Weed Management in Potato[1]

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Weeds are a major problem in potato production in Florida and can reduce yields through direct competition for light, moisture, and nutrients, or by harboring insects and diseases that attack potatoes. Weeds can have a detrimental impact on tuber yield when compared to potatoes grown in weed-free conditions (Love et al. 1995; Nelson and Thoreson 1981). For example, Love et al. (1995) found a reduction in vine biomass, tuber biomass, and total yield in both 'Frontier Russet' and 'Russet Burbank' in weedy plots compared to weed-free plots. Weedy conditions also resulted in a greater number of small tubers and fewer US No. 1 grade tubers compared to weed-free conditions (Love et al. 1995). Nelson and Thoreson (1981) found that competition with weeds reduces both the average tuber size and the number of tubers. However, in both studies, there was little effect of weed competition on specific gravity (Love et al. 1995; Nelson and Thoreson 1981). Aside from impacts on the physiological formation of yield during the season, weeds present at harvest can be detrimental to yield by increasing mechanical damage to the tubers and reducing harvesting efficiency by slowing the harvesting operation, leaving un-dug tubers in the ground, and/or carrying them over the conveying chain.

Early season competition with weeds is extremely critical; therefore, weed control measures should be emphasized during this period. Potatoes may be planted during a seven-month period in Florida. During this period, variable climatic conditions influence the diversity and severity of weed species present. Growers should plan a total weed control program that integrates chemical, mechanical, and cultural methods to fit their weed species and production practices.

One cultural method that may have an impact on weed control is row spacing. Love et al. (1995) compared the effect of two row spacings (28" and 37.8") on weed competition and found no difference in either weed and vine biomass or tuber yield. This may be related to their findings that row spacing did not greatly affect the time to canopy closure, which impacts the establishments of weeds. They also compared three within-row seed piece spacings (5.9", 9.8", and 13.8") and found a small numerical decrease in weed biomass with decreasing within-row spacing, likely because of more rapid vine elongation and a greater impact on canopy closure (Love et al. 1995).

Beyond row and plant spacing, researchers have studied other management practices for weed control, such as cover

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crops. Boydston and Hang (1995) studied the impact of a rapeseed crop preceding potatoes on the presence of weeds. Rapeseed contains a compound called glucosinolate that has been found to have negative effects on seed germination (Evenari 1949). In a two-year study comparing rapeseed and sudangrass covers, rapeseed produced more biomass and had a greater reduction in midseason and final weed density in the following potato crop than sudangrass (Boydston and Hang 1995). Potatoes following rapeseed (with or without herbicide) yielded higher than comparative plots following sudangrass, while the specific gravity of tubers was not affected by either cover (Boydston and Hang 1995).

Cultivation is another effective way to manage weeds early in the season, a time when weed presence is most detrimental to potato growth and yield (Connell, Binning, and Schmitt 1999; Nelson and Thoreson 1981). Weeds that emerge before potatoes have been shown to be the most competitive with the crop (Love et al. 1995). Connell, Binning, and Schmitt (1999) determined that the canopy of the potato crop would continue to shade out weeds emerging after initial cultivation and herbicide applications at 7–8 weeks after crop emergence. This timeline may vary by cultivar because of variable canopy structures. In addition, if the canopy is damaged, additional herbicide applications may be necessary until the canopy recovers (Connell, Binning, and Schmitt 1999). During hilling operations, rolling cultivators behind the hilling blades can uproot many annual weeds that may have survived preplant herbicides. Cultivation and hilling, while useful, also disrupt the efficacy of several soil-applied herbicides. For cultivars that require several hilling operations during the season, additional herbicides may be necessary during or directly following hilling and cultivation operations. This combination of practices can greatly enhance and extend weed control during the season.

Herbicide performance depends upon weather, irrigation, soil properties, proper selection for weed species to be controlled, and accurate herbicide application and timing. Obtain consistent results by reading the herbicide label and other information concerning the proper application and timing of each herbicide. To avoid confusion between commercial formulations, the suggested rates listed in Table 1 are stated in pounds of active ingredient per acre (lb. a.i./A). On marl and sandy soils with low organic matter, the lower rates should be applied. All herbicides listed below have been tested in research trials in Florida with successful results.

When applying an herbicide for the first time in a new area, use in a small trial area first. Before applying an herbicide, *carefully read and follow the label*.

References

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Table 1. Preemergence chemical weed control in potato.

Common name lb. a.i. /A	(Trade name) amount of product/A	MOA code	Weeds controlled / remarks
Carfentrazone Up to 0.031	(Aim®) 2 EC or 1.9 EW Up to 2 fl. oz.	14	Emerged broadleaf weeds. Apply as a preplant burndown for emerged broadleaf weeds. Use a crop oil concentrate (COC) or nonionic surfactant (NIS) at recommended rates. No transplant interval.
Dimethenamid-p 0.56–0.84	(Outlook®) 6 L 12–8 fl. oz.	15	Apply after planting or drag-off. Consult label for exact rates based on soil texture. In cold, wet conditions, delayed crop emergence or stunting may occur. PHI 40 days.
EPTC 1	(Eptam®) 20 G 15 lb.	8	Broadleaf and grass weeds and nutsedge. Apply preplant or after drag-off. Incorporate mechanically or with irrigation 2–4 in. deep. Do not apply the emulsifiable formulation preemergence in winter and early spring potatoes.
Flumioxazin 0.05	(Chateau®) 51 WDG 1.5 oz.	14	Annual broadleaf weeds. Apply after drag-off with a minimum of 2 in. of soil covering the vegetative portion of the potato plant. Should be tank mixed with other herbicides, especially for grass control.
Fomesafen 0.25	(Reflex®) 2 EC 1.0 pt.	14	Annual broadleaf and grass weeds. Yellow/purple nutsedge suppression. Effectiveness reduced if later cultural practices expose untreated soil. Can be applied after drag-off and before crop emergence. Variety tolerance may vary; test on a small sample before applying to the entire field. PHI 70 days.
Glyphosate	(Various formulations) Consult labels	9	Emerged broadleaf and grass weeds. Apply as a preplant burndown. Consult label for individual product directions.
Imazosulfuron 0.19–0.3	(League®) 75 WG 4–6.4 oz.	2	Broadleaf and grass weeds. Limit of 2 applications per year and no more than 6.4 oz./A per year.
Linuron 0.75–1.25	(Lorox® DF) 50 DF 1.5–2.5 lb.	7	Apply after final drag-off. If weeds are present, include an NIS. Best results are obtained in moist fields at application followed by rain or irrigation within 2 weeks.
S-metolachlor 0.95–1.9	(Dual Magnum®) 7.62 EC 1.0–2.0 pt.	15	Annual broadleaf and grass weeds. Yellow/purple nutsedge suppression. Apply after drag-off before crop and weed emergence. If cool, wet soil conditions occur after application, they may delay maturity and/or reduce yield. PHI 60 days.
Metribuzin 0.23–1.0	(Tricor® DF) 75 DF 0.3–1.3 lb.	5	Annual broadleaf and grass weeds. Apply after drag-off but before crop emergence. Do not incorporate. Use lower rates on sandy soil.
Metribuzin + *S*-metolachlor 0.23–0.31 + 0.98-1.31	(Boundary®) 6.5 EC 1.5–2 pt.	5 + 15	Broadleaf and grass weeds. Apply before potato emergence, including drag-off. Do not incorporate.
Paraquat 0.25–0.5	(Gramoxone® SL) 2 SL 1.0–2.0 pt. (Firestorm®) 3 SL 0.7–1.3 pt.	22	Emerged broadleaf and grass weeds. Apply as a preplant burndown treatment. Apply up to ground cracking before potatoes have emerged. Use an NIS.
Pelargonic acid	(Scythe®) 4.2 EC 3%–10% v/v	27	Emerged broadleaf and grass weeds. Apply as a preplant burndown treatment. Product is a contact, nonselective, foliar-applied herbicide with no residual control. May be tank–mixed with soil residual compounds.
Pendimethalin 0.75	(Prowl® H_2O) 3.8 1.5 pt.	3	Annual broadleaf and grass weeds. Apply after planting but before potatoes and weeds emerge or after drag-off. Incorporate with rainfall or mechanically into the top 1–2 in. of soil within 7 days. Do not use on peat or muck soils.
Pyraflufen 0.0008–0.003	(ET® Herbicide/ Defoliant) 0.208 EC 0.5–2.0 fl. oz.	14	Emerged broadleaf weeds. Apply as a preplant burndown treatment.
Rimsulfuron 0.016–0.023	(Matrix®) 25 DF 1–1.5 oz.	2	Apply immediately after drag-off. Rainfall or sprinkler irrigation of 1/3–1 in. is required within 5 days after application. Do not exceed 2.0 oz./A per year
Sulfentrazone 0.09-0.14	Willowwood sulfentrazone 3.0–4.5 fl. oz.	14	Broadleaf and grass weed control. Nutsedge suppression. Do not apply on sands with less than 1% organic matter. Do not apply more than 8 fl. oz./A within a 12 mo. period. Should be trialed on a small area to find suitable rate for the soil type in your area.
Trifluralin 0.5	(Trust, Treflan) 10 G 5 lb. (Treflan®) 4 L 1 pt.	3	Broadleaf and grass weeds. Apply after drag-off or prior to crop emergence. Incorporate the herbicide into the soil profile. If applied after plant emergence do not allow soil contact with the emerged plants.

Table 2. Postemergence chemical weed control in potato

Active Ingredient lb. a.i. /A	(Trade name) amount of product/A	MOA Code	Weeds controlled / remarks
Carfentrazone Up to 0.31	(Aim®) 2 EC or 1.9 EW Up to 2 oz.	14	Emerged broadleaf weeds. Apply as hooded application to row middles only. Use a crop oil concentrate (COC) or nonionic surfactant (NIS) at recommended rates. May be tank mixed with other herbicides. Do not exceed 6.1 fl. oz. per cropping season. PHI 7 days.
Clethodim 0.09–0.25 0.07–0.25	(Select®, Arrow®) 2 EC 6–16 fl. oz. (Select Max®) 1 EC 9–32 fl. oz	1	Perennial and annual grass weeds. In fields with heavy grass pressure or larger grass weeds, use higher rates or repeat applications 14 days apart. Use a COC at 1% v/v in the finished spray volume. Nonionic surfactant with Select Max®. PHI 30 days.
Imazosulfuron 0.19–0.3	(League) 75 WG 4-6.4 oz.	2	Broadleaf and grass weeds. Limit of 2 applications per year and no more than 6.4 oz./A per year. PHI 45 days.
EPTC 3 3.1–7.9	(Eptam®) 20 G 15 lb. (Eptam) 7E 3.5 to 9 pt.	8	Annual broadleaf and grass weeds and nutsedge. Apply at layby to a clean, cultivated soil. Incorporate mechanically or with irrigation. PHI 45 days.
Metribuzin 0.23–0.5	(Tricor®) 75 DF 0.3–0.6 lb.	5	Broadleaf weeds. Do not apply to early smooth-skinned, red-skinned, and other specified varieties on the label. Do not exceed 1.3 lb./A per production. PHI 60 days.
Pelargonic acid	(Scythe®) 4.2 EC 3%–10% v/v	27	Emerged broadleaf and grass weeds. Direct spray to row middles. Product is a contact, nonselective, foliar-applied herbicide with no residual control. May be tank–mixed with several soil residual compounds.
Rimsulfuron 0.016–0.023	(Matrix®) 25 DF 1–1.5 oz.	2	Apply immediately after drag-off. Rainfall or sprinkler irrigation of ⅓ –1 in. is required within 5 days after application. Apply as a sequential treatment 14–28 days after the first application. Do not exceed 2.0 oz./A per year.
Sethoxydim 0.28–0.47	(Poast®) 1.5 EC 1.5–2.5 pt.	1	Controls growing grass weeds. A total of 5.0 pt./A applied in one season. Include a COC. Unsatisfactory results may occur if applied to grasses under stress. PHI 30 days.