

European and Mediterranean Plant Protection Organization
 Organisation Européenne et Méditerranéenne pour la Protection des Plantes

Data sheets on pests recommended for regulation

Fiches informatives sur les organismes recommandés pour réglementation

Andropogon virginicus L.

Identity

Scientific name: *Andropogon virginicus* L.

Synonyms: *Holcus virginicus* (L.) Steudel; *Sorghum virginicum* (L.) Kuntze

Taxonomic position: phylum Tracheophyta; class Magnoliopsida; order Poales; family Poaceae

Common names: English: broomsedge, broomsedge blue-stem, yellowsedge bluestem, yellow bluestem, whisky grass, sedge grass, beardgrass, sage grass, deceptive blue-stem, old-field broomstraw, broomstraw, smooth bluestem; Russian: андропогон виргинский; Korean: na-do-sol-sae

EPPO Code: ANOVI

Phytosanitary categorization: EPPO A2 List no. 421

Geographical distribution

Native range

North America: Canada (Ontario), Mexico, USA (Alabama, Arkansas, Connecticut, Delaware, District of Columbia, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Mississippi, Missouri, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, West Virginia)

South and Central America and the Caribbean: Bahamas, Belize, Bermuda, Colombia, Costa Rica, Cuba, Dominican Republic, Guatemala, Honduras, Jamaica, Nicaragua, Panama, Puerto Rico, Trinidad and Tobago

Introduced range

EPPO region: France, the Russian Federation and Georgia

Asia: Japan, South Korea

North America: California, Hawaii

Oceania: Australia, New Zealand.

History of introduction and spread

Andropogon virginicus (Poaceae) is native to North and Central America. In the USA, *A. virginicus* mainly has an eastern and central native range. The species is also present in California where it is regarded as non-native. It is reported as invasive in Hawaii, where it was first

reported in 1924. This species has been introduced and naturalized in Australia, New Zealand, Japan and South Korea. Prior to 2006, the only report from the EPPO region was in Georgia and the Russian Federation. In 2006, *A. virginicus* was found in France in a military camp.

In Japan, *A. virginicus* was first recorded around 1940 at Aichi Prefecture in the region of Chūbu, Honshu (NIES, 2017), where it is reported to be an aggressive invader (Enomoto *et al.*, 2007). *Andropogon virginicus* is recorded from South Korea (Lee *et al.*, 2008); the authors describe the habitat as ‘vacant lots near the inhabited areas, forest side’. *Andropogon virginicus* was first recorded in 1947 in Georgia in the Autonomous Republic of Abkhazia near Lake Bebsyr [Ochamchira (Очамчыра) region]. In this area, *A. virginicus* is widespread in the natural environment, as well as in ruderal and disturbed land across the low-lying (up to 250 m) maritime part of the country (Колаковский, 1986), and is expanding its range in the Caucasus region. The most northerly point of its spread is the region of Tuapse town (Туапсе), where in 1996 the population of this species was dominant in the area of a former vineyard on the marine terrace of the bank of the estuary (Зернов *et al.*, 2000).

Andropogon virginicus has been introduced and is established in Australia and in New Zealand (Gardner *et al.*, 1996). In Australia, the first report of the species was in 1942 in New South Wales (Gardner *et al.*, 1996). It is also recorded from Queensland and Victoria (AVH, 2017). In New Zealand, the species is recorded as having a scattered distribution in the North Island near Albany Hill (despite 7 years of eradication measures) and Warkworth.

Andropogon virginicus is established in the EPPO region in France, Georgia and the Russian Federation. In France, *A. virginicus* was found in 2006 in the military camp ‘Camp du Poteau’ (Granereau & Verloove, 2010). It is suspected that *A. virginicus* was introduced into a military camp with NATO munitions between the years 1950 and 1967 (Granereau & Verloove, 2010; EPPO, 2011). It has also been recorded in Arjuzanx (Landes) in 2008, where its population has been observed to have increased (Royaud, 2010). In the Russian Federation, *A. virginicus* is established on the Black Sea coast of the Caucasus (Mironova, 2013).



Fig. 1 *Andropogon virginicus* (HAVO, Hawaii, Hawaii). Image by Forest and Kim Starr.

Morphology

Plant type

Perennial grass.

Description

Andropogon virginicus is a herbaceous, perennial, warm season (C₄) grass (Fig. 1). It has a cespitose (i.e. densely tufted) growth form and a height range of 40–210 cm (Campbell, 2003). Under the Raunkiaer life-form system it is a hemicryptophyte (Uchytíl, 1992). The culms are typically branched distally, with light-green to reddish brown coloration (Weber, 2003). The leaf sheaths are long-ciliate, with a tuberculate (scabrous) surface. The ligules are yellow to brownish and membranous, 0.2–1 mm, with cilia 0.2–1.3 mm (Campbell, 2003; Weber, 2003). Leaf blades reach up to 52 cm and are 1.7–6.5 mm wide. These blades are variably hairy, with Campbell (2003) reporting them ‘smooth and glabrous or sparsely to densely pubescent with spreading hairs’. Weber (2003) reports that the inflorescences are racemes of length 2–4 cm containing spikelets of length 3–4 mm.

Biology and ecology

General

Reproduction in *A. virginicus* is sexual, although inbreeding is not unusual due to cleistogamous florets (i.e. flowers that do not open to allow cross-pollination). Chasmogamy (i.e. flowers that open to allow cross-pollination) is reported to vary from around 40% to 100% across described varieties and forms within the species; Campbell (1982, 1983) gives a figure of around 50% chasmogamy for the reportedly weedy subtaxa within *A. virginicus*, a trait which he links to their

success as weeds. Note that some sources (e.g. CABI, 2016) do not make this distinction between subtaxa, thus giving the unwarranted impression that the species is always predominantly chasmogamous. Chasmogamous florets are wind-pollinated, as is true for most grasses.

Habitats

Andropogon virginicus invades a wide variety of habitats from disturbed to relatively intact habitats including ruderal areas, wetlands, open pastures, grasslands and open woodlands. Campbell (2003) describes the habitats of the three named varieties of *A. virginicus*. For *A. virginicus* var. *decepiens*, these include flatwoods (open pine forest or savannah), scrublands and disturbed sites such as roadsides and cleared timberlands, of the south-eastern coastal plain of the USA. For *A. virginicus* var. *glaucus*, habitats include moist or dry soils of the coastal plain, from Southern New Jersey to Eastern Texas. For *A. virginicus* var. *virginicus*, the listed habitats include openings in mature vegetation created by disturbance and poorly drained soils of pond margins, swales and cutover flatwoods. Weber (2003) highlights that the species is an indicator of acid soil and lists prairies as the main habitat. The species also tolerates extremely nutrient-poor soils in Australia, burnt areas and grassland and has a low requirement for phosphorus (Weber, 2003). Although it is also found on more fertile soils, its abundance decreases as competition increases; indeed, the species has often been used as an exemplar of a mid-successional species (Bazzaz, 1968, 1975, 1990).

Environmental requirements

Fire is an important part of the species’ ecology, both within its native (Irving, 1983; Uchytíl, 1992) and invaded ranges (e.g. Hughes *et al.*, 1991) where the species depends on frequent disturbance to maintain its population (Lemon, 1949; Lewis & Harshbarger, 1976; White David *et al.*, 1991; Uchytíl, 1992). Hughes *et al.* (1991) state that *A. virginicus* is one of the several non-native grasses in Hawaii that are excellent fire promoters, given their high dead: live biomass ratio, ability to burn at high relative humidity and high fuel moisture. Overall, then, it is worth noting that this species is fire-promoting, with the potential for positive feedbacks, but that controlled burning at a particular time of year and frequency may also reduce the species’ abundance (e.g. Butler *et al.*, 2002).

Natural enemies

There are no known natural enemies in the EPPO region.

Uses and benefits

This species is generally considered to be of low economic value. *Andropogon virginicus* is sold by nurseries

promoting native species gardening in the USA. A named cultivar ('Silver Beauty') exists for horticulture (USDA, 2009). There is evidence that the species is sold within the EPPO region, in particular in the European Union (EU); however, again, it is considered to be of low economic value to the horticulture industry. It is frequently mentioned as a low-value forage species in North America and is therefore undesirable when it invades pastures, outcompeting other vegetation that has greater value as fodder (Griffin *et al.*, 1988; Butler *et al.*, 2002). Nutritional quality can be increased by prescribed burning, presumably due to the higher nutritional value of young shoots (Uchytel, 1992). There is no evidence that the species is used as a forage species within the EPPO region.

Pathways for movement

There is evidence that *A. virginicus* has entered the EPPO region as a contaminant of machinery and equipment (Granereau & Verloove, 2010). In France, it is suspected that *A. virginicus* was introduced into a military camp with NATO munitions between the years 1950 and 1967 (Granereau & Verloove, 2010; EPPO, 2011).

Andropogon virginicus is available for commercial purposes (through the horticultural trade) in the USA and within the EPPO region (EPPO, 2018). However, there is no evidence that the species is commonly imported as seed into the EPPO region for horticultural purposes. In the pest risk analysis (PRA) conducted for the species (EPPO, 2018), the pathway contaminant of hay imports was considered. Although there is no published evidence of *A. virginicus* being transported as part of hay material from the USA, there is evidence that hay is imported into the EU and seed material of *A. virginicus* can potentially be included. Grass species have been intercepted via this pathway into other regions with seeds remaining viable (e.g. into Alaska from other US States; see Conn *et al.*, 2010). In Australia, seeds of *A. virginicus* are also reported to be spread through the movement of hay and livestock (EPPO, 2011).

Impact

Effects on plants

Andropogon virginicus stands can be dense, widespread and highly competitive, suggesting that the species reduces biodiversity (Uchytel, 1992; CABI, 2017). The species is reported to be able to dominate within the grass layer (Sorenson, 1991) (Fig. 2).

Andropogon virginicus has been documented in Hawaii as having a negative impact on biodiversity by outcompeting native species through the promotion of fire and transformation of vegetation from native woodlands to fire-adapted non-native grassland. In dry habitats, it competes with the endangered shrub *Tetramolopium remyi* and the



Fig. 2 *Andropogon virginicus* (HAVO, Hawaii, Hawaii). Image by Forest and Kim Starr.

endangered tree *Santalum freycinetianum* var. *lanaiense* (USFWS, 1995). On Oahu, it threatens the endangered subshrub *Schiedea nuttallii* (US Fish and Wildlife Service, 2009). It is a major threat to the small herb *Portulaca sclerocarpa* on the island of Hawaii and an islet off of Lanai. *Andropogon virginicus* is also sympatric with *Pritchardia napaliensis* and *Schiedea apokremnos* in Hawaii and is a potential threat to those species. In conjunction with other non-native grasses in Hawaii, the species has altered fire regimes in seasonal submontane woodland, reducing the abundance of native species (D'Antonio *et al.*, 2000).

In Australia, *A. virginicus* degrades habitat occupied by the Charmhaven apple (*Angophora inopina*, Myrtaceae) and may be having a direct impact on the regeneration of the species (Queensland Government, 2016). It is also recorded as a weed threat to the downy wattle (*Acacia pubescens*, Fabaceae) (Queensland Government, 2016).

Although present in the EPPO region, there are no reported studies that have evaluated the ecological or economic impact of *A. virginicus* in the region. Due to the aggressive spread of the species in natural areas in Georgia and around the Black Sea, and due to the rapid expansion of the area covered by the plant in France, the Expert Working Group (EWG) that assessed the risk of the species to the EPPO region considered that the potential impacts in the EPPO region will be in part similar to those seen in the current area of distribution. This is further compounded by the fact that when *A. virginicus* invades an area it forms dense monospecific stands, and this has been observed in the EPPO region (Granereau & Verloove, 2010).

Environmental and social impact

Due to its competitive nature, the species may have negative economic impacts on forage and timber production in the South-Eastern USA.

Primary production and habitat stability are likely to be altered by *A. virginicus* invasion due to a reduction in infiltration rates. Along with other non-native grasses, the species has an impact on nitrogen cycling by reducing the abundance of native species.

Andropogon virginicus has been found to affect plantation forestry by decreasing the soil water content (Balandier *et al.*, 2006). In forestry, control or suppression of this species may be necessary to enable the establishment of the plantation species (Groninger *et al.*, 2004).

Andropogon virginicus is frequently mentioned as a low-value forage species in North America and is therefore undesirable when it invades pastures, outcompeting other vegetation that has greater value as fodder (Griffin *et al.*, 1988; Butler *et al.*, 2002). Uchytel (1992) states that ‘nearly pure stands can persist on soils low in nitrogen or phosphorus as a result of competition and allelopathy’. Parsons & Cuthbertson (2001) also note impacts on pasture productivity in Australia.

Control

Since this plant thrives on low-pH and low-fertility soils, soil testing is the first step in managing *A. virginicus* in infested fields. Fertilization with nitrogen and phosphate and potassium supplementation can achieve control of *A. virginicus* in pastures (Peters & Lowance, 1974). Both mowing and burning may be ineffective at managing the species in isolation. Regular close cutting in February, March and April (USA) will help reduce abundance of the plant. Physical removal of the plant is possible in discrete areas, but this is both costly and time-consuming.

Herbicides have been shown to be effective at controlling *A. virginicus* under certain circumstances. However, Butler *et al.* (2002) found that *A. virginicus* seedlings were highly likely to germinate in the following season after herbicide application and suggest that soil fertility and grazing management are necessary to control the density of *A. virginicus*. Indeed, Butler *et al.* (2006), reporting on the same experimental system, found that *A. virginicus* could be effectively managed with proper fertility and tillage regimes.

Regulatory status

Andropogon virginicus was added to the EPPO Observation List of invasive alien plants in 2014 following a prioritization assessment (EPPO, 2014). In 2016, *A. virginicus* was identified as a priority for risk assessment within the requirements of Regulation 1143/2014 (Branquart *et al.*, 2016; Tanner *et al.*, 2017). A subsequent PRA concluded that *A. virginicus* carried a high phytosanitary risk to the endangered area (EPPO, 2018), and the species was added to the EPPO A2 List of pests recommended for regulation in 2018. At the time of publishing, *A. virginicus* is being considered for inclusion on the list of (European) Union concern.

Although in some areas in Australia the aim is to reduce population sizes of *A. virginicus* (e.g. in Brisbane, where it is a low priority environmental weed; <http://weeds.brisbane.qld.gov.au/weeds/whisky-grass>), it is not currently controlled at the national level in Australia (Queensland Government, 2016). It is also considered to be an ‘environmental weed’ in New South Wales and Queensland (Queensland Government, 2016).

The species is on the quarantine pest list for French Polynesia (e.g. see <http://www.biosecurity.govt.nz/node/7067>).

The species has been included on many weed lists in New Zealand, and was included in a summary ‘consolidated list’ by Howell (2008). However, it is not currently listed on the country’s National Plant Pest Accord (which would prohibit it from sale and commercial propagation and distribution).

In the USA, *A. virginicus* is on the composite list of weeds of the Weed Science Society of America (<http://wssa.net/wssa/weed/composite-list-of-weeds/>); however, this does not imply by itself the existence of any regulatory instruments. In Hawaii, *A. virginicus* is on the List of Plant Species Designated as Noxious Weeds for Eradication or Control Purposes by the Hawaii Department of Agriculture (<https://hdoa.hawaii.gov/pi/files/2013/01/AR-68.pdf>).

In South Africa, control of the species is enabled by the Conservation of Agricultural Resources (CARA) Act 43 of 1983, as amended, in conjunction with the National Environmental Management: Biodiversity (NEMBA) Act 10 of 2004. Currently, *A. virginicus* is listed as a ‘Prohibited Alien Species’ on the NEMBA mandated list of 2014. ‘[Prohibited alien species are] defined as alien species that are not yet in South Africa, that are known to be invasive and should not be imported into South Africa. If a Prohibited Alien species does occur in South Africa, it is automatically listed as a ‘Species that requires compulsory control’ unless listed otherwise’ (NEMBA Act 10 of 2014, www.environment.gov.za).

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