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Striga (Orobanchaceae)

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X. STRIGA Loureiro, Fl. Cochinch. 1: 22. 1790 * Witchweed [Latin, *striga*, hag or witch, alluding to rendering victims prematurely aged and weak] I

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Herbs, annual; obligate root parasites, (haustoria either single and large or numerous and smaller and formed on secondary roots). **Stems** erect, sometimes fleshy, hispid, puberulent, or glabrous. **Leaves** cauline, opposite or subopposite, not succulent; petiole absent (if leaves sessile); blade margins entire. **Inflorescences** terminal, racemes or spikes; bracts present. **Pedicels** present or absent; bracteoles present. **Flowers**: sepals 5(--8), calyx radially or bilaterally symmetric, tubular, lobes lanceolate or subulate; petals 5, corolla red, brownish red, purple, rarely white or yellow, tubular, abaxial lobes 3, obovate, spreading, adaxial lobes 2; stamens 4, adnate to corolla, didynamous, filaments glabrous, staminode 0; ovary 2-locular, placentation axile; stigma capitate. **Capsules** symmetric, dehiscence loculicidal. **Seeds** 400--600, brown or black, ovoid, not winged.

Species ca. 40 (2 in the flora): introduced; s, se Asia (Arabian Peninsula), Africa, Australia.

Striga produces leaves of different sizes; typical leaves are scalelike at the base and become progressively larger medially. *Striga* is characterized by its bilabiate corolla with an abruptly bent tube, distinguishing it from its close relative *Buchnera*, which possesses a salverform corolla. *Striga* has been divided into three sections based on the number of ribs on the calyx tube (R. Wettstein 1891--1893): sect. *Pentapleurae* Wettstein with 5, sect. *Polypleurae* Wettstein with 10, and sect. *Tetrasepalum* Engler with 15.

Thirty-four species and subspecies of witchweeds occur in Africa; 22 are endemic (K. I. Mohamed et al. 2001). All *Striga* species parasitize hosts in the Poaceae except *S. gesnerioides* (Willdenow) Vatke, which grows on hosts in Convolvulaceae, Euphorbiaceae, Fabaceae, and Solanaceae. *Striga asiatica* (Linnaeus) Kuntze, *S. aspera* Benth, *S. forbesii* Benth, *S. gesnerioides*, and *S. hermonthica* (Delile) Benth, are of economic importance. Crops most affected by *Striga* include *Digitaria exilis* Stapf (fonio), *Oryza* subsp. (upland rice), *Pennisetum americanum* (Linnaeus) K. Schum (bulrush millet), *Sorghum vulgare* Persoon (sorghum), and *Zea mays* Linnaeus (maize). *Striga gesnerioides* is a serious pest on *Vigna unguiculata* (Linnaeus) Walper (cowpea, Fabaceae) and a minor pest on other dicot crops. All species of witchweed are listed as noxious weeds by the United States Department of Agriculture and eleven state governments. New infestations of quarantine pests in the United States, such as witchweeds, should be reported to the State Plant Health Director in the appropriate state; the following website provides current (as of 2009) contact information: http://www.aphis.usda.gov/services/report_pest_disease/report_pest_disease.shtml.

1. Calyx ribs 10; leaves 20--50 mm, linear or narrowly elliptic, ascending or spreading; bracts linear, longer than calyces; corollas red (rarely yellow) with yellow throats; parasitic on species of Poaceae.....1. *Striga asiatica*
1. Calyx ribs 5; leaves 3--7 mm, scalelike, lanceolate, appressed; bracts lanceolate, shorter than calyces; corollas brownish red, purple, or rarely, white; parasitic only on dicots.....2. *Striga gesnerioides*

1. **Striga asiatica** (Linnaeus) Kuntze, Revis. Gen. Pl. 2: 466. 1891 F I W

Buchnera asiatica Linnaeus, Sp. Pl. 2: 630. 1753

Herbs, 15--35 cm; hemiparasitic. **Taproots** slender, not fleshy; secondary roots present, all roots terminating in equal size, small, globose haustoria. **Flowering stems** erect, drying green, simple or branched medially, obtusely square, not fleshy, antrorsely scabrous-hispid. **Leaves**: basal ones reduced to scales, opposite, lanceolate, medial ones expanded, alternate, ascending or spreading, linear or narrowly elliptic, 20--50 x 2--4 mm, margins ciliate, apex tip acute, scabrous-hispid. **Racemes** lax, equaling or exceeding vegetative stem; flowers alternate; bracts linear, 20--35 x 1--2 mm, longer than calyx, tips upright, margins ciliate, hispid. **Pedicels** 1 mm; bracteoles paired, subulate, 2--3 x 0.5 mm, margins ciliate. **Flowers**: sepals 5(--8), 7--8 mm; calyx ribs 10, hispid along ribs, tube 5 mm, teeth 5 and equal or 6--8 and subequal, lanceolate or sublanceolate, 2--3 mm, margins entire, ciliate; corolla red (rarely yellow) with yellow throat, glandular pubescent, tube bent, expanded distally, 15 mm, abaxial lobes spreading, obovate, 12 mm wide, adaxial lobes 5 mm wide, wider than long, apex emarginate; style persistent, terete, 7--10 mm, rolled in when dry, with few hairs or glabrous. **Capsules** oblong, 5--7 x 2--3 mm. **Seeds** ovoid, 0.3--0.4 mm, with prominent and ornamented ridges.

Flowering Jul--Aug. Parasitic on species of Poaceae; chiefly in maize fields; 20--90 m; introduced; N.C., S.C.; Africa.

Striga asiatica was discovered in southern North Carolina and adjacent South Carolina in 1956 (H. R. Garriss and J. C. Wells 1956). At one time, 38 counties in the Carolinas were infested (R. E. Eplee 1981). Through a comprehensive control program and quarantine measures, the original infested area has been reduced by 99%, with only about 2374 acres remaining in 2008 (R. Iverson, pers. comm.) in a few locations in Horry and Marion counties, South Carolina, and Bladen, Cumberland, Pender, Robeson, and Sampson counties, North Carolina.

Use of the name *Striga lutea* Loureiro by C. J. Saldanha (1963) and C. E. Smith (1966) for our plants is a misapplication. Saldanha rejected *S. asiatica*, believing that its Linnaean basionym could not be lectotypified; see F. N. Hepper (1974) for a counterargument and lectotypification.

Studies on climatic requirements and potential for spread indicate that this species could invade new areas as a result of global warming (D. T. Patterson et al. 1982; K. I. Mohamed et al. 2006; Mohamed et al. 2007).

2. *Striga gesnerioides* (Willdenow) Vatke, Oesterr. Bot. Z. 25: 11. 1875 * Cowpea or tobacco witchweed F I W

Buchnera gesnerioides Willdenow, Sp. Pl. 3: 338. 1800

Herbs, 15--30 cm; holoparasitic. **Taproots** tuberous, stout, fleshy; secondary roots absent, haustoria single, large, globose. **Flowering stems** erect, drying black or brown, simple or typically much branched proximally from base, obtusely square or terete, fleshy, puberulent, pilose, or glabrous. **Leaves** all scalelike, opposite or subopposite, appressed, lanceolate, 3--7 x 2 mm, margins ciliate, apex tip acute, puberulent. **Spikes** congested or most often lax, equaling or exceeding vegetative stem; flowers opposite or, rarely, alternate; bracts lanceolate, 5--7 x 1--2 mm, shorter than calyx, tips incurved, margins ciliate, glabrous or puberulent. **Pedicels** 0 mm; bracteoles paired, subulate, 2--3 x less than 0.5 mm, margins ciliate. **Flowers**: sepals 5, 4--7 mm; calyx ribs 5, scarious between ribs, pilose or with short hairs, tube 3--5 mm, teeth 5, unequal (adaxial tooth reduced to less than 1 mm), subulate, 1--2 mm, margins ciliate; corolla brownish red, purple or, rarely, white, sparsely pubescent or glabrous, tube bent, dilated distally above calyx, 8--12 mm, abaxial lobes spreading, obovate, 6 mm wide, adaxial lobes 3--4 mm wide, wider than long, apex emarginate; style persistent, terete, 5 mm, curved out, glabrous. **Capsules** oblong or ovoid, 4--5 x 2--3 mm. **Seeds** ovoid, 0.3--0.4 mm, with prominent and ornamented ridges.

Flowering Aug--Oct. Parasitic only on dicots; heavily disturbed phosphate mines and mine reclamation sites; 0--50 m; introduced; Fla.; Asia (Arabia Peninsula); Africa.

Worldwide, host-specific strains of *Striga gesnerioides* occur on *Euphorbia* (Euphorbiaceae), *Indigofera*, *Tephrosia*, and *Vigna* (Fabaceae), *Ipomoea* and *Merremia* (Convolvulaceae), *Lepidagathis* (Acanthaceae), and *Nicotiana* (Solanaceae) (K. I. Mohamed et al. 2001); some of these may be potential hosts for this species in the United States.

Striga gesnerioides was discovered in Florida in 1979 as a parasite on *Indigofera hirsuta* Linnaeus (hairy indigo), an African species planted for phosphate mine reclamation. *Alysicarpus ovalifolius* (Schumacher) J. Léonard (alyce clover) is also attacked in the field but with much less frequency (L. Herbaugh et al. 1980; L. J. Musselman et al. 1980). *Striga gesnerioides* is now known from Hillsborough, Lake, Orange, and Polk counties (<http://www.plantatlas.usf.edu/>). Greenhouse experiments conducted in Florida on over 125 known potential hosts of *S. gesnerioides* (Herbaugh et al. 1980) showed that this parasitic weed poses little threat to American agriculture (Musselman et al. 1980). In addition to hairy indigo and alyce clover, the only other hosts reported in

the Florida study were *Jacquemontia tamnifolia* (Linnaeus) Grisebach (smallflower morning-glory), *Helianthus annuus* Linnaeus (sunflower), and *Ipomoea batatas* (Linnaeus) Lamarck (sweet potato) (Herbaugh et al. 1980). In an experiment conducted by Musselman and C. Parker (1981) on more than 30 potential hosts, the American strain of *S. gesnerioides* failed to grow on any of them except hairy indigo showing the strict specificity of this strain.