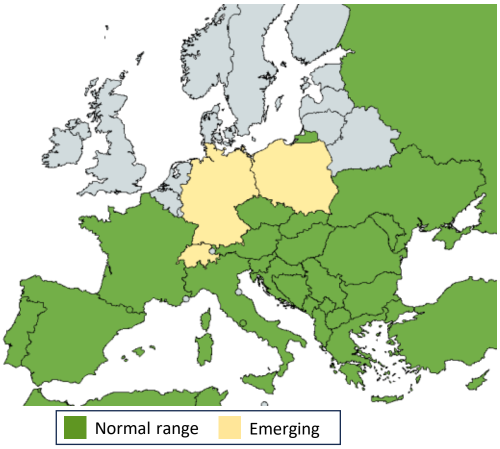
Weed Fact Sheet
Sorghum halepense

Sorghum halepense is an invasive, highly competitive, C_4 species well adapted to hot, dry environments. It is common in southern and central Europe and is further expanding due to climate change. It normally infests spring-summer crops such as maize, soybean, sunflower, cotton and beans as well as orchards, non-crop areas and watercourses. It can cause important yield losses and allelopathic effects on several subsequent crops.



Weed Biology

EPPO-codes (Latin and common names)	SORHA - *Sorghum halepense;* Johnsongrass
Life cycle	Perennial geophyte (rhizomes)
Germination window	Base temperature is around 10-12 °C, optimal temperature around 20 °C
Max. generation/year	1
Occurrence in crop or cultivation system	Spring-summer crops such as maize, soybean, cotton, sunflower, beans, orchards, amenity areas and watercourses
Yield loss	Cop dependent, generally high
Preferred environmental conditions	Warm habitats, with air temperatures between 15 and 30 °C
Ploidy	Allotetraploid (2n = 4x = 40)

Reproduction system	Monoecious
Pollination	Predominantly self-pollinating
Pollen dispersal	By wind
Seed shattering	>50% at crop harvest
Seed fecundity	Up to 30,000 seeds per plant
Seed dispersal	Wind, water, animals, birds, livestock machinery, contaminated crop seeds
Seed dormancy	High
Seed bank longevity	50% viability after 5 years
Seed decline per year	No clear data
Rhizomal dispersal	Up to 70m produced per plant; easily fragmented and dispersed by soil disturbance to expand infestations
Rhizomal fecundity	Rhizomes decay soon after sprouting

Impact of Agronomic measures on Occurrence and Spread

Seeds and Rhizomes

- Effective control is needed for plants emerging from seed and also plants originating from rhizomes. Only a few herbicides are effective against rhizomes
- It is crucial to prevent the transport of seeds and rhizomes from infested fields to non-infested fields and properly manage the inter-cropping period

Soil Cultivation

- Deep ploughing is an effective method for controlling Johnsongrass by burying rhizomes deep enough that seedlings cannot emerge; harrowing can also expose rhizomes to extreme winter or summer temperatures
- Apical dominance in rhizomes means that mechanical tools have to be used carefully
- Early planting is better than later sowings

The adoption of an **integrated weed management** (IWM) approach is strongly recommended. The measures vary according to the type of cropping system and agro-ecological conditions. In general, deep ploughing, crop rotation with alternation of winter and summer crops, false seed bed preparation, competitive crop varieties, mechanical control, as well as a careful use of herbicides (e.g. glyphosate, some pre-emergence residuals and sulfonyl-ureas) and any measure which favours the establishment and growth of a good crop are all useful tools.

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Herbicide Resistance in Europe

- Resistant weed populations are present in most southern European countries: Greece, Croatia, Hungary, Italy, Serbia and Spain. Resistance is most frequent in Serbia, Spain and Italy
- Intensive use in space and time of herbicides with the same MoA and a lack of or short crop rotation are key factors that have led to the selection of resistant populations
- Modes of action impacted: Group 1 / ACCase inhibitors in summer dicot crops, Group 2 / ALS inhibitors in maize and Group 9 / EPSPS-inhibitors (glyphosate) in Spain. Overall, resistance to Group 2 in maize is most frequent, followed by resistance to Group 1 in summer dicot crops such as soybean, sunflower, cotton, tomatoes; glyphosate resistance in S. Spain has been found along railways and highways
- Resistant biotypes can have a diversity of mechanisms, with the levels of resistance depending on specific selection conditions, especially for self-pollinated and geophyte weed species. Target-site resistance (TSR) is the most frequent mechanism, however non-target site resistance (NTSR) such as enhanced metabolism can play a role. Both mechanisms can sometimes be present in the same plant
- Group 1 mutations: Ile-2041-Asn has been identified
- Group 2 mutations: the most frequent Trp-574-Leu mutation induces broad cross-resistance to all ALS inhibitors, whereas the less frequent Asp-376-Glu mutation is controlled by imidazolinone herbicides such as imazamox, but shows resistance to sulphonyl ureas (such as nicosulfuron / foramsulfuron) and also to pyrimidinyl thiobenzoates (e.g. bispyribac-Na); varying levels of resistance are seen
- Cross-resistance amongst Group 1 'FOPs' or amongst ALS inhibitors is common, but cross-resistance patterns have proved difficult to predict. A few cases of multiple resistance between Group 1 and Group 2 have been identified in Serbia

Best Management Practices

- To prevent and mitigate resistance development, follow the Global HRAC guidelines for managing herbicide resistance
- The availability of alternative herbicides varies according to the crop and the country. Only a few chemical options are still available and they have different efficacies against germinating seeds or sprouting perennial rhizomes
- Post-emergence: use of Group 1 herbicides against populations with Group 2 resistance and *vice versa*, but not for more than 2 consecutive years. An important non crop tool to use is glyphosate
- In summer dicot crops, alternate Group 1 post-emergence herbicides with pre-emergence herbicides from groups 15 and 3. In maize, use pre-emergence herbicides from groups 27, 3, 15 or 5, or use them early post-emergence in tank-mixture with herbicides from groups 2, 5 or 27
- Integration of non-chemical methods: crop rotation, deep ploughing and other mechanical interventions. Deep ploughing is effective by burying rhizomes, whereas harrowing can pull rhizomes onto the soil surface to expose them to extreme summer or winter temperatures
- Early detection and destruction of resistance patches
- Inter-row mechanical cultivation combined with in-row chemical control to reduce herbicide selection pressure

References

Heap, I. The International Herbicide-Resistant Weed Database. Online. Friday, September 25, 2025. Available www.weedscience.org.

Jhala A.J., Beckie H.J., Mallory-Smith C., Jasieniuk M., Busi R., Norsworthy J.K., Bagavathiannan M.V., Tidemann B.D., Geddes C.M. (2021) Transfer of resistance alleles from herbicide-resistant to susceptible grass weeds via pollen-mediated gene flow. Weed Technol. 35: 869–885. doi: 10.1017/wet.2021.82

Loddo D., Hull R., Sattin M., Comont D. (2025) Multi-year assessment of seed shedding for economically important grass weed species in Italy and the UK. European Journal of Agronomy, 168, 127648. https://doi.org/10.1016/j.eja.2025.127648

Mait, A., Young B., Subramanian N. et al. (2022) Pollen-mediated transfer of herbicide resistance between johnsongrass (*Sorghum halepense*) biotypes. Scientific Reports 12, 7663. https://doi.org/10.1038/s41598-022-11713-8

Monaghan, N. (1979) The biology of Johnsongrass (*Sorghum halepense*). Weed Research 19, 261–267.

Panozzo S., Milani A., Scarabel L., Balogh Á., Dancza I., Sattin M. (2017) Occurrence of different resistance mechanisms to ALS inhibitors in European *Sorghum halepense*. Journal of Agricultural and Food Chemistry 65, 7320-7327. DOI: 10.1021/acs.jafc.7b01243

Panozzo S., Sattin M. (2021) Fitness Costs Associated to an Ile2041Asn Mutation in the Geophyte *Sorghum halepense* Resistant to ACCase-Inhibiting Herbicides. Frontiers in Agronomy, 3, 711840. https://doi.org/10.3389/fagro.2021.711840

Peerzada A. M., Ali H. H., Hanif Z., et al. (2023) Eco-biology, impact, and management of *Sorghum halepense* (L.) Pers. Biological Invasions, 25, 955-973. DOI: 10.1007/s10530-017-1410-8

Sattin M., Calha I., Torra J., Travlos I. (2025) Trends in herbicide resistance in southern Europe. In “Global trends in pesticide resistance”, Ed. R. Oliver, Burleigh Dodds Science Publishing, Cambridge. In press.

Scarabel L., Panozzo S., Savoia W., Sattin M. (2014) Target-site ACCase-resistant *Sorghum halepense* selected in summer dicot crops. Weed Technology 28, 307-315. https://doi.org/10.1614/WT-D-13-00137.1

Scopel A. L., Ballare C. L., Ghersa C.M. (1988) Role of seed reproduction in the population ecology of *Sorghum halepense* in maize crops. Journal of Applied Ecology, 951-962.

Squires C.C., Walsh M.J. (2021) Chapter 18 - *Sorghum halepense*. In “Biology and Management of Problematic Crop Weed Species”, Editor: Bhagirath Singh Chauhan. Academic Press, 391-405. https://doi.org/10.1016/B978-0-12-822917-0.00012-4

Travlos I.S., Montull J.M., Kukorelli G., et al. (2019) Key Aspects on the Biology, Ecology and Impacts of Johnsongrass [*Sorghum halepense* (L.) Pers] and the Role of Glyphosate and Non-Chemical Alternative Practices for the Management of this Weed in Europe. Agronomy, 9, 717. https://doi.org/10.3390/agronomy9110717

Vazquez-Garcia J.G., Palma-Bautista C., Rojano-Delgado A.M., De Prado R., Menendez J. (2020) The First Case of Glyphosate Resistance in Johnsongrass (*Sorghum halepense* (L.) Pers.) in Europe. Plants, 9(3):313. https://doi.org/10.3390/plants9030313

Maity, A., Lamichaney, A., Joshi, D.C., Bajwa, A., Subramanian, N., Walsh, M., Bagavathiannan, M. (2021) Seed Shattering: A Trait of Evolutionary Importance in Plants. Frontiers in Plant Science, 12, 657773.