

National regulatory control systems
Systèmes de lutte nationaux réglementaires

Ambrosia artemisiifolia

Specific scope

This standard describes the procedures for control of *Ambrosia artemisiifolia*.

Specific approval and amendment

First approved in 2008-09.

Introduction

Ambrosia artemisiifolia (Compositae) is an introduced exotic pest of the EPPO region originating from North America. Within EPPO, the question whether this species should be recommended for regulation as a quarantine pest has been extensively debated. Although member countries agreed that this plant presented a threat mainly because of human health problems, no consensus could be reached that the plant be regulated as a quarantine pest. However, it should be noted that *Ambrosia artemisiifolia* may have severe impacts on certain crops. While *A. artemisiifolia* is already widespread in several European countries such as France, Hungary and Italy, it is still absent or rare in other parts of Europe but is beginning to spread, for example in Austria, Germany and Switzerland. It was considered that countries with areas at risk may wish to regulate this plant at the national level to prevent introduction into non-invaded areas and to manage infested areas. This EPPO Standard includes general recommendations on the surveillance and control of *A. artemisiifolia*.

Regional cooperation is important and it is recommended that countries should communicate with their neighbours to exchange views on the best programme to implement in order to achieve the regional goal of preventing further spread of the pest.

For the efficient implementation of monitoring and control at a national level, cooperation between the relevant public bodies (e.g. NPPOs, Ministries of Health, Ministries of Environment, Ministries in charge of transports, water management) as well as with other interested bodies (private sector, associations) should be established.

A national technical committee including these representatives may be established in order to coordinate regional and international actions and to implement the following national

measures: raising awareness, monitoring, regulating, management measures and further research.

EPPO member countries at risk are advised to prepare a contingency plan for the surveillance, eradication and containment of this pest.

This standard presents the basis of a national regulatory control system for the monitoring, eradication and containment of *A. artemisiifolia* and describes:

- Elements of the monitoring programme that should be conducted to detect a new infestation or to delimit an infested area
- Measures aiming at eradicating recently detected populations (including an incursion)
- Containment measures: to prevent further spread in a country or to neighbouring countries, in areas where the pest is present and eradication is no longer considered feasible.

Monitoring of *A. artemisiifolia*

An annual delimiting survey (according to the ISPM no. 6 *Guidelines for surveillance*) is necessary to determine the geographical distribution of the plant and its prevalence. Such information is necessary to determine control measures. Control strategies need to be adjusted on a case-by-case basis according to the density and occurrence of the plant within a country.

Priority areas to survey are private gardens, along roads and railway lines, sunflower crops, maize and soybean fields, wheat stubble, construction areas, field and forest edges, river banks, wastelands, lawns, surroundings of grain and fodder warehouses, oil mills and grain processing factories, and fodder industry factories.

Information to gather and analyze at the national level includes:

- the geographical occurrence of the plant (size of populations, phenological conditions, habitats, etc.)
- pollen occurrence through a network of captors (spatial and temporal distribution, origin, movements)
- the occurrence of seeds of *A. artemisiifolia* as a contaminant in imported commercial goods.

To ensure good quality of the data and to avoid false identifications, a network of experts should be trained in identifying the plant and to take appropriate precautions in applying measures.

Eradication of *A. artemisiifolia*

The eradication programme for *A. artemisiifolia* in the case of recently detected populations (including an incursion) is based on the delimitation of an area within the country and the application of measures to both eradicate and prevent further spread of the pest. The feasibility of eradication for *A. artemisiifolia* depends on the size of the area infested and the density of the plants. These measures are described in Appendix 1.

Containment of *A. artemisiifolia*

The containment programme for *A. artemisiifolia* in the case of established populations is based on the application of measures to prevent further spread of the pest in the country or to neighbouring countries. These measures are described in Appendix 2.

Communication

Communication should be directed to a broad audience (e.g. in schools, pharmacies, public places) and in particular to professionals concerned with the species (administration, road and railroad services, farmers, gardeners, birdseed producers and traders, allergy specialists, builders, etc.).

This information should raise awareness about the problems, help to identify the species, help to identify and apply adequate control measures, and publicize existing legislation on the plant.

References

- Bohren C (2006) *Ambrosia artemisiifolia* L. in Switzerland: concerted action to prevent further spreading. *Nachrichtenbl. Deut. Pflanzenschutz* **58**(11), 304–308.
- Bohren C, Mermillod G & Delabays N (2008) *Ambrosia artemisiifolia* L. – Control measures and their effects on its capacity of reproduction. *Journal of Plant Diseases and Protection* Special Issue **XXI**, 307–312, 2008, ISSN 1861–4051. © Eugen Ulmer KG, Stuttgart (in prep.; proceedings of 24th German Weed Conference, Stuttgart Hohenheim, March 4–6, 2008)
- IPPC (1997) *Guidelines for surveillance*. ISPM no. 6. FAO, Rome (IT).
- OEPP/EPPO (2006) EPPO Standard PM 3/66 (2) Guidelines for the management of plant health risks of biowastes of plant origin. *Bulletin OEPP/EPPO* **38**, 4–9.
- Prioux S & Bertin G (2007) [Ambrosia control: the use of tribenuron-methyl in sunflower] AFPP, Vingtième Conférence du COLUMA. *Journées Internationales sur la lutte contre les mauvaises herbes*. Dijon, 11 et 12 Décembre 2007. 8 p. (In French).

Vacher C, Drieu Y & Pauget J (2007) [Management of *Ambrosia artemisiifolia* in grain legumes and intercropping period] AFPP, Vingtième Conférence du COLUMA. *Journées Internationales sur la lutte contre les mauvaises herbes*. Dijon, 11 et 12 Décembre 2007, p. 8 (In French).

Appendix 1. Eradication programme

The eradication process involves four main activities:

- surveillance to fully investigate the distribution of the pest
- containment to prevent the spread of the pest
- treatment and/or control measures to eradicate the pest when it is found
- verification of pest eradication.

Surveillance

A delimitation survey (IPPC, 1997) should be conducted to determine the extent of the pest distribution (see monitoring). Infested areas and adjacent areas that might receive seed should be monitored.

Containment

Particular efforts should be made to prevent the introduction of the plant into new areas where it is not occurring. Measures to prevent spread include:

- cleaning machinery used in areas infested by *A. artemisiifolia* (agricultural, gardening and construction machinery)
- avoiding movement of contaminated soil and gravel from infested areas
- reducing the contamination of (bird-)seeds or other consignments. Wastes resulting from cleaning processes should be destroyed (e.g. by burning).

Treatment and control programme

As *A. artemisiifolia* is an annual plant, control measures should aim at reducing seed production. In addition, treatments should occur before the flowering of the plant to reduce pollen production in order to avoid allergies.

Control measures will be determined depending on the situation in different habitats, climates, crops, levels of infestation and legal conditions in the countries.

Control

Priority areas for control should be private gardens, along roads and railway lines, on sunflower fields, wheat stubbles, construction areas, field and forest edges, river banks, surroundings of grain and fodder warehouses, oil mills, grain processing factories and fodder industry factories where contaminated plant material is stored or processed. House gardens can be starting points for invasion, therefore it is important to remove isolated individuals as early as possible.

Single stands of *A. artemisiifolia* can be controlled by private individuals. Suppression of larger stands (> ~20 plants) should preferably be undertaken by specialists. Each control action

should be repeated once or twice a year to ensure sufficient elimination. Success of control should be monitored **every year** before the flowering period of *A. artemisiifolia*.

In crops, some production techniques such as crop rotation and tillage and harrowing systems help to reduce *A. artemisiifolia* populations. Cultivation of cover plants causes a decrease in the number of seeds of *A. artemisiifolia* and prevents re-contamination of the fields.

Mechanical control

Mechanical control includes hand-pulling, cutting, vaporizing, burning, etc. When working with blooming plants, the respiratory tracts should be protected by a FFP2 particulate matter mask, eyes should also be protected. As contact allergenic reactions may occur, long-sleeved clothes and gloves will protect the skin from contact with the plant. Control of blooming stands should preferably be done in the afternoon as the pollen is mainly released in the morning.

Pulling out plants before seed ripening is efficient for small and medium sized populations. Non-blooming and non-fruiting plants shall be composted, pulled out plants should be stored so their roots do not have contact with the soil as they might regrow. Otherwise, plants pulled out from July onwards should be put in plastic bags and given for waste collection or burnt (requirements for the treatment of biowaste of plant origin to ensure its phytosanitary safety are presented in PM 3/66 *Guidelines for the management of plant health risks of biowaste of plant origin*, EPPO, 2006).

Chemical control

Chemical control is widely used in agricultural areas. For most crops, with the exception of closely related species (e.g. sunflowers), efficient herbicides exist (see Appendix 3 for active substance suggestions). The success of chemical control depends on the growth stage of the plant. Information on herbicide efficacy is provided in the technical literature accompanying the plant protection product. Chemical control is limited by legal restrictions for the use of herbicides and can have impacts on the environment if misused. The main limitation to chemical control is the possibility of resistance development. It is therefore advised that users do not rely on heavy use of single active substances, and care should be taken to diversify plant protection product use to limit resistance development (consult the resistance management area of the product label or contact the national plant protection authority for advice).

Verification of pest eradication

Chemical or mechanical measures should be conducted until there is no sign of *A. artemisiifolia*'s seedlings. As the seeds can survive for several years in the soil (up to 7 years on average), follow-up monitoring should be undertaken for several years.

Appendix 2 Containment programme

In the case of an established population, eradication is difficult to achieve and often, the objective is the suppression of the

plant. Containment measures aiming to prevent further spread of the pest to endangered areas or to neighbouring countries should be applied.

As for eradication, measures to prevent spread from an infested area should be applied (see Appendix 1). Treatment should also start before flowering to avoid allergies. Chemical and mechanical control (as described in Appendix 1) may be implemented to suppress populations of *A. artemisiifolia*. Applying a combination of different measures may prove more effective.

Mechanical control

In crops, some production techniques such as crop rotation mowing, tillage and harrowing systems help to reduce *A. artemisiifolia* populations.

- directly after harvest of the crop, perform a 8–10 cm deep plough of the stubble. Soon after harvest of a field destined to spring sowing, perform a 25–30 cm deep primary plough.
- in heavily infested fields with light soils where pre-winter ploughing has been performed, do not perform any soil work before sowing the crop. In these conditions, *A. artemisiifolia* seeds would germinate before the crop and should be harrowed.

In other situations, perform usual cultivation treatments.

Cultivation of cover plants causes a decrease in the number of *A. artemisiifolia* seeds and prevents re-contamination of the fields.

False seedbed should be done in March, prior to the sowing of the crop so that *A. artemisiifolia* grows before the sowing of the crop and can be destroyed.

Mowing (also repeated mowing) immediately before flowering will greatly reduce pollen production, but it will not kill the plants completely because of the ability of *A. artemisiifolia* to re-sprout. Mowing may be useful when other methods such as removing or herbicide application are not efficient (the population is too big) or have not been done on time. A 5 cm mowing at the vegetative phase will not prevent the plant from regrowing. The mowing height requires adjustment. For major infestations, it should be 2–6 cm. In case of dense Graminae cover, a 10 cm mowing height will prevent erosion and regrowth of *A. artemisiifolia*. Timing is crucial as it greatly influences the plant's biology. The following factors should be considered when mowing:

- mowing shortly after blossom (around mid-July till mid-August), and repeated four weeks later (mowing the new flower-heads) could lead to an increased production of female flower-heads and therefore an increased seed-production
- mowing before the beginning of seed production (beginning of September) impedes seed production. Nevertheless, release of pollen would not have been prevented
- mowing while seeds are mature should not be conducted as it would increase the risk of seed dispersal.

For greater efficiency, mowing should be combined with other control measures. Mowing before the blossoming in combination with an herbicide treatment on re-sprouted plants guarantees a highly efficient control.

As a catch-up operation, hoeing is efficient on sunflower at the 2 leaf stage when *A. artemisiifolia* is not very well developed, as well as on maize at a 2 leaf stage. Hoeing can also be done manually on small plots dedicated to the growing of vegetables and gives good results under dry conditions without rain.

Biological control

For the moment, no effective biological control agent is currently available for *A. artemisiifolia* in Europe. Further work is needed in this area.

Appendix 3

Examples of active substances that have been tested for control of *Ambrosia artemisiifolia* in different ecosystems are presented below. It should be stressed that the availability of products containing these active substances will vary nationally and other products may be available and effective. Indications of the approved uses for each active substance may be incomplete. Products should be used following the instructions on the label and in line with the relevant plant protection product regulations.

1 In crops other than sunflower

Active substance (a. s.)	Selectivity	Period of application	Crop on which the a. s. has been tested	Remarks
Linuron	Selective systemic	Pre- and post-emergence control	Cereals, potatoes	
Dicamba	Selective systemic	Post-emergence	Set aside, corn, cereals	
Clopyralid	Selective systemic	Post-emergence	Grassland.	Viability tests of seeds from regrowth of treated plants
Metribuzin	Selective systemic	Pre and post-emergence	Potatoes	
Glyphosate	Non-selective systemic	Pre-harvest, post-planting/ pre-emergence	Various crops	Viability tests of seeds from regrowth of treated plants
Glufosinate	Non-selective contact with some systemic action	Pre-emergence in vegetables	Various crops	Viability tests of seeds from regrowth of treated plants
Lenacil	Selective systemic	Pre-plant-soil-incorporated or pre-emergence	Potatoes, beetroot	
Isoproturon	Selective systemic	Pre- and post emergence	Cereals	To be used in spring
Orbencarb, Metribuzin	Systemic	Pre-emergence	Corn, faba beans, peas, cereals, potatoes, soybean	
MCPB	Selective systemic	Post-emergence	Corn, peas, cereals, potatoes.	Viability tests of seeds from regrowth of treated plants
Bromoxynil, Fluoroxypyr, Ioxynil	Selective contact	Pre-emergence	Cereals	
Terbuthylazine, S-Metolachlor	Selective systemic	Pre and post-emergence	Corn	
Aclonifen, Flurtamone, (Flurochloridone), Bentazone	Selective	Pre and post-emergence	Grain legumes	To be used in spring

Note: This table has been assembled on the basis of Bohren (2006), Bohren *et al.* (2008), Vacher *et al.* (2007) for active substances demonstrating efficacy between 95 and 100%. Country variations will apply and some active substances/uses may not be available. In European Member States, changes are currently being enforced as part of the EU review following the Annex I listings of actives substances under Directive 91/414/EEC.

This is not intended as an exhaustive list. Other active substances may be used but have shown efficacy lower than 95% according to this study.

2 In sunflower

Control of *Ambrosia artemisiifolia* in sunflower is extremely difficult, owing to botanical similarity between the weed and the crop itself. Only a limited number of herbicides can be used. These data are provided by CETIOM (<http://www.cetiom.fr>). There are various possibilities with Aclonifen + Flurtamone:

Aclonifen + Flurtamone used alone

Active substance	Selectivity	Period of application
Aclonifen + Flurtamone	Selective systemic	Pre-emergence

Aclonifen + Flurtamone used after Trifluraline

Active substance	Selectivity	Period of application
Trifluraline	Selective soil	Pre-emergence
Aclonifen + Flurtamone	Selective systemic	Pre-emergence

Aclonifen + Flurtamone used after S-Metolachlor

Active substance	Selectivity	Period of application
S-Metolachlor	Selective herbicide	Pre-emergence or early post-emergence
Aclonifen + Flurtamone	Selective systemic	Pre-emergence

Note: The comments regarding active substance/use availability mentioned under Table 1, also apply to the active substance.

Additionally, tribenuron-methyle has given good results (up to 70%) on tolerant sunflower (non-genetically modified). In association with adjuvant, efficiency reached 90% (Prioux & Bertin, 2007).