DRAFT WRITTEN FINDINGS OF
THE WASHINGTON STATE NOXIOUS WEED CONTROL BOARD

SCIENTIFIC NAME: *Orobanche cumana*

SYNONYMS: *Orobanche ceruna subsp. Cumana* (Plants of the World Online)

COMMON NAMES: Sunflower broomrape

FAMILY: Broomrape family, Orobanaceae

LEGAL STATUS: Federally listed as a Noxious Weed in the United States (Invasive.org). Currently a temporary Emergency Class A weed in Washington State. Considered for listing as Class A.

DESCRIPTION AND VARIATION:

OVERALL HABIT:

Orobanche cumana is an herbaceous annual plant. It is an obligate holoparasite, a plant which is completely dependent on its host for survival, as it lacks chlorophyll and cannot perform photosynthesis (Rubiales, 2020; Atsmon *et al.,* 2022). It spends the majority of its lifecycle underground as a tubercle (a bulb-like storage structure) attached to the host root, emerging above the soil only to flower and disperse seeds (Dhanapal *et al.,* 1996).

Dr. Reuven Jacobsohn

STEMS:

The aerial stems of *O. cumana* are erect, simple, usually straight, unbranched, and covered in short, small hairs. They typically reach heights ranging from 40 to 60 cm (and rarely up to 1 meter in optimal conditions) (Masliiov *et al.,* 2018). While typically a single stem emerges from the underground storage organ, some may produce multiple stems (Strelnikov *et al.,* 2020). Unlike most plants, the stems lack green pigmentation and may appear brownish, yellowish, or purplish, reflecting their lack of photosynthetic activity (Fernández-Martínez *et al.,* 2015). It is thickened at its base and is usually rusty-brown in color (Masliiov *et al.,* 2018).

LEAVES:

As a holoparasite, *Orobanche cumana* does not possess true leaves. Instead, its stem is covered with rudimentary, structures described as scales (Masliiov *et al.,* 2018). The scales are typically brown and can be whole or slightly jagged, and are covered in short, small hairs (Strelnikov *et al.,* 2020). These modified leaves do not perform photosynthesis and function mainly as protective structures (Dhanapal *et al.,* 1996).

WSDA and Yakima County.

FLOWERS:

The flowers are arranged in an inflorescence—a flower cluster—that forms a loose, cylindrical spike at the upper end of the stem (Masliiov *et al.,* 2018; Strelnikov *et al.,* 2020). Each flower possesses a tubular, two-lipped corolla (the fused petals). These corollas are distinctly curved downward and typically 20-30 mm long (Mohamed & Musselman, 2007). The color of the flower ranges from white to tan, blue, and purple, though purple tones are most diagnostic. This darker pigmentation distinguishes it from the closely related *O. cernua*, which typically has paler flowers (García-Carneros *et al.,* 2025; Satovic *et al.,* 2009), but this look-a-like is not known to occur in Washington State (Burke Herbarium). The flowers are zygomorphic (bilaterally symmetrical) and covered in short, small hairs on the exterior (García-Carneros *et al.,* 2025; Satovic *et al.,* 2009). A single plant may develop up to 100 individual flowers (Strelnikov *et al.,* 2020).

FRUITS/SEEDS:

The fruit of sunflower broomrape is a tulip-shaped capsule-like structure, that contains thousands of extremely small, dust-like seeds (Strelnikov *et al.,* 2020). A single plant is incredibly fecund, capable of producing from tens of thousands to over 500,000 seeds (Kaundun *et al.,* 2024; Antunović et al., 2025). These seeds are oval, dark brown, and measure approximately 0.25 to 0.35 mm in length, with a 1000-seed weight of only about 20 mg (Dhanapal *et al.,* 1996; Masliiov *et al.,* 2018). The seed coat has a distinctive pitted, reticulate pattern resembling a honeycomb, which is a key trait for identification. Critically for its persistence, seeds can remain viable in the soil for up to 50 years, creating a long-term "seed bank" that complicates control efforts (Petrova & Stoyanov, 2025; Kaundun *et al.,* 2024).

ROOTS:

O. cumana lacks a conventional root system for water and nutrient absorption from the soil (Strelnikov *et al.,* 2020). Upon germination, the seed produces a small, root-like structure called a radicle or germ tube (Auriac *et al.,* 2023). When this radicle makes contact with a host root, it develops a specialized invasive organ known as the haustorium. The haustorium physically penetrates the host's root tissues, connecting the parasite's vascular system to that of its host, allowing it to siphon off resources (Auriac *et al.,* 2023). The penetration of this haustorium is "intracellular," meaning it pushes directly *through* host root cells rather than navigating between them (intercellularly). This intrusion involves physical pressure and enzymatic degradation of the sunflower cell walls to access the vascular system (Auriac *et al.,* 2024). Following successful attachment, a swollen storage organ called a tubercle, or nodule, develops on the host root, serving as a nutrient reservoir from which the flowering shoot will eventually emerge (Petrova & Stoyanov, 2025).

Post flower, seeding. Katerina Kashirina

SIMILAR SPECIES:

Many plants in the Orobanchaceae may, at a glance, look similar to sunflower broomrape. Upon closer inspection, green pigment will be found on reduced leaves, such as in paintbrush genus (*Castilleja*), and thus they are able to photosynthesize, in addition to parasitizing from host plants (Burke Herbarium).

Suksdorf's broomrape (*Aphyllon ludovicianum*) and Pine broomrape (*A. pinorum*) are two native holoparasite plants that are covered in fuzzy hairs like O. cumana, and have white, purple, or tan stems and flowers. Pine broomrape only parasitizes off of ocean spray (*Holodiscus discolor*) in Washington and thus is primarily found forest understories. Suksdorf's broomrape parasitizes on woody plants in the Asteraceae family, including sages (*Artemisia*) just like sunflower broomrape. However, the centers of Suksdorf's broomrape flowers are very obviously yellow and the entire plant looks much bristlier and more robust than sunflower broomrape (Burke Herbarium).

Hellroot (*Orobanche minor*) is a non-native broomrape that is only known to be in Western Washington, where it can be found in open, grassy, and often disturbed sites, where it tends to parasitize from legumes, asters, and grasses. Hellroot and sunflower broomrape look very similar (Burke Herbarium).

HABITAT:

O. cumana thrives primarily in the agricultural ecosystems of sunflower cultivation (Auriac *et al.,* 2023). Its natural habitat includes Mediterranean, sub-tropical, and continental climates with warm summers (Antunović *et al.,* 2025; Rubiales, 2020). Environmental modeling indicates its distribution is shaped by factors such as elevation and soil pH, with a preference for alkaline soils (pH > 7.0) (Zhang *et al.,* 2022). It performs better in sandy or sandy loam soils than in heavy clay and generally prefers nutrient-poor conditions, especially low nitrogen (Grenz *et al.,* 2008; Zhang *et al.,* 2022; Dhanapal *et al.,* 1996), though it adapts well to intensive farming conditions common in Southern and Eastern Europe (Molinero-Ruiz *et al.,* 2015; Cantamutto *et al.,* 2014).

BIOLOGY

GROWTH AND DEVELOPMENT:

The life cycle of *O. cumana* is highly specialized and synchronized with its host. Seeds require a dormant period followed by a period of several days in warm, moist soil, to become responsive to germination cues (Dhanapal *et al.,* 1996; Zhang *et al.,* 2022). Germination is triggered exclusively by chemical germination stimulants which are released from the host's roots (Auriac *et al.,* 2023; Petrova & Stoyanov, 2025; Raupp & Spring, 2013). This chemical signaling ensures that the parasite only germinates when a suitable host is nearby.

Once germinated, the radicle grows toward the host root and, upon contact, develops a haustorium that penetrates the host root tissues intracellularly. This penetration is achieved through a combination of physical force and the secretion of enzymes, which dissolve the host's cell walls (Auriac *et al.,* 2023). The haustorium connects to the host's xylem and phloem, establishing a permanent parasitic link (Krupp *et al.,* 2019; Auriac *et al.,* 2023). The majority of this process occurs underground, with the flowering shoot emerging 35-40 days later, often coinciding with the sunflower's own flowering period (Atsmon *et al.,* 2022; Shevchenko *et al.,* 2024).

Pre-flowering, parasitizing on sage in Eurasia

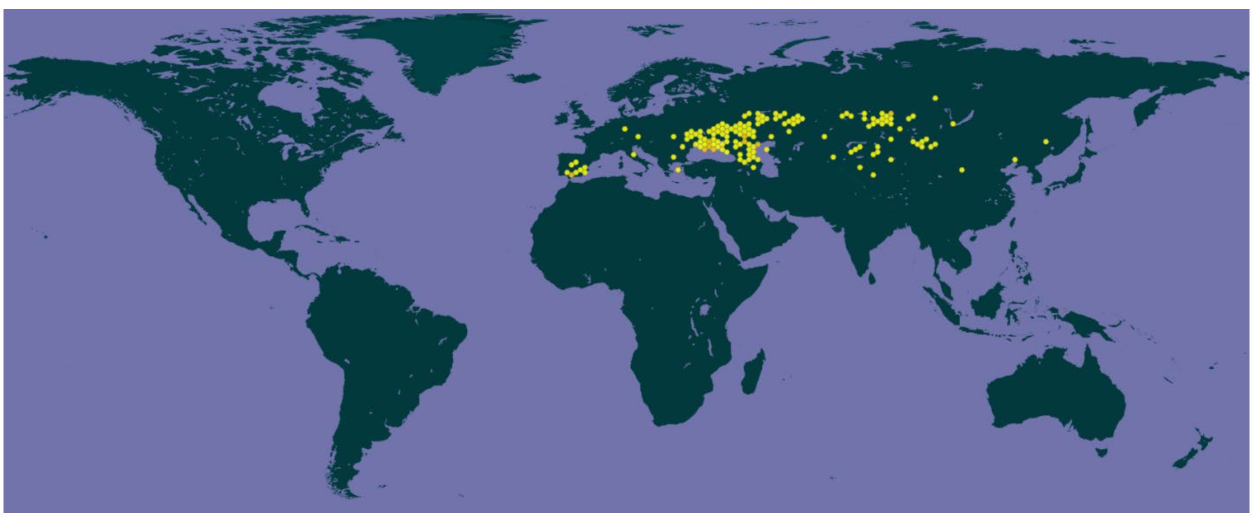
REPRODUCTION:

O. cumana is an annual plant that reproduces exclusively via seeds (Dhanapal *et al.,* 1996). Historically considered self-pollinating due to its flower structure, though research has revealed it to be partially cross-pollinating (Rodríguez-Ojeda *et al.,* 2013). Field experiments using a genetic marker have measured cross-fertilization rates as high as 29%. This capacity for cross-pollination, facilitated by small bees, allows for genetic recombination, which is a major factor in the rapid evolution of new, more virulent races of the parasite that can overcome resistant sunflower cultivars (Rodríguez-Ojeda *et al.,* 2013; Rubiales, 2020). Genetic studies confirm a "gene-for-gene" interaction between the parasite and the sunflower host, where specific virulence genes in the parasite interact with resistance genes in the host (Calderón-González *et al.,* 2024; Rodríguez-Ojeda *et al.,* 2013).

GEOGRAPHIC DISTRIBUTION:

NATIVE DISTRIBUTION

The native range of *O. cumana* is Central Asia and Southeastern Europe, including the Black Sea and Caucasus regions (Rubiales, 2020; Petrova & Stoyanov, 2025; Miladinović *et al.,* 2014). In these areas, it originally parasitized wild plants of the genus *Artemisia* (sagebrush) before adapting to sunflower (Antonova, 2014).



Global Biodiversity Information Facility.

NON-NATIVE DISTRIBUTION

The expansion of sunflower as a major global oilseed crop facilitated the parallel spread of *O. cumana*. It is now a severe agricultural pest across Europe (Spain, France, Romania, Bulgaria, Serbia, Hungary, Ukraine, Russia) and Asia (Turkey, Israel, Iran, Kazakhstan, China) (Molinero-Ruiz *et al.,* 2015; Khablak *et al.,* 2024). It has also expanded into parts of North Africa, with recent reports from Tunisia and Morocco (Amri et al., 2012). In 2023, it was reported for the first time in South America (Bolivia), posing an imminent threat to major sunflower-producing countries like Argentina (Barea *et al.,* 2025).

HISTORY:

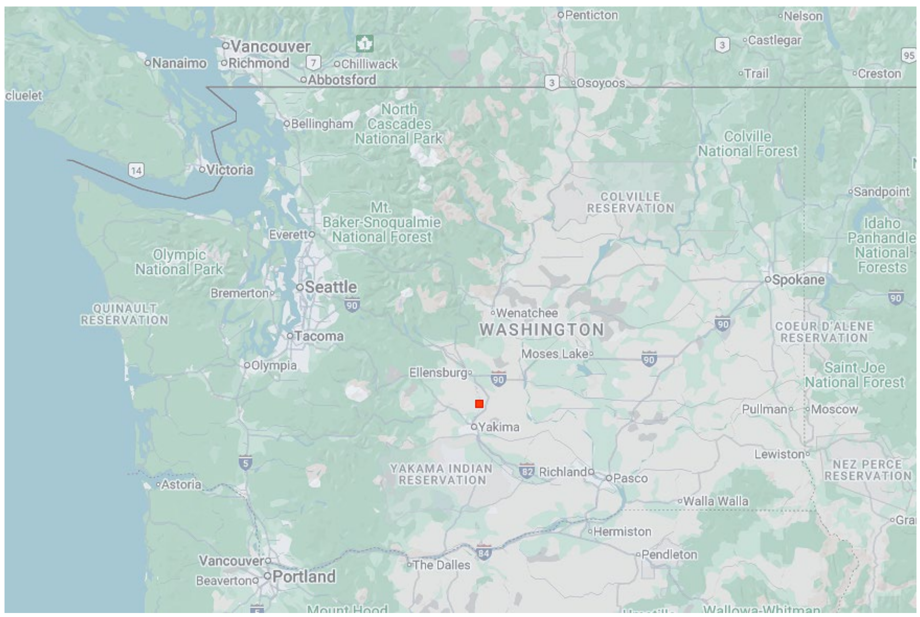
On July 25th, 2025, the first, and as of writing these findings, only report of O, cumana was made in North America. This report was made on iNaturalist. Washington State Department of Agriculture (WSDA) and Yakima County Noxious Weeds worked together to confirm the report and take action to control the infestation. On October 1st, 2025, WSDA put out a press release on the confirmation of *O. cumana* in Yakima County. On October 20th, the Washington State Noxious Weed Control Board held an emergency meeting to vote on an Emergency Class A listing of *O. cumana* in Washington, which took effect the following day. This emergency listing would only last 90 days, thus the board voted to start the emergency listing again on January 22nd, 2026, which took effect the following day.

WASHINGTON:

A small infestation of O. cumana was found on a farm in Yakima County (iNaturalist, WSDA). At the time of writing these findings, this was the only known report of O. cumana in North America (iNaturalist).

LISTINGS:

Federally listed as a Noxious Weed in the United States (Invasive.org).



iNaturalist report in Washington.

ECONOMIC AND ECOLOGICAL IMPORTANCE:

DETRIMENTAL:

Sunflower broomrape is one of the greatest economic threats to sunflower production globally (Auriac *et al.,* 2023; Kaundun *et al.,* 2024). Infestations cause severe sunflower yield losses, commonly exceeding 50% and often reaching 100% in heavily infested fields, leading to complete crop failure (Petrova & Stoyanov, 2025; Antunović *et al.,* 2025). It stunts plant growth, reduces the size of the sunflower head (capitulum), and lowers the oil content of the seeds, and lowers both the number and quality of seeds (Antunović *et al.,* 2025; Strelnikov *et al.,* 2020). Heavy infestations often force farmers to abandon sunflower cultivation entirely in affected fields (Masliiov *et al.,* 2018; Antunović *et al.,* 2025). The global annual economic losses attributed to broomrapes are estimated to be between $1.3 and $2.6 billion (Zhang *et al.,* 2022), with some estimates exceeding €2 billion just for *O. cumana* (Barea *et al.,* 2025). There has also been more recent observations of “host jump” to tomatoes and other crops on the Solanaceae family in the Middle East (Yakima County Noxious Weed Control Board).

While primarily an agricultural problem, the ecological impact of O. cumana is of growing concern. Originally host-specific to wild Artemisia, it has made a "host jump" to sunflower (Rubiales, 2020). Recent research documented, for the first time, its ability to successfully parasitize burdock (*Arctium lappa*), another species in the Asteraceae family (Petrova & Stoyanov, 2025). This finding suggests its host range may be broadening, which could allow it to persist in wild or weedy plant communities. Such reservoirs would act as a source of inoculum (seeds that can start new infections) for adjacent agricultural fields and facilitate gene flow between wild and crop-infesting populations, complicating control efforts (Petrova & Stoyanov, 2025). Washington State has 17 species of native sages in the genus Artemisia, and almost 400 native species in the wider aster family, including several native sunflowers (Burke Herbarium).

BENEFICIAL:

There are no significant beneficial economic impacts associated with *O. cumana* in agricultural contexts; it is strictly regarded as a noxious weed. Though a pest, its presence has driven the innovation of herbicide-tolerant sunflower hybrids and molecular breeding techniques that benefit broad agriculture (Kaundun *et al.,* 2024; Khablak *et al.,* 2024).

Aleksey Baushev

In its native habitat parasitizing wild flora like *Artemisia*, *O. cumana* would play a natural role in ecosystem dynamics. However, in the context of global agriculture, as documented in the provided research, it is considered an invasive pest, and no beneficial ecological impacts in these managed systems are reported (Antonova, 2014).

CONTROL:

MECHANICAL:

Hand-weeding or pulling emerged broomrape shoots can prevent the plant from setting seed, thereby reducing the addition of new seeds to the soil seed bank (Dhanapal *et al.,* 1996). However, this method is labor-intensive, expensive, and largely ineffective at preventing crop damage, as the parasite has already drawn significant nutrients from the host before it emerges from the soil (Habimana *et al.,* 2014; Dhanapal *et al.,* 1996).

Mechanical tillage can influence infestation levels. Deep plowing has been traditionally recommended to bury broomrape seeds below the germination depth (Habimana

et al., 2014). However, conflicting evidence suggests this may be counterproductive. One study found that deep plowing placed seeds in closer proximity to the well-developed sunflower root system,
thereby increasing broomrape damage. In contrast, conservation tillage methods like disking or no-till leave seeds at or near the soil surface. At the surface, seeds are exposed to harsh fluctuations in temperature and moisture and are less likely to encounter a host root system, leading to lower rates of germination and infestation (Shevchenko *et al.,* 2024).

Stanislav Murashkin.

CULTURAL:

Preventing the spread of seeds is paramount. This includes using certified, broomrape-free sunflower seed and thoroughly cleaning farm machinery and tools between infested and non-infested fields (Strelnikov *et al.,* 2020; Habimana *et al.,* 2014).

Genetic resistance is the most effective, economical, and environmentally friendly method for controlling the use of resistant sunflower cultivars (Kaundun *et al.,* 2024; Khablak *et al.,* 2024). Breeding programs have successfully developed hybrids containing dominant resistance genes, each providing race-specific resistance. This has created an ongoing "arms race" as the parasite rapidly evolves new virulent races capable of overcoming resistant genes (Rubiales, 2020; Molinero-Ruiz et al., 2015).

Long crop rotations that space sunflower plantings 6–9 years apart are critical for naturally reducing the broomrape seed bank in the soil (Shevchenko *et al.,* 2024; Dhanapal *et al.,* 1996). Continuous or short sunflower rotations drastically increase infestation pressure (Shevchenko *et al.,* 2024).

Planting non-host crops, as “trap crops”, that release germination stimulants can induce "suicidal germination" of broomrape seeds, which die without a host to attach to. Maize, sorghum, soybeans, switchgrass, and flax are effective trap crops that can be integrated into rotations to deplete the soil seed bank (Shevchenko *et al.,* 2024; Ye *et al.,* 2020; Habimana *et al.,* 2014).

Applying nitrogen fertilizer, especially in ammonium form, can inhibit broomrape germination and growth (Dhanapal *et al.,* 1996; Zhang *et al.,* 2022). Incorporating green manures from brassica crops like mustard and rapeseed also suppresses broomrape through a process called bio fumigation (Strelnikov *et al.,* 2020).

Adjusting the sunflower planting date to be later in the season can sometimes help the crop avoid peak periods of broomrape germination, although this may carry a yield penalty (Grenz *et al.,* 2008).

BIOLOGICAL:

Specific strains of the fungus, *Fusarium oxysporum f. sp. orthoceras,* are pathogenic to *O. cumana* but not to sunflower. They can be formulated into granules and applied to the soil to infect and kill broomrape at early stages of its development (Müller-Stöver *et al.,* 2005; Dhanapal *et al.,* 1996).

The fly, *Phytomyza orobanchia,* is a natural enemy whose larvae consume the developing seeds within the broomrape capsule, thus reducing the parasite's reproductive output (Dhanapal *et al.,* 1996).

Max Parkhomenko.

Soil inoculation with the bacterium *Streptomyces rochei* D74 has been shown to induce a systemic defense response in the sunflower, form a protective barrier on its roots, and reduce germination stimulants, all of which inhibit broomrape parasitism (Xi *et al.,* 2025). Similarly, symbiotic arbuscular mycorrhizal fungi can reduce germination stimulant production by the host and secrete their own compounds that inhibit broomrape germination (Louarn *et al.,* 2012).

CHEMICAL:

Chemical control of *O. cumana* is primarily achieved using acetolactate synthase (ALS)-inhibiting herbicides from the imidazolinone (IMI) family, such as imazamox (Kaundun *et al.,* 2024; Atsmon *et al.,* 2022). This approach requires planting sunflower hybrids specifically bred for IMI tolerance, known commercially as Clearfield® or IMISUN varieties (Kaundun *et al.,* 2024). The herbicide is applied post-emergence to the sunflower leaves, translocates through the plant's vascular system to the attached parasite underground, and kills it (Atsmon *et al.,* 2022; Eizenberg *et al.,* 2009). For years, this was a highly effective, non-race-specific control method. However, the first cases of herbicide-resistant *O. cumana* populations have recently been documented in Greece. These populations have evolved their own mutations in the ALS gene, rendering them insensitive to the herbicide imazamox (Kaundun *et al.,* 2024).

RATIONALE FOR LISTING:

O. cumana commonly known as sunflower broomrape, is an obligate holoparasitic plant that poses a severe threat to sunflower (*Helianthus annuus*) cultivation worldwide. As a holoparasite, it is entirely dependent on its host for nutritional survival, lacking the ability to produce its own food through photosynthesis. This species has co-evolved with sunflower crops, leading to an aggressive "arms race" of virulence and resistance development across Europe and Asia (Molinero-Ruiz *et al.,* 2015). It also may pose a threat to crops in the Solanaceae family, such as tomatoes, as well as native sunflowers and sages.

Sunflower broomrape flowering among sage in Eurasia. Дмитрий Епихин.

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