California Pest Rating Profile for

Setaria faberi R. A. W. Herrm., giant foxtail, Chinese foxtail

Family: Poaceae tribe Paniceae

Pest Rating: B

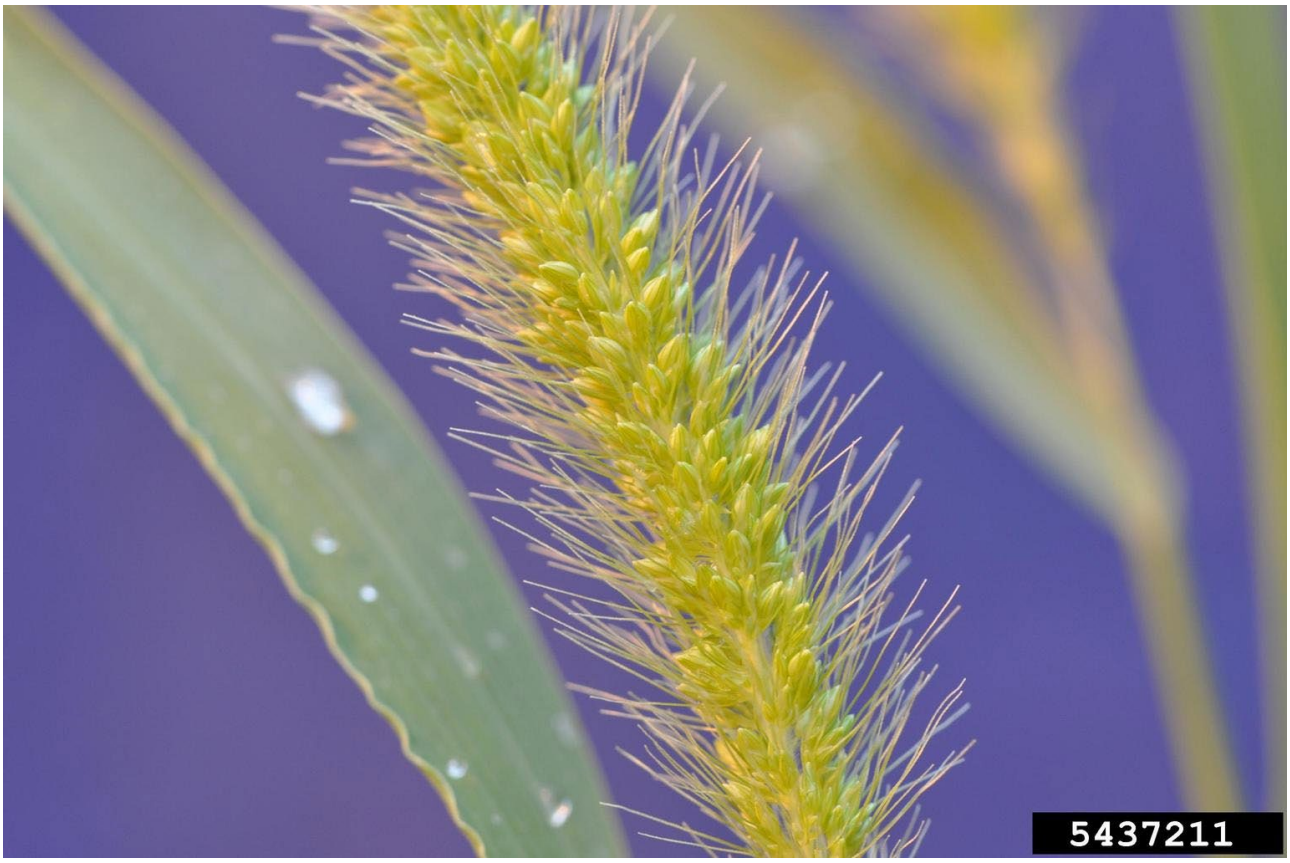

Photo Credit: Bruce Ackley. The Ohio State University. Bugwood.org

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Comment Period: 12/19/2022 through 02/02/2023

Initiating Event:
Setaria faberi has been assigned a B-rating by the California Department of Food and Agriculture (CDFA), Plant Health and Pest Prevention Services. *Setaria faberi* is designated as a noxious weed as defined by

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the California Food and Agricultural Code (FAC) Section 5004 and is listed in Title 3, California Code of Regulations (CCR), Section 4500. A pest rating proposal is required to evaluate its current rating and status in the state of California.

History & Status

General Description

Setaria faberi is an annual tufted grass. It can have single or many, mostly erect, robust culms that can be 50-200 centimeters (cm) tall with terminal, dense, spikelike, nodding panicles approximately 6-20 cm in length, with many stiff bristles (Nurse et al., 2009; Rominger, 2003). Leaves are 10-40 cm long, broadly linear, becoming narrower toward the base, and usually have scattered, short, soft hairs on the upper leaf surface. The ligule at the leaf base is 1-2.5 millimeters (mm) long and is made up of a fringe of short hairs (Nurse et al., 2009). Spikelets are 2.5-3 millimeters long and subtended by 1-6 (commonly 3) stiff bristles (Rominger, 2003).

Setaria faberi can be distinguished from similar-looking *Setaria viridis* (green foxtail) and *Setaria pumila* (yellow foxtail) by the nodding panicles and the short, soft hairs on the upper leaf surface (Knake, 1990). The spikelets of *S. faberi* are longer than those of *S. viridis*, which are approximately 2 mm long (Preston and Webster, 2012; Rominger, 2003), and have a glossy rim on the lower surface that is not present in *S. pumila*.

Worldwide Distribution

Setaria faberi is native to temperate eastern Asia, including regions of the Russian Federation, China, Korea, Japan, and Taiwan. It is reported as naturalized in North America in Canada, Mexico, and the United States, and in southern and central Europe and the Caucasus (Plants of the World Online, 2022; USDA GRIN database, 2022). *Setaria faberi* is known to occur in the states of Washington, Oregon, California, Arizona, all states east of the Rocky Mountains except North Dakota and Texas, and in the Canadian provinces of Ontario, Quebec, and southern British Columbia (EDDMapS, 2022; Giblin et al., 2018; Rominger, 2003).

Official Control:

Setaria faberi is listed on CCR Section 4500 as a noxious weed defined by California FAC Section 5004. The Department is mandated by California FAC, Division 1, Chapter 3, Section 403 to prevent the introduction and spread of noxious weeds.

Setaria faberi is listed as a restricted noxious weed seed in California defined by California FAC Section 52258. The species is also listed as a prohibited noxious weed seed in South Carolina and as a restricted noxious weed seed in the states of Alabama, Arkansas, Colorado, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Michigan, Minnesota, Missouri, North Carolina, Oklahoma, South Dakota, Tennessee, Texas, and Virginia (USDA AMS, 2022). The species is listed as a harmful organism subject to phytosanitary exclusion by the countries of Australia, Ecuador, Nauru, and Thailand (USDA PCIT, 2022).

California Distribution:

The Consortium of California Herbaria database (CCH, 2022) has several vouchered locality records for *Setaria faberi* from Placer County in the Sierra Nevada foothills, 2-3 collections from Solano County and

Los Angeles County, and individual collections from Sonoma County near the Marin County line and Santa Cruz County. The first collection reported for California is from 1951 along railroad tracks in southern Los Angeles County. The species has also recently been reported in northern California from multiple localities in San Joaquin County in 2022 and from the San Gabriel Mountains in San Bernardino County in southern California in 2018 (Calflora database, 2022). The populations in Solano County, southern Los Angeles County, and the border of Sonoma and Marin counties were reported to have been eradicated (DiTomaso and Healy, 2007).

California Interceptions:
Setaria faberi has been detected twice at the CDFA Needles Border Protection Station; once in 2015 on a lift (machinery) from Michigan, and once in 2021 on a tractor, also from Michigan (CDFA PDR database, 2022). Detached seed units of the species have been found in over 45 samples of corn grain submitted for feed mill certification in California in the last 20 years, with the grain presumably originating from central or eastern areas of the United States (CDFA PDR database, 2022).

Consequences of Introduction

1) **Climate/Host Interaction:** Score is **Medium (2)**
Setaria faberi grows in disturbed or open habitats including agricultural crop land, pastures, orchards, vineyards, railroad sidings and roadsides, ditch banks, and gardens. It has been found in the southeastern Sacramento Valley and the adjacent Sierra Nevada foothills and scattered localities in northern and southern coastal California up to an elevation of 100 meters (Preston and Webster, 2012), with a single report from approximately 2000 meters in the San Gabriel Mountains (Calflora database, 2022). *Setaria faberi* is not shade tolerant and can grow in moist or dry soil; however, soil moisture is required for germination (Knake, 1990). The distribution of the species in the western United States has been limited to date (EDDMapS, 2022) despite movement of propagules in agricultural commodities, suggesting limitation by water availability. Fausey and Renner (1997), showed that *Setaria faberi* seed germination exceeded 60% in controlled temperatures of 20°C, and germination rates decreased when the temperature was increased to 30°C.

-Low (1) Not likely to establish in California; or likely to establish in very limited areas
- **Medium (2) may be able to establish in a larger but limited part of California**
- High (3) likely to establish a widespread distribution in California

2) **Known Pest Host Range:** Score is **High (3)**
Setaria faberi can occur wherever general ecological conditions exist that are conducive to its survival.
- Low (1) has a very limited host range
- Medium (2) has a moderate host range
- High (3) has a wide host range

3) **Pest Dispersal Potential:** Score is **Medium (2)**
Setaria faberi reproduces by seed. *Setaria faberi* can produce over 2,000 seeds per panicle (Nurse *et al*, 2009), with mature plants producing up to 20 panicles. However, some seed units may be unfilled (Knake, 1990). Seeds are dispersed, most often locally, by gravity, wind, water, and can be

moved by birds, cattle, and small mammals (Nurse et al., 2009). Seeds are known to contaminate hay and grain and can be moved long distances in contaminated shipments.

- Low (1) does not have high reproductive or dispersal potential
- **Medium (2) has either high reproductive or dispersal potential**
- High (3) has both high reproduction and dispersal potential

4) **Economic Impact:** Score is **High (3)**

In the mid-western agricultural regions of the United States, *Setaria faberi* is known to reduce crop yields and increase production costs for corn and soybeans (Nurse et al., 2009). *Setaria faberi* is known to have an allelopathic effect on corn (Knake, 1990). The bristles on *Setaria* species in general can cause mechanical injury, such as lesions and ulcers in the mouth, tongue, gums, and eyes of sheep, cattle, horses, and goats (UC, ANR Publication, 2010).

In 2019, California sweet corn was valued at $172 million and corn for grain production was valued at $46 million. Corn for silage was valued at $536 million in 2018. In 2018, approximately 400,000 acres of corn (for all purposes) was planted in California. The majority of California corn is produced in the Sacramento and San Joaquin valleys. Sweet corn is also produced in Imperial, Fresno, Contra Costa, Riverside, and Santa Clara counties (CDFA, Agricultural Statistics Review, 2020).

In 2019, cattle, calves, sheep, and lamb production in California was valued at approximately $3.6 million dollars. The top five cattle and calf producing counties in California in 2019 were Tulare, Imperial, Fresno, Merced, and Kern. The top five sheep producing counties in California in 2019 were Fresno, Kern, Sonoma, Solano, and Merced (CDFA, Agricultural Statistics Review, 2020). The American Horse Council summarized that in 2017, the California horse industry, including horse-related goods, services, salaries, wages, and benefits, contributed over $2.6 billion to the state's Gross Domestic Product (HorsesOnly.com, 2022).

Shipments, including agricultural seed, that are found infested with *Setaria faberi* are subject to rejection, treatment, reconditioning, or destruction, typically at the owner's expense.

A. The pest could lower crop yield.
B. The pest could lower crop value (includes increasing crop production costs).
C. The pest could trigger the loss of markets (includes quarantines).
D. The pest could negatively change normal cultural practices.
E. The pest can vector, or is vectored, by another pestiferous organism.
F. The organism is injurious or poisonous to agriculturally important animals.
G. The organism can interfere with the delivery or supply of water for agricultural uses.

Economic Impact:
- Low (1) causes 0 or 1 of these impacts
- Medium (2) causes 2 of these impacts
- **High (3) causes 3 or more of these impacts**

5) **Environmental Impact:** Score is **Medium (2)**

A. The pest could have a significant environmental impact such as lowering biodiversity, disrupting natural communities, or changing ecosystem processes.
B. The pest could directly affect threatened or endangered species.
C. The pest could impact threatened or endangered species by disrupting critical habitats.
D. The pest could trigger additional official or private treatment programs.
E. The pest significantly impacts cultural practices, home/urban gardening or ornamental plantings.

Environmental Impact:
- Low (1) causes none of the above to occur
- **Medium (2) causes one of the above to occur**
- High (3) causes two or more of the above to occur

Consequences of introduction to California for *Setaria faberi*: **Medium (12)**

Low = 5-8 points
Medium = 9-12 points
High = 13-15 points

1) Post Entry Distribution and Survey Information: Score is **Medium (-2)**

-Not established (0) Pest never detected in California or known only from incursions.
-Low (-1) Pest has a localized distribution in California or is established in one suitable climate/host area (region).
-Medium (-2) Pest is widespread in California but not fully established in the endangered area, or pest established in two contiguous suitable climate/host areas.
-High (-3) Pest has fully established in the endangered area, or pest is reported in more than two contiguous or non-contiguous suitable climate/host areas.

7) Final Score: Medium (12-2=10)

Conclusion and Rating Justification:
Setaria faberi is a serious pest of corn crops and is potentially injurious to livestock due to the numerous bristles in its inflorescences. Due to the continuing introduction of *Setaria faberi* into California in infested agricultural seed shipments, and to mitigate potential spread of populations within California, a B-rating is recommended.

Uncertainty:
Spread and establishment of *Setaria faberi* in California and other western states has been limited to date, perhaps due to water availability, and it is unclear to what degree the species has been establishing soil seed banks in the state.

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***Comment Period:** 12/19/2022 through 02/02/2023

***NOTE:**

You must be registered and logged in to post a comment. If you have registered and have not received the registration confirmation, please contact us at permits[@]cdfa.ca.gov.

Comment Format:

- Comments should refer to the appropriate California Pest Rating Proposal Form subsection(s) being commented on, as shown below.

Example Comment:

Consequences of Introduction: 1. Climate/Host Interaction: [Your comment that relates to "Climate/Host Interaction" here.]

- Posted comments will not be able to be viewed immediately.

- Comments may not be posted if they:

  Contain inappropriate language which is not germane to the pest rating proposal;

  Contains defamatory, false, inaccurate, abusive, obscene, pornographic, sexually oriented, threatening, racially offensive, discriminatory or illegal material;

  Violates agency regulations prohibiting sexual harassment or other forms of discrimination;

  Violates agency regulations prohibiting workplace violence, including threats.

- Comments may be edited prior to posting to ensure they are entirely germane.
- Posted comments shall be those which have been approved in content and posted to the website to be viewed, not just submitted.

Pest Rating: B