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—Scientific Note—

Screening Broad-spectrum Herbicides to Identify Lettuce Lines with Tolerance

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Production of leafy vegetables such as lettuce (*Lactuca sativa* L.) on organic soils in the Everglades Agricultural Area in south Florida is hindered by lack of effective weed management programs, particularly chemical control due to limited number of herbicides available for weed control. Lettuce is very sensitive to weed competition from early in the season because of its relatively slow growth, low stature, and short growing season. Weeds including common lambsquarters (*Chenopodium album* L.), common purslane (*Portulaca oleracea* L.), *Amaranthus* spp. and nutsedges (*Cyperus* spp.) are the most problematic in lettuce. Season-long competition from these weeds can result in up to 52% lettuce yield reduction (Santos et al., 2004a, 2004b). There are limited herbicide options for use in leafy vegetables compared to major row crops (Lati et al., 2015). Preemergence herbicides registered for selective broadleaf and sedge weed control in lettuce are not efficacious on organic soils (Kanissery et al., 2019). Imazethapyr is the only selective broadleaf herbicide for postemergence weed control in lettuce in Florida. Since discovery and development of new herbicides for small acreage crops such as leafy vegetables is limited, utility of existing herbicides with broad-spectrum weed control to develop varieties through enhanced non-transgenic genetic resistance using chemical mutagenesis and conventional breeding is important.

A study was conducted to screen broad-spectrum postemergence and premergence herbicides on 189 lettuce lines at the Everglades Research and Education Center (EREC) in Belle Glade, FL. The lines included 98 University of Florida (UF) breeding lines, 5 UF historic cultivars 13 commercial cultivars, 3 UF mapping populations, 20 parents of mapping populations, 8 USDA–Pullman lines, and 42 wild types. A total of 13 postemergence herbicides (6 modes of action) were used to screen the 189 lettuce lines in the greenhouse. An untreated control was included for comparison. The herbicides were applied 30 days after emergence. Plants were visually rated as dead or alive at 7, 14, and 28 days after treatment. The experiment was conducted twice. For the preemergence herbicide screening, a total of 3 herbicides (2 modes of action) were used to screen the 189 lettuce lines in EREC fields. Preemergence herbicides were applied immediately after planting and incorporated into the soil using overhead irrigation. The experiment was repeated twice. Germination was recorded at 21 days after planting. For the preemergence screening, 9 UF breeding lines, 1 commercial cultivar, 1 parent of mapping population, and 1 wildtype showed tolerance to pronamide, metribuzin, and hexazinone. All 189 lettuce lines showed tolerance to postemergence flumetsulam, imazmox, imazapic, and rimsulfuron. Eight UF breeding lines, 1 commercial cultivar, 1 UF historic cultivar, 1 USDA–Pullman lines, and 1 wildtype showed tolerance to either postemergence linuron, saflufenacil, or topremezone. The 24 lines that showed tolerance to preemergence or postemergence will be further evaluated using replicated greenhouse and field experiments. Any of the aforementioned lines in which herbicide tolerance is confirmed will be subjected to chemical mutagenesis to help isolate herbicide resistant mutants. These lines will be used in the lettuce breeding program in the future to develop cultivars with herbicide tolerance and enable efficacious weed control in this crop.

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