Weeds are introduced in several ways: seed blow in from adjacent areas, seed cling to the inside of recycled containers, from the propagation area with the potted liners, soil in the media from storing media on the ground, and even up through the gravel. Sometimes pots blow over and spill media and weeds or seed. Occasionally, weeds in containers are allowed to produce seed. When things get bad, they can get real bad quickly.

Difficult to control container weeds include prostrate spurge, woodssorrel (oxalis), nutsedge, bittercress and eclipta. Nutsedge (nutgrass), all perennial weeds such as bermudagrass, bittercress and eclipta must be dealt with correctly and timely.

Isoxaben is the (only, best, most effective) preemergent defense against bittercress. Prodiamine and Isoxaben are the most water insoluble preemergent herbicides available.

Prodiamine is sold as Factor, Barricade, RegalKade G and is an ingredient in RegalStar II. Isoxaben is sold as Gallery and is an ingredient in Snapshot 2.5 TG.

The Floor
The industry standard has been several inches of gravel to grow conventional containers on. Boom spray 10 qt Simazine 4L (Princep 4L) per acre of gravel area prior to the placement of containers each year. The inclusion of a DNA preemergent herbicide during this application is debatable. 4 qt Surflan per acre, perhaps, or the corresponding amount of Pennant, Pendulum or Factor can be added to the Simazine. Some nurseries are laying a Geo-Textile fabric over gravel or over poly, not requiring a herbicide application.

During Potting
A granular pre-emergence container herbicide applied with a shaker can on the potting line can not be calibrated. A herbicide is not recommended until after a good watering to settle the media.
In the Container, after they are spaced out

On or about March 15: Broadcast a granular pre-emergence container herbicide over all of the containers after they are spaced out. (Note: If the floor is fabric, consider broadcasting a granular while the containers are bunched together somewhere; immediately after being potted and watered throughly on the wagon if the applicator can be provided a safe raised walkway.)

60-90 days later; on or about June 1: Broadcast a granular pre-emergence container herbicide over the containers regardless of the floor.

60-90 days later; on or about August 15: Broadcast a granular pre-emergence container herbicide over the containers again. Snapshot 2.5 TG is the best choice at this application if eclipta is a problem weed, since it contains Gallery.

These applications will help prevent weeds in the containers, as well as between them. Granular pre-emergence container herbicides to choose from are listed later and should be selected for plant safety and their ability to control weeds, especially the tough ones. Refer to the label for the ornamental species that each product is labeled for. The Univ. of Tenn. Pub. #1226, “Weed Management in Ornamental Nursery Crops” can be used as a planning guide; but the label should be consulted, as they change periodically.

Granular products are broadcast with a spreader (belly grinder) carried around the neck. These spreaders can be very accurate when used correctly. Most of the herbicide companies and their dealers will provide a calibration tray free. These are plastic trays, 1 square foot in size, with a dimple in each corner to measure the per acre rate. Accuracy will come with experience.

Extra effort will be required when foliage interferes with the applications. Where possible, apply the herbicide from more than 1 direction. Reduce the rate and make several passes to apply the correct total amount. Lay several calibration trays among the containers. Avoid trying to apply granular products with even a slight breeze, because the particles will be blown off target, wasting product without achieving control.

Accuracy is important. Accuracy here is dependent upon walking speed, wind, plant foliage, and obstructions. Obstructions include irrigation risers, building supports and the plant canopy. Placement of the product in the pot is critical. Too much can damage and too little can allow weeds to grow. The hand pulling of grass and weeds from containers is far too expensive and it disturbs the topdressed fertilizer.
Always read and follow label instructions. The information given herein is supplied with the understanding that no discrimination is intended and no endorsement by the University of Tennessee Agricultural Extension Service is implied. Mention of any pesticide names is strictly for educational purposes.

Existing weeds must be pulled prior to the application of pre-emergence herbicides. Some granular products will burn if applied to wet foliage. A chemical in some granular products will vaporize in extreme heat soon after application in enclosed poly houses and burn foliage. Those products recommend application so many days prior to winter enclosure to avoid phytotoxicity. While this information is on the label, pertinent characteristics have been pulled together in several later pages of this handout.

If the irrigation water is caught and recycled on a container yard of several acres, a potential problem exists, if the entire area is treated with a herbicide the same day or so. Sixty percent of the herbicide falls between the containers. The first 3 irrigation events moves a high percentage of the herbicide with the runoff water away from the production area and into collection ponds. Even if this water is pumped to a primary reservoir and mixed with fresh water, there is a strong potential for tender foliage of some species to be burned.

Oxyfluorfen or Goal should not be used if the water is recycled. Regal O-O, OH-2 and Rout contain oxyfluorfen and are very effective products. A better solution is to divide the area that drains into the same pond into thirds or quarters. **Stagger the application of herbicides by at least 6 irrigation events.** Hard research supports this and detailed information is available upon request.

Keep someone **constantly pulling and spraying escaped weeds.** Weeds should be collected and removed from the area. Use care not to remove media and fertilizer when pulling weeds from containers. Instruct labor to pull with one hand and use the other hand to hold the media in place. Neatness here pays dividends in more than appearance for visiting customers. Spilled media offers a place for future weeds to grow.

Keep all vegetation in the area **mowed** frequently to reduce seed formation. Devise a plan for escaped weeds within the container yard to be spot sprayed every 2 weeks with the proper post-emergent herbicide. Prevent as much seed formation as possible. Remember, "One year of seeds, 7 years of weeds." Roundup is effective on most grass and weed species.
Consider creating a "Weed Patrol"; on duty every 2 weeks; to scout and spray the difficult to control weeds, as well as the escapes. Provide 1 worker with a small vehicle that can get into tight places. Arm the vehicle with 2 or 3 tanks; depending on weeds present. Select 1 or 2 of the battery powered 15 or 25 gal. tanks available at TSC or TFC. The third tank could be a back-pack sprayer possible. Consider adding longer hoses to the spray tanks in the vehicle. Wind up reels are convenient.

A small container yard might survive with 2 or 3 back-pack sprayers; but the emphasis here is the scheduled and timely application of the correct herbicide on the different difficult weeds on site. If nutsedge is present one tank should contain Gramoxone, Basagran T/O, or Manage and another for Pennant Magnum. If annual grasses or Bermudagrass is present in containers, another tank needs Envoy, Fusilade or Vantage. Roundup will probably require the largest sprayer; to spray all green weeds on the floor except nutsedge.

Be sure and instruct them as to what nutsedge looks like and what to spray it with. They must be in close contact with the irrigation controller, so that the sprays are not washed off too quickly. Note: Post-emergence herbicides are more effective when applied on to dry foliage. Stressed weeds are harder for any post-emergence herbicide to control.

If not confused, read this. Eclipta, if present, requires a 2% solution of Roundup. A 2% Roundup solution will kill everything green except nutsedge. Roundup must be shielded. Only Basagran T/O, Gramoxone, Diquat, Image, Manage, 5% Roundup and Finale will kill green nutsedge and must be shielded. To be effective, the irrigation can not be turned on for 0.5 to 8 hours, depending on the herbicide selected. (see Rainfastness)

An alternative to granular pre-emergence herbicides are the sprayables

Factor, Gallery, Pendulum WDG, Pennant, Ronstar WP and Surflan are also labeled for containers. A high, long boom must be devised to apply these over the plants 1 to 3 times during the growing season. Bed width and irrigation riser location and height must be considered. Sprayables should be as effective as the granular products and more economical. There is limited research.

Gallery could be tank mixed with one of the other products mentioned. Wash the chemical from the foliage within 30 minutes of application to avoid problems with some of the products. Ronstar could be used alone. Evaluate the success after the first couple of applications and adjust the rates accordingly.
**Nutgrass or Nutsedge**

It looks like a grass, but the grass herbicides don't kill it. In fact, it's not a true grass. Everyone calls it nutgrass, but it's really a sedge. Remember, the phrase, "sedges have edges," meaning that sedges have triangular stems whose edges you can feel with your fingers. Grasses have round or flattened stems. Nutsedge reproduces by seed and tubers. Like seed, the tubers can lay dormant in the soil for several years.

**Pennant Magnum** can be used on the floor and over some ornamentals in containers. Pennant Magnum is the only pre-emergence herbicide that offers any pre-emergence activity on nutsedge. The 2 pints per acre rate will provide about 60 days of control. It can be repeated. The 2 pints per acre rate equals 20 ml or 4 teaspoons per 1000 sq. ft. for spot spraying. The Pennant Magnum label states that it can be tank mixed with Roundup. Joe Paul Downs, Monsanto rep. on Oct 5, 1998, stated that he thought Pennant Magnum would be compatible with Manage. Basagran T/O can be tank mixed with Pennant according to Basagran’s label, but not over the top.

**Nutsedge on the Floor**

Green actively growing (May-Sept) nutsedge can be spot sprayed with Basagran T/O, Gramoxone, Diquat, Image, Manage, Roundup and Finale. Repeat applications will be required to kill with some of these. Avoid getting any of these on any plant parts by being careful, avoiding windy days or improvising a hand-held shield. (See later) It is not safe for any of these herbicides to contact foliage (or stems in some cases). Multiple applications will be required as new tubers germinate. Nutsedge must be actively growing and not stressed in order to obtain good control.


Basagran T/O may be applied as a directed spray around all ornamental and nursery plants except sycamore and rhododendron, as injury to these plants can be caused by spraying the soil over their roots.
Rates range from 0.55 fl. oz. per 1,000 sq. ft. (1.5 pints per acre) to 0.75 fl. oz. per 1,000 sq. ft. (2 pints per acre). Add 0.75 fl. oz. oil concentrate per 1,000 sq. ft. (2 pints per acre). Use a minimum of 0.5 gal water per 1000 sq ft or 20 gal per acre at 40 psi. Increase water volume and pressure for extremely thick stands to obtain good coverage.

Apply when the nutsedge is 6-8 inches tall. Repeat at same rate in 7-10 days, if needed. Rainfall or overhead irrigation within 8 hours may reduce effectiveness. Basagran T/O can be tank mixed with Pennant according to Basagran’s label, but not over ornamentals.

The only rate I have for Gramoxone is 1 ounce per gallon. Spray to wet. One application should kill the plant and its' tuber. A chemical card is required to purchase this “Restricted Use Pesticide”. Additional tubers will germinate when the sun is allowed to reach the soil, as the vegetation dies down. Some people assume that the plant never totally died, when the regrowth from seed or tubers is rapid. Gramoxone is rainfast in 0.5 to 1 hour.

Image 1.5 LC, by American Cyanamid, is labeled for yellow and purple nutsedge, at the rate of 1.0 fluid ounce per 1000 square feet. It will damage ornamental plants. Repeat applications may be required.

Manage, by Monsanto, is labeled for yellow and purple nutsedge, but can not go over the top of any ornamentals. It is a 75 percent water dispersible granule (WDG). Mix 0.9 gram (using measuring scoop provided) + 2 teaspoons (1/3 fl oz) nonionic surfactant per 1 gallon. Mix 2.7 grams Manage + 1 fluid ounce surfactant per 3 gallons. Mix 13.5 grams Manage + 5 fluid ounces surfactant per 15 gallons.

Use level scoops, not rounded. Best to apply to dry foliage. The nonionic surfactant must be high quality. Sun-It II was the best one in UT research. Manage is effective if no rainfall occurs within 3 hours, but best results are obtained with no rainfall or irrigation for at least 8 hours. Wet the entire leaf surface. Symptoms of dying are slow, taking 7-10 days to yellow, and 30 days to brown. Manage is available through Co-op, Terra, & BWI. Manage has no effect on bermudagrass.

Roundup is effective on nutsedge when mixed at a 5% solution. The secret for success is that it must be sprayed very lightly across the foliage tips. Surprising, but effective. Roundup is also more effective on nutsedge as it approaches flowering. Roundup is rainfast in 2-4 hours. Repeat treatments will be required as new tubers germinate.
A 1% solution of Roundup requires 3.75 fl oz in 3 gal or 2 qts in 50 gal. A 2% solution of Roundup requires 7.5 fl oz in 3 gal or 4 qts in 50 gallons. A 5% solution of Roundup requires 20 fl oz in 3 gal or 10 qts in 50 gallons.

The Finale label says that 3-4 fluid ounces per gallon will control nutsedge. Finale is rainfast in 4 hours. Strive for thorough spray coverage, and don't use excessive water. Like Roundup, keep Finale off of all foliage and bark of ornamentals.

**Nutsedge in Containers**

No post-emergence herbicide is safe to spray over ornamentals, except Basagran T/O. Refer to that list on the label or above. After hand pulling existing nutsedge, Pennant Magnum can be sprayed over a limited list of container grown species. Refer to the label for a list of ornamentals. The label states to “follow with sufficient overhead irrigation to wash Pennant Magnum from the foliage to reduce the chance of injury.” Any foliar burn on tender foliage is usually quickly covered by new growth.

**Bermudagrass on the Floor**

Spot spray repeatedly with Roundup, where and when safe. Where spraying Roundup might be dangerous to nursery plants, and shielding would slow the process down considerably; consider Fusilade, Vantage or Envoy. Fusilade, Vantage and Envoy are more effective on young tender grasses than Roundup. Envoy is more effective than Fusilade or Vantage. Repeat treatments will be required.

Envoy is mixed at 2.0 - 4.3 fl oz plus 1 fl oz non-ionic surfactant per 3 gal water. Envoy is mixed at 10 - 21.5 fl oz plus 5 fl oz non-ionic surfactant per 15 gal. Envoy is mixed at 1-2 quarts plus 17 fluid ounces non-ionic surfactant per 50 galls. Use the lower rate on small, young, tender grasses; and the higher rate on larger plants.

**Bermudagrass in Containers**

Select either Fusilade, Vantage or Envoy based on which ornamentals their labels recommend that they can be sprayed over safely. Envoy is slightly more effective.

Grading or working the gravel during the off season is normally a very good practice. But it will scatter nutsedge and bermudagrass and should be avoided until control is obtained.
Improvising a Hand-held Shield

Commercially made cones are available to fit over the nozzle of a back-pack sprayer. These can be made from plastic liter bottles, gallon bleach bottles, etc. Stick the nozzle thru the small top opening. Duck tape it in place. Cut the bottom from the bottle. Would cutting a few more inches from the bottom benefit matters? Don’t allow the drips to contact desirable plant parts. Replace the tip with an 8001 or 8002. Maintain little pressure. Drag the container about, so-to-speak. Let the shield hover just over the foliage.

A thin piece of paneling, fiberglass or roofing can be carried in one hand while spraying along the outside edge of a container bed. Cut a piece out for a handle. Be cautious of drips.

The Enviromist mounted on a small tractor or 4-wheeler would be a safe way to apply Roundup or Gramoxone close to containers, along the edge of the overwintering house, or in the open; even in the wind. Enviromist hoods come in several widths: 16", 24", 36", 48", and wider.

Weeds in the open areas can be sprayed with a boom, with no wind. Two nozzles can be rigged under the spray tank and wrap a piece of plastic around the tank, with the plastic touching the ground to prevent the herbicide drifting onto ornamental foliage.

Rainfastness:
Basagran T/O requires 8 hours before rain or irrigation to work.
Envoy, Fusilade and Vantage are rainfast within 1 hour.
Finale is rainfast in 4 hours.
Gramoxone is rainfast in 0.5 to 1 hour.
Manage is rainfast in a minimum of 3 hours, but 8 hours for maximum effect.
Roundup requires 2-4 hours.
Pennant Magnum should be washed off with irrigation within 30 minutes of application to avoid injury to ornamental foliage. Any foliar burn on tender foliage is usually quickly covered by new growth however.

For additional information, contact: Mark Halcomb, UT Area Nursery Specialist
Warren Co Ag Extension Service
201 Locust St. #10, McMinnville, TN 37110
mhalcomb@utk.edu
(931) 473-8484  Fax: (931) 473-8089
Granular Pre-emergence Container Herbicides

Corral 2.68 G
Scotts
Caution Pendimethalin
76 – 114 lbs per acre; 1.7– 2.6 lbs per 1000 sq ft
Will control spurge, woodsorrel, annual grasses and some broadleaves.
Apply to dry foliage only. Irrigate immediately after applying.
Delay use 2-4 weeks if liners were bareroot.
Do not use in an enclosed poly structure
12 hours REI

OH-2
Scotts
Caution
2% Goal + 1% Pendulum Oxyfluorfen + Pendimethalin
100 lbs per acre; 2.3 lbs per 1000 sq ft
Will control bittercress, eclipsa, woodsorrel, spurge
Avoid wet foliage; water in immediately with 0.5-1 inch irrigation
Avoid tender foliage; avoid applying during a flush of new growth.
Avoid use on newly transplanted liners; Euonymus alata 'Compacta', Rhodo.
'Snow', Rhodo. 'Hino-Crimson'
Do not apply in enclosed structures.
Avoid applying to plant types whose leaves funnel granules
24 hours REI

Pendulum 2G
Am. Cyanamid
Caution Pendimethalin
100 lbs per acre; 2.3 lbs per 1000 sq ft
Will control spurge, woodsorrel
Delay use 2-4 weeks if liners were bareroot. Delay use until liners have become well rooted. Media should be well settled, with no cracks.
12 hours REI

RegalKade G
Regal
Caution
0.5% Factor Prodiamine
132-300 lbs per acre; 3 - 6.8 lbs per 1000 sq ft 300 lbs is annual maximum
Will control spurge, woodsorrel
Avoid wet foliage
Safe after transplanting when media has settled. Apply before budding/grafting or after buds/grafts have taken to avoid any inhibition of the union
Apply 30 days prior to enclosure
12 hours REI
**Regal O-O Herbicide**

*Regal*

**Caution**

2% Goal + 1% Ronstar Oxyfluorfen + Oxadiazon

No root pruning

100 lbs per acre; 2.3 lbs per 1000 sq ft

Will control bittercress, woodsorrel, spurge

Avoid use on wet foliage

Avoid applying to plant types whose leaves funnel granules

12 hours REI

**RegalStar II**

*Regal*

**Warning**

1% Ronstar + 0.2% Factor Oxadiazon + Prodiame

Contains 38% total nitrogen: 27% insoluble, 11% soluble nitrogen

Ureaform is the insoluble fertilizer carrier of the herbicide

200 lbs per acre; 4.6 lbs per 1000 sq ft

Avoid wet foliage

Do not apply in greenhouses

Delay application to new transplants until soil has settled.

12 hours REI

**Ronstar 2%**

*Rhone-Poulenc*

**Warning**

no root pruning

100-200 lbs per acre; 2.25 - 4.5 lbs per 1000 square feet

Will control bittercress, woodsorrel.

Avoid wet foliage

Safe on newly transplanted liners

**Rout**

*Scotts*

**Caution**

2% Goal + 1% Surflan Oxyfluorfen + Oryzalin

100 lbs per acre; 2.3 lbs per 1000 sq ft

Will control bittercress, woodsorrel, spurge

Safe on wet foliage

Tender foliage is sensitive.

Do not apply 2 weeks prior to or 2 weeks following leaf bud break or during a flush of growth. Not recommended for use in liner production beds. Safe on newly transplanted liners after the first irrigation, or wait 3 weeks if liners were bareroot.

Avoid applying to plant types whose leaves funnel granules.

Irrigate immediately to completely remove particles from leaf surface.

Apply 14 days prior to enclosure. Do not use in enclosed structures.

24 hours REI
**Snapshot 2.5 TG**  
**Dow AgroSciences**

**Caution**  
2% Treflan + 0.5% Gallery  
Trifluralin + Isoxaben  
100-200 lbs per acre; 2.3 - 4.6 lbs per 1000 sq ft  
Will control bittercress, wood sorrel, prostrate spurge, & eclipta  
Do not apply more than 600 lbs per 12 month period  
Avoid use on newly transplanted liners  
Avoid use on pots less than 4 inches across  
Avoid use on ajuga, Euonymus alatus 'Compacta', Hydrangea spp., Juniperus horizontalis 'Prince of Wales', Rhodo. carolinianum, Rhodo. catawbiense 'Roseum elegans'.  
Apply 21 days prior to enclosure; do not use in enclosed structures.  
12 hours REI

**Treflan 5 G**  
**Dow AgroSciences**

**Caution**  
5% trifluralin  
Treflan  
May root prune. Do not apply to unrooted liners or cuttings  
Irrigate to settle prior to first application after potting  
80 lbs per acre; 1.8 lbs per 1000 sq ft  
Avoid use on pots less than 4 inches across and groundcovers until established and well-rooted  
Do not use in enclosed structures.  
12 hours REI

**XL 2G**

**Caution**  
1% Benefin + 1% Surflan  
Benefin + Oryzalin  
May root prune. Do not apply to unrooted liners or cuttings  
200-300 lbs per acre; 4.5 - 7 lbs per 1000 sq ft  
Will control bittercress, spurge, wood sorrel,  
Avoid use on pots less than 4 inches across  
Do not apply to *Thuja occidentalis* 'Techny' (arborvitae) or *Tsuga canadensis* (Canadian or eastern Hemlock)  
Do not use in enclosed structures.  
12 hours REI

This information was correct when compiled. Labels change periodically. Always READ and follow label directions.
Fall Management of Container Herbicides

Weed control in containers is always important. The hand pulling of weeds from containers is expensive, but it also can allow the ornamental roots to dry out, while removing some of the slow-release fertilizer granules.

Several of the granular pre-emergence herbicides for containers contain a volatile component. These can not be used inside a closed overwintering quonset house or greenhouse. In fact, they must be used several weeks prior to the normal fall enclosure.

The fumes will kill the tender foliage in a closed house. Leaving the doors open may not be adequate ventilation. Labels specify 2, 3 or 4 weeks between application and enclosure in order to safely protect the plants and the manufacturers liability.

These products prevent weed germination for 60-90 days usually. A container producer must really pay attention to when the applications are made, in order to come into the fall with the proper timing for safe enclosure. Many feel that 30 days is a safe period, though the Rout label recommends waiting 14 days between application and enclosure. DowElanco told me 21 days for Snapshot 2.5 TG.

One grower makes granular pre-emergence herbicide applications March 1, May 1, July 1, and Sept 1; with enclosure around Thanksgiving. Another likes March 1, May 15, August 1, and October 15. Timing will vary with the management, the herbicide selected and the rate used.

OH-2, Regal 0-0, Ronstar, Rout and Snapshot 2.5 TG are the commonly used granular pre-emergence herbicides for conventional container production. They are recommended at 100-200 pounds per acre. Most of their labels recommend that they not be applied over wet foliage, or while plants are producing a new flush of tender new growth.

Generally they should not be applied immediately following being potted, but this varies with the product. OH-2 recommends 2 regular waterings after potting up potted liners before application, but waiting 3-4 weeks after potting up bareroot liners before treating.
Some product labels specify to not treat containers less than 4 inches wide. Most of these products should not be applied over plants whose leaves would channel the granules to the leaf base, like yucca.

All the labels suggest avoiding wind; applying the granules in more than one pass and at right angles if possible; to not incorporate the herbicide; and to immediately irrigate with 1/2 inch water to wash the particles off the plant foliage and to activate the herbicide. The reentry interval is either 12 or 24 hours.

These are good products, and like everything else, they must be used correctly to work right with no injury. Take the time to read the label, PLEASE.

**Stagger Applications of Granular Herbicides over Containers**

Most conventional commercial container production is on gravel or a Geotextile fabric. Granular pre-emergence herbicides are broadcast over the containers. If the irrigation water is caught and recycled on a container yard of several acres, a potential problem exists, if the entire area is treated with a herbicide at the same time. Perhaps as much as 60% of the herbicide granules fall between the pots. The first 3 irrigation events moves a high percentage of the herbicide with the runoff water away from the production area and into collection ponds. Even if this water is pumped to a primary reservoir and mixed with fresh water, there is a strong potential for tender foliage of some species to be burned.

Oxyfluorfen or Goal should not be used if the water is recycled. Regal O-O, OH-2 and Rout contain oxyfluorfen and are very effective products. A better solution is to divide the area that drains into the same pond into thirds or quarters. **Stagger the application of herbicides by at least 6 irrigation events.** This reduces the likelihood of foliar burn (phytotoxicity) by reducing the amount of herbicide in the runoff water. Hard research conducted at several container nurseries by Dr. Donna Fare while working on her thesis at Auburn University showed that: Pre-emergence herbicides can move with the irrigation runoff water back into the reservoir and herbicide detection in the irrigation water is generally higher following the first few irrigations after application.

In a test at a nursery in Montgomery, Ala., herbicide levels in the pond peaked following the first irrigation after herbicides were applied. Following the 6th irrigation, herbicide levels were rapidly declining and following the 12th irrigation (about 10 days) herbicides were only detectable at a very low level.
In South Carolina research, about 10% of the isoxaben (a component of Snapshot 2.5 TG) applied was in the runoff water with the first two irrigations. Fortunately, this chemical does not accumulate in the holding pond.

The floor – gravel, fabric, or plastic; can play a vital role in reducing the amount of herbicide that moves with the runoff water. In several reports, a gravel floor had less measurable herbicide in the runoff than plastic or fabric; because gravel impeded the movement of the herbicide granules. But herbicides were detected in all runoff from all floor surfaces.

Another way to reduce the amount of herbicide in the runoff water is to treat the containers while they are jammed. But even when containers are jammed, about 25 percent of the herbicide granules still falls between the containers and ends up on the floor.

If the pre-emergence herbicides are applied after the containers have been spaced, then there is greater risk of more herbicides in the runoff water. When plants are spaced 8 inches, the non-target loss is about 51 percent, and increases to 80 percent when containers are spaced 12 inches apart.

Technical information for this article was furnished by Dr. Donna Fare.