

Rivista Scientifica

Igiene e Sanità Pubblica

fondata nel 1945 da Gaetano Del Vecchio
già diretta da Gaetano e Vittorio Del Vecchio



*Custodit vitam qui custodit sanitatem
Sed prior est sanitas quam sit curatio morbi
(Flos Medicinae Scholae Salerni)*

The weeding of *Ambrosia artemisiifolia* and sanitary risks

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Elena Cerrato, Domenico Russo*

Estratto

Volume LXVII – N. 3 – Maggio/Giugno 2013

IgSanPubbl – Issn 0019-1639

www.igienesanita.org

Igiene e Sanità Pubblica

In collaborazione con:



**POLICLINICO
ITALIA**

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Redazione

Istituto Superiore di Studi Sanitari "Giuseppe Cannarella" - www.istitutostudisanitari.it

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Edizioni Panorama della Sanità - S.C.a R.L.

Piazzale di Val Fiorita, 3 - 00144 Roma

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IGIENE E SANITÀ PUBBLICA È INDICIZZATA SU MEDLINE E INDEX MEDICUS.

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Igiene e Sanità Pubblica - Periodico bimestrale a carattere scientifico

Reg. Trib. di Roma n. 4198 del 19.10.1954

Proprietà artistica e letteraria riservata

Accreditato SItI - Società Italiana di Igiene, Medicina Preventiva e Sanità Pubblica

The weeding of *Ambrosia artemisiifolia* and sanitary risks

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Key words *Ambrosia artemisiifolia*, weeding, allergy, asthma

Summary *Ambrosia artemisiifolia* is a potentially allergenic annual herbaceous plant coming from North America and widespread in Italy, where it can be easily seen since May-April. Its pollination is mainly windborne and each plant is able to produce billions of pollen grains. The pollen peaks are in the hottest days in the absence of rain and wind. In susceptible individuals, the great amount of pollen produced by this species may cause rhinitis and severe asthma attacks. Some allergic subjects can manifest disorders already at a concentration of a few granules per cubic metre. Chemical control is often practiced on a large scale and uses herbicides. A major risk is the result of the unprofessional use of chemicals by the population, especially in residential or very busy areas (eg railways, urban areas). In this paper we propose preventive measures of chemical hazards that may be resulting from the excessive use of plant protection products.

Il diserbo di *Ambrosia artemisiifolia* e rischi sanitari

Parole chiave *Ambrosia artemisiifolia*, diserbo, allergia, asma.

Riassunto L'*Ambrosia artemisiifolia* è una pianta erbacea annuale con potenzialità allergeniche proveniente dal Nord America e diffusa in Italia dove la si può facilmente osservare dai mesi di maggio-aprile. L'impollinazione è prevalentemente attuata dal vento ed ogni singola pianta è in grado di produrre miliardi di granuli pollinici. I picchi di diffusione di polline si hanno nelle giornate più calde, in assenza di precipitazioni e vento. In soggetti predisposti, la grande quantità di polline prodotto da questa specie, può causare riniti e gravi crisi asmatiche. Alcuni soggetti allergici possono manifestare disturbi già alla concentrazione di pochi granuli per metro cubo.

La lotta chimica è spesso praticata su vasta scala e si avvale di diserbanti. Un rischio notevole è conseguente all'utilizzo non professionale di prodotti chimici da parte della popolazione, soprattutto in aree residenziali o molto frequentate (es.: ferrovie, aree urbane). In questo lavoro si propongono misure preventive al rischio chimico che può essere conseguente all'eccessivo uso di prodotti fitosanitari.

Common ragweed or *Ambrosia artemisiifolia* L. is a North American species widespread in Italy and potentially allergenic. Some early records of its presence in Europe date back to 1863, in France and Germany. In susceptible individuals, the great amount of pollen produced by this species may cause rhinitis and severe asthma attacks. *A. artemisiifolia* is currently reported in several European countries, where it has become a major cause of hay fever in summer. The most common symptoms are rhino-conjunctivitis and asthma.

This species adapts easily to different environmental situations being able to colonize new lands in uncultivated and arid areas (e.g. gardens, railway ballasts, yards, roadsides, cultivated fields after harvest). It can be easily seen since the months of May-April.

A. artemisiifolia is an annual herbaceous plant belonging to the family Asteraceae having both male and female flowers on the same plant and is from 30 to 180 cm tall. The male flowers are borne at the end of the stems, the female ones are in the axils of upper leaves. Pollination is mainly carried out by wind.

Pollen, with a spheroidal shape, varies in size between 15 and 24 microns and its “sea urchin” aspect enhances its stinging potential. Every single plant is capable of producing billions of pollen grains that demonstrate a great capacity for diffusion into the atmosphere, with the peak in the mid-day, as pollen is released mainly during daylight hours. In periods of intense pollination, the maximum values recorded in Piedmont have also reached 200 grains/m³ of air, but it is possible to record over 1,000 grains/m³ of air. Pollen spread peaks take place in the hottest days in the absence of rainfall and wind. Some allergic subjects may manifest disorders already at a concentration of a few granules per cubic metre, but the concentration of 20 pollen grains per cubic metre is able to cause disorders in most allergic subjects.

The plant is usually present since the month of May and it can take 30 days to flower and 50 to produce seeds. Each plant can produce from 3,000 to 60,000 seeds able to survive for more than 40 years before germinating and they are spread thanks to their spinules by man, animals and even water.

The presence of this plant has been ascertained all over Italy (rarely beyond 1,000 m above sea level). It can be found also in the midst of crops such as in sunflower fields (this plant belongs to the same family of *Artemisia*).

For the classification of the plant one can ask for help to the local health

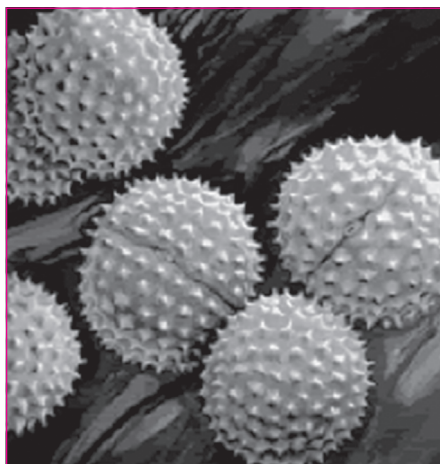


Photo of pollen grains (Taramarcaz P. et al., 2005)

authorities, as it happens in Piedmont. The “suspicious” plants should be collected with the roots, enclosed inside a waterproof plastic bag and kept cool (preferably in a refrigerator). The sample must be accompanied by a card with the following information:

- the collector’s identity and telephone number;
- the place of collection;
- the collecting date.

Problems caused to the population

It is a plant of American origin whose presence in uncultivated or abandoned areas, roadsides and railways, provokes pollen allergies, such as rhinitis, conjunctivitis and asthmatic bronchitis (sneezing, stuffy nose, watery eyes, itchy throat and eyes, shortness of breath). It causes allergic reactions due to exposure to pollen, but also because of the direct contact with the inflorescence (pruritic dermatitis). The allergy is developed through a sensitization phase and a reaction phase. *Ambrosia artemisiifolia* produces at least 22 known allergens, six of which are considered more important. The allergens can be spread even outside the flowering period.

Care must be taken not to confuse the allergic reaction generated by other antigens and the interaction with drugs that may cause false positives or negatives. One must consider that almost 1,800 different allergens have been identified (<http://www.allergome.org/script/statistic.php>).

It is estimated that presently, in Italy, the percentage of subjects allergic to pollen is about 10-15% of the population, and to make a comparison, it is over 12% in Switzerland or in France. The patients are predominantly polysensitized, namely sensitive to different species at the same time, such as Gramineae, Compositae and mites.

Individuals who suspect to suffer from these disorders should consult their doctor who, if appropriate, directs them to the allergy specialist to define the severity of the symptoms and to undertake a diagnostic (e.g. skin tests) and therapeutic

route (e.g. antihistamines). To identify correctly the patients suffering from diseases of this kind, the allergy skin tests are used. The tests evaluate numerous allergens at skin level. This permits to know precisely the substances to which there is an allergic sensitization.

The measurement of the appearance of a reaction to dermal exposure with a skin test is an essential test to confirm the IgE-mediated sensitization to allergic diseases in patients with rhino-conjunctivitis, asthma, urticaria, eczema and food and drug allergies. The skin test method through the appropriate use of specific allergens allows the determination of positivity in less than 20 minutes, by interpreting the appearance of a wheal of less than 3 mm in diameter. Another possibility is to measure the concentration of antibodies in the blood, but this procedure is longer and more expensive.

The health care costs, generated by allergic reactions to the pollen of this plant, are high. It is estimated that the Milano 1 State hospital had spent, in 2002, approximately 1,390,000 Euros to treat people allergic to *A. artemisiifolia* (pollen concentrations measured in the province of Milan, at Busto Arsizio, often exceeded 200 up to 700 pollen grains per cubic metre).

Preventive actions

In Italy, a local network for monitoring aero-dispersed pollen has been active for several years (e.g. since 2002 in Piedmont, www.arpa.piemonte.it). In the web, one can find information in the pollen weekly bulletin, updated with daily concentrations expressed in pollen granules/m³ of air. Monitoring is carried out with volumetric samplers placed in locations representative of the different regional realities.

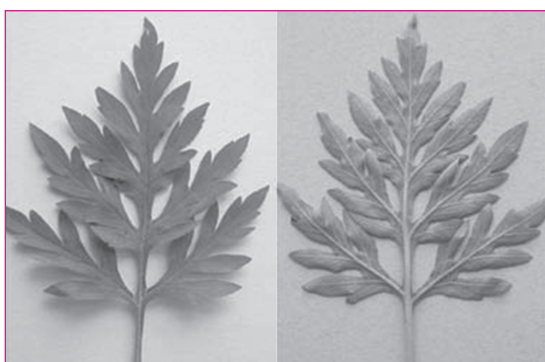
Among the activities that can be implemented to prevent the spread of allergies, the following should be noted:

- monitoring the presence and density of plants;
- arranging mows (the first one in June, a possible second one in July and a third one in August);
- the operator who is mowing must pay attention to do so before flowering and to wear protective equipment, such as glasses and mask (mowing may favour the spread of allergens, so it must be performed using special precautions against the spread of dust);

- allergy sufferers should avoid areas where these plants grow;
- attention must be turned to the possible inadvertent spread of *A. artemisiifolia* seeds with other seeds, with grain for birds (e.g. sunflower seeds), with the movement of soil and compost.

The use of chemicals (herbicides)

Chemical control is often practiced on a large scale and makes use of herbicides. It has the advantage of providing even just a single operation, which must be applied in a uniform manner only during the growth of the plant and in the absence of rain. The seeds already fallen from the plant can withstand the treatment, in which case the operation must be repeated in the next growing season.



Ragweed leaf: upper and lower side

A major risk is the result of the unprofessional use of chemicals by the population, especially in residential or very busy areas (e.g. railways). We do not recommend the routinary use of herbicides by non-professional operators to reduce the spread of this plant, because chemical control should consider the following aspects before being decided:

- The actual presence and density of plants in the different areas that need to be surveyed by specially trained personnel. The species name “*artemisiifolia*” recalls the appearance of the leaves that are very similar to those of *Artemisia vulgaris*, another Compositae extremely common in Piedmont, but much less dangerous from the allergenic point of view. It is therefore important not to confuse the two species, not to provoke unnecessary alarm.
- The indiscriminate use of chemicals promotes the onset of plants resistant to herbicides that may get difficult to eliminate in agricultural food crops. The presence of *A. artemisiifolia* has already been recorded as a pest of maize in Italy.

- The herbicide treatment should only be decided after evaluating the crossing of economic and health intervention thresholds to be evaluated with appropriate agronomic and health advice.
- There are no herbicides which are not dangerous for the environment. Today herbicides are increasingly found as unwanted residues in surface water and drinking water, and may be harmful to the fauna.
- There are no herbicides that harm only the target species, so many other plant species will be affected.
- There are no herbicides which are not dangerous to humans.
- Herbicides must be sprayed by trained personnel, using the personal protective equipment and calibrated instruments (atomizers), being able to read and understand the Material Safety Data Sheets, knowing the agronomic rules (e.g. buffer zones; distribution mode) and plant protection requirements for field distribution, capable of handling the maximum doses allowed (possessing, in Italy, the chemical spray license or being a technician, such as a land surveyor or an agronomist).
- The treatments made should be recorded (active ingredient, amount, date, treated areas).
- In urban areas, only the herbicides belonging to the lower hazard classes should be used and the drift risk must be avoided. Many herbicides affect only the growing plants, so they cannot be used preventively.
- Only the herbicides approved for this species must be used.
- The field treatment is followed by the definition of a re-entry time, i.e. a time interval during which the treated area should not be accessible to anyone (e.g. with appropriate signals of danger warning and access prohibition).
- Any waste products must be disposed of by authorized operators as they are hazardous wastes (e.g. empty containers).



Flower

- Herbicides in turn may, in some cases, favour the onset of health problems for both operators using them and the resident population in the treated areas, among which there is the increase of allergic and respiratory problems.

Therefore, it is convenient not to plan the use of chemicals (herbicides) if all the aspects derived therefrom, including those highlighted, cannot be managed. Any problems generated by unprofessional weeding in populated areas could be a disadvantage greater than the desired benefits. Therefore it is necessary to avoid inviting the population or any non-professional operator to use herbicides.

Among the best preventive measures there is the mechanical removal of plants and the good agronomic practice of not keeping fallow fields.

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