 18m	7 days	0.05	30-Apr-24 MAPP 16993	0.050 L/ha	2		10 days	5m insect buffer zone
Chlorantraniliprole	Coragen	EAMU 0800/22		21 days		30-Jun-27 MAPP 19498	0.175 L/ha	1			Apply after 9 + TL (BBCH 19)
Deltamethrin	Decis Forte	EAMU 0916/14	ABZ 7m	21 days		30-Apr-24 MAPP 16110	0.075 Lha		0.225 L/ha	14 days	5m insect buffer zone
	Decis Protech	EAMU 1672/13				30-Apr-24 MAPP 16160	0.50 L/ha		1.50 L/ha		Apply March - Sept
Lambda-cyhalothrin	Hallmark with Zeon Technology	Full	B	14 days	0.04	09-Sept-99 MAPP 12629	0.150 L/ha	4	0.450 L/ha	7 days	5m insect buffer zone
Garlic	NEMguard DE	Full	n/a	At sowing/drilling	NA	29-Feb-24 MAPP 16749	20 Kg/ha	1			Incorporated
						28-Feb-27 MAPP 19851					
Cyantraniliprole	Minecto One	Full	ABZ 5m	7 days	0.05	14-Mar-29 MAPP 18649	0.185 Kg/ha	None stated 2 recommend ed	0.370 kg/ha	12 days	
Spirotetramat	Movento	Full	n/a	21 days	0.1	31-Jan-27 MAPP 18435	0.30 L/ha	2			
C7-C20 Fatty acid	Flipper	EAMU 0103/20	N/A	N/A	N/A	28-Feb-25 MAPP 19154	5.0 L/ha	9		7 days 28 days between apps of 3	Apply 1st Mar - 30th Aug
Acetamiprid	Gazelle SG	EAMU 0382/22	ABZ 5m	28 days		TBC	0.200 Kg/ha	1			200 - 400L/ha water
		issued 15.02.22		GS 41		MAPP 13725					No later than 31st July 5m insect buffer zone
Flonicamid	Teppeki	EAMU 0772/21	N/A	21 days	0.30 GB	30-Apr-24 MAPP 12402	0.140 Kg/ha	2			Apply May - Oct
Fluopyram	Velum Prime	EAMU 0288/21	N/A	at drilling	0.4	31-Jul-26 MAPP 18880	0.625 L/ha	1			Apply Feb - June only

Insecticide Sequence: MC Parsnips



Future control strategies



Interference with population dynamics by utilising synthetic pheromones...?

- Trap and Kill?
- Attracting Predators?
- Alarm pheromones?
- Mating disruption?

To be integrated with a reduce frequency, targeted agrochemical use?

Mating Disruption...

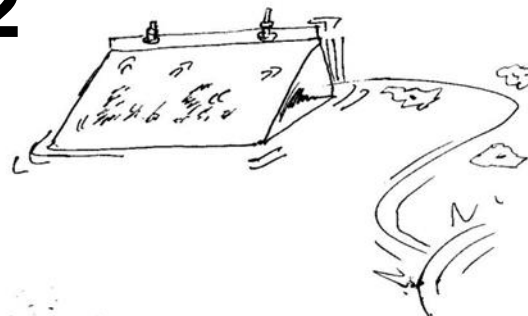


exosect[®]
ADVANCED PEST CONTROL SCIENCE

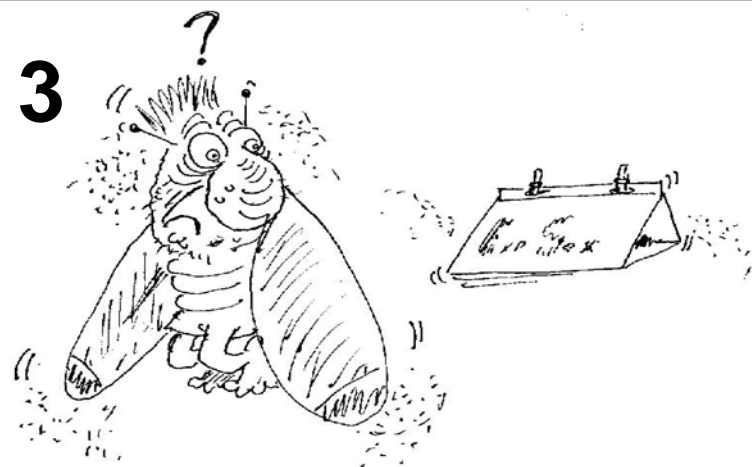
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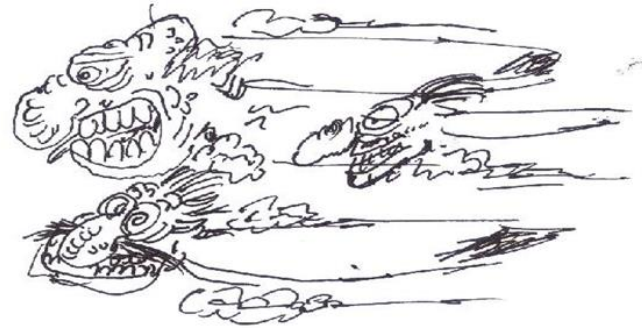


Mating Disruption...



A truly frightening thought!

4



Diseases and Control Options



Disease Control in Parsnips



Principles:

Prevention

- rotation
- clean seed
- close irrigation and nutrition management
- tolerant varieties
- protectant fungicides

Curative

- timely eradican fungicides

Minimise pesticide use by careful planning and timely applications.

Powdery Mildew (*Erysiphe heraclei*)



Prevention

- Avoid moisture stress.
- Adopt more tolerant varieties **Javelin, Gladiator, Palace**

Biological Control

- *Bacillus subtilis*
- Natural oils eg Codacide
- Sulphur

Agro-chemical control

- Prothioconazole, fluxapyroxad + difenconazole, azoxystrobin + difenoconazole.

Parsnip Blight (*phloeospora*)



Prevention/ cultural control

- Avoid long periods of leaf wetness.
- Avoid crop scorch.

Biological Control

- *None known to be effective.*

Agro-chemical control

- None specifically approved however azoxystrobin, azoxystrobin + difenoconazole, tebuconazole + trifloxystrobin and isopyrazam all have an effect.

Ramularia pastinacae



Prevention/ cultural control

- Avoid long periods of leaf wetness.

Biological Control

- *None known to be effective.*

Agro-chemical control

- None specifically approved however azoxystrobin, azoxystrobin + difenoconazole, tebuconazole + trifloxystrobin and isopyrazam all have an effect.

Parsnip Canker (*itersonilia* sp)



Prevention/ cultural control

- Ensure seed is not infected with *itersonilia* sp. Wash as appropriate.
- Avoid over mature plants

Biological Control

- None known to be effective.

Agro-chemical control

- Isopyrazam, Azoxystrobin + Difenconazole, Boscalid + Pyraclostrobin, Cyprodinil + Fludioxonil, Tebuconazole + Trifloxystrobin and Prothioconazole.



Virus Diseases



Parsnip Yellow Fleck Virus (PYFV) (semi-persistent, needs helper virus AYV)

Cylindrocarpon



Prevention/ cultural control

- Avoid over mature roots.
- Soils with higher pH have less incidence. Review rotational organic matter amendments.

Biological Control

- *None known to be effective.*

Agro-chemical control

- *None known to be effective.*



Large
“corky”
lesions
with
orange
halo



Itersonilia pastinaceae



Surface tissue often becomes ruptured



Black to purple bruise type lesion



Prevention/ cultural control

- Ensure clean seed. Wash if infected.
- Avoid overmature roots.

Biological Control

- *None known to be effective.*
- Little variety differences.

Agro-chemical control

- *None known to be effective.*

Mycocentrospora



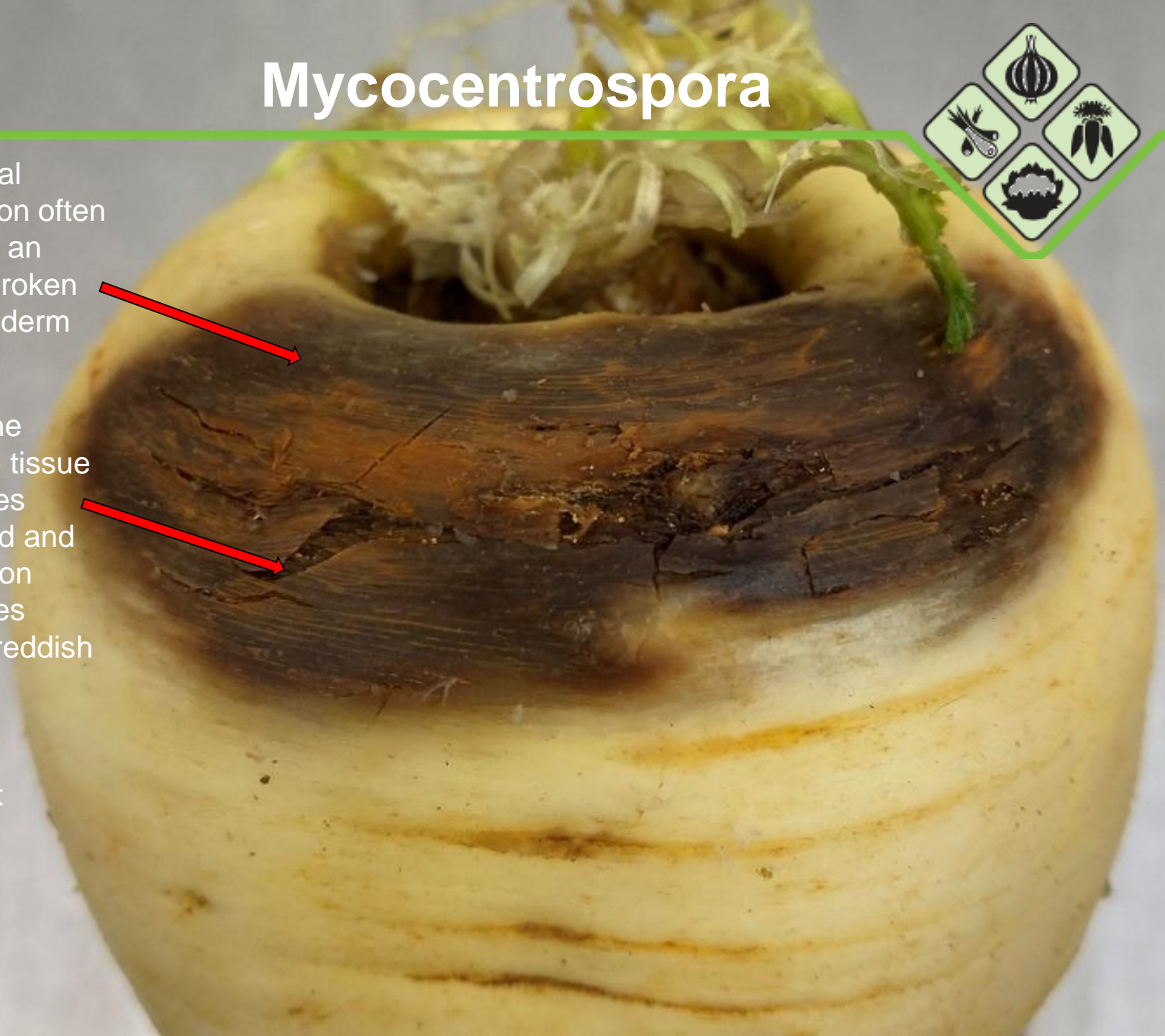
Initial
lesion often
has an
unbroken
periderm



Then the
surface tissue
becomes
ruptured and
the lesion
becomes
brown/reddish



Distinct
needle
shape
spores



Phoma



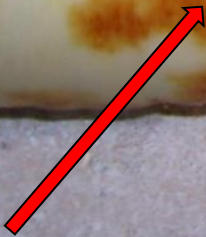
Large dark brown to black lesion often on the shoulder with black pycnidia in the centre



Ginger Spot: (*Fusarium* sp)



Rusty
coloured
surface
lesion



Cavity Spot: (*pythium sp*)



First signs of cavity spot – elliptical depressions up to 6mm wide, the skin remains intact while the tissue beneath collapses

Prevention /cultural control:

- Target soils with pH>7
- Avoid the crop becoming over mature.
- Avoid irregular irrigation.
- Rotational management

Agro chemical control

- Seed treatment: Fludioxonil,
- Field treatment: SL567a (Metalaxyl M)
- Ozone.

Violet Root Rot: *Helicobasidium purpureum*



Prevention

- Avoid following intense Potato and/or Sugar beet rotations
- Do not dump infected parsnips/carrots back on land that might be used to produce root vegetables.
- Harvest as soon as symptoms are first noted

Biological Control

- None, as yet

Agro-chemical control

- None

Common Scab: (*Streptomyces scabies*)



Prevention/ cultural control

- Ensure high risk soils (high pH) do not have a soil moisture deficit >15mm until the “pencil” root stage.
- Soils with higher organic matter content have less incidence. Review rotational organic matter amendments.

Biological Control

- *None known to be effective.*

Agro-chemical control

- *None known to be effective.*

Common on high pH soils, especially if conditions are dry

Parsnip Root Diseases



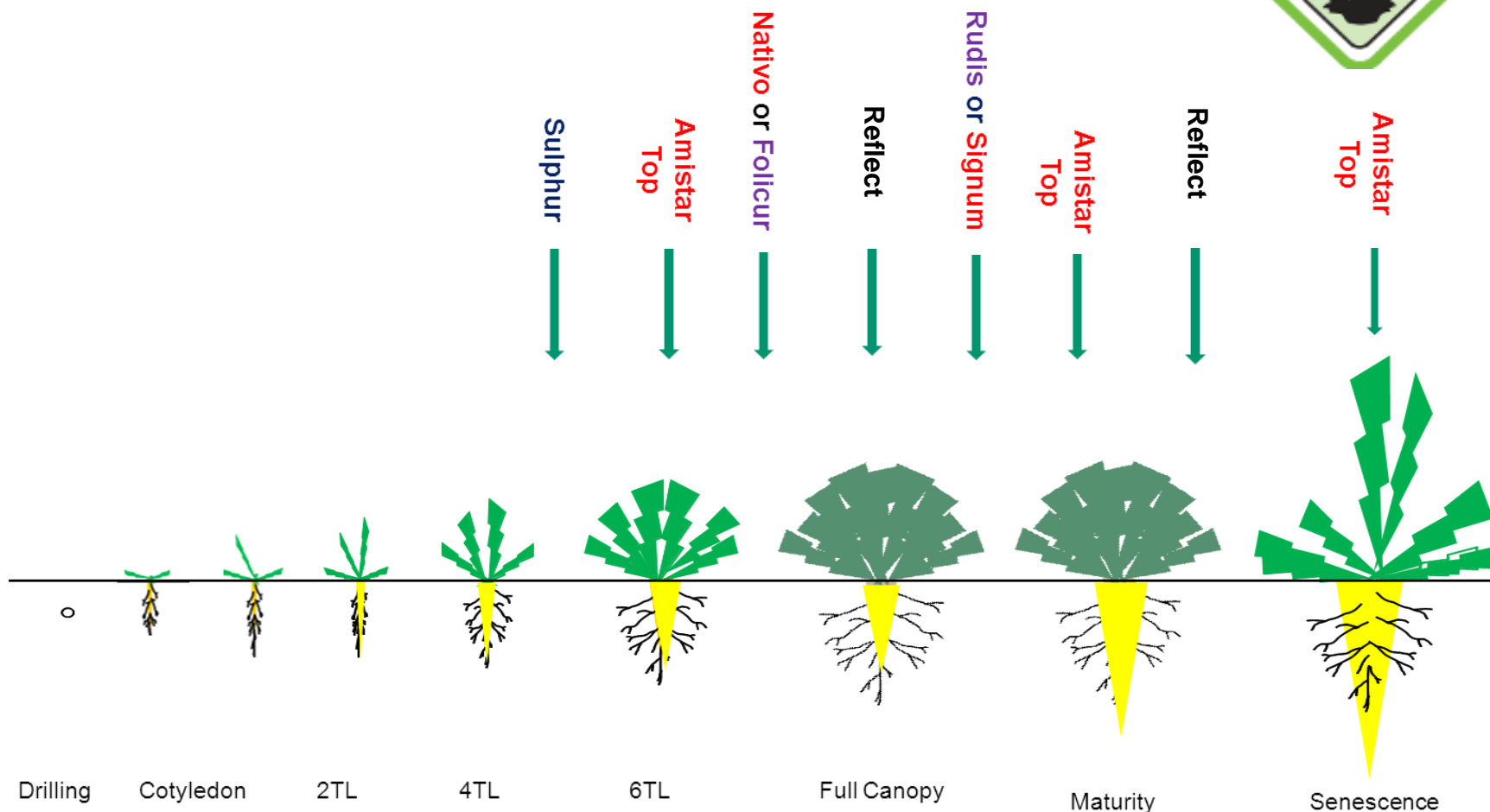
Disease	Potential source	Common name	Key symptoms
Cylindrocarpon	Soil	Canker	<ul style="list-style-type: none"> Typically on the crown and shoulder Small dark brown blemishes that develop into larger corky lesions Often appears to have an orange halo
Itersonillia	Seed, soil, foliage	Canker	<ul style="list-style-type: none"> Dark brown/black bruise type lesion Often shallow (<5mm deep) Typically found on the crown and shoulder during autumn and winter. Surface tissue appears ruptured and underlying tissue may appear purple.
Mycocentrospora	Soil, seed	Liquorice Rot	<ul style="list-style-type: none"> The periderm often appears unbroken with purple black diseased tissue. Typically on the crown and shoulder Sub tissue exposed with development and a brown-reddish halo develops
Phoma	Seed, foliage, soil	Canker	<ul style="list-style-type: none"> Large dark brown to black, mainly on the crown and root shoulder. Pycnidia in the lesion centre Infected roots sometimes have a sweet cinnamon odour.
Fusarium	Soil	Ginger Rot	<ul style="list-style-type: none"> Rusty coloured surface discolouration becoming black in time
Pythium	Soil	Cavity Spot	<ul style="list-style-type: none"> Elliptical lesions anywhere on the root, 1 to 20mm, enlarging in time, becoming black lesions
Sclerotinia	Soil	Soft Crown Rot	<ul style="list-style-type: none"> Crown with white mycelium and sclerotia.

Fungicides approved on Parsnips in the UK



Active Ingredient	Example Product*	Type of Approval	LERAP Category	HI Latest application.	MRL Mg/Kg	Expiry Date MAPP no.	Max indiv.dose	Max No. apps	Max total dose	Application interval	Other application info
Fludioxonil SEED TREATMENT	Maxim 480FS	EAMU 2903/15	n/a	Pre-drilling	1.0	30-Apr-24 MAPP 16725	0.10 L/ 100 Kg seed	1			
Fluopyram NEMATICIDE	Velum Prime	EAMU 0288/21		at sowing/planting		30-Jul-26 MAPP 18880	0.625 L/ha	1			1 app per 2 yrs via broadcast spray
Azoxystrobin	Amistar	EAMU 2198/19	ABZ 5m	14 days Root maturity (GS 49)	1.0	30-Jun-27 MAPP 18039	1.0 L/ha	3		10 days	Apply from 6 TL until root maturity
Azoxystrobin + Difenconazole	Amistar Top	EAMU 1340/17	n/a	14 days	1.0 Azox 0.40 Dif	30-Jun-26 MAPP 18050	1.0 L/ha	2			
Bacillus subtilis	Serenade ASO	EAMU 2359/18	n/a	0 days	n/a	24-Feb-25 MAPP 16139	10.0 L/ha	6		7 days	
Bacillus subtilis	Serenade ASO DRENCH	EAMU 0306/15	n/a		n/a	24-Feb-25 MAPP 16139	10.0 L/ha	1			Apply during drilling
Boscalid + Pyraclostrobin	Signum	EAMU 3375/09	B	14 days	2.0 Bos 0.5 Pyra	31-Jul-25 MAPP 11450	1.0 Kg/ha	2			
Cyprodinil + Fludioxonil	Switch	EAMU 3087/10	B	7 days	1.5 Cyp 1.0 Flud	31-Oct-25 MAPP 15129	0.80 kg/ha	3			
Fluxapyroxad + Difenconazole	Perseus	EAMU 3426/19	ABZ 5m	7 days Root maturity (GS 49)	0.3 Flux 0.40 Dif	30-Jun-26 MAPP 18397	2 L/ha	None stated	2 L/ha		Apply from 9 TL (GS 19)
Isoprazam	Reflect	EAMU 1190/22	ABZ 5m	14 days	0.2	30-Sep-28 MAPP 18573	1.0 L/ha	2		14 days	
Mancozeb	Dithane NT Dry Flowable	Full	B	30 days	0.2	30-Jul-26 MAPP 18889	2.0 Kg/ha	4		14 days	
Metalaxyl-M	SL567A	EAMU 1508/05	n/a	6 weeks after drilling	0.1	09-Sep-99 MAPP 12380	1.30 L/ha	None stated	1.30 L/ha		
Prothioconazole	Rudis	Full	B	21 days	0.1	31-Jan-24 MAPP 14122	0.40 L/ha	3			
Tebuconazole	Toledo	Full	ABZ 5m	35 days	0.4	29-Feb-24 MAPP 18298	0.60 L/ha	None stated	1.20 l/ha		
	Fathom	Full	ABZ 5m	21 days	0.4	29-Feb-24 MAPP 18737	1.25 L/ha	1			
Tebuconazole + Trifloxystrobin	Nativo 75 WG	EAMU 1959/15	ABZ 12m	21 days	0.4 Teb 0.04 Tri	09-Sep-99 MAPP 16867	0.30 Kg/ha	3		21 days	

Fungicide application timings: MC Parsnips



NB: Fungicide applications depend on the potential harvest/storage periods. First 3 applications with Syngenta Potato or Amistar nozzle (@200L/ha) , last 3 with Syngenta 06 or 08 Veg nozzle (@ 3-400L/ha)

Ozone injection



Summer Parsnip Harvest



**Parsnip
Harvest:**
positive selection

Storage

Straw covering



To optimise straw mulch...

- Chop
- Keep dry?
- Cover wheelings



Straw Removal



Traditional Winter Parsnip Harvest



The Future?



Ultimately our goal is to develop a fully integrated, precision production system adopting minimal pesticides, maximising production efficiency with minimal environmental impact

To achieve this we must improve our understanding of weed, pest and disease biology, soil chemistry and the dynamics between. Developing technologies are critical tools to help us achieve this.



Thank you for your attention!

Tom Will

Vegetable Consultancy Services (UK) Ltd.