Weed Management in Cucurbit Crops (Muskmelon, Cucumber, Squash, and Watermelon)[1]

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Crop Competition

A good crop stand in which plants emerge and rapidly shade the ground is an often overlooked tool for reducing weed competition. The plant that emerges first and covers the ground most rapidly has the competitive advantage. Good management practices, such as correct fertility rates, well-adapted varieties, effective water management (irrigation, drainage), and establishment of adequate plant populations all help reduce weed competition. Everything possible should be done to ensure that the crop, not the weeds, has the competitive advantage. Tests with watermelons and muskmelons have shown that if weeds such as smooth pigweed emerge 4–5 weeks after the crops, they will not reduce crop yield. If the weeds emerge and compete with the crop in the first 4 weeks, however, yield will be reduced. Two nightshade plants growing within the row and between watermelon plants have been shown to reduce yield by as much as 80%–100% in open culture and 60%–75% in mulch culture production.

Mechanical Control

Mechanical control includes field preparation by plowing or disking, cultivation, mowing, hoeing, and pulling weeds by hand. Mechanical control practices are among the oldest weed management techniques. Seedbed preparation by plowing or disking exposes many weed seeds to variations in light, temperature, and moisture. For some weeds, this process breaks weed-seed dormancy, leading to early season control with herbicides or additional cultivation.

Cultivate only as deep as needed to adequately control the weeds. Excessively deep cultivation may prune crop roots, bring weed seeds to the surface, and disturb soil previously treated with an herbicide. Watermelon roots may extend as far as the tips of the vines, even when grown on mulch. Turning the vines and deep cultivation in the vine area may destroy a large number of roots and reduce water and nutrient uptake. Timely cultivation is also extremely important. In general, small weeds are more easily killed by many cultivators than large weeds, and weeds should be cultivated before or during early flowering to prevent seed production.

Mulching

Polyethylene mulch has been shown many times to increase cucurbit yield and earliness. Properly injecting fumigants under the mulch can help control nematodes, soil insects, soilborne diseases, and weeds. Mulches inhibit

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the germination and growth of most broadleaf and grassy weeds. Nutsedges, however, are able to penetrate the plastic mulch.

Herbicides

Properly selected herbicides are effective tools for weed management in cucurbits. Most of the registered herbicides are for preemergence or pre-transplant applications to the crop and weeds. Care must be exercised to use these materials at the proper rate and correct time to avoid crop damage. Cucurbits as a group have very limited tolerances to most herbicides.

Accurately calibrate all equipment before herbicide application. Make sure the proper speed, pressure, and nozzles are being used in the field. Worn nozzles can significantly increase the application volume. Always use the same size nozzles across the boom. Most of the new herbicides being tested for labeling on cucurbits have a narrow range of tolerance. A mistake in calibration or application will cause damage to the crop. They must also be applied in the proper manner. Herbicides must be applied at exactly the correct rate and time to selectively control weed growth in a vegetable crop. Obtain consistent results by reading the herbicide label and other information about the proper application and timing of each herbicide. To avoid confusion between commercial formulations, suggested rates listed in Tables 1 and 2 are stated as pounds of active ingredient per acre (lb. a.i./A). Read and follow all label directions.

Preemergence herbicides can be categorized as surface-applied or incorporated herbicides. Surface-applied herbicides require rainfall or irrigation shortly after application for best results. Lack of moisture often results in poor weed control; however, they are relatively easy to apply. Incorporated herbicides are not dependent on rainfall or irrigation and have generally given more consistent and wider-spectrum control. They do, however, require more time and equipment for incorporation. Herbicides labeled for surface application may cause phytotoxicity to melons if incorporated.

Do not use herbicides that are not labeled for use in Florida. Use of unregistered materials can result in destruction of the crop, a fine, or both. Use of herbicides with pending labels can also delay or jeopardize subsequent registrations.

For tolerance purposes, the EPA has recently defined which crops may be included under certain general commodity names. The general term "melon" on a label includes muskmelons as well as hybrids and/or varieties of *Cucumis melo* (including true cantaloupe, cantaloupe, casaba, Santa Claus melon, crenshaw melon, honeydew melon, honey balls, Persian melon, golden pershaw melon, mango melon, pineapple melon, and snake melon) and watermelons, including hybrids and/or varieties of *Citrullus* spp.

The term "summer squash" includes fruits of the gourd (Cucurbitaceae) family. Fruits in this category are consumed when immature, are 100% edible either cooked or raw, cannot be stored once picked, have a soft rind that is easily penetrated, and have seeds which, if they were harvested, would not germinate (e.g., *Cucurbita pepo* [i.e., crookneck squash, straightneck squash, scallop squash, and vegetable marrow], *Laginaria* spp. [i.e., spaghetti squash, hyotan, and cucuzza], *Luffa* spp. [i.e., hechima and Chinese okra], *Memordica* spp. [i.e., bitter melon, balsam pear, balsam apple, and Chinese cucumber], and other varieties and/or hybrids of these).

Table 1. Pretransplant or preemergence herbicides for weed control in cucurbit crops (muskmelon, cucumber, squash, watermelon)

Active ingredient lb. a.i./A	(Trade name) amount of product/A	MOA code	Crops	Weeds controlled / remarks
Bensulide 5–6	(Prefar®) 4E 5–6 qt.	8	All cucurbits	Annual broadleaf and grass control. Incorporate or irrigate 1–2 in. within 36 hours of application. Non-labeled crops should not be planted within 120 days of application.
Carfentrazone Up to 0.031	(Aim®) 2 EC Up to 2 fl. oz.	14	All cucurbits	Apply as a preplant burndown for emerged broadleaf weeds. Use crop oil concentrate (COC) or nonionic surfactant (NIS) at recommended rates. Maximum rate of 0.096 lb. a.i./A per season. No pretransplant interval.
Clomazone 0.15–0.38	(Command®) 4ME 0.4–1 pt.	13	Cucumber	Annual broadleaf and grass control. Use lower rates in coarse soils.

Active ingredient lb. a.i./A	(Trade name) amount of product/A	MOA code	Crops	Weeds controlled / remarks
Clomazone 0.15–0.25	(Command®) 4ME 0.4–0.67 pt.	13	Melon (muskmelon, watermelon)	Annual broadleaf and grass control. Use lower rates in coarse soils.
Clomazone 0.25–0.5	(Command®) 4ME 0.67–1.33 pt.	13	Summer and winter squash	Annual broadleaf and grass control. Use lower rates in coarse soils. Consult label for cultivars where application is prohibited. Do not apply under plastic; apply only between plastic-covered beds.
Ethalfluralin + Clomazone 0.4–0.6 + 0.13–0.19	(Strategy™) 2–3 pt.	3 + 13	Cucumber, melon, summer and winter squash, pumpkin, watermelon	Annual broadleaf and grass control. Must be applied no later than 2 days after seeding. Overhead irrigation or rainfall of 0.5 in. within 5 days. Do not apply under row mulch or over the top of plants.
Ethalfluralin 1.1–1.5	(Curbit®) 3 EC 3–4 pt.	3	Cucumber, melon, pumpkin, squash, watermelons	Annual broadleaf and grass control. Apply broadcast after seeding and before crop emergence. Row middles only if transplanted.
Flumioxazin Up to 0.125	(Chateau®) 51 WDG Up to 4 oz.	14	Cucumber, muskmelon, watermelon, pumpkin, summer and winter squash	Broadleaf weeds. Row middles only. Do not apply after crops are transplanted / seeded. Raised plastic beds must be at least 4 in. higher than treated row middle and 24 in. wide bed. All applications must be made with shielded or hooded equipment. Label is a Third-Party Registration (TPR, Inc). Use without a signed authorization and waiver of liability is a misuse of the product.
Glyphosate 0.3–1.0	(Various formulations) Consult labels	9	All cucurbits	Controls emerged broadleaf and grass weeds. Consult individual labels for restrictions.
Halosulfuron 0.024	(Sandea®) 75 DG 0.5 oz.	2	Cantaloupe, cucumber, crenshaw, honeydew	Yellow and purple nutsedge and broadleaf control. Apply uniformly with ground equipment in a minimum of 15 gal. of water/A.
Halosulfuron 0.024–0.036	(Sandea®) 75 DG 0.5–0.75 oz.	2	Watermelon	Yellow and purple nutsedge and broadleaf control. May be applied preemergence to seeded watermelon on bare ground or preseeding to mulch-cultured watermelon. Transplanting should be no sooner than 7 days after application. Use lighter rates on sandy soils with low organic matter.
Halosulfuron 0.024–0.036	(Sandea®) 75 DG 0.5–0.75 oz.	2	Pumpkin, winter squash	Yellow and purple nutsedge and broadleaf control. Apply before soil cracking or pretransplant. Transplanting should not be made sooner than 7 days after application. May be applied after crop emergence over-the-top of the crop when plants reach the four to five true leaf stage but before first female flowers appear.
Paraquat 0.5–1.0	(Gramoxone®) 2 SL 2.0–4.0 (Firestorm®) 3 SL 1.3–2.7	22	Cucumber, muskmelon, cantaloupe, pumpkin, squash, watermelon	Controls emerged weeds. Apply prior, during, or after planting, but before crop emergence. Use a NIS.
Pendimethalin 1.0	(Prowl H20) 2.1 pt.	3	Cantaloupe, citron melon, muskmelon, watermelon	Annual broadleaf and grass weeds. Apply to the row middles only. May be applied as a sequential application with 2.1 pt./A before and 2.1 pt./A after transplanting or seeding with 21 days between applications. Do not exceed 4.2 pt./A per season

Active ingredient lb. a.i./A	(Trade name) amount of product/A	MOA code	Crops	Weeds controlled / remarks
Pelargonic acid	(Scythe®) 4.2 EC 3%–10% v/v	27	All cucurbits	Controls emerged weeds. Apply before crop emergence. Product is a contact, nonselective, foliar-applied herbicide. There is no residual activity. May be tank mixed with soil residual compounds.
S-metolachlor 0.95–1.26	(Brawl™, Dual Magnum®) 1.0–1.33 pt.	15	Pumpkin	Annual broadleaf, grass weeds, and nutsedge control. Apply as interrow or interhill application. Leave a 1 ft. untreated area over the seeded row (6 in. on either side of the row.) Use lower rates on lighter soils. Apply before weeds emerge.
Sulfentrazone 0.07-0.11	(Willowwod sulfentrazone) 4SC 2.25-3.75 fl. oz.	13	Citron melon, muskmelon, watermelon	Broadleaf and grass weed control. Nutsedge suppression. Do not apply on sands with less than 1% organic matter. Shuld be trialed on a small area to find suitable rate for the osil type in your area.

Table 2. Post-transplant or post-emergence herbicides for weed control in cucurbit crops (muskmelon, cucumber, squash, and watermelon)

Active ingredient lb. a.i./A	(Trade name) amount of product/A	MOA code	Crops	Weeds controlled / remarks
Carfentrazone Up to 0.031	(Aim®) 2 EC Up to 2 fl. oz.	14	All cucurbits	Emerged broadleaf control. Postdirect hooded application to row middles for burndown of emerged broadleaf weeds. Use crop oil concentrate (COC) or nonionic surfactant (NIS) at recommended rates. PHI 0 days.
Clethodim 0.94–0.125 0.07–0.125	(Arrow®, Select®) 2 EC 6–8 fl. oz. (Select Max®) 1 EC 9–16 fl. oz.	1	Cucumber, squash, melon, and all commodities in crop group	Annual and perennial grass control. Use a COC at 1% v/v of the spray volume for Arrow® and Select®. Use an NIS in Select Max®. PHI 14 days.
DCPA 4.5–10.5	(Dacthal®) W75 6–14 lb. (Dacthal®) 6F 6–14 pt.	3	Muskmelon, cantaloupe, honeydew, watermelon	Annual grasses and certain broadleaf control. Apply only when plants have four to five true leaves, are well-established, and growing conditions are favorable for good plant growth. Cultivate prior to application to control emerged weeds.
Ethalfluralin + Clomazone 0.4–0.6 + 0.13–0.19	(Strategy™) 2–3 pt.	3 + 13	Cucumber, melon, summer and winter squash, pumpkin, watermelon	Annual broadleaf and grass control. After transplanting, apply to row middles only. Does not control emerged weeds.
Glyphosate 0.3–1.0	(Various formulations) Consult labels	9	All cucurbits	Controls emerged broadleaf and grass weeds. Apply to row middles only. Consult individual labels for restrictions.
S-metolachlor 0.95–1.26	(Brawl™, Dual Magnum®) 7.62 EC 1.0–1.33 pt.	15	Pumpkin	Annual broadleaf and grass weeds and nutsedge control. Apply as interrow or interhill application. Leave a 1 ft. untreated area over the plant (6 in. on either side of the row.) Use lower rates on lighter soils. Apply before weeds emerge. PHI 30 days.
Paraquat 0.47–0.93	(Gramoxone®) 2 SL 1.88–3.72 pt. (Firestorm®) 3 SL 1.25–2.48 pt.	22	Cucumber, muskmelon, cantaloupe, pumpkin, squash, watermelon	Controls emerged weeds. Row middles only. Limit of 3 applications per year. Gramoxone® 2 SL is a supplemental label consult labels for other paraquat formulations.
Pelargonic acid	(Scythe®) 4.2 EC 3%–10% v/v	27	Cucumber, gourd, muskmelon, cantaloupe, pumpkin, squash, watermelon	Controls emerged weeds. Row middles only. Use a shielded sprayer directed to the row middles to reduce drift to the crop.

Active ingredient lb. a.i./A	(Trade name) amount of product/A	MOA code	Crops	Weeds controlled / remarks
Sethoxydim 0.19–0.28	(Poast®) 1.5 EC 1.0–1.5 pt.	1	All cucurbits	Growing grass weeds. Include a COC. Efficacy is decreased if weeds are under stress. Use 1 pt. for seedling grasses and 1.5 pt. on perennial grasses. PHI 14 days.
Terbacil 0.1–0.2	(Sinbar®) 80 WP 2–4 oz.	5	Watermelon	Annual broadleaf weed. Direct seeded: broadcast application after seeding and before crop emergence. Transplanted: Sinbar® can be applied under plastic mulch and to row middles before transplanting. PHI 70 days.
Trifluralin	(Treflan®) 4 EC 1 pt. (Treflan®) TR 10 5 lb.	3	All cucurbits	Annual broadleaf and grass control. Apply after crop is 3 to 4 true leaf stage. Row middles only. PHI 30 days except watermelon. PHI 60 days for watermelon.

Table 3. Application timing and stages of weed growth

		Timing and placement to the crop						Weed growth stage		Weeds Controlled/ Suppressed			Crops					
Common name	Product [1]	Before seeding	After seeding before emergence	Before transplanting	Postemergence	Postemergence- row middles only	Incorporated	Preemergence	Postemergence	Annual grasses	Broadleaves	Perennial Sedges	Cucumber	Muskmelon	Squash, summer	Squash, winter	Pumpkin	Watermelon
Bensulide	Prefar®	X					X	X		X	X		X	X	X	X	X	X
Carfentrazone	Aim®	X	X	X		X			X		X		X	X	X	X	X	X
Clethodim	Select Max®				X				X	X			X	X	X	X	X	X
Clomazone	Command®	X		X				X		X	X		X	X				X
Clomazone + Ethalfluralin	Strategy™	X				X		X		X	X		X	X	X	X	X	X
DCPA	Dacthal®				X			X		X	X			X				X
Ethalfluralin	Curbit®		X[2]			X		X		X	X		X	X	X	X	X	X
Flumioxazin	Chateau®	X		X				X			X		X	X	X	X	X	X
Glyphosate	Roundup®	X				X			X	X	X	X	X	X	X	X	X	X
Halosulfuron	Sandea®		X[2,3]			X		X	X	X	X	X	X	X	X	X	X	X
S-metolachlor	Dual Magnum®		X					X		X	X	X					X	
Paraquat	Gramoxone®	X	X			X			X	X	X		X	X	X	X	X	X
Sethoxydim	Poast®				X				X	X			X	X	X	X	X	X
Terbacil	Sinbar®		X[2]		X			X		X	X							X
Trifluralin	Treflan®					X		X					X	X	X	X	X	X

[1] Additional products may contain the same active ingredient.
[2] Different uses for transplanted and direct seeded cucurbits.
[3] Use pattern not registered in all crops; consult label for specific uses in individual crops.