Title Understanding 2,4-D resistance in prickly lettuce (*Lactuca serriola* L.) and evaluating chemical fallow systems for the inland PNW

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Abstract

The objectives of this research were to: (1) compare reduced and no-tillage fallow systems with conventional fallow systems; (2) evaluate weed control efficacy of Light-Activated Sensor-Controlled (LASC) sprayer systems compared to conventional broadcast application in chemical fallow; and (3) determine mechanism and inheritance of 2,4-D resistance in prickly lettuce (*Lactuca serriola* L.); and (4) develop EST-SSR's to study genetic diversity among *Lactuca* accessions.

Average soil moisture in 150cm and seed-zone profile during summer fallow was similar for reduced and conventional tillage treatments across locations. Soil moisture content in all tillage treatments was lower at Helix compared to Davenport and a deep-furrow type drill was needed to successfully seed wheat into the soil moisture and obtain an adequate seedling stand. The deep-furrow drill was required to seed wheat could not be used in no-tillage treatments due to greater crop residue and resulted in emergence and yield penalty. The winter wheat yield in undercutter treatments followed by rodweeder or broadcast application of herbicide was similar to conventional tillage treatments but had 7 to 38% greater surface crop residue compared to conventional tillage. The herbicide use by LASC sprayer technology was 45 to 72% less compared to conventional broadcast application system. However, detection of very small weeds by LASC sprayer reduced in dusty and high residue conditions prevalent in sweep undercutter and no-tillage systems, respectively. Under no-tillage system, glyphosate alone and in mixture with 2,4-D or pyrasulfotole plus bromoxynil controlled weeds ($\geq$95%) similar to conventional broadcast application of glyphosate.

Prickly lettuce is an important weed of Pacific Northwest (PNW) and has developed resistance to 2,4-D. Reduced uptake followed by reduced translocation to the crown in resistant prickly lettuce biotypes could be a mechanism or partial mechanism for 2,4-D resistance in prickly lettuce. Inheritance of 2,4-D resistance in prickly lettuce is governed by one major gene and few modifier-genes.

A total of 15,970 simple sequence repeats (SSRs) were identified from 57,126 expressed sequence tag (EST) assemblies belonging to five different species of genus *Lactuca.* Primer pairs were synthesized

for 45 prickly lettuce EST-SSRs and were used to group *Lactuca* accessions based on genetic dissimilarity.