2. *Humulus lupulus* L.  (common hops)

Pl. 333 e; Map1420

Plants perennial herbs, with stout rhizomes. Stems 1–6 m or more long, sparsely to moderately pubescent with 2-armed hairs on the ridges, rough and prickly to the touch, minutely hairy or glabrous between them. Leaves with petioles 1–8 cm long, mostly shorter than the blades, usually sparsely to moderately pubescent with stiff, 2-armed hairs. Leaf blades 3–14 cm long, 2–13 cm wide, narrowly to broadly ovate in outline, unlobed or with 3(–5) shallow to relatively deep lobes, the margins sometimes with short, soft hairs, the upper surface sparsely roughened with stiff, bulbous-based, prickly hairs, the undersurface not roughened, glabrous or more commonly sparsely to moderately pubescent with short, fine hairs, also with yellowish, sessile glands. Staminate panicles 3–15 cm long, 2–3 cm wide. Pistillate spikes 0.5–1.5 cm long at flowering, elongating to 1–5 cm long at fruiting, the bracts 10–18 mm long, ovate to elliptic-ovate, the margins glabrous, the outer surface glabrous or sparsely to moderately hairy, also with yellowish to orangish, stalked glands, especially near the base. Sepals 1.5–2.5 mm long, lanceolate to ovate or oblong-ovate, glabrous or hairy, also with yellowish to orangish, stalked glands. Stamens with the anthers usually having orangish glands. Fruits 2.0–2.7 mm long, 2.0–2.5 mm wide, the surface smooth, yellowish brown, the persistent calyx occasionally darker-mottled. 2n=20, 40. July–October.

Scattered nearly throughout the state but apparently absent from the Mississippi Lowlands Division and some western portions of the Ozarks (U.S., Canada, Mexico, Europe, Asia). Banks of streams and rivers, margins of lakes, bottomland forests, and moist ledges of bluffs; also fencerows, railroads, roadsides, and disturbed areas.

The pistillate inflorescences, which in the brewing industry are referred to as cones, are harvested for beer-making, medicinals, and flavorings. The bitter flavor and antibacterial properties are derived from the yellow resinous exudate from the cup-shaped glands, which contain essential oils known collectively as lupulin. Tannins in the extract also improve the clarity of beer after boiling during the production process. The origin of hops as a crop is obscure. They were known and cultivated in Europe at a very early date, but they might have been brought in from China, where all three species of *Humulus* occur today. How and when hops came to be used to impart flavor and aroma in beer is unknown, but the practice probably originated in Germany (Barth et al., 1994). Prior to the use of hops, beer was preserved with oak leaves, bark, and bitter herbs such as wormwood. Hops were grown in European monasteries in the eighth and ninth centuries and were used to flavor and preserve beverages by the twelfth century. Hops were first brought to England around 1500 by Flemish settlers. The traditional English ale was brewed without hops, but the use of hops eventually caught on. British settlers brought hops with them to New England, where hops became a large and important crop, especially in New York. Hops were well established before the great waves of German immigration to the New World. Prohibition and a fungal disease brought an end to hop production in the east. For a while, hops were widely grown in Wisconsin, California, and other places, but presently the largest producers are Oregon and Washington (Barth et al., 1994).

In addition to their use in the beer industry, hops have been used medicinally, especially by Native Americans, both as a stimulant and mild sedative, for urinary and reproductive problems, to ease fevers and pains, to treat pneumonia and coughs, and as a tonic (Moerman, 1998).

Populations in various parts of North America have been named as distinct species, but the differences are
slight and they are now all considered varieties of H.lupulus. Potentially making matters more difficult is that varieties of H.lupulus native to North America possibly have interbred with introductions from Europe (Small, 1997). A statistical analysis of patterns of variation in eleven morphological characters in H. lupulus revealed five intergrading groups roughly correlated with geographic distribution and recognized as varieties (Small, 1978, 1997). Beer is made using only var. lupulus, and the North American varieties are avoided because they impart objectionable flavor and aroma to the brew. However, some native North American populations have been a source of germplasm for breeding programs to improve various aspects of cultivated hops (Hampton et al., 2001).