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Inula britannica is an aggressive, difficult-to-control weed that is invading many nurseries in Michigan and other parts of the United States through contaminated rootstock. *Inula* was first reported in Michigan around 1990 and has since been confirmed in at least six nurseries and one homeowner site. The USDA Animal and Plant Health Inspection Service recently rated *I. britannica* as a medium/high risk for the potential consequences and risks of introduction. *Inula* is also regulated by the Netherlands as a noxious weed with zero tolerance in fields for export. In addition, the Michigan Department of Agriculture places restrictions on infested crops until the weed is adequately controlled.



Figure 1. Rosette stage of *I. britannica*.

Inula Background and Biology

Inula britannica is a member of the aster or sunflower family. This plant is native to temperate climates in Asia and Europe and has been introduced into North America several times since 1915. *Inula* is known by several common names, including British yellowhead, British elecampane and xuan fu hua. The plant is reported to have medicinal properties and is currently being researched in attempts to isolate useful phytochemicals.



Figure 2. Mature *I. britannica* plant in full flower.

Inula is a perennial plant that reproduces from seed or roots. From seed, inula forms a rosette requiring a chilling (vernalization) period to bolt and flower. Flowers appear to be day-neutral and will usually form during the summer, persisting until October or November. The flowers are self-fertile, containing both male and female organs. Bees and flies contribute to pollination, though this is not required for the formation of viable seed. Seeds are small, light brown and disseminated by wind. Individual seeds do not mature at the same time, as do dandelion seed, but mature beginning at the outside and so release seed into the wind over a period of days. Hairs attached to the seeds allow for wind dispersal.



Figure 3.
Hosta roots
with intertwined
I. britannica roots.

Inula also reproduces vegetatively from roots. Root sections as small as 1 inch may form adventitious buds that sprout and produce new shoots. These buds may form when roots are separated or when roots are exposed to sunlight, and they allow the plants to form dense colonies. Vegetatively produced shoots usually require vernalization (cold temperatures for a period of time) to begin flowering.



Figure 4.
I. britannica root
section and emerging
shoots.

Soil is generally not a limiting factor to inula growth. The plant may grow in a wide range of soil types from light (sand) to heavy (clay), and in acidic, neutral or basic conditions. Inula grows best in fertile, moist, well-drained soil, although roots are fairly drought resistant and may persist even after the foliage has died from lack of moisture. The plant is not very shade tolerant but is hardy to at least 5 degrees F and has survived recent Michigan winters.

Two other perennial inula species, *I. helenium* (elecampane inula) and *I. salicina* (willowleaf yellow-head), have the potential to become weedy. *I. helenium* has become naturalized in the United States and may be found from North Carolina to Canada. This species may grow to 8 feet tall and also forms yellow flowers. *I. salicina* is uncommon in the United States and will likely not exceed 2 feet in height.



Figure 5. 1) Visible hairs on leaf and stem of bolted *I. britannica* plant; 2) small serrations on leaf margin.

Inula Identification

The rosette form of this plant may slightly resemble horseweed (marestalk, *Conyza canadensis*), but horseweed is not perennial, and horseweed leaves have toothed margins with short, prominent petioles. Inula leaf margins are finely serrated, and coarse white hairs are easily distinguishable on the undersides of leaves and on the stem. The flowering stalk may grow up to 30 inches tall, depending on soil fertility. Few to many flowering branches may be formed on each plant.

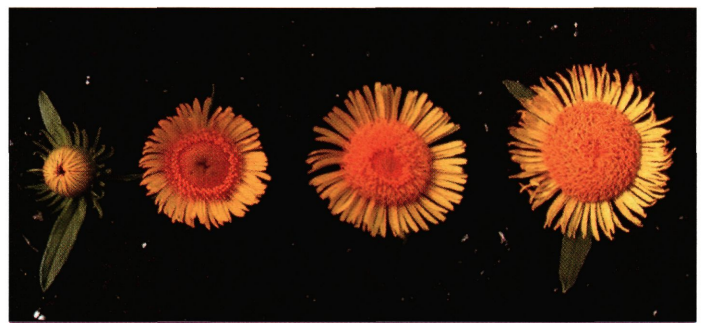


Figure 6. Maturation of *I. britannica* flowers.

Many coarse hairs are visible on *I. britannica* stems and leaves. Alternate leaves appear densely pubescent (hairy) below and lightly pubescent on the upper leaf surface. Lanceolate (narrow and tapering to a blunt tip) leaves have smooth to finely serrated margins. Leaves are sessile to slightly clasping the stem, and upper leaves will not have a petiole. Leaf tips are acute and bases are lobed in a rounded to arrowhead shape.



Figure 7. Linear, green, softly hairy bracts (arrow) on underside of *I. britannica* flower head.

The attractive flowers of *I. britannica* are composed of yellow disc (found in flower center) and yellow ray (found along flower margin) flowers. Flower heads are roughly the size of a half-dollar (0.75 to 1.5 inch) and resemble small sunflowers. Plants continue to produce new flowers as older flowers mature and die, resulting in numerous flowers on each plant. Under each flower head are multiple, small green bracts that help distinguish this from other inula species. Each seed is contained within a small achene. Achenes are released over a period of days from individual flower heads beginning along the margin. Seed may be able to mature fully even if the plant dies before seed maturation.

Inula Management

Most reports of rootstock contaminated with Inula have been attributed to hosta imported from the Netherlands, but inula may also be introduced with other species from other locations. State restrictions within the United States are likely to be less stringent than those of the Netherlands and may allow for interstate spread of the weed once it is introduced. This increases the importance of buying rootstock from reputable sources and maintaining a stringent prevention and sanitation program. Growers should inspect all imported root shipments for the presence of inula.



Figure 8. *I. britannica* achenes.

Distinguishing between inula and hosta roots is very difficult. Inula roots appear light white, smooth and usually thin, whereas hosta roots are generally thicker and coarser with small raised bumps. Sprouts from inula roots will also be thinner than the thick, stubby hosta sprouts.

Control of established inula can be quite difficult. Mechanical control with equipment such as discs or plows is not recommended because these implements will divide the roots and may carry root pieces to non-infested areas. This practice will result in an increased total number of plants unless the soil is very dry at time of cultivation. A good option for eradication should be fumigation of the affected area with methyl bromide. Several herbicides are also available that have controlled the weed effectively in MSU research studies, though none are currently labeled for inula control. Glufosinate (*Rely* or

Finale) and triclopyr plus clopyralid (*Redeem R+P*) may control the weed in non-crop situations, but these products do not have adequate safety or a label for in-crop use. Clopyralid (*Lontrel*) also has shown promising results, but it cannot be used in all crops. Because inula is a perennial weed, multiple herbicide applications may be required. An active scouting and hand weeding program should be used in combination with chemical controls for long-term management.



Figure 9. Untreated *I. britannica* forming a dense colony in hosta field.



Figure 10. Plot treated with clopyralid four weeks after treatment. Hosta is slightly twisted and curled; *I. britannica* has turned purple because much of the foliage is dying.



Research on *Inula britannica* control has been funded by Project GREEN, the Michigan Nursery and Landscape Association, and the MSU Center for Integrated Plant Systems (CIPS). All photographs by Robert Richardson, MSU Dept. of Horticulture.

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