CAPS Datasheets provide pest-specific information to support planning and completing early detection surveys.

Scientific Name of Pest

Scientific Name
Alectra vogelii

Synonym(s):
Alectra angustifolia Engl.*, Alectra merkeri* Engl.*, Alectra scharensis* Engl. (GRIN Taxonomy, 2022)

Common Name
Yellow witchweed, cowpea witchweed (CABI, 2023)

Type of Pest
Hemiparasitic plant (Mwaipopo, 2014)

Taxonomic Position
Class: Magnoliopsida, **Order:** Scrophulariales. **Family:** Orobanchaceae (CABI, 2023; GRIN Taxonomy, 2022)

Pest Recognition
This section describes characteristics of the organism and symptoms that will help surveyors recognize possible infestations/infections in the field, select survey sites, and collect symptomatic material. For morphological descriptions, see the Identification/Diagnostic resources on the AMPS pest page on the CAPS Resource and Collaboration website.

Flowers: Flowers are five-lobed, sulfur yellow to pale orange (Fig. 1), bell-shaped with large horseshoe-shaped stigma. Plant height ranges from 12 to 18 inches tall, often as a single stem, but sometimes the plant is branched near ground level. Flowers are borne individually on short stems in the axils of the upper leaves. The corolla, formed of five petals, which are fused into a tube for the bottom half, is bell-shaped when open, 0.39 to 0.63 inches in diameter, and somewhat longer than the calyx. Petals are generally pale yellow and may or may not have three deep red veins. Anthers and filaments are smooth. After flowering, the corolla withers and remains covering the developing spherical seed capsule, which eventually swells to approximately 0.2 inches in diameter (Mwaipopo, 2014).

Leaves: Leaves are 0.59 to 1.4 inches long by 0.12 to 0.59 inches wide and are hairy. Leaf margins vary from being smooth to having two to six sharp teeth. Stems and leaves are conspicuously hairy (CABI, 2023).

Roots: Roots are bright orange below the soil surface (Mwaipopo, 2014).

Seeds: The dust-like seeds have a complex structure. An outer cell layer of the seed coat is modified into a cone or a 'trumpet-like' structure about 0.039 in long, within which the 'kernel' of the seed, measuring about 0.0059 by 0.0098 in, is suspended. The surface of the seed coat is covered in indentations (CABI, 2023).

Figure 1. Mature *A. vogelii* plant (left) and close-up of flowers (right). Photos courtesy of C.R. Riches (CABI, 2023).

Symptoms: Symptoms associated with *A. vogelii* include stunted crop plants with smaller leaf area, wilting, chlorosis, and reduced flower and fruit set (Alonge et al., 2001; Singh and Emechebe, 1997).

Easily Mistaken Species

Alectra vogelii is easily confused with *A. picta* and *A. sessiliflora* (CABI, 2023); however, these species are not present in the United States (Kartesz, 2023; NRCS, 2023). It is in the same plant family as *Striga asiatica*, found in North and South Carolina, and *S. gesnerioides*, found in Florida (CABI, 2023; Kartesz, 2023). When flowering, these species can be readily distinguished by the flower colors: those of *S. asiatica* are red-orange (Lusweti et al., 2023), and those of *S. gesnerioides* are light purple (Wunderlin et al., 2023).

Biology and Ecology

This species is a parasite that primarily infests legume crops. In agricultural systems, it completes its life cycle in one year (Mwaipopo, 2014). Seeds can germinate as soon as they experience several days of warm, moist soil and exposure to chemical signals from host plants (Mwaipopo, 2014). The young plant initially grows within the host and penetrates its vascular tissue. External shoots are first produced about seven to eight

weeks after germination, and flowers are produced two weeks later (CABI, 2023). It can, however, take up to three months for shoots to appear after germination (Visser, 1978). In natural vegetation, the species sometimes parasitizes perennials and acts as a perennial itself, with shoots that die back each year. It also appears to reproduce clonally when parasitizing perennial species (Van Wyk and Hyde-Johnson, 2021).

Seed capsules of *A. vogelii* contain up to 3,000 seeds per capsule, and plants may produce approximately 200 capsules per plant, resulting in up to 600,000 seeds per plant (Musango et al., 2022; Visser, 1978). The seeds are dispersed by wind and water and on the hooves of animals (Ohlson and Timko, 2022; Parker and Riches, 1993). They can remain viable in the soil for more than ten years (Mwaipopo, 2014).

Known Hosts

Alectra vogelii is a well-documented and serious annual parasitic weed of legume crops in Africa. It infests economically important crops, including *Glycine max* (soybean), *Vigna unguiculata* (cowpea, black-eyed pea), *V. subterranea* (Bambara groundnut), *V. radiata* (mung bean), *Cicer arietinum* (chickpea), and *Arachis hypogaea* (peanut) (Mwaipopo, 2014; Parker and Riches, 1993; Rank et al., 2004). Heavy infestations of cowpea often cause total yield loss (Mwaipopo, 2014).

The host list below includes cultivated and wild plants that 1) are infected or infested by the pest under natural conditions, 2) are frequently described as major, primary, or preferred hosts, and 3) have primary evidence for damage documented in the literature. Plants are highlighted in bold if they are commercially produced and the pest causes economically significant damage.

Primary hosts

***Arachis hypogaea* (peanut)[*],** *Cicer arietinum* (chickpea)[*], ***Glycine max* (soybean)[*],** ***Helianthus annuus* (sunflower)[*],** *Lablab purpureus* (hyacinth bean)[*], *Phaseolus acutifolius* (tepary bean)[*], *Phaseolus coccineus* (runner bean)[*], *Phaseolus vulgaris* (common bean)[*], *Vigna radiata* (mung bean)[*], ***Vigna subterranea* (Bambara nut)[*],** and ***Vigna unguiculata* (cowpea)[*]** (Alonge et al., 2001; Kabambe et al., 2008; Mohamed et al., 2006; Musango et al., 2022; Mwaipopo, 2014; Visser, 1978)

Pest Importance

Alectra vogelii is a parasitic weed found in major leguminous crops, including chickpea, cowpea, soybean, and runner bean (Parker and Riches, 1993; Visser, 1978). It can cause total yield loss in cowpea (Alonge et al., 2001; Mwaipopo, 2014). In Nigeria, it has caused total yield loss in soybean (Parker and Riches, 1993). Yield losses of 15 percent have been observed in peanut in Nigeria and a 30 to 50 percent reduction in Bambara nut yields in South Africa (Kabambe et al., 2008). It occasionally causes complete yield loss in sunflower (Mwaipopo, 2014). A ten year crop rotation study found that long-term rotation with non-crop hosts did not reduce the density of *A. vogelii* infestations (Salako, 1984). The weed is regulated in Honduras, Egypt, Israel, and South Korea (USDA

[*] Species with U.S. distribution

PCIT, 2019). In the United States, it is regulated as a Federal Noxious Weed (7 CFR § 360.200, 2022) and a parasitic plant (7 CFR § 330, 2020).

Known Distribution

Africa: Angola, Botswana, Congo, Democratic Republic of the Congo, Eswatini, Ethiopia, Ghana, Guinea, Kenya, Malawi, Mali, Mozambique, Namibia, Nigeria, Sierra Leone, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe (GRIN Taxonomy, 2022; Mohamed et al., 2006; Visser, 1978)

Pathway

Seeds are tiny, approximately 0.0098 inches (0.25 mm) in length, and are thought to be wind dispersed (Ohlson and Timko, 2022; Visser, 1978). They are also buoyant and can be dispersed short distances in water (Parker and Riches, 1993).

In Africa, *Alectra vogelii* has been transported to uninfested areas in contaminated forage (Berner et al., 1994). It is likely to be spread in contaminated crop seed, on agricultural equipment and vehicles, and in mud on livestock (Parker and Riches, 1993; Visser, 1978).

This species is a weed and may potentially enter the United States through any number of pathways as a hitchhiker on commodities or conveyances. Because it is a Federal Noxious Weed, a permit is required for importation and interstate movement (7 CFR § 360.200, 2022).

Potential Distribution within the United States

Based on the distribution of the species elsewhere in the world, it is most likely to establish in southwestern Texas, southern California, southwestern Arizona, the southern tip of Florida, and southwestern Puerto Rico. Because several of the U.S. climate types are only minimally present in Africa, we do not know if it could establish in other areas within the Plant Hardiness Zones 9a to 13b. These areas of unknown certainty are located along the Gulf Coast and the Atlantic Coast north to South Carolina, as well as in northern California and the coasts of Washington and Oregon (PPQ, 2023).

Survey and Key Diagnostics

Approved Methods for Pest Surveillance*:

For the current approved methods and guidance for survey and identification, see Approved Methods for Pest Surveillance (AMPS) pest page on the CAPS Resource and Collaboration website, at https://caps.ceris.purdue.edu/approved-methods.

References

7 CFR § 330. 2020. U.S. Code of Federal Regulations, Title 7, Part 330, (7 CFR §330 - Federal Plant Pest Regulations; General; Plant Pests, Biological Control Organisms, and Associated Articles; Garbage).

7 CFR § 360.200. 2022. U.S. Code of Federal Regulations, Title 7, Part 360 (7 CFR § 360.200 - Designation of Noxious Weeds).
Alonge, S. O., S. T. O. Lagoke, and C. O. Ajakaiye. 2001. Cowpea reactions to *Alectra vogelii* I: effect on growth. Crop Protection 20(4):283-290.
Berner, D. K., K. F. Cardwell, B. O. Faturoti, F. O. Ikie, and O. A. Williams. 1994. Relative roles of wind, crop seeds, and cattle in dispersal of *Striga* spp. Plant Disease 78(4):402-406.
CABI. 2023. Invasive Species Compendium. Center for Agriculture and Biosciences International (CABI). https://www.cabidigitallibrary.org/product/qi.
GRIN Taxonomy. 2022. Germplasm Resources Information Network (GRIN Taxonomy, Online Database). United States Department of Agriculture, Agricultural Research Service, National Plant Germplasm System (National Germplasm Resources Laboratory, Beltsville, Maryland). https://npgsweb.ars-grin.gov/gringlobal/taxon/taxonomydetail?id=25669.
Kabambe, V., L. Katunga, T. Kapewa, and A. R. Ngwira. 2008. Screening legumes for integrated management of witchweeds (*Alectra vogelii* and *Striga asiatica*) in Malawi. African Journal of Agricultural Research 3(10):708-715.
Kartesz, J. 2023. Biota of North America Program (BONAP). North American Plant Atlas http://www.bonap.org/.
Lusweti, A., E. Wabuyele, P. Ssegawa, and J. Mauremootoo. 2023. *Striga asiatica* (Red Witchweed). East African Network for Taxonomy. Last accessed 1/9/2023, https://keys.lucidcentral.org/keys/v3/eafrinet/weeds/key/weeds/Media/Html/Striga_asiatica_(Red_Witchweed).htm.
Mohamed, K. I., M. Paes, R. Williams, B. W. Benz, and A. Townsend Peterson. 2006. Global invasive potential of 10 parasitic witchweeds and related Orobanchaceae. Ambio 35(6):281-288.
Musango, R., J. T. Pasipanodya, T. Tamado, S. Mabasa, and W. Makaza. 2022. *Alectra vogelii*: A threat to bambara groundnut production under climate change: A review paper. Journal of Agricultural Chemistry and Environment 11:83-105.
Mwaipopo, B. V. 2014. Characterization of *Alectra vogelii* (witch weed) strains using molecular markers in selected parts of Malawi and Tanzania, Sokoine University of Agriculture, Morogoro, Tanzania.
NRCS. 2023. The PLANTS Database. United States Department of Agriculture, Natural Resources Conservation Service (NRCS), The National Plant Data Center. http://plants.usda.gov/java/.
Ohlson, E. W., and M. P. Timko. 2022. Mapping and validation of *Alectra vogelii* resistance in the cowpea landrace B301. Agronomy doi:10.3390/agronomy12112654.
Parker, C., and C. R. Riches. 1993. Parasitic Weeds of the World: Biology and Control. CAB International, Wallingford, UK. 332 pp.
PPQ. 2023. Weed risk assessment for *Alectra vogelii* Benth. (Orobanchaceae) - Yellow witchweed. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (PPQ), Raleigh, NC. 18 pp.
Rank, C., L. S. Rasmussen, S. R. Jensen, S. Pierce, M. C. Press, and J. D. Scholes. 2004. Cytotoxic constituents of *Alectra* and *Striga* species. Weed Research 44(4):265-270.

Salako, E. A. 1984. Observations on the effect of *Alectra vogelii* infestation on the yield of groundnut. Tropical Pest Management 30(2):209-211.
Scher, J. L., D. S. Walters, and A. J. Redford. 2023. Federal Noxious Weed Disseminules of the United States. United States Department of Agriculture, California Department of Food and Agriculture. http://idtools.org/id/fnw/factsheet.php?name=14579.
Singh, B. B., and A. M. Emechebe. 1997. Advances in research on cowpea *Striga* and *Alectra*. Pages 215-224 *in* B. B. Singh, D. R. Mohan, K. E. Dashiell, and L. E. N. Jackai, (eds.). Advances in Cowpea Research. Sayce Publishing, Devon, UK.
USDA PCIT. 2019. Phytosanitary Certificate Issuance and Tracking System (PCIT). United States Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS). https://pcit.aphis.usda.gov/pcit/faces/signIn.jsf.
Van Wyk, A. E., and J. Hyde-Johnson. 2021. *Alectra vogelii*. Flowering Plants of Africa 67:158-173.
Visser, J. H. 1978. The biology of *Alectra vogelii* Benth., an angiospermous root parasite. Beitrage zur Chemischen Kommunikation in Bio- und Okosystemen 1978:279-294.
Wunderlin, R. P., B. F. Hansen, A. R. Franck, and F. B. Essig. 2023. Atlas of Florida Plants. University of South Florida, Institute for Systematic Botany. https://florida.plantatlas.usf.edu/photo.aspx?ID=5459.

USDA-APHIS-PPQ-ST staff developed this datasheet. Cite this document as:

PPQ. 2023. Cooperative Agricultural Pest Survey (CAPS) Pest Datasheet for *Alectra vogelii* (Orobanchaceae): Yellow witchweed. United States Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (PPQ), Raleigh, NC.

Versions

May 2023: Datasheet completed (Version 1)

Reviewer(s)

Scott Blackwood USDA APHIS PPQ Weeds Cross Functional Working Group
Sherrie Emerine NCSU CIPM
Tony Koop USDA APHIS PPQ Weeds Cross Functional Working Group
Anne LeBrun USDA APHIS PPQ Weeds Cross Functional Working Group
Alec Ormsby USDA APHIS PPQ Weeds Cross Functional Working Group
Indira Singh USDA APHIS PPQ Weeds Cross Functional Working Group