

Weed Control in Leafy Vegetables (Lettuce, Endive, Escarole and Spinach)¹

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Optimum leaf crops production depends on successful control of weeds. Weeds reduce yields of the leaf crops by direct competition for nutrients, water and light.

Weed control is especially important early in the growth of the crop. Competition from the amaranth (spiney, common or livid) weeds can cause 20 to 40% yield reduction in lettuce if not controlled in 3 to 5 weeks of emergence. One spiney amaranth plant will reduce yield and quality of four lettuce plants in the row around it.

Effective weed control should include a combination of practices designed to suppress weeds during the entire year.

Some of the management practices include crop rotation, cover cropping, cultivation flooding, and mulching. Crop rotation and flooding are routinely followed in the more intensively cultivated organic soils in Florida. Care should be taken when the leaf crops are rotated behind crops where more persistent herbicides are used. Bioassays using indicator crops can save valuable time and problems in indicating if a

herbicide persists in the soil if carried out before planting.

Mulching should be considered for any lettuce grown on mineral soils. Colored mulches can increase or decrease soil temperature depending on the time of year and with a labeled multi-purpose fumigant many soil-borne insects, diseases and weeds may be eliminated.

Cultivation in leaf crops is a necessity and if not accomplished properly a detriment.

In seeded lettuce, thinning and blocking usually is done at 21 to 28 days. Cultivation at this time is a must to reduce any competition from weeds emerging in the row. Cultivation also will prune roots of the lettuce plants and in itself reduce subsequent quality and yield if special care isn't exercised in the operation. Cultivation in older lettuce has also been shown to reduce quality if carried out improperly.

Pursuit is a third party registrations. For legal use of the herbicide, the grower (applicator) must obtain the label from the third party registrant, in this

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case TPR, Inc, Orlando. Use of the products without having a signed authorization and waiver and limitation of liability agreement is a misuse of the product.

To reduce confusion EPA has recently defined for tolerance purposes terminology in lettuce. If a label states head lettuce, the pesticide may only be applied to the crisp head varieties of lettuce. If leaf lettuce is stated, this applied to all leaf lettuce types including, leaf lettuce, cos (Romaine) and the butterhead varieties. The term "lettuce" includes head and leaf lettuce, i.e. all types except endive and escarole. Endive is a separate tolerance crop and includes endive and/or escarole.

The leafy greens group includes: lettuce (head and leaf) endive; spinach as well as amaranth; arugula (roquette); chervil; chrysanthemum; corn salad; garden and upland cress; dandelion; dock; orach; parsley; purslane (garden and winter); radicchio; New Zealand spinach; vine spinach. A label for the "leafy greens" group includes all of these. If a label has the term "leafy vegetables", it is labeled for the leafy greens plus the leaf petiole (celery) group.

Use only labeled herbicides and those herbicides in the proper formulations. Read the label carefully for the proper rate and timing for each application. To avoid confusion between formulations suggested rates listed here in Table 1 are stated in pounds active ingredient per acre (lb ai/acre).

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Table 1. Chemical weed controls: lettuce, endive, escarole and spinach.

Herbicide	Labeled crops	Time of application to crop	Rates (lb. Ai./Acre)	
			Mineral	Muck
Benefin (Balan)	Lettuce (direct seeded)	Preplant incorporated	1.12 - 1.5	----
Remarks: Controls germinating annuals. Incorporate 2 to 3 inches within 8 hours. Not recommended for organic soils.				
Bensulide (Prefar 4E)	Leafy vegetables (Lettuce [head and leaf] endive, arugula, chervil, cress [garden and upland], dandelion, parsley, and radicchio)	Preplant Preemergence	5-6	----
Remarks: Preplant incorporate using power driven rotary cultivations or apply preemergence and incorporate with irrigation. Use preemergence only with lettuce to be irrigated up. Controls many grasses. Provides fair to good control of lambsquarter, purslane, and amaranths.				
Carfentrazone (Aim)	Leafy Vegetable Group (all)	Preplant Direct-hooded Row middles	0.031	0.031
Remarks: Aim may be applied as a preplant burndown treatment and/or as a post-directed hooded application to row middles for the burndown of emerged broadleaf weeds. May be tank mixed with other registered herbicides registered for this treatment pattern. May be applied at up to 2 oz (0.031 lb ai). Use a quality spray adjuvant such as crop oil concentrate (coc) or non-ionic surfactant at recommended rates.				
Fluazifop (Fusilade DX)	Endive	Postemergence	0.188	0.188
Remarks: Controls actively growing grass weeds. A total of 48 oz. may be applied per season. Do not apply within 28 days of harvest for endive. Use a crop oil concentrate at 0.5 - 1% v/v or a nonsurfactant at 0.25 - 0.5% v/v in spray mixture. Consult the label for specific rates and grass growth stages for best control.				
Glyphosate (Roundup, Durango, Touchdown, Glyphomax)	Leafy Vegetables	Chemical fallow Preplant, pre emergence, Pre transplant	0.3 - 1.0	----
Remarks: Roundup, Glyphomax and Touchdown have several formulations. Check the label of each for specific labeling directions.				
Imazethapyr (Pursuit)	Lettuce, Endive, Escarole	Preemergence Postemergence	---- ----	0.015 - 0.03 0.015 - 0.03
Remarks: Third Party Registration (TPR, Inc.) only. Apply with ground equipment only at broadcast rates of 1 to 2 ounces material per acre preemergence and/or postemergence after 3-4 true leaf stage. Do not apply more than 2 applications per crop. A maximum of 4 ounces of product may be used per crop season and 6 ounces of product per acre per calendar year. Should be applied in 20 or more gallons of water per acre. Do not apply within 30 days of harvest. Potential for rotational crop damage is highly variable. Do not plant other crops within 45 days of application. Use of Pursuit on lettuce, endive, or escarole, without having a signed authorization and waiver and limitation of liability agreement is a misuse of the product.				
Paraquat (Gramoxone Inteon) (Firestorm)	Lettuce	Preemergence	0.63-0.94	0.63-0.94
Remarks: Controls emerged weeds. Apply prior to, during or after direct seeding, but before lettuce emerges. Use a non-ionic spreader.				

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Herbicide	Labeled crops	Time of application to crop	Rates (lb. Ai./Acre)	
			Mineral	Muck
Paraquat (Gramoxone Inteon)	Lettuce	Postemergence as a directed/shielded spray	0.3 - 0.45	0.3 - 0.45
Remarks: Controls emerged weeds. Apply as a directed/shielded spray between rows when weeds are 1 to 6 inches tall, using 1.2 to 1.9 pts./acre. Use a non-ionic spreader.				
Pelargonic Acid (Scythe)	Leafy vegetables (lettuce, endive, cilantio, cress, spinach)	Preplant Directed-Shielded	3-10% v/v	3-10% v/v
Remarks: Product is a contact non-selective, foliar applied herbicide. There is no residual activity. May be tank mixed with soil residual compounds. Consult the label for rates and other information.				
Pronamide (Kerb 50-W)	Lettuce, Endive, Escarole	Preemergence	1.0 1.5	----
Remarks: Controls germinating annuals. Overhead-irrigate briefly or incorporate 2 to 3 inches. Note precautions of planting nonor sensitive crops after application. Not recommended for organic soils.				
Sethoxydim (Poast)	Lettuce: Head, Leaf, Spinach, Endive	Postemergence	0.188-0.28	0.188-0.28
Remarks: Controls actively growing grass weeds. A total of 3 pts. product per acre may be applied in one season. Do not apply within 30 days of harvest for head lettuce and 15 days of harvest for leaf lettuce and spinach. Apply in 5 to 20 gals. of water adding 2 pts. of crop oil concentrate per acre. Unsatisfactory results may occur if applied to grasses under stress. Use 0.188 lb. ai. (1 pt.) to seedling grasses and up to 0.28 lb. ai. (1.5 pts.) to perennial grasses emerging from rhizomes, etc. Consult label for grass species and growth stage for best control.				
Trifluralin (Treflan EC, Treflan 5) Treflan MFT, AFP, TR-10, Trifluralin 4EC	Endive, Escarole, Radicchio	Preplant Incorporate	0.5	----
Remarks: Apply as a preplant incorporated treatment to mineral soils only. Consult label for application instructions.				