

AMBROSIA AND CLIMATE CHANGE, A PUBLIC HEALTH ISSUE

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CONTEXT / INTRODUCTION

Ambrosia, known in Greek mythology as the food of the gods, "sweeter than honey", is far from being a friendly plant, in reality.

Scientifically called *Ambrosia artemisiifolia*, this is a plant with North and South American origins whose presence has been felt in Europe since 1860, through allergies known to most inhabitants as "hay fever", this spreading in late summer and autumn often on the side of the road, in fields, in parks, in cereal crops, in peripheral urban spaces, not in high areas. It is an annual, perennial plant, which grows spontaneously and which needs a lot of sunlight. [3] Symptoms can range from simple sneezing, itchy eyes, nose, throat, and nasal congestion to severe complications, such as asthma. These reactions alter the quality of life and some patients end up moving to another country, where the air is cleaner and they can breathe easier.

Pollination of this plant begins in August and lasts until mid-autumn. The months of August and September are when the highest concentrations of ambrosia pollen in the air are recorded. A single ambrosia plant can release up to 30,000 seeds into the atmosphere. Ambrosia pollen grains can cause seasonal allergies in allergic people. The amount of pollen is highest between 10:00 and 15:00, but it also depends a lot on weather conditions. Ambrosia pollen can spread over large areas and can survive the winter, provided that temperatures do not drop very much.

Ambrosia is also a major agricultural concern on a large scale because it is a persistent and difficult-to-control weed, infesting almost all field crops and negatively impacting soil fertility. The costs associated with ambrosia control are estimated at several hundred million euros, both for public health and agricultural reasons. [4]

Trends in approach

The increase in cases of allergies caused by ambrosia has led to the need to regulate ways to reduce the spread of this plant and the harmful consequences caused by ambrosia for the health of citizens. Since 2018, the Romanian Government has adopted Law no. 62/2018 on combating ambrosia, with subsequent amendments and supplements. According to the legislation in force, local public administration authorities are obliged to annually identify the lands infested with ambrosia within their territorial area and

Ambrosia (Ambrosia artemisiifolia) is an invasive plant with highly allergenic pollen, which spreads rapidly, especially in urban and abandoned agricultural areas.

Increasing temperatures and the extension of the warm season favor both the early and prolonged flowering of ambrosia, as well as the production of a greater amount of pollen.

Ambrosia is one of the strongest causes of seasonal allergic rhinitis, triggering or worsening: bronchial asthma, allergic conjunctivitis, chronic respiratory problems. [1].

The impact on public health consists in the increase in the number of medical consultations, sick leave days and costs for the health system.

This plant is a clear example of a public health problem, directly influenced by the climate crisis, requiring integrated approaches: ecological, urban and sanitary to combat. [2].

Keywords: *Ambrosia, an aggressive allergen plant, global warming, public health programs*

to summon their owners or holders to take the necessary measures to avoid the establishment or spread of the weed. In addition, the following aspects are regulated:

- ⇒ the obligation to destroy ambrosia throughout the year;
- ⇒ the possibility for owners or holders of land, administrators of public roads, railways, watercourses, lakes, irrigation systems and fish ponds to request local public administration authorities to carry out weed control works, for a fee, if, for good reason, they cannot destroy it;
- ⇒ local public administration authorities may carry out weed control works, where owners or holders of land, administrators of public roads, railways, watercourses, lakes, irrigation systems and fish ponds have not done so, neither during the flowering period of the plant, nor following a warning issued by local authorities. [5].

Demographic trends

Ambrosia spread to Europe in the 20th century, especially during World War I, and can now be found in several European countries including France, Italy, Germany, Austria, the Czech Republic, Bulgaria, Ukraine, Russia, and Romania [4]. Some researchers believe that climate change will extend ambrosia problems in warmer regions into November, and for western countries such as Italy and Spain into December [1]. (Figure 1)

In Romania, ambrosia is found in almost all areas (except in the high hills and mountainous areas), preferring sandy, less fertile, slightly alkaline soils. According to the Ministry of Health of our country (www.ms.ro), it is estimated that, of the active population of Romania (9,000,000 people), a number of 482,000 people are allergic to ambrosia pollen, the majority of whom present rhinoconjunctivitis, a condition that over time evolves into asthma. These data highlight an increased prevalence of ambrosia allergy of 5.35% in the active population of Romania, which indicates increased morbidity. It is estimated that the population exposed to ambrosia pollen reaches

Figure 1 - Map of ambrosia in Europe in August

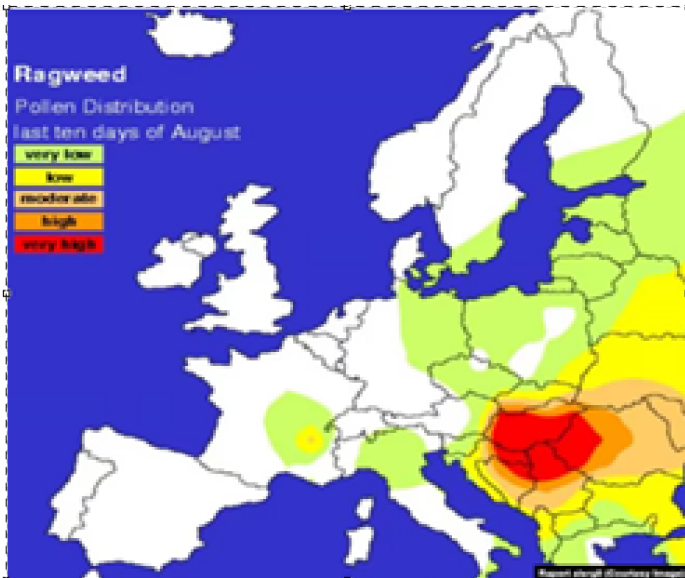
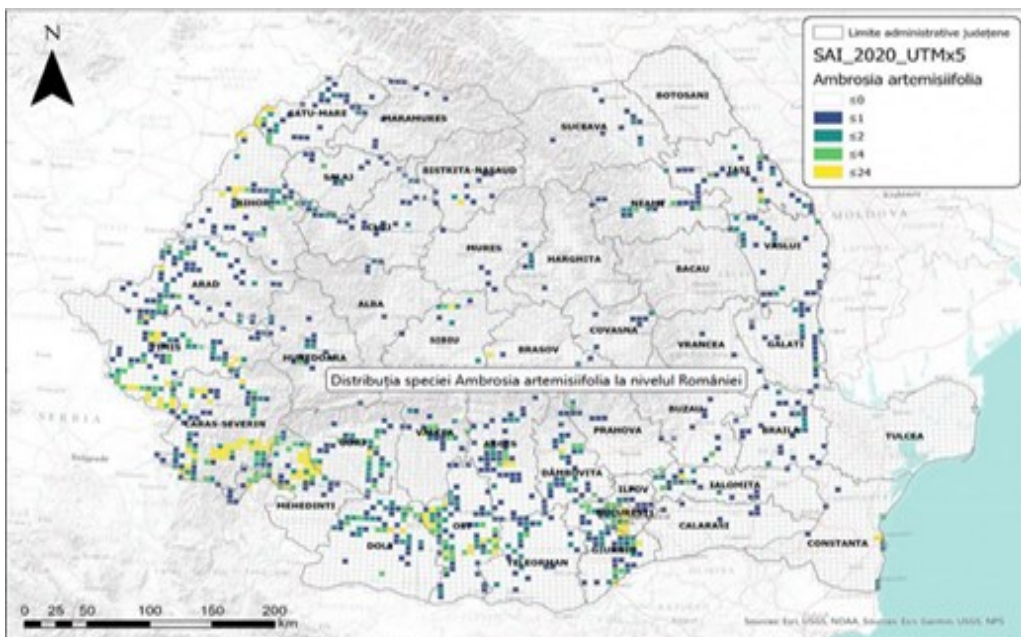


Figure 2 - Distribution of the species *Ambrosia artemisiifolia* (ambrosia) in Romania (2021)



6 million, most of whom are in the west of the country, the other regions being less affected. [4] (Figure 2)

Romania is considered a country practically infested with ambrosia, based on field observations in different regions, pollen counts in the Western region, and clinical reports from allergists in the western and southern parts of the country.

Ambrosia becomes the enemy when the nights are cool and the days are warm and dry. Its season usually begins in early August and ends after mid-October.

Collaborative, integrated approaches. Initiatives. Policies to combat ambrosia

The destruction of this weed is carried out in accordance with the legislation in force, they are obliged to inform in writing the local public administration authorities within whose radi-

us the infested land is located, in order to verify the application of the control works.

The ambrosia weed must be destroyed in the period between emergence and the appearance of the first inflorescences, respectively by June 30 of each year. In the event of the recurrence of infestation outbreaks, after this date or in the event of the appearance of new outbreaks as a result of changing pedoclimatic conditions, it is recommended to carry out the control works repeatedly throughout the vegetation period of the year, thus avoiding the appearance of inflorescences.

Farmers are getting help from scientists who examine weed behavior and can discover herbicides that work effectively and quickly and control the growth of weeds that are dangerous to both humans and crop yields. Globally, large companies have invested hundreds of millions of dollars in research, in recent years, to discover new molecules that will form the basis of highly effective protection products.

Proper use of herbicides will not have a negative impact on the environment. The widespread use of such innovative products by farmers will help protect people from the impact of strong allergens, such as ambrosia. [4]

A modern pollen monitoring system has been implemented in Timisoara, using state-of-the-art sensors and artificial intelligence.

It provides real-time information on pollen levels, allowing patients and doctors to better manage their exposure to allergens.

In addition, the system can monitor other airborne particles, including microplastics associated with pollution. [6]

It is estimated that 40% of the European population will be allergic to ambrosia pollen in the coming decades, a problem that requires urgent action. [6]

More and more European countries, as well as the USA, have reported an increase in the incidence of ambrosia allergy in recent years. One in five people with or without a history of allergic rhinitis reacts to ambrosia pollen.

There is a strong fight to eradicate it worldwide, and climate change organizations are drawing attention to the increasing number of allergenic factors reported in this context. [6]

Current Issues in Ambrosia Allergy Management

Once ambrosia is widespread in a country, it is much more difficult to control, the amount of pollen we receive is increasing, and ambrosia seems to cause strong reactions in the body. Normally, the immune system defends the body against viruses and bacteria, to remove infectious agents.

In the case of allergic people, the immune system mistakenly interprets the pollen as a dangerous substance. A natural substance called histamine is released

when the body encounters ambrosia pollen. The body's reaction leads to irritating manifestations such as sneezing, watery nasal discharge, nasal congestion, and itchy eyes or throat irritation. The allergy is unlikely to go away once it has developed.

Global warming and two anticyclonic currents that keep the pollen in the air contribute to the development of the plant and, at the same time, to the extension of the allergy season.

“There is also a genetic factor, if one parent is allergic, the child has a 50% risk of becoming allergic, if both parents suffer from allergies, the child has an 80% risk of being allergic.

Exposure over 3, 4, 5 years to ambrosia pollen will lead to allergies even in those who are not initially allergic. Hence the conclusion of our study together with the University of Vienna, that in Europe, especially in the Pannonian Plain, in two decades almost half of the population will be allergic to ambrosia or other allergens.” [7]

Non-respiratory comorbidities may include conditions such as atopic dermatitis and oral allergy syndrome. These conditions may arise as a result of an exaggerated immune response to ambrosia allergens, manifesting outside the respiratory system.

It is important that these comorbidities are assessed and managed appropriately to reduce the impact on the patient's quality of life.

The high costs of ambrosia allergy can be determined by both the severity of symptoms and the high level of associated comorbidities. These factors contribute to the increased resources required for treatment, monitoring, and patient management, resulting in higher costs for the healthcare system and the patient.

A significant problem in the management and control of this invasive plant is the lack of rehabilitation programs that determine the difficulties in reducing its spread and the negative impact on public health and the environment.

Strategies for improving ambrosia allergy management

- Implementation of rehabilitation and control programs is essential to limit the spread of ambrosia and to protect the population from allergies by mapping and monitoring infested areas and introducing early eradication measures and maintenance of green spaces;
- Implementation of integrated programs, which ensure an efficient transition between diagnosis, treatment and monitoring through multidisciplinary teams formed by specialist doctors (allergology, pulmonology), nurses, physiotherapists (for cases with respiratory impairment), social workers (for logistical or educational support). Electronic medical records are also useful to ensure a coherent flow of information between medical specialists. Also, the development of digital infrastructure for managing medical data and coordinating multidisciplinary teams.
- Prevention programs focused on public information campaigns about the risks of ambrosia allergy and methods of combating this plant, with the support of the mass media.
- Legislative support is essential, through the application of Law no. 62/2018 on combating ambrosia, periodic controls and fines for failure to maintain land on which ambrosia is identified.

- Community support is equally important through community involvement in ecological volunteer programs and granting local subsidies for cleaning works on affected land
- Another important medical approach consists of facilitating access to modern treatment for specific immunotherapy (allergy vaccines) and developing guidelines for drug management: antihistamines, corticosteroids, bronchodilators, as well as partial reimbursement of treatments in severe cases.
- Implemented at national level of a modern pollen monitoring system that uses state-of-the-art sensors and artificial intelligence.

Health Policy Recommendations:

Intersectoral collaboration is useful by introducing and strengthening partnerships between the Ministry of Health, the Ministry of Environment, local authorities and communities for a unified and efficient management of the problems caused by ambrosia.

At the same time, visible results are also obtained by supporting the development of local regulations that include measures adapted to the specific area.

Conclusions:

To manage and combat ambrosia we propose:

1. Identification and monitoring of ambrosia

- Mapping of ambrosia infested areas using digital methods and regular inspections.
- Monitoring the evolution of the ambrosia population and the level of pollen in the air.

2. Control measures for ambrosia using mechanical, chemical, biological and agronomic methods

- Mechanical eradication by cutting, pulling and burning ambrosia before flowering.
- Application of controlled chemical treatments, with authorized substances, in hard-to-reach areas.
- Crop rotation and use of cover crops,
- Revegetation of areas with competitive native species after ambrosia removal.
- Creation of ecosystems resistant to biological invasions of ambrosia.
- Maintenance of biodiversity to reduce susceptibility to ambrosia invasions.

3. Involvement of the community and authorities

- Informing and involving citizens in activities to combat and prevent ambrosia.
- Collaboration between local authorities, the Ministry of Health and the Environment for unitary strategies.



- Enforcement of the law and sanctioning owners who do not maintain their lands on which ambrosia has been identified.

4. Education and prevention

- Public awareness campaigns on the risks of ambrosia allergy and methods of protection against ambrosia.
- Training of medical personnel for early diagnosis and treatment of ambrosia.
- Promotion of preventive measures in schools and communities against ambrosia.

5. Clinical management of ambrosia allergy

- Accurate diagnosis and monitoring of symptoms in allergic patients.
- Drug treatment and specific immunotherapy.
- Psychosocial support for patients and families.

The success of management strategies depends on their perseverance in the long term, as well as on the coordination of efforts at regional, national and cross-border levels

References

1. European Association of Allergy & Immunology - EAACI (2021) – Ragweed allergy and public health
2. WHO (2021) – Climate change and health
3. De ce apare alergia la ambrosie, cum se manifestă și cum scapi de ea <https://www.medlife.ro/articole-medicale/de-ce-apare-alergia-la-ambrosie-cum-se-manifesta-si-cum-scapi-de-ea>
4. <https://www.corteva.ro/noutati/comunicate/ambrosia-o-buruiana-care-si-a-gasit-leacul.html>
5. Legea nr. 62/2018 privind ambrosia cu modificări și completări ulterioare
6. Cum să folosești tehnologia pentru a te proteja de buruiana de ambrosie. Inovația unui tânăr din Timișoara <https://romania.europalibera.org/a/solutii-alegerie-ambrosie/33193600.html>
7. Creștere alarmantă a alergiilor provocate de ambrosie. Avertisment al Societății Române de Alergologie, pentru autorități <https://alba24.ro/crestere-alarmanta-a-alergiilor-provocate-de-ambrosie-avertisment-al-societatii-romane-de-alergologie-pentru-autoritati>