# Synthetic Auxin Resistance in Lambsquarters

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HERBICIDE RESISTANCE ACTION COMMITTEE

## Synthetic Auxin Resistant Common Lambsquarters

Common lambsquarters is a rapidly growing summer annual weed found in many agricultural systems. Synthetic auxins have long been used for control of common lambsquarters throughout the world. They became particularly important for control of triazine resistant common lambsquarters in the 1970's. In 2005 synthetic auxin resistant common lambsquarters was reported in maize (corn) fields in New Zealand. Growers had been using dicamba for over 10 years to control triazine-resistant common lambsquarters.

## Levels of Resistance and Cross-Resistance

Several resistant populations have been identified and they exhibit between 7 and 19 fold increase in resistance to dicamba in greenhouse experiments. Field trials have shown a resistant biotype surviving eight times the recommended rate of dicamba. This rate severely damaged the maize crop allowing the dicamba resistant common lambsquarters to thrive.

*Dicamba-resistant lambsquarters in maize after application of 4X recommended rate of dicamba.*

## Mechanism of Resistance

The mechanism of synthetic auxin resistance in common lambsquarters is unknown.

## Rate of Spread

Dicamba resistant lambsquarters are currently (2015) difficult to find in the original fields because they have been effectively controlled by ALS inhibitor herbicides. No other populations of synthetic auxin resistant common lambsquarters have been found in New Zealand, or elsewhere in the world at this time.

## Resistance to Other MOA's

Common lambsquarters has evolved resistance to two other herbicide mechanisms of action, which complicates strategies to mitigate the evolution of resistance to synthetic auxins. Common lambsquarters has evolved resistance to the following herbicide mechanisms of action.

1. PSII-inhibitors (TSR*) — first identified in 1973 in Ontario, Canada (ON, SK), and now in Belgium, Bulgaria, Canada, Czech Republic, France, Germany, Greece, Italy, Netherlands, New Zealand, Norway, Poland, Portugal, Serbia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, and the USA (CT, DE, IL, IN, IA, ME, MD, MA, MI, MN, NH, NY, NC, OH, PA, RI, TN, VT, VA, WA, WV, and WI).
2. ALS-inhibitors (TSR*) — first identified 2001 in Michigan. ALS inhibitor common lambsquarters occurs in Canada (ON, SK), Serbia, and the USA (MI and OH)

Despite being an important crop weed globally, multiple resistance in common lambsquarters has only been reported to a combination of PSII and synthetic auxins from New Zealand.

## Lessons for the US Mid-West

Common lambsquarters is a primary weed in maize and soybean in the United States. Triazine-resistant common lambsquarters is relatively common in the mid-west, and growers have used synthetic auxins, ALS inhibitors, and glyphosate as the main ways of controlling triazine-resistant common lambsquarters in maize. Transgenic crops could soon enable broader use of synthetic auxins in soybeans, maize and cotton. This may increase the selection pressure towards evolution of synthetic auxin resistant common lambsquarters if growers rely upon them too much. Programs to control common lambsquarters should include at least two herbicides from different herbicide mechanisms of action that are still effective on the particular common lambsquarters population. Pre-emergence herbicides may be of benefit to assist in rotation of herbicide mechanisms of action. It is important to use full herbicide rates applied at the correct weed size and to carefully monitor results.

## Best Management Practices

Integrated weed management including herbicide rotation, mixtures, and cultural/ mechanical controls should be practiced to delay the selection of synthetic auxin resistant common lambsquarters. The fact sheet “Synthetic Auxin Resistant Weeds” provides more detail on how to delay and mitigate resistance.

## Facts about Common Lambsquarters

### SCIENTIFIC NAME

*Chenopodium album*

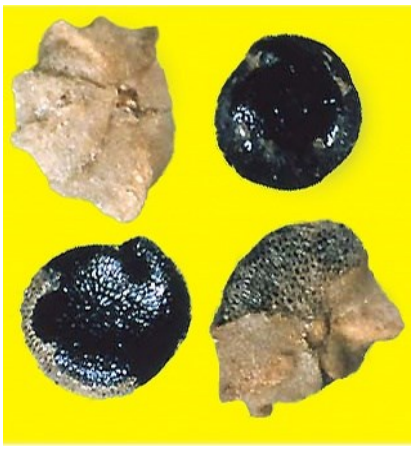
### OTHER COMMON NAMES

fathen, white goosefoot

Common lambsquarters, a native of Europe and Asia, is one of the most widespread and important weeds in the world. Weed surveys in the mid west of the United States place common lambsquarters amongst the top 10 most problematic weeds. It is a summer annual and is highly competitive partly because it germinates at a low temperature allowing it to emerge before the crop.

### SEED LONGEVITY AND EMERGENCE

Individuals produce an average of 72,000 seeds per plant and without crop competition they can produce up to 500,000 seeds per plant. Freshly harvested seed has a high degree of dormancy and the seed can last 30-40 years in the soil, making the prevention of seed set very important. Seed can be dispersed on soil that clings to equipment, as a contaminant in crop seed, and by birds and livestock that eat them.



## Biotype Morphology

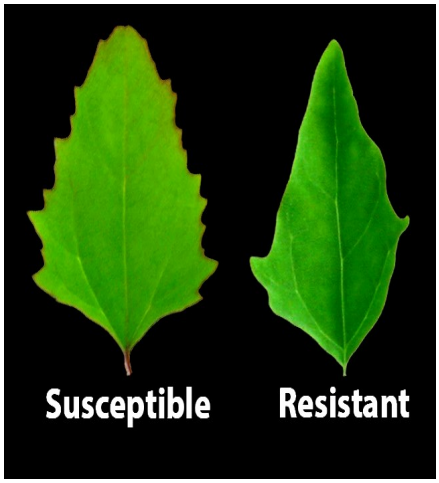



*Photo: Dr. Trevor*

Researchers noted that common lambsquarters plants exhibiting resistance to dicamba had far fewer leaf serrations than most plants from normal susceptible populations. If this morphology is directly linked to resistance it suggests that the resistance trait may have plant effects other than conferring resistance to dicamba.

** TSR = Target Site Resistance, NTSR = Non Target Site Resistance*

**REFERENCES**

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