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Hophornbeam copperleaf (*Acalypha ostryifolia* Riddell)

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Intriguing World of Weeds

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Get someone else to blow your horn and the sound will carry twice as far.
Will Rogers

It is said that love makes the world go 'round—the announcement lacks verification. It's wind from the dinner horn that does it.
O. Henry

The finest workers in stone are not copper or steel tools, but the gentle touches of air and water working at their leisure with a liberal allowance of time.
Henry David Thoreau

Introduction

Hophornbeam copperleaf (*Acalypha ostryifolia* Riddell) is an erect, herbaceous, dicot species in the Euphorbiaceae, or spurge, family that constitutes more than 200 genera and some 6,000 species (Mayfield and Webster 2013). Although the euphorbs have a cosmopolitan distribution, none are found in the Arctic (Mabberley 1997). Members of the Euphorbiaceae may be trees, shrubs, herbs (occasionally aquatic), or vines; sometimes succulent and cactus-like; and often have glands on vegetative plant parts (Mabberley 1997; Zomlefer 1994). Genera in the spurge family include *Croton, Euphorbia, Ricinus*, and *Acalypha*. *Acalypha* consists of 450 species that are native to both the Eastern and Western hemispheres (Zomlefer 1994). *Acalypha* was the name used by Hippocrates because the leaves resemble those of nettles, whereas *ostryifolia* alludes to the resemblance of leaves to plants in the genus *Ostrya* (hophornbeam trees; Burrows and Tyrl 2013; Haddock 2014; Hilty 2018). As plants mature in the fall, the leaves can turn reddish-brown, which may indicate why "copperleaf" is included in the species' common name (Hilty 2018). Hophornbeam copperleaf is native to North America; it occurs in the United States ranging from Arizona east to Florida, north to Pennsylvania, and west to Nebraska (Anonymous 2019). It occurs in a variety of habitats including agronomic fields, cultivated areas, landscapes, roadsides, river and stream banks, thickets, pastures, and waste sites (Bryson and DeFelice 2010; Haddock 2014; Hilty 2018). This plant's other common names include copperleaf, pineland three-seed mercury, Virginia copperleaf, hornbeam mercury, hornbeam three-seed mercury, mercury, and rough-pod copperleaf (Bryson and DeFelice 2010; Haddock 2014; Hilty 2018; Steckel 2006).

Description

Hophornbeam copperleaf seedlings have two round cotyledons, similar to those of the mallow family. The cotyledons and seedling stems of hophornbeam copperleaf are pubescent, while the first leaves are sparsely hairy. The first true leaves are oppositely arranged. The mature stems are erect, 0.3–0.8 m tall, simple to usually branched, and are pubescent. The trichomes are sparse to dense, glandular, or short and recurved. Although many members of the spurge family produce a milky sap, hophornbeam copperleaf lacks this characteristic. Leaves of mature plants are alternate, 3.0–10.0 cm long, 1.5–5.0 cm wide, simple, ovate to rhombic-ovate with sharply serrated margins, and are sparsely pubescent. Petioles are typically 2.0–7.0 cm long and stipules are typically 1.5 mm long. Inflorescences are both terminal and axillary. Female spikes are terminal, 3.0–11.0 cm long, with deeply cleft subtending bracts. Male florets occur on axillary spikes, are 1.0–3.0 cm long, crowded, with subtending bracts that are 2.0–7.0 mm long and 5.0–12.0 mm wide. Fruits occur in a 2.0- to 3.5-mm-long, pubescent capsule that has tuberculate projections and are three-seeded (hence the alternate common name: three-seed mercury). Seeds are ovoid, 1.4–2.3 mm long, silvery gray in color, and tuberculate (Bryson and DeFelice 2010). Reproduction is solely by seed. The mature plant has fibrous roots originating from a taproot.

Hophornbeam copperleaf seedlings are often mistaken for *Sida spinosa* (prickly sida or teaweed; Bradley and Rosenbaum 2011). Seedling prickly sida plants have one round and one heart-shaped cotyledon, which is a trait that can be used to distinguish between it and



Drawing reproduced from Britton and Brown (1913)



Hopehornbeam copperleaf competing with cotton

hophornbeam copperleaf's round cotyledons. The first true leaves of hophornbeam copperleaf are opposite compared with the alternate true leaves of prickly sida. Additionally, the leaf margins of prickly sida are more coarsely serrated than the sharply serrated leaves of hophornbeam copperleaf. Copperleaf also lacks the small stipules (spines) in leaf axils that prickly sida has (Bradley and Rosenbaum 2011). A related species, Virginia copperleaf (*A. virginica* L.) can be a troublesome weed species as well.

Weediness

Hophornbeam copperleaf prefers full or partial sun, moist to mesic conditions, and can thrive in both disturbed and undisturbed areas. Hophornbeam copperleaf plants are capable of producing numerous seeds. Horak et al. (1998) conducted a study examining its biology and control among soybean (*Glycine max* L. Merr.) plantings and found that hophornbeam copperleaf grown alone produced 12,510 seeds per plant, whereas plants grown in competition with soybean produced 980 seeds per plant. Hophornbeam copperleaf fruit capsules are dehiscent (capsules split open at maturity to release seed), which aids dispersal. Although this plant reseeds itself, animals may also contribute to propagule movement (Hilty 2018; Miller and Miller 1999). Plants may be found singly or in large colonies.

Although scarification is not required for seed germination, cold stratification for up to 3 wk increased germination compared to no cold stratification time (Horak et al. 1998). Whereas hophornbeam copperleaf seeds can germinate over a wide range of temperatures, which could explain how these plants can thrive in varying environments, Horak et al. (1998) found that alternating temperatures of 30 C to 20 C were optimal for germination. These results are consistent with observations that emergence can begin in late spring or early summer and continue throughout the growing season (Driver and Oliver 1984). Steckel (2006) reported that hophornbeam copperleaf can be found across many fields in mid to late summer in the mid-South region of the United States. Hophornbeam's ability to germinate in warmer temperatures throughout the summer allows it to emerge after most herbicide applications (Steckel 2006). With respect to soil pH, hophornbeam copperleaf seed can germinate at levels between 5.1 and 10.9, with an optimum pH for germination of 7.0.

Hophornbeam copperleaf has been reported to be a weedy pest of corn (*Zea mays* L.), soybean, peanut (*Arachis hypogaea* L.), and watermelon (*Citrullus lanatus* L.; Baldwin et al. 1974; Brandenberger et al. 2005; Horak et al. 1998; Prostko 2017; Stephenson et al. 2015). For example, Prostko (2017) reported that hophornbeam copperleaf can occur at densities that have the potential to reduce yields and influence harvest efficiency in peanuts grown in Georgia (Prostko 2017). Conversely, Steckel (2006) noted that hophornbeam emerges later in the soybean growing season and is less likely to reduce yields. However, hophornbeam copperleaf plants that emerge after crop maturity could flower and add seed to the soil seed bank, thereby impacting crops in following years. Hophornbeam copperleaf has also been reported to be an early invader of sites prepared for forest plantations (Miller and Miller 1999).

No-till row crop production along with glyphosate-tolerant crops has likely provided an environment for this weed to thrive (Steckel 2006). The reduction in the use of cultivation and applications of soil-applied residual herbicides and the species' tolerance to glyphosate has allowed this weed to become more widespread in the mid-South and midwestern United States (Horak et al. 1998; Steckel 2006). The species also has some tolerance to acetolactate synthase-inhibiting herbicides often used POST in cotton (*Gossypium hirsutum* L.), corn, and soybeans (Steckel 2006). Despite these limitations, the application of both PRE and POST herbicides has been recommended for the management of extremely dense populations of hophornbeam copperleaf (Prostko 2017). In more recent years with the widespread adoption of soybean and cotton that is tolerant to POST dicamba applications

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(Wechsler et al. 2019) in the mid-southern United States, there has been an increase in the frequency of reports from growers of hophornbeam copperleaf infesting those crops (authors' personal observations). This is not surprising because dicamba is not that effective on hophornbeam copperleaf (Steckel 2019).

Toxicity

Consumption of plants may cause digestive irritation, colic, and diarrhea, although to a lesser extent than the related species, Virginia copperleaf, *A. virginica* (Bryson and DeFelice 2010; Burrows and Tyrl 2013). The problem is a result of the presence of diterpene esters, which cause irritation to the mucosa of the digestive tract (Burrows and Tyrl 2013). Another poisonous plant in the *Acalypha* family is the chenille plant, *A. hispida* Burm.f. (Zomlefer 1994). However, a related species, slender copperleaf (*A. gracilens* Gray), is a highly used forage plant by white-tailed deer (*Odocoileus virginianus*) throughout the southeastern U.S. in the summer (Miller and Miller 1999). Additionally, it has been reported that the Cherokee people used the roots of Virginia copperleaf as a drug to treat urinary problems (Moerman 1998).

Other Uses

Unlike most Euphorbs, hophornbeam copperleaf flowers are pollinated by wind (anemophilous), and therefore, they don't attract many pollinators. The species is, however, an early season wild host plant for two important crop insect pests, corn earworm (*Helicoverpa zea* Boddie) and tobacco budworm (*Heliothis virescens* F.), in Tennessee (Sudbrink and Grant 1995). Interestingly, a research study found that sweet corn patches infested with hophornbeam copperleaf had higher densities of predacious lady beetle (*Coleomegilla maculata* DeGeer) larvae and increased predation on corn earworm eggs compared with patches that lacked these weeds (Cottrell and Yeargen 1998). This was perhaps due to a preference by the lady beetle to lay eggs on plants with abundant glandular trichomes when available. Additionally, eggs oviposited on these plants suffered less cannibalism and predation than those on plants without these anatomical structures.

Interestingly enough, although *Acalphya* have some toxic properties, both copperleaf species and chenille plant are considered ornamentals (Zomlefer 1994). That hophornbeam copperleaf could be a fellow traveler with man by being an ornamental to some while at the same time becoming more of a troubling weed to others shows it has evolved to fit in well to its currently diverse environments. Hophornbeam copperleaf is quite a long-winded name for such a short-statured plant, and it is indeed proving to be a pesky weed problem where it becomes established.

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