# GLOBAL INVASIVE SPECIES DATABASE

FULL ACCOUNT FOR: ***Sorghum halepense***

***Sorghum halepense*** 简体中文 正體中文 **System:** Terrestrial

| Kingdom | Phylum | Class | Order | Family |
|---|---|---|---|---|
| Plantae | Magnoliophyta | Liliopsida | Cyperales | Poaceae |

**Common name**

sorgho d'Alep (French), sorgo de Alepo (French), herbe de Cuba (French), kola (Tongan), gumai (Russian), zacate Johnson (English), grama China (English), Don Carlos (English), sorgho (French, New Caledonia), yerba Johnson (English), Johnson grass (English), Johnsongrass (English), Aleppo grass (English), Aleppo milletgrass (English), cañuela (English)

**Synonym**

*Andropogon arundinaceus* , Scop. 1772
*Andropogon halepensis* , (L.) Brot. 1804
*Andropogon halepensis* , (L.) Brot. var. *anatherus* Piper 1915
*Andropogon halepensis* , (L.) Brot. var. *genuinus* Stapf ex Hook. f. 1896
*Andropogon halepensis* , (L.) Brot. var. *muticus* (Hack.) Asch & Graebn. 1915
*Andropogon halepensis* , (L.) Brot. var. *typicus* Asch & Graebn. 1898
*Andropogon sorghum* , (L.) Brot. ssp. *halepensis* (L.) Hack 1889
*Andropogon sorghum* , (L.) Brot. subvar. *genuinus* Hack 1889
*Andropogon sorghum* , (L.) Brot. subvar. *leiostachys* Hack 1889
*Andropogon sorghum* , (L.) Brot. subvar. *muticus* Hack 1889
*Blumenbachia halepensis* , (L.) Koeler 1802
*Holcus halepensis* , L. 1753
*Milium halepense* , (L.) Cav. 1802
*Sorghum almum* , Parodi 1943
*Sorghum almum* , Parodi var. *typicum* Parodi 1943
*Sorghum controversum*
*Sorghum halepense* , (L.) Pers. var. *muticum* (Hack.) Grossh. 1928
*Sorghum miliaceum* , (Roxb.) Snowden
*Sorghum saccharatum* , (L.) Moench var. *halepense* (L.) Kuntze 1891

**Similar species**

*Sorghum bicolor ssp.drummondii*

**Summary**

Sorghum halepense is an extremely invasive noxious weed with a worldwide distribution. High seed production and an extensive rhizomal system makes it difficult to eradicate. This species has a number of detrimental effects including: toxicity to grazing stock, fire risk during summer and competitive exclusion of other plants. It reduces soil fertility, acts as a host for crop pathogens and is a known allergen.

view this species on IUCN Red List

**Species Description**
Perennial grass with strong rhizomes; rhizomes fleshy, to 1cm in diameter, to 2m long, often rooting from the nodes; culms erect, to 1.5m tall; nodes with short pubescence; sheaths glabrous; ligule ciliate-membranous, 2mm long; blades elongate, usually 1-1.5cm wide, the midrib prominent; panicles 15-25cm long, branches ascending; spikelets 5mm long, acute; first glume hard; fertile lemma awned or awnless, awn if present 1cm long or less\" (Stone, 1970). Grain remains enclosed by glumes, 4.0-6.6mm long, 2.0-2.6mm wide, oblong-ovate, glumes reddish brown to shiny black. The plant has both diploid and tetraploid races, with a chromosome number of either 2n = 20 or 40 (Stone, 1970; Warwick and Black 1983).

**Notes**
*S. halepense* is able to spread through a number of pathways. Seeds can be distributed via livestock, wind, contaminated farm machinery, hay or grain. They may also move long distances if transported by water, or in the excreta of birds or livestock (Holm et. al. 1977; Warwick and Black 1983).
A problem species in Hawaii. A Class A (eradicate) noxious weed in New Zealand.
Fosberg *et al* (1987) list three varieties: *S. halepense* var. *halepense* f. *halepense*, present on Saipan and Rota; *S. halepense* var. *halepense* f. *muticum* (Hack.) Hubb., present on Saipan, Tinian, Rota, Guam, Palau, Chuuk, and Pohnpei; and *S. halepense* var. *propinquum* (Kunth) Ohwi, present on Saipan and Palau. There is some question as to whether or not the species in Western Polynesia is S. halepense or not. Whistler (1988) identifies it as *S. sudanense* (Piper) Stapf.

**Lifecycle Stages**
Plant development begins from rhizomes that have overwintered up to 120cm deep in the soil. These serve as the energy source for above and below-ground development of the plant in the spring. Flowering occurs throughout the growing season, depending on the climate, and the majority of rhizome growth occurs after flower production. Tertiary rhizomes grow deep into the soil during winter and serve as the following season's primary structure. Seeds can lie dormant for long periods of time, with 50% still able to germinate after 5 years (The Nature Conservancy Element Stewardship Abstract).

**Uses**
*S. halepense* is still in wide use as a forage plant, and was originally introduced to the United States as such in the early 1800s, later spreading into crops. Under optimum growing conditions it can provide nutritious fodder. Although toxicity can be high in younger plants, cured hay is considered safe for livestock (Washington State Weed Control Board). Because of the tendency of the plant to form spreading patches, it can be used to stabilise erosion-prone land (The Nature Conservancy Element Stewardship Abstract).

**Habitat Description**
Moist tropics, sub-tropics and Mediterranean climate zones. Adaptations depend upon whether the plants are Mediterranean or tropical ecotypes; and while most are frost-sensitive, some have been able to overwinter in warm temperate zones of Europe, the United States and Canada. Plants are generally intolerant of hot, dry conditions which can lead to dessication and rhizome death (McWhorter 1972). S. halepense thrives in fertile lowland areas, especially where land has been disturbed or cleared, and is particularly productive during the rainy season in tropical areas (La O *et al*.1993b).

**Reproduction**
Reproduction is by seed and by budding from rhizomes, both determined by such environmental factors as soil fertility, air temperature and moisture availability. Seeds germinate after a period of dormancy imposed by mechanical restrictions of the seed coat. Seeds can lie dormant for long periods of time, with 50% still able to germinate after 5 years (The Nature Conservancy Element Stewardship Abstract). The optimal air temperature for seed germination is within the range 25-30@C (Horowitz 1972a). The ultimate plant size and number of tillers will determine the seed production, which can vary from 540 to 1440kg/ha (McWhorter 1973, 1989). Rhizome initiation usually takes place a month or 45 days after Johnson grass emergence from seed, and coincides with tillering or the 6-7 leaf stage of shoot growth (Oyer *et al*. 1959; Anderson et al. 1960; Horowitz 1972a; La O et al. 1993a). This process is commonly faster with plants developing from perennial rhizomes bearing buds which germinate readily. Rhizomes are distributed mainly in the top 20cm of the soil profile. Most are located in the first 15cm, but up to 10% are found below 30cm (Horowitz 1972b; McWhorter 1972). Rhizome growth is more abundant than the shoot growth (Oyer et al. 1959; La O et al. 1993b) and in some cases rhizome fresh weight reaches 90% of the whole developed Johnson grass plant (Horowitz 1972b). Apical dominance is broken with rhizome fragmentation, which consistently stimulates lateral bud germination (Hull 1968) and each bud produces one shoot. *S. halepense* produces prodigious amounts of seed. Depending on conditions, over 1kg of seed can be produced per plant over one growing season. Rhizomes can grow 60 to 90 metres in one growing season (Warwick and Black 1983).

**Nutrition**
Adapted to a wide range of soil types, but prefers fertile porous soils with a pH between 5 and 7.5 (Nature Conservancy Element Stewardship Abstract)

**General Impacts**
Considered a serious agricultural pest. Its extensive spreading rhizome and shoot system and high rate of seed production make it extremely invasive. Its height and size further allow it to shade out surrounding plants and to decrease the availability of moisture and nutrients to them. It is also believed to produce allelopathic chemicals capable of inhibiting the germination and seedling development of a number of crop species. Numerous recent reports from around the world show that the principal crops affected by its weedy traits continue to be maize, sugarcane, grain sorghum, soybean, sunflowers, wheat, citrus crops and cotton as outlined in Holm *et al*. 1977. It has also been an alternate host for many insect, fungal, viral, bacterial and nematode pathogens that attack crops. Other problems can arise from gene transfer between Sorghum halepense and S. bicolour. This can result in smaller seed and reduced yield of the latter, and can complicate control of S. halepense in sorghum crops, particularly if transgenes are involved (Arriola & Ellstrand 1996). Under very hot dry conditions, dessicated plants can become a fire hazard, particularly in the tropics. It also has dangers as a forage crop. Stress (caused by drought, frost, herbicides) or mechanical damage (eg. trampling by stock) can cause the plant to produce hydrocyanic acid, particularly in the young leaves and stems of secondary growth. This can prove toxic to grazing livestock (Findlay 1975). Horses are subject to inflammation of the bladder from any Sorghum spp (Food & Agriculture Organisation of the United Nations).

**Management Info**
Various methods have been used to control *Sorghum halepense*. While herbicides continue to provide the most effective control of plants growing among crops in Europe and North America (e.g. Bridges & Chandler 1987), herbicide-resistant strains have been reported (Smeda *et al.* 1997), and biological controls are being studied (Milhollon 2000; Chandramohan *et al.* 2002 ). Alternative management systems involving such measures as crop rotation can be effective in areas where herbicides are unavailable or too expensive (Ugen & Wortmann 2001). Various kinds of mechanical control have been used to prevent seed dispersal and rhizome production before the plants become fully established. These include slashing the plants at the beginning of the flowering stage in field margins, ditch banks, canals and crop land; avoiding animal grazing in infested areas; and cultivation within the first month after shoot emergence to prevent new rhizome production (The Nature Conservancy Element Stewardship Abstract). McWhorter (1989) considers that cultivation is most effective when the grass is about 36cm tall, helping to prevent the plants from maturing and spreading. The Nature Conservancy's Stewardship Abstract contains information on control methods. .
For details on preventative measures, chemical and physical control options, please see *management information*.

**Pathway**
Originally planted in the 1800s as a forage crop (this method may be unlikely at present)Seeds may be found in the coats of livestock

**Principal source:** Pacific Island Ecosystems at Risk (PIER), 2006. *Sorghum halapense* (L.) Pers., Poaceae

**Compiler:** IUCN SSC Invasive Species Specialist Group
Updates with support from the Overseas Territories Environmental Programme (OTEP) project XOT603, a joint project with the Cayman Islands Government - Department of Environment

**Review:** Dr. Ardath Francis, Agriculture and Agri-Food Canada.

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**ALIEN RANGE**

**[1]** AMERICAN SAMOA
**[1]** AUSTRALIA
**[1]** CANADA
**[1]** CROATIA
**[1]** FRENCH GUIANA
**[1]** GUADELOUPE
**[1]** INDONESIA
**[1]** NEW CALEDONIA
**[3]** NORTHERN MARIANA ISLANDS
**[1]** PUERTO RICO
**[1]** THAILAND
**[15]** UNITED STATES
**[1]** ANGUILLA
**[1]** BRITISH INDIAN OCEAN TERRITORY
**[1]** CHINA
**[1]** FIJI
**[2]** FRENCH POLYNESIA
**[1]** GUAM
**[2]** MICRONESIA, FEDERATED STATES OF
**[1]** NEW ZEALAND
**[1]** PHILIPPINES
**[1]** SWAZILAND
**[1]** TURKEY
**[1]** WALLIS AND FUTUNA

**BIBLIOGRAPHY**
**27** references found for **Sorghum halepense**

**Managment information**
Bridges, D.C. and Chandler, J.M. 1987. Effect of herbicide and weed height on Johnsongrass (*Sorghum halepense*) control and cotton (*Gossypium hirsutum*) yield. Weed Technology 1: 207-211.
California Dept. Of Food & Agriculture - Noxious Weeds database
**Summary:** Contains information on both *S. halepense* and the related *S. bicolor* (syn. *S. bicolor* ssp. *drummondii*). Provides good info on reproduction and growth. Has a small amount of management information.

Chandramohan, S., Charudattan, R., Sonoda, R.M. and Singh, M. 2002. Field evaluation of a fungal pathogen mixture for the control of seven weedy grasses. Weed Science 50: 204-213.
Mack, R. N and W. M. Lonsdale., 2002. Eradicating invasive plants: Hard-won lessons for islands. In *Turning the tide: the eradication of invasive species*: 311-318. Veitch, C.R. and Clout, M.N.(eds). IUCN SSC Invasive Species Specialist Group. IUCN. Gland. Switzerland and Cambridge. UK.
**Summary:** Uses *Clidemia hirta* in Hawaii as an eradication case study. *Clidemia* is in the Melastomataceae and somewhat similar ecologically to miconia.
Eradication case study in Turning the tide: the eradication of invasive species.
McWhorter, C.G. 1972. Factors affecting johnsongrass rhizome production and germination. Weed Science 20: 41-45.
Millhollon, R. 2000. Loose kernel smut for biocontrol of *Sorghum halepense* in Saccharum sp. hybrids. Weed Science 48: 645-652.
National Pest Plant Accord, 2001. Biosecurity New Zealand.
**Summary:** The National Pest Plant Accord is a cooperative agreement between regional councils and government departments with biosecurity responsibilities. Under the accord, regional councils will undertake surveillance to prevent the commercial sale and/or distribution of an agreed list of pest plants.
Available from: http://www.biosecurity.govt.nz/pests-diseases/plants/accord.htm [Accessed 11 August 2005]
Pacific Island Ecosystems at Risk (PIER), 2006. *Sorghum halapense* (L.) Pers., Poaceae
**Summary:** Available from: Pacific Island Ecosystems at Risk (PIER), 2006. *Sorghum halapense* (L.) Pers., Poaceae [Accessed 22 January 2006]
Royal New Zealand Institute of Horticulture (RNZIH), 2005. Johnson grass *Sorghum halepense*
**Summary:** Available from: http://www.rnzih.org.nz/pages/nppa_051.pdf [Accessed 1 October 2005]
Smeda, R.J., Snipes, C.E. and Barrentine, W.L. 1997. Identification of graminicide-resistant johnsongrass (*Sorghum halepense*). Weed Science 45: 132-137.
Swaziland s Alien Plants Database., Undated. *Sorghum halepense*
**Summary:** A database of Swaziland s alien plant species.
The Nature Conservancy Element Stewardship Abstract for *Sorghum halepense*
**Summary:** Comprehensive coverage of general biological information and management strategies related to *S. halepense*. Contains a comprehensive list of references and links to related sites.
Varnham, K. 2006. Non-native species in UK Overseas Territories: a review. JNCC Report 372. Peterborough: United Kingdom.
**Summary:** This database compiles information on alien species from British Overseas Territories.
Available from: http://www.jncc.gov.uk/page-3660 [Accessed 10 November 2009]
Washington State Noxious Weed Control Board. 2002. Information on Johnsongrass
**Summary:** Good summary of information on *S. halepense*. Mainly general information, but has short sections on control methods.

**General information**

Arriola, P.E. and Ellstrand, N.C. 1996. Crop-to-weed gene flow in the genus Sorghum (Poaceae): spontaneous interspecific hybridization between johnsongrass, *Sorghum halepense*, and crop sorghum, *S. bicolor*. American Journal of Botany 83: 1153-1159.
Boggan, J., Funk, V., Kelloff, C., Hoff, M., Cremers, G. and Feuillet, C. (eds) 1997. Biological Diversity of the Guianas (BDG) Guyana; Surinam; French Guiana. The Checklist of the Plants of the Guianas; 2nd Edition.
**Summary:** Produced as a cooperative project between the Biological Diversity of the Guianas Program (Smithsonian Institution; Washington; DC USA) and the ORSTOM Herbarium (Cayenne; French Guiana); under the auspices of the Centre for the Study of Biological Diversity (University of Guyana; Georgetown; Guyana).
Centre des ressources biologiques. Plantes tropicales. INRA-CIRAD. 2007.
**Summary:** Available from: http://collections.antilles.inra.fr/ [Accessed 31 March 2008]
CONABIO. 2008. Sistema de informaci&#65533;n sobre especies invasoras en M&#65533;xico. Especies invasoras - Plantas. Comisi&#65533;n Nacional para el Conocimiento y Uso de la Biodiversidad. Fecha de acceso.
**Summary:** English:
The species list sheet for the Mexican information system on invasive species currently provides information related to Scientific names, family, group and common names, as well as habitat, status of invasion in Mexico, pathways of introduction and links to other specialised websites. Some of the higher risk species already have a direct link to the alert page. It is important to notice that these lists are constantly being updated, please refer to the main page (http://www.conabio.gob.mx/invasoras/index.php/Portada), under the section Novedades for information on updates.
Invasive species - Plants is available from: http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Plantas [Accessed 30 July 2008]
Spanish:
La lista de especies del Sistema de informaci&#65533;n sobre especies invasoras de m&#65533;xico cuenta actualmente con informaci&#65533;n aceca de nombre cient&#65533;fico, familia, grupo y nombre com&#65533;n, as&#65533; como h&#65533;bitat, estado de la invasi&#65533;n en M&#65533;xico, rutas de introducci&#65533;n y ligas a otros sitios especializados. Algunas de las especies de mayor riesgo ya tienen una liga directa a la p&#65533;gina de alertas. Es importante resaltar que estas listas se encuentran en constante proceso de actualizaci&#65533;n, por favor consulte la portada (http://www.conabio.gob.mx/invasoras/index.php/Portada), en la secci&#65533;n novedades, para conocer los cambios.
Especies invasoras - Plantas is available from: http://www.conabio.gob.mx/invasoras/index.php/Especies_invasoras_-_Plantas [Accessed 30 July 2008]
Findlay, R.M. 1975. Potential menace of Johnsongrass. New Zealand Journal of Agriculture 130: 40-41.
Fournet, J. 2002. Flore illustr&#65533;e des phan&#65533;rogames de guadeloupe et de Martinique. CIRAD-Gondwana editions.
Gargominy, O., Bouchet, P., Pascal, M., Jaffre, T. and Tourneu, J. C. 1996. Consequences des introductions d'especes animals et vegetales sur la biodiversite en Nouvelle-Caledonie. Rev. Ecol. (Terre Vie) 51: 375-401.
**Summary:** Consequences to the biodiversity of New Caledonia of the introduction of plant and animal species.

Holm, L. G., Donald, P., Pancho V., and Herberger, J.P. 1977. The World s Worst Weeds: Distribution and Biology. The University Press of Hawaii, Honolulu, Hawaii. 609pp.
ITIS (Integrated Taxonomic Information System), 2005. Online Database *Sorghum halepense*
**Summary:** An online database that provides taxonomic information, common names, synonyms and geographical jurisdiction of a species. In addition links are provided to retrieve biological records and collection information from the Global Biodiversity Information Facility (GBIF) Data Portal and bioscience articles from BioOne journals.
Available from:
http://www.cbif.gc.ca/pls/itisca/taxastep?king=every&p_action=containing&taxa=Sorghum+halepense&p_format=&p_ifx=plglt&p_lang= [Accessed March 2005]
MAF (Ministry of Agriculture and Forestry)/Biosecurity New Zealand Biosecurity website (New Zealand)
**Summary:** A small amount of info.
Meyer, J.-Y. 2000. Invasive plants in the Pacific Islands. In: The Invasive Species in the Pacific: A Technical Review and Draft Regional Strategy. Sherley, G. (tech. ed). Published in June 2000 by the South Pacific Regional Environment Programme (SPREP).
**Summary:** Resource that includes the distribution of invasive species throughout the Pacific Islands.
Ugen, M.A. & Wortmann, C.S. 2001. Weed flora and soil properties in subhumid tropical Uganda. Weed Technology 15: 535-543.
Warwick, S. and Black, L. 1983. The biology of Canadian weeds - *Sorghum halepense*. Canadian Journal of Plant Science 63: 997-1014