NURSERY PAPERS

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Weed Management in Production Nurseries

SUMMARY

- Weed management is one of the most important and costly aspects of container nursery production.
- Weeds reduce the rate of crop growth, crop saleability and spread pests down the supply chain.
- Weed management is most efficient using a combination of cultural, physical, and chemical strategies to prevent weeds from establishing.
- Preventing weeds from flowering and seeding is the single most important strategy for weed control.
- Weed seeds are the most important weed source and can be distributed by their explosive fruiting bodies, people, animals, birds, wind, and water.

Image: *Weed infestation in containers can reduce plant growth and vigour by interfering with water and nutrient uptake.*

BACKGROUND

This nursery paper can assist you to develop a weed management program for your nursery. The first step requires an understanding of the different types of weeds present and the appropriate management options for each weed.

Most weeds can be classified as broadleaf (dicots) or grassy weeds (monocots). Sedges, such as nutgrass, may be grouped with grasses on some herbicide labels, but they are not true grasses. Mosses and **liverworts** are also quite problematic in container nurseries. Aquatic weeds, like algae, may pose a problem in water storages and on solid surfaces in production areas.

It is recommended to identify and record all weed species in your nursery each season. This information can be used to build or update a flexible weed management plan. It is important to do this regularly as weed populations change over time, and some control measures are not effective against certain weeds.

It is critical to understand the lifecycle of the weed in your area to prevent them from setting seed. Most nursery weed seeds can germinate within a week, and some can set seed within 3–4 weeks. Seeds can be distributed via wind, water-splash, or explosive dehiscence, an effective seed dispersal mechanism, capable of spreading seeds metres away from the weed. Such weeds must be managed very proactively, even if plants are grown on benches.

The rest of this paper will summarise the most important management actions that will assist you in breaking the lifecycle of weeds at your nursery. As stated above, this is best done by using as many strategies as possible, cultural, physical and chemical.

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Hort Innovation Strategic levy investment | NURSERY FUND

Cultural and physical weed management

Effective weed management uses different cultural and physical practices as a baseline to prevent entry of weeds into the nursery and reduces weed pressure passively. These practices reduce time spent hand weeding and herbicide applications.

Nursery hygiene and cultural strategies

The following practices are recommended to proactively mitigate weed pressure in the nursery:

- **Inspect new plants** brought into the nursery and remove any weeds present in containers. Follow up actions may be required depending upon how weeds were managed in the supplier's business.
- **Store media on a clean sealed surface and cover media** to reduce exposure to organic matter, sunlight and water (irrigation and rain).
- **Ensure regular monitoring** of freshly potted plants for weeds. Any seeds present in the growing media are most likely to germinate once watered and fertilised.
- **Do not recycle growing media**; this practice substantially increases the risk of infection from a range of pests including soilborne pathogens and weeds.
- **Dibble or incorporate fertiliser** into the growing media to avoid nutrients being available on the media surface. Avoid topdressing slow-release fertiliser. Altering fertilising practices can reduce the growth of common nursery weeds by 85%.
- **Clean and disinfest growing areas** and remove all organic matter in growing areas between crop cycles.
- **Filter and disinfest irrigation water**. Weed seeds, bryophyte spores and algae can be spread in recycled water.
- **Avoid overwatering** and allow for sufficient drainage of containers; increase air-filled porosity where possible. Allowing the surface of the growing medium to dry between irrigation cycles reduces weed abundance.
- **Use of raised benches** and/or coarse gravel improves water drainage by preventing water pooling under pots. It can reduce weed seeds from blowing from the growing area into pots.
- **Avoid moving containers infested with weeds**. Dehiscent seeds can be spread over the nursery easily during this process. Carefully remove such weeds before moving them.
- **Disinfest re-used trays and containers**. Re-used pots should be cleaned thoroughly to remove all organic matter. Heat and chlorine treatments do not kill weed seeds.
- **Store containers hygienically**. New and disinfested containers should be stored under cover and in such a way as to avoid contamination with organic matter.
- **Disinfest tools, equipment, machinery** and vehicles to stop spread of diseases and weed seed.
- **Manage discarded plants proactively**. Do not leave discarded plants in a heaped pile on site. Waste should be managed by composting, deep burial, or covered and promptly removed from the site.
- **Use organic or plastic mulch** to minimise weed establishment. Weed mats or similar products are essential underneath containers in production areas. Coir weed mat covers can also be used as a surface mulch for containers and may be cost-effective in certain cases. Plastic mulch can be helpful in areas where mother stock are grown in ground.

Hand weeding and mowing

Hand weeding often has a massive impact on weed pressure. Employing a fortnightly hand weeding schedule can reduce overall weed growth by up to 70%, compared to hand weeding only when weeds are an undeniable and large problem. Focus on the removal of relatively large weeds that could potentially flower before the next hand weeding event. Small weeds that will not flower and go to seed in the next fortnight do not need to be weeded. The exact timing and size category targeted may need to be altered depending on climate and weed species.

Dispose of weeds hygienically, in covered bins or bays or bagged until they are removed from the site. Weeds left in or around the growing area may still release seeds that can become a problem.

Weeds in non-crop areas (such as the nursery perimeter, fencelines, driveways, and around irrigation sources) will inevitably move into production areas if they are not controlled. Mowing peripheral areas and lawned areas to prevent seeding is very effective.

Herbicide weed management

Many production nurseries use herbicides as a component of their weed management plan. Be aware that herbicides will not eliminate the need for hand weeding, however their use will reduce overall weeding costs and time, dependent on the conditions in your nursery.

There are four main factors to consider when selecting a herbicide: the crop, the weed species, the weed growth stage, and herbicide chemistry. Proper weed identification is crucial to the success of a herbicide management plan so that an appropriate herbicide is chosen. Even broad spectrum herbicides can have varying performances on different weeds. In most cases, a single herbicide does not control all weeds at a specific site. Combining herbicides may be useful to increase the spectrum of weeds controlled and reduce the risk of inducing herbicide resistance.

Herbicides can be either selective (products that only kill certain plants with little to no effect on others) or non-selective (toxic to most plants). They can act systemically by travelling throughout the plant, or by contact action. Herbicides are also differentiated by timing of application as either preemergence or postemergence products.

Preemergence products are active against growing meristematic tissue, preventing growth of emerging seed growth; they are not effective against established weeds. **Postemergence** herbicides are applied to actively growing weeds and are most effective when weeds are small.

Carefully read the chemical label to ensure the herbicide is not toxic to the crop plants in question. It is recommended to test preemergence products on a small number of plants from commonly grown plant lines to determine if a phytotoxic reaction occurs. Leave some plants untreated as a point of comparison for container plant (and weed) growth.

Manage herbicide resistance by using as many cultural strategies as possible, hand weeding regularly and rotating between herbicides of different modes of action.

Preemergence herbicides

Preemergence herbicides are applied to the surface of weed-free container media and surrounding production areas. Irrigation activates the herbicide to incorporate it into the growing media. A complete and uniform chemical barrier is required for the product to be effective; weeds can germinate and proliferate in gaps in the chemical barrier. Preemergence herbicides last between 6 to 12 weeks, so reapplications are often necessary. Note that excessive irrigation can impact herbicide efficacy by leaching away from the media surface and may increase phytotoxicity. There are also restrictions on the use of some preemergence herbicides in production nurseries as they are not labelled for use in enclosed structures; volatilisation increases risk of phytotoxicity.

Table 1. Preemergence products registered for use in production nurseries.

MOA GROUP	ACTIVE INGREDIENT	EXAMPLE PRODUCT NAME	SELECTIVITY	PERSISTENCE IN SOIL[1]	PERSISTENCE IN WATER[1]	PROTECTED CROPPING[2]
C	Simazine PER84951	FarmOz Simazine	Broadleaf weeds	M	LM	Y
D	Chlorthal dimethyl	Dacthal	Grasses and broadleaf weeds	M	H	Y
D	Oryzalin	Surflan	Annual grasses and some broadleaf weeds	LM	L	Take special care[3]
D	Prodiamine PER84303	Barricade	Grasses and some annual broadleaf weeds	MH	VL solubility – adheres to soil	Y, check label
D+G	Oryzalin + Oxyfluorfen	Rout Vault	Grassy and broadleaf weeds, particularly woody plants	LM	L	Take special care[3]
D+K	Pendimethalin + Dimethenamid-P	Podium Freehand	Grasses and some broadleaf weeds.	L	L	N
G	Oxyfluorfen PER84951	Goal GoalTender	Broadleaf weeds and limited annual grasses.	LM	L	Take special care[3]
G	Oxadiazon	Ronstar Turf and Ornamental	Broadleaf and grassy weeds	H	H	N
O	Dichlobenil	Casaron 4G	Annual and perennial broadleaf and grassy weeds	MH	MH	N
O	Isoxaben	Gallery	Broadleaf weeds	H	L	Y (empty structure)
O	Indaziflam	Specticle	Grasses and broadleaf weeds	H	Probably L; tends not to be mobile in water bodies	Y (empty structure)

[1] Persistence categories were given as VL (less than 7 days); L (7-30 days); M (30-100 days); H (100-1000 days); VH (greater than 1000 days). Where more than one category is present (e.g. MH) there is relatively high variability in persistence dependent on environmental factors.
[2] Enclosed structures with high irrigation demands create an environment which may lead to the volatilisation or leaching of some registered preemergence herbicides, causing phytotoxicity to plants within protected structures. Yes/No indicates that the product is or is not available for use in protected structures.
[3] Research has indicated that application of some products in protected cropping has a relatively high risk of causing phytotoxicity. As such, their use in protected structures requires special care despite being registered for use in this situation.

Postemergence herbicides

Postemergence products must remain on weed foliage for several hours without rain or irrigation to be effective. Postemergence herbicides are generally non-selective and may provide broad-spectrum weed control if used carefully. Avoid applications directly onto crop foliage, and limit spray-drift. Many products are best used in non-production areas and between crop cycles that do not drain into waterways or irrigation catchments.

Postemergence products are most effective when weeds are actively growing, small and not under moisture stress; stressed plants are not controlled as easily. Products are often temperature sensitive; activity may be reduced with cold temperatures and volatilisation may occur at high temperatures, which can increase the risk of phytotoxicity.

Image: *Weeds growing in non-cropping areas can quickly spread into container plants.*

Table 1. Postemergence products specifically registered for use in production nurseries.

MOA GROUP	ACTIVE INGREDIENT	PRODUCT NAME	SELECTIVITY	CONTACT SYSTEMIC	PERSISTENCE IN SOIL[1]	PERSISTENCE IN WATER[2]
A	Clethodim	Havoc Plus 360	Grassy weeds	S	VL	L
A	Fluazifop-P	Surefire Cannonade	Grassy weeds	S	L	M
A	Sethoxydim	Sertin 186EC Selective	Grassy weeds	S	L	MH
L	Diquat + Paraquat PER84951	Spray Seed 250 Herbicide	Broad spectrum	C	VH	HVH – absorbed by sediments
M	Glyphosate PER84951	Roundup	Broad spectrum	S	LM	LM
N	Glufosinate-ammonium PER84951	Basta; Finale	Broad-leaf weeds	C (limited systemic activity)	L	L
Z	Acetic acid	Richgro Beat-a-Weed	Broad spectrum	C	VL	VL
Z	Nonanoic acid	Eureka! Organic Nonanoic Acid	Broad spectrum	C	VL	Probably VL

MORE INFORMATION

For an in-depth discussion of nursery weed management and herbicide resistance refer to ***A Management Plan for Weeds in Production Nurseries*** and ***Managing Liverworts in Production Nurseries***. A ***webinar*** with complimentary information is also available.

A great deal of information on chemicals and their usage is available on the ***Nursery Production FMS website***, including the ***Best Practice Manual for Pesticide Application*** and all current minor use permits for the Australian production nursery industry.

The ***NC State Extension Weed Management website*** is a wealth of information for weed identification, herbicide chemicals and crop injury.

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