Weed Biology & Management Series for Christmas Tree Production

Biology & Management of Common Lambsquarters *(Chenopodium album)* in Christmas Tree Production

DEBALINA SAHA
ASSISTANT PROFESSOR, DEPARTMENT OF HORTICULTURE, MICHIGAN STATE UNIVERSITY

Common lambsquarters (*Chenopodium album* L.), a member of the goosefoot family (Chenopodiaceae), is a significant weed affecting agricultural systems worldwide. This family also includes cultivated crops like spinach and beets. Originally native to Europe and Asia, common lambsquarters has now become one of the most widely distributed and troublesome weeds globally, ranking among the top five most widespread weeds (Holm et al., 1977). This weed emerges throughout the growing season, with peak emergence occurring in mid- to late spring. It thrives in well-drained soils and can begin its emergence early in the growing season. Common lambsquarters are difficult to control for their adaptability and resistance to several herbicides (Curran et al., 2021, Chandran, 2020).

Figure 1 – *Triangular shaped leaves of common lambsquarter.* (Photo credits: Debalina Saha, MSU Horticulture)

Figure 2. *Greenish colored small flowers of common lambsquarters.* (Photo credits: Debalina Saha, MSU, Horticulture).

Biology of Common Lambsquarters

Common lambsquarters (*Chenopodium album* L.) is an upright, branching summer annual weed that grows between 1 to 6 feet tall and thrives in disturbed, fertile habitats such as barnyards, Christmas tree fields, and farmsteads. This shallow-rooted plant develops from a taproot and produces succulent stems that are grooved, smooth, or hairless, and often streaked with red, purple, or green (Chandran, 2020; Michigan State University Extension, 2015).

The cotyledons are narrow, linear, and dull green to gray, lacking a midvein. The first one or two leaf pairs are opposite, with all subsequent leaves alternating. Mature leaves are highly variable, ranging from triangular and diamond-shaped to lance-shaped (Fig 1), with light green upper surfaces and gray, mealy undersides. Young leaves often have a similar mealy coating on both surfaces, which gives the plant its characteristic whitish appearance (Michigan State University Extension, 2015).

At flowering, small, green or gray-green flowers form in dense clusters at the tips of stems and branches (Fig 2). These flowers produce seeds enclosed in a thin, papery, star-shaped covering. Common lambsquarters is a prolific seed producer, with each plant capable of producing over 70,000 seeds. These seeds exhibit dormancy lasting over 20 years, with approximately 3% being brown and germinating readily, while the remaining black seeds are more dormant (Stevens, 1932; Williams & Harper, 1965). Most seeds remain on the plant until early winter and are dispersed through equipment transfer or livestock digestion, as they can survive passage through the digestive tract (Curran et al., 2021). Germination of common lambsquarters seeds is influenced by light, temperature fluctuations, and nitrate presence in the soil, although only 10–30% of the current season's seeds germinate the following year under favorable conditions (Mohler & DiTommaso, 2006; Forcella et al., 1997).

Propagation

Common lambsquarters (*Chenopodium album* L.) propagates exclusively through seed production. Flowering typically occurs in late summer and fall for plants that emerge in the spring. However, plants that emerge later in the season can complete their life cycle and reach the reproductive stage in as little as six weeks (Mohler and DiTomasso, 2005). This rapid reproductive cycle allows the weed to adapt and persist in various environmental conditions. Environmental factors such as prolonged drought can trigger early maturation, enabling common lambsquarters to produce seed under stress. The plant is primarily self-pollinated, although wind can facilitate some degree of cross-pollination. Once flowering begins, seed production occurs over a relatively short period before the plant senesces and dies. This efficient seed production strategy contributes to its persistence and spread, making it a challenging weed to manage (Curran et al., 2021).

Similar Species

Several species within the *Chenopodium* genus and related groups resemble common lambsquarters (*Chenopodium album* L.), including thick-leaved goosefoot (*Chenopodium desiccatum*), oak-leaved goosefoot (*C. glaucum*), maple-leaved goosefoot (*C. hybridum*), and Atriplex patula. The maple-leaved goosefoot has thin, oval leaves with pointed tips and lobes along the margins, forming loose flower clusters, unlike the denser clusters of common lambsquarters. The oak-leaved goosefoot displays small, oblong leaves with irregular edges and whitened undersides, and simpler, less branched flower clusters (Pennsylvania State University, College of Agriculture, Cooperative Extension Service).

Additionally, *Atriplex patula* (spreading saltbush) can be distinguished by its larger cotyledons, opposite leaf arrangement in early growth, and small lobes at the leaf bases (Michigan State University Extension, 2015).

Management of Common Lambsquarters

Non-chemical control:
Managing common lambsquarters (*Chenopodium album* L.) involves a combination of cultural, mechanical, and mulching practices to suppress its growth and prevent seed production. Fertilizer placement near the crop limits nutrient access for lambsquarters, while cover crops like legumes help disrupt its life cycle. Mulches, such as hardwood chips or pine barks can block sunlight and suppress germination. Mechanically, shallow cultivation or mowing prevents seed production. Combining these practices offers a sustainable, herbicide-free approach to managing common lambsquarters (Chandran, 2020; Curran et al., 2021).

Chemical control:
For larger populations, herbicides specific to labeled crops can be applied. However, some biotypes of common lambsquarters in North America have developed resistance to herbicides in the triazine and ALS-inhibitor families (Chandran, 2020). Populations resistant to ALS-inhibitors have since been identified in Michigan, Ohio, and Ontario (Heap, 2005). Resistance to photosystem II inhibitors (triazines) was first documented in the 1970s in Ontario, Canada (Bandeen and McLaren, 1979). Recently, there is growing concern over its potential resistance to glyphosate, further complicating its management in agricultural production systems across North America (Curran et al., 2021).

Preemergence control:
There are several effective preemergence herbicides available for lambsquarter control in Christmas tree production. Goaltender (oxyfluorfen) can provide excellent control whereas, Barricade (prodiamine), Cobra (lactofen), Gallery (isoxaben), and Mission(flazasulfuron) can provide good control in Christmas tree production. These herbicides work by targeting the weed during seed germination, preventing it from establishing in the field (Pennsylvania State University, Department of Plant Science).

Postemergence control:
For established common lambsquarters, postemergence herbicides provide effective control. Some of the good postemergence options are Roundup (glyphosate), Goaltender (oxyfluorfen), Garlon (triclopyr), Frequency (topramezone) for controlling lambsquarters in Christmas tree production. These herbicides are most effective when applied during the weed's early growth stages for optimal results (Pennsylvania State University, Department of Plant Science).

REFERENCES:

Bandeen, J.D., and R.D. McClaren. 1979. Resistance of Chenopodium album to triazine herbicides. Canadian Journal of Plant Science. 56:411.

Chandran, R. 2020. Common lambsquarters. West Virginia University Extension Service. https://extension.wvu.edu/lawn-gardening-pests/weeds/common-lambsquarters

Curran, B., Sprague, C., Stachler, J., & Loux, M. 2021. Biology and management of common lambsquarters (GWC-11). Purdue University Extension. https://ag.purdue.edu/btny/purdueweedscience/wp-content/uploads/2021/01/GWC11_Lambsquarters.pdf

Forcella, F., R.G. Wilson, J. Dekker, R.J. Kremer, J. Cardina, R.L. Anderson, D. Alm, K.A. Renner, R.G. Harvey, S. Clay, and D.D. Buhler. 1997. Weed seedbank emergence across the Corn Belt. Weed Sci. 45: 67-76.

Heap, I.M. 2005. International survey of herbicide resistant weeds. Online. Internet. October 31, 2005. Available http://www.weedscience.org/in.asp.

Holm, L.G. D.L. Plucknett, J.V. Pancho, and H.P. Herberger. 1977. The World's Worst Weeds Distribution and Biology. Honolulu, HI: Univ. Press of Hawaii. Pp. 84-91.

Michigan State University Extension. (2015). Common lambsquarters https://www.canr.msu.edu/resources/common_lambsquarters

Mohler, C.L. and A. DiTommaso. Common Lambsquarters. In Manage Weeds on Your Farm: A Guide to Ecological Strategies. In Press. Sustainable Agriculture Network, (www.sare.org/publications).

Pennsylvania State University, College of Agriculture, Cooperative Extension Service. Common lambsquarters. https://www.maine.gov/dacf/php/gotpests/weeds/factsheets/lambsquarters-penn.pdf

Pennsylvania State University, Department of Plant Science. Lambsquarters (*Chenopodium album*). https://plantscience.psu.edu/outreach/plant-id/broadleaf/lambsquarter

Stevens, O.A. 1932. The number and weight of seeds produced by weeds. Am. J. Bot. 19:784-794.

William, J.T. and J.L. Harper. 1965. Seed polymorphism and germinationthe influence of nitrates and low temperatures on the germination of Chenopodium album. Weed Res. 5:141-150.