Pre-emergence, selective contact and total herbicide options for container-grown HNS. Herbicide damage – symptom identification by various active substances

Selchuk Kurtev, Zest Sustainable ICM

What I will cover

- Pre-emergence herbicides
- Selective contact herbicides
- Non-selective (total) contact herbicides
- Herbicide effect on weeds
- Crop symptoms

Sustainable ICM

Pre-emergence herbicides

- Applied over the top of crops but the target is the growing media surface
- Applied before weed emergence
- Mostly short to medium persistence
- Many are soluble and easily displaced
- Incorporation into the growing media surface layer is the objective
- Where more than one approved application possible to top up the layer
- Adherence to regulatory restrictions can be challenging
- Crop penetration can be problematic

Sustainable ICM

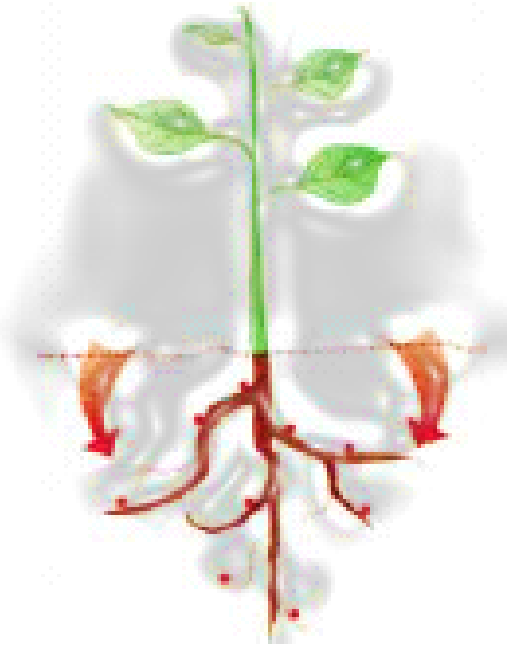
Root mitotic inhibitors

AIM: To block cell division

Pendimethalin, propyzamide

<u>Effect on weeds</u>

- ✓Root development inhibited resulting in stunted plant growth
- ✓Stems and leaves turn purple (similar to phosphorus deficiency)
- ✓High concentration of herbicide near soil surface can lead to formation of callus tissue
- ✓Stems become brittle
- ✓Damage from drift is uncommon
- ✓Low water solubility + volatile nature of product
- ✓Require soil incorporation



Sustainable ICM

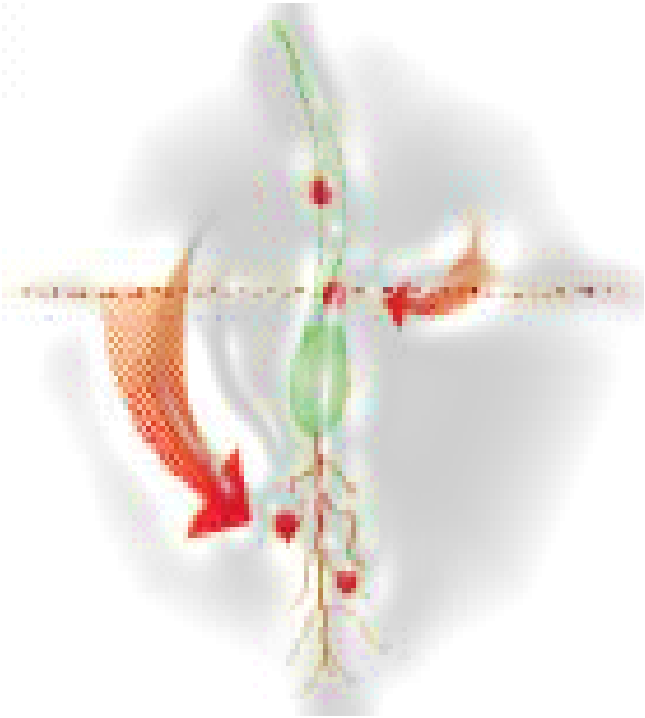
Shoot inhibitors

AIM: To affect cell growth and division

Flufenacet, metazachlor, napropamide, S-metolachlor

<u>Effect on weeds</u>

- ✓Stunted shoots; leaf crinkling
- ✓Seedlings may leaf up underground making emergence difficult
- ✓Grass seedling leaves may not unfurl correctly
- ✓Carry over or tank contamination injury is unlikely
- ✓Direct damage to crop only if under stress or if conditions encourage uptake (cool, wet spell followed by warm, windy weather)



Sustainable ICM

Photosynthetic inhibitors

AIM: To interfere with photosynthesis by blocking electron transfer, resulting in cell damage and cell death

Lenacil, metamitron, metribuzin

<u>Effect on weeds</u>

- ✓Herbicides applied to soil penetrate root and translocate throughout plant
- ✓Oldest leaves turn chlorotic first
- ✓Plant becomes stunted and may die if enough leaf tissue is affected
- ✓Carry over damage is common especially in soils >pH 7.0

Dimethenamid-P and metazachlor

- HRAC K3 + K3 – α-chloroacetamide
- Two EAMUs – 1.6L field application and 2.5L pre-crop emergence
- 50 days handling restriction, this product must not be applied via handheld equipment
- Workers must not enter treated crops for a minimum of six days after an application is made
- Useful broadleaf weed spectrum, top up option for metazachlor for one year in three - 1,000g a.s/ha permitted per year per field
- Used at 1.25L/ha in late autumn, early winter

Isoxaben

- HRAC L - benzamide
- Inhibits cell wall formation in dividing cells
- Excellent broadleaf weed control particularly chickweed, **some** bittercress control
- Poor control of annual grass weeds, groundsel and willowherb
- Application immediately before standing down is OK
- Do not apply to very dry or extremely dry surfaces
- Can last up to 12 weeks
- One application per crop

Sustainable ICM

Lenacil

- HRAC C1
- Residual activity, no contact
- Outdoors ONLY
- Good control of grasses, pearlwort, liverwort and willowherb
- Avoid application to soft spring growth, absorbed primarily by roots
- OK on most conifers except Cryptomeria and Taxus
- Use before end of July in year of application
- A maximum total dose of 500g/l lenacil per hectare may only be applied every third year on the same field
- 0.4L/ha in 200L of water, two applications at 0.4L/ha + one application at 0.2L/ha permitted

Sustainable ICM

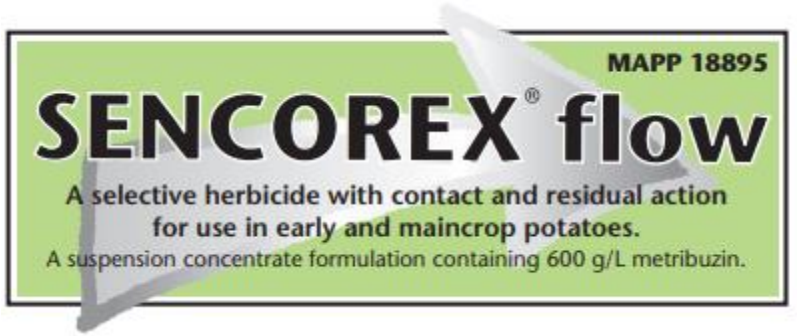
Metazachlor

- HRAC K3 - α-chloroacetamide
- Residual activity with a limited contact action on growing weeds
- Good control of grasses, groundsel, pearlwort and willowherb
- Avoid applications to soft spring growth
- Very good safety profile, lots of tolerance information available, absorbed by the hypocotyls and roots
- If damage occurs, crops often recover by the end of the season
- Less damage from applications made in the autumn/winter period
- Maximum total dose 1,000g metazachlor active substance per ha may only be applied every third year to same field

Sustainable ICM

Metribuzin

- HRAC C1 - triazinone
- Good on wide range of annual and perennial broadleaved weeds including grasses
- Pre- and post-emergence control
- Contact and residual
- Root and shoot uptake
- Damage visible much later in season
- Two EAMUs available – post-emergence dormant season and pre-emergence of crop
- Deciduous and some evergreens
- Risk to crops
- 1.15L/ha – lower rate down to 0.75L/ha still OK



Napropamide

- HRAC K3 - acetamide
- Broken down by light in the soil/growing media
- Works best if followed by rainfall or a sprinkler irrigation of 10-15mm within 7 days
- Safe on many woody plants but is weak at controlling some broadleaf weeds such as oxalis
- Good grass, willowherb and groundsel control and can also suppress small nettle
- Useful on herbaceous subjects, and deciduous crops
- Absorbed by roots with systemic activity
- Not for use on alpines and succulents – stunted growth
- Do not use on variegated evergreens and pots less than 1L
- Apply in December – February – FULL RATE at 7L/ha use in 1,000L
- 13 weeks handling period!

Sustainable ICM

Pendimethalin

- HRAC K1 - dinitroaniline
- Good grass control and many broadleaved weeds
- Controls oxalis
- Absorbed by roots and leaves, residual
- Broken down by light in tank
- Bright orange colour
- Good for sand beds and gravel beds
- Very useful on sand and MyPex as it prevents rooting through
- Application immediately before standing down
- One per crop

S-metolachlor

- HRAC K3 – α-chloroacetamide
- Controls annual and perennial grasses and wide range of broadleaved weeds
- Particularly useful for chickweeds, groundsel, willowherb
- Absorbed by hypocotyls
- Outdoor ONLY
- AHDB HNS 166 report for fern, herbaceous and ornamental grass tolerances
- Application may only be made between 1 May - 31 May
- One application at 0.78L/ha use 400-600L/ha

Sustainable ICM

Other products

- Dimethenamid-P + pendimethalin – **Wing-P (MAPP15424)**
- Metamitron – **Goltix 70SC (MAPP16638)**
- Prosulfocarb – **Defy (MAPP16202)**

Sustainable ICM

Selective contact herbicides

- Require dry weather conditions before and after treatment
- Wet foliage canopy reduces efficacy
- Timing of application is crucial as it depends on weed growth stage
- Concentrations of product more important than dose rate
- ‘Selective’ means specific weed species
- Damage does occur frequently, and it can be permanent, especially with herbaceous
- Presence of leaf wax on the crop provides the best tolerance
- Do not use with adjuvants

Sustainable ICM

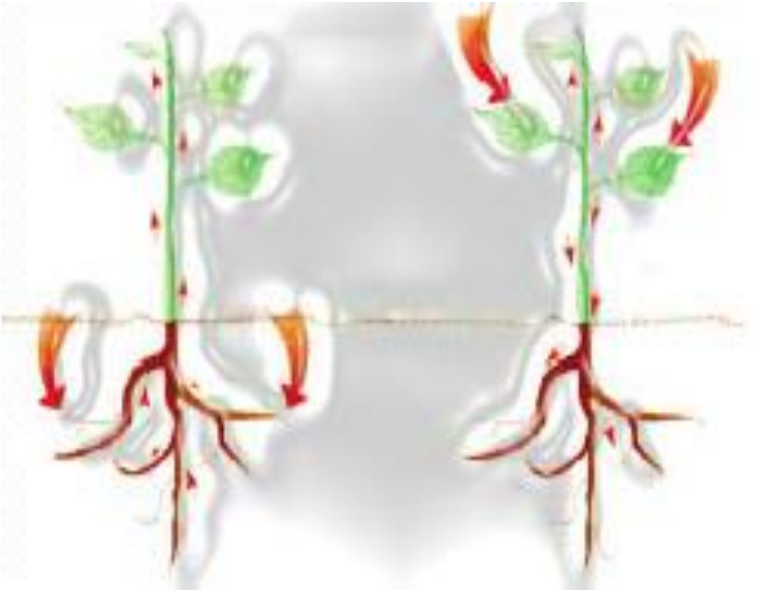
Hormone (auxin)-type herbicides (soil + foliar applied)

AIM: To affect growth in the newest stems and leaves

2,4-D, clopyralid, fluroxypyr, MCPA

<u>Effect on weeds</u>

- ✓Stunted, malformed seedlings
- ✓New growth twisted and distorted
- ✓Calluses form on stem; plant may lean and become brittle
- ✓Grasses exhibit leaf rolling
- ✓Symptoms likely from drift, tank contamination or direct injury



Sustainable ICM

Meristematic (lipid) inhibitors (foliar applied)

AIM: To block formation of lipids in shoot (meristem) and roots of grass weeds

Clethodim, cycloxydim

<u>Effect on weeds</u>

- ✓Symptoms slow to develop
- ✓Plants become stunted when new growth is stopped
- ✓Growing point disintegrates and dies first
- ✓Carry over unlikely at normal application rates; tank contamination and drift can affect crops
- ✓Direct damage usually caused by adjuvants used with products

Sustainable ICM

Clethodim

- HRAC: A
- Controls perennial and annual grass weeds
- Can be used over deciduous nursery stock and certain bulb species from 5-10 cm tall
- Best control when weeds are small
- Do not cultivate for 14 days after application
- Death of foliage takes three to four weeks after application
- No rain for four hours after application
- Drought and cool conditions reduce effectiveness
- Can be used with a knapsack sprayer
- Compatible with Butisan S, Dow Shield
- Application March to September
- Six weeks handling restriction with protective workwear

Sustainable ICM

Clopyralid

- HRAC: O
- Controls creeping thistle, spear thistle, corn marigold, mayweeds, groundsel, clover and dandelion
- Treat creeping thistle at rosette stage
- Avoid rain for six hours, absorbed **by roots** and leaves
- Not on Brachyglottis, Cytisus, Eryngium, Genista or Laburnum
- On-label approval for ornamentals for a range of products
- EAMU available for ornamentals
- Good for weed wiping
- Avoid drift at all costs!
- DO NOT use in protected structures on production beds
- Slow to work but it's very effective
- Needs actively growing weeds
- Effects reduced by low temperature

Sustainable ICM

Fluroxypyr

- HRAC: O
- Good on a range of annual and perennial broad-leaved weeds but won't control grasses
- Low volatility so no vapour drift
- Requires high temperatures of 10°C+
- Fantastic bind weed, chickweed, cleaver, groundsel, red dead nettle control
- Poor on bittercress, fat hen, and other brassica weeds
- EAMU available for outdoor ornamentals
- 0.6L/ha (18ml/10L or 15ml/10L)
- Outdoors only, good in mixes with Nirvana in summer or autumn
- Serious problems if mixed with sulfonylureas

Starane® Hi-Load HL
HERBICIDE

Sustainable ICM

Non-selective contact herbicides

- Particularly sensitive to weather conditions before and after treatment
- Wet foliage canopy reduces efficacy
- Weed coverage and dose is very important – speed and efficacy
- Adjuvants and water conditioners enhance performance
- Some can be used over top of dormant crops successfully
- Persistence in growing media and soils is noticeable

Sustainable ICM

Protein biosynthesis inhibitors

AIM: To inhibit a key enzyme in the amino acid synthesis pathway

Glyphosate

<u>Effect on weeds</u>

- ✓Slow chlorosis of tissue (10-14 days)
- ✓Stunting
- ✓Change in flower colour
- ✓Systemic, non-selective action on tissue
- ✓Inactivated on contact with soil

Sustainable ICM

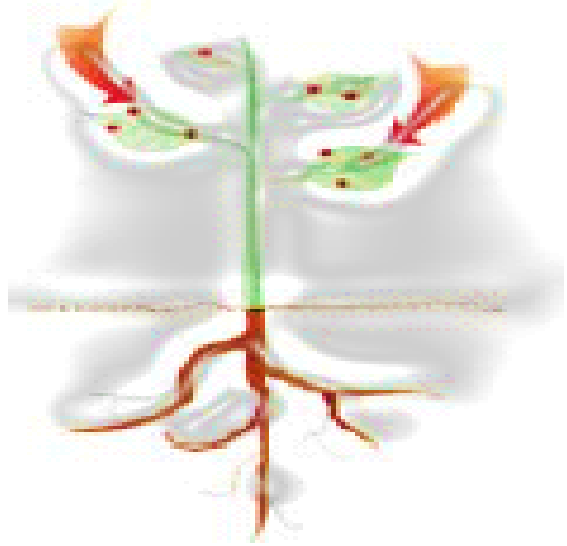
Photosynthetic inhibitors

AIM: To block photosynthetic reaction; disrupt cellular membranes so light can't be converted into chemical energy

Carfentrazone-ethyl, pelargonic acid

<u>Effect on weeds</u>

- ✓Spray penetrates leaves and produces localised tissue discoloration and death
- ✓Plants become stunted and die if enough tissue is affected
- ✓Carry over unlikely and drift injury limited to droplets from nearby applications
- ✓Control increased with addition of spray additives



Sustainable ICM

Carfentrazone-ethyl

- HRAC: E
- Can be used around the perimeter of the nursery
- Controls young annual weeds but not grasses, absorbed by leaves
- OK to use over fully dormant crops
- On-label approval for all non-edible crops
- EAMU available for protected and outdoor ornamentals (21 days PHI)
- Volatile and requires adjuvant ‘Silwet L77’
- Best applied on dry sunny days
- Good in tank mix with glyphosate if you looking for speed of kill and grass control
- Use with some residuals in dormant season
- Some formulation challenges when mixing with residuals
- DOES HAVE RESIDUAL ACTIVITY ON SEED GERMINATION

Glyphosate

- HRAC: G
- Systemic herbicide, translocated to roots and shoots; kills the entire plant
- Effective on both annual and perennial weeds
- Contact with leaves of the ornamentals results in injury or total plant death
- Glyphosate activity is increased in low water volumes
- Often takes seven or more days after application for control
- Avoid drift
- pH and alkalinity sensitive
- Water conditioners and adjuvant may be required
- EAMUs available on Clinic Up, Roundup ProActive

Pelargonic acid

- HRAC: Z
- Two products available both unique
- Both require specific environmental conditions and coverage
- Good on broadleaf weeds, grasses require adjuvant and early-stage application
- Poor on a range of perennial weeds
- Avoid rain or high humidity after application
- Good for herbaceous perennial crops indoors in dormant season (Katoun Gold only)
- Some formulation difficulties, can become like a gel

Sustainable ICM

Crop symptoms (herbicide or otherwise)

HTA

zest®
Sustainable ICM

Sustainable ICM

HTA

zest®
Sustainable ICM

NURSERY PRODUCTION

Zest-ICM

0333 005 0167

nurseryproduction@hta.org.uk

Sustainable ICM

Sustainable ICM