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The "Berlin Action Programme against Ambrosia"

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ABSTRACT: During the hot summers of 2003 and 2006 the two Berlin pollen traps of the Institute of Meteorology (Free University Berlin) detected the first very high exposure (60 pollen grains per m**3 air) of Ambrosia pollen. In early 2009 interested groups and individuals in Berlin founded the "Berlin Action Programme against Ambrosia" (www.fu-berlin.de/ambrosia). The aim of the information and action network is to prevent the spread of Ambrosia in Berlin and to minimize the occurrence. Information from, and participation of the general public, systematic surveys and mapping, the systematic removal and monitoring of habitats and the expansion of the network are the key objectives. "Ambrosia Scouts" have been searching 9 out of 12 districts of Berlin systematically, eliminating Ambrosia plants and mapping sightings in the public internet based „Ambrosia Atlas".

An important conclusion of the "Action Programme" is that annual *Ambrosia artemisiifolia* occurs mainly in the western part of Berlin and is usually spread through bird food. In the eastern part, one finds mainly the perennial *Ambrosia psilostachya*, which is spread by earth moving during construction activities. 90% of the 1281 populations documented in 2010 were classified as *Ambrosia artemisiifolia* (some 65,000 plants). Only 10% were *Ambrosia psilostachya* but set against the vast number of 1.5 million plants. 95% of the *Ambrosia artemisiifolia* populations could be eliminated, but only 45% of the perennial Ambrosia.

Therefore, *Ambrosia artemisiifolia* habitats can be combated effectively by „Ambrosia Scouts" and the general public. The vast expansion of *Ambrosia psilostachya* is Berlin's greatest problem.

KEYWORDS: Ambrosia, "Action Programme", Ambrosia allergy, *Ambrosia psilostachya,* health

1 INTRODUCTION

The neophyte *Ambrosia artemisiifolia* is a wind-pollinated plant of North American origin which found its way to Europe in the 19th century in the form of contaminated seeds. It generally remained casual because its vegetation cycle was seldom concluded before the first frost. At the beginning of the 20th century contaminated seeds from the USA came once more with Ambrosia to Hungary (Marka et al. 2004). On account of favourable climate conditions the plants were able to complete their entire life cycle on farmland and became naturalized. During the following decades the Ambrosia was spread to North Italy and France.

Ambrosia pollen are one of the main allergens in the USA and have a very high allergy potential (Banken & Comtois 1992). Thus, in North America 10-20% of the population react allergically to Ambrosia (Alberternst et al. 2006). In Hungary 65% of the population are sensitive to pollen, of which 60% already react to Ambrosia. It is especially alarming that the number of the patients with allergic reactions has doubled within 40 years and the number of those with asthma has even quadrupled (Marka et al. 2004).

Progressive climate warming in recent decades has brought about good weather conditions for Ambrosia in Germany and also in Berlin. Therefore, the Ambrosia pollen flight is an increasing health danger for the population in Germany. Besides the annual *Ambrosia artemisiifolia*, Berlin is also home to the perennial *Ambrosia psilostachya*, the fight against which is a particular challenge.

In early 2009 the „Berlin Action Programme against Ambrosia" was founded. This information and action network aims to prevent the propagation of Ambrosia in Berlin, to minimise its increased population and to investigate its effects on the Berlin citizens. This should be achieved via information of the public, mapping of sightings (monitoring), the removal of any plants found, the investigation of methods of propagation of the plants typical for Berlin and by data elevations with lung specialists and allergists with regard to the level of sensitivity of the Berlin population towards Ambrosia.

2 MATERIAL AND METHODS

Since 2008 two employment services in Berlin have tried to re-integrated long-term unemployed people into the job market by engaging them in biological programmes involved in the search and the removal of Ambrosia in the city. These measures find the approval of, and are financed by the job centres of 9 of 12 Berlin's districts. In each of the 9 districts approx. 20 people, the so-called „Ambrosia Scouts", search their respective district systematically.

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The basic idea of the „Berlin Action Programme against Ambrosia“ is the combination, coordination and aggregation of all potential and resources of everyone in the city who wants to contribute something to the fight against Ambrosia. There is as yet no financial support from the government.

The Institute of Meteorology (Free University of Berlin) has brought the “Action Programme” into being as a voluntary network together with the Senate Department of Urban Development (protection of plants office), the Senate Department of Health, Environmental and Consumer Protection, the employment services "meco gGmbH" and "trias gGmbH", and the Botanical Garden and Botanical Museum (Free University of Berlin), as well as some of the Berlin district councils.

2.1 Information

Information of the general public about the Ambrosia problem is sourced directly via the internet page of the “Action Programme”, and indirectly by the press which is kept informed by means of regular press conferences about the situation in Berlin. Moreover, printed flyers are in public places with high visitor numbers (zoological gardens, botanical gardens, leisure parks, to civil offices, etc.). The entire population of Berlin is invited to actively participate in the fight against Ambrosia.

2.2 Monitoring

Monitoring occurs mainly via the „Ambrosia Scouts“ who are given extensive training before every season on the biology, appearance, potential areas under threat and the fight against the two types of Ambrosia concerned. Armed with this knowledge they search their district systematically, collecting all relevant meta data and taking a photo of the location as they go.

In order to document and archive the findings, the internet-based „Ambrosia Atlas“ (www.fu-berlin.de/ambrosia) was programmed. The „Ambrosia Atlas” is a map with connected data base for the meta data pertaining to all detected habitats. It is part of the Ambrosia web page where the public is extensively informed about the problem and can also submit own sightings. For verification purposes a sighting can be only be submitted together with a photo.

The „Ambrosia Scouts“ register their own findings daily in the “Ambrosia Atlas” and verify the findings of the public. Only verified findings are visible in the „Ambrosia Atlas“ for everyone. Also the Departments of Parks and Gardens of some districts take part voluntarily, resource-permitting in the monitoring and removal of the plants.

2.3 Combatting and controlling

The „Ambrosia Scouts“ remove, wherever possible, any plants found in their districts. They wear protective gloves as a matter of course. If the plants are in bloom, pulling them out is only permitted whilst wearing a facemask. The general public is also encouraged to remove the plants.

Areas already checked are re-checked by the scouts a number of weeks later. All activities pertaining to any habitat are registered as meta data and made openly available. Berlin’s railways have some very big disused sites with up to one million *Ambrosia psilostachya* which owner “Deutsche Bahn AG” partly cut down at least in 2010 shortly before blossoming.

2.4 Health, allergy test

Up to now there have been no big clinical studies which provide information about the sensitivity of the Berlin population towards Ambrosia. To gain a first insight into this, more than 500 specialists were asked in Berlin to test their patients by means of allergy tests for Ambrosia and to submit prick test results for evaluation.

The prick test is a simple skin test that allows a statement about a person’s reaction towards certain allergens. The test procedure is described by (Wehrmann & John in 2008) and (Ruëff et al. in 2010). In case of an allergic reaction a wheal develops on the arm, the size of which is an indication of the degree of sensitivity of the person concerned. The test is diagnostically valid a wheal of at least 3 mm in diameter appears under the histamine lotion. The size of the Ambrosia wheal indicates the degree of sensitivity. A positive reaction permits no conclusions on clinical relevance. Even if a person is sensitive to certain materials, discomfort is not a foregone conclusion. However, if the Ambrosia wheal is greater than or equal to the histamine one, it is very likely that the patient would show symptoms during a provocation test.

3. RESULTS

3.1 Information

During the last three years increased knowledge about the Ambrosia problem has been ascertained within the Berlin population. Also the use of the Ambrosia web site has clearly increased. However, there are no objective studies up to now. Thankfully, the number of confirmed Ambrosia sightings by the general public rose from 91 in 2009 to 144 in 2010. The participation of the general public was clearly

higher, however, the recognition rate lies only between 50-60%.

3.2 Monitoring

In Berlin a total of 1280 Ambrosia sightings were made in 2010. In 2007 there were 121, in 2008 only 95 and 737 were discovered in 2009. Systematic searching began only in 2009, in 2010 most intensely. Hence, a real increase in the spread of the plant is not determinable yet. It is remarkable that the spread of Ambrosia is clearly stronger in the eastern part of the city, than in the western part (see Fig.1). 781 sightings in the two southeastern districts of Lichtenberg and Treptow-Köpenick alone, account for more than 60% of all habitats.

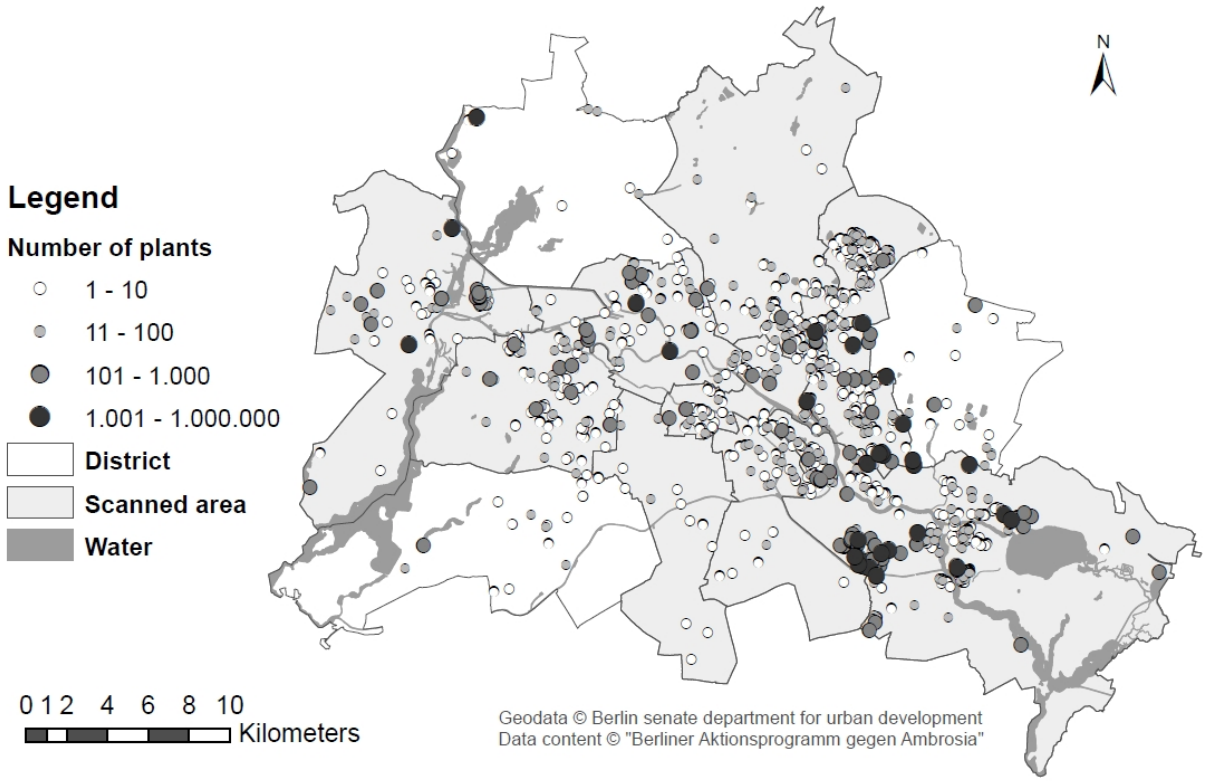

Figure 1. Ambrosia habitats according to size. In the districts of Berlin coloured white there were no „Ambrosia Scouts“ in 2010: here information on sightings came primarily from the general public.

Nearly 97% of all plants were counted in 30 large habitats of more than 1000 plants. 65% of the habitats are small with up to 10 plants. Problematically for Berlin are the large stocks of *Ambrosia psilostachya*, mainly observed in the districts Lichtenberg and Treptow-Köpenick. In recent years, huge habitats with several thousand plants developed.

In 2010 127 habitats of the perennial *Ambrosia psilostachya* were discovered in Berlin (Fig. 2) which with approx. 1.44 million plants are bigger by far, than the stocks of *Ambrosia artemisiifolia*: 1147 in number with only 65,000 plants. The biggest Ambrosia habitats in Berlin are rather old habitats of the *Ambrosia psilostachya* and are on disused land belonging to a former marshalling yard in the Wuhlheide. Three areas have been discovered so far with a total of 1.2 million plants.

If one compares the districts systematically searched by „Ambrosia Scouts“ in the Eastern Berlin (Lichtenberg, Mitte, Treptow-Köpenick) with those in the western part of the city (Charlottenburg-Wilmersdorf, Neukölln, Spandau und Tempelhof-Schöneberg) a significant difference is apparent. In the western part of the town 96% of the habitats and 80% of the plants are of the type *Ambrosia artemisiifolia* and only 3% of the habitats and 20% of the plants of the type *Ambrosia psilostachya*.

In the eastern part of the town 87% of the habitats and only 2.7% of the plants are *Ambrosia artemisiifolia*, however, 12.7% of the habitats and 97% of the plants are *Ambrosia psilostachya*. This can be explained by the extensive construction activity which has been carried out in the eastern part of the city since reunification.

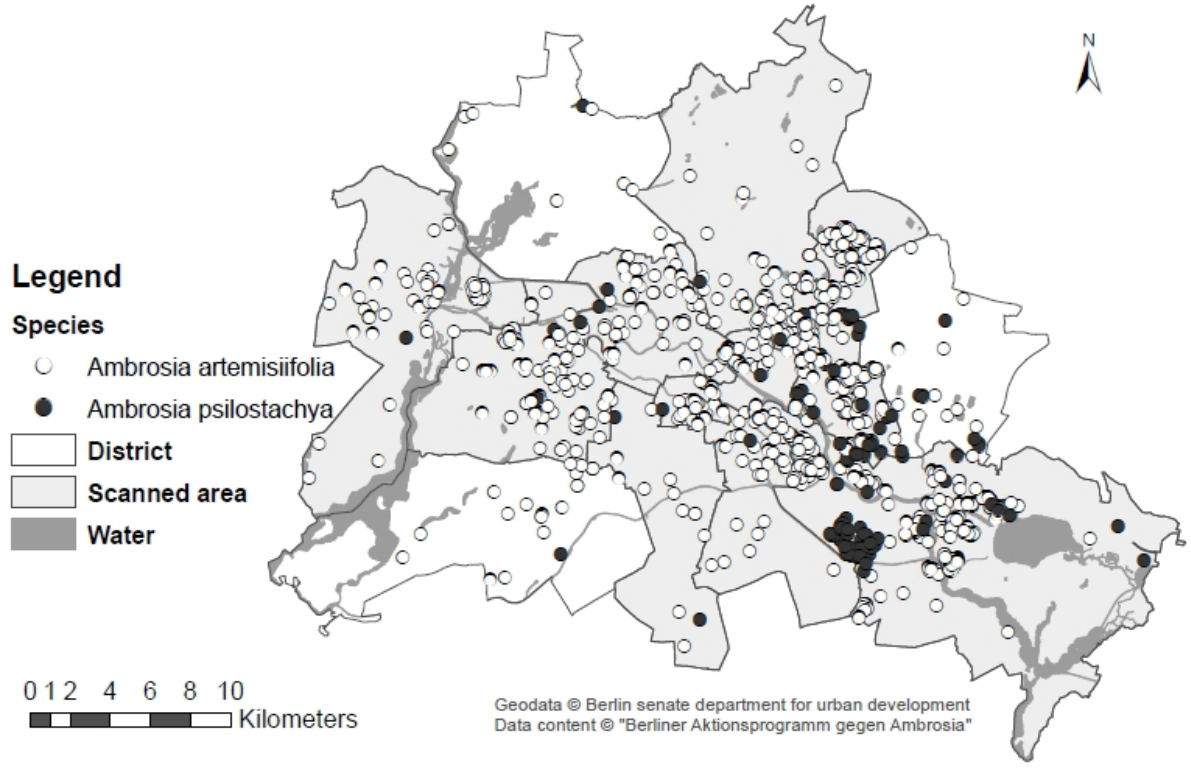

Figure 2. Distribution of *Ambrosia artemisiifolia* and *Ambrosia psilostachya* occurrences in Berlin 2010

3.3 Types of propagation

In Berlin the existence of *Ambrosia artemisiifolia* is mostly (35%) caused by distribution of birdseed which was contaminated with Ambrosia seed (396 habitats, 17,200 plants). However, *Ambrosia psilostachya* is spread in Berlin primarily (32%) by the transport of earth containing Ambrosia seed and rhizom residue within the scope of construction activities (42 large stocks with 49,000 plants). Where this earth was stored in the interim, is yet unknown.

After reunification many new streets and residential areas were built primarily in the eastern half of the city, with the gigantic amounts of earth material being shifted as a result. This explains the numerous populations of *Ambrosia psilostachya* in areas with new infrastructure. An "unquantifiable" propagation was determined for 61% of the stocks. Whether, how and how quickly large and old Ambrosia habitats spread out over disused railway land remains to be seen over the coming years.

3.4 The fight against Ambrosia

The success of continuous monitoring and the fight against *Ambrosia artemisiifolia* is pointed out by the district of Friedrichshain-Kreuzberg. In the first year of the monitoring (2008) in this district 36 habitats with approx. 1,000 *Ambrosia artemisiifolia* plants were found which originated primarily from birdseed.

95% of the stocks and 98% of the plants were removed in 2008. In 2009 the number of newly discovered habitats rose to 104, having approx. 2,200 plants. Only 4 stocks (15 plants) were not removed. After two years of monitoring and respective measures to combat Ambrosia, only 63 habitats (approx. 1,100 *Ambrosia artemisiifolia*) were discovered in 2010, 99% of that was removed. In inner-city areas where mainly the *Ambrosia artemisiifolia* exists, a permanent reduction of the plants should be possible assuming regular measures are taken in fighting them.

All together almost 91% of the populations (Tab.1) were removed in 2010 by the „Ambrosia Scouts“ and the help of the public. However, this success is attributable to the less abundant and more easily eliminated *Ambrosia artemisiifolia*. 96% of the small stocks have been removed.

size in plants	number	removed	
1 up to 10	833	803	96.4%
11 up to 100	322	273	84.8%
101 up to 1000	95	66	69.5%
> 1000	30	18	60.0%
total	1280	1160	90.6%

Table 1. Removed Ambrosia habitats in 2010 according to size

Unfortunately, only 45% of the largest stocks (> 1000 plants) of the *Ambrosia psilostachya* could be removed. In Fig. 3 an accumulation of not yet eliminated stocks in the southeast of Berlin can be identified. These are mostly habitats with more than 1000 plants of the *Ambrosia psilostachya* which have originated from earth movement within the scope of construction activities. Given the volume of these habitats, they could not be removed by the „Ambrosia Scouts“ by hand.

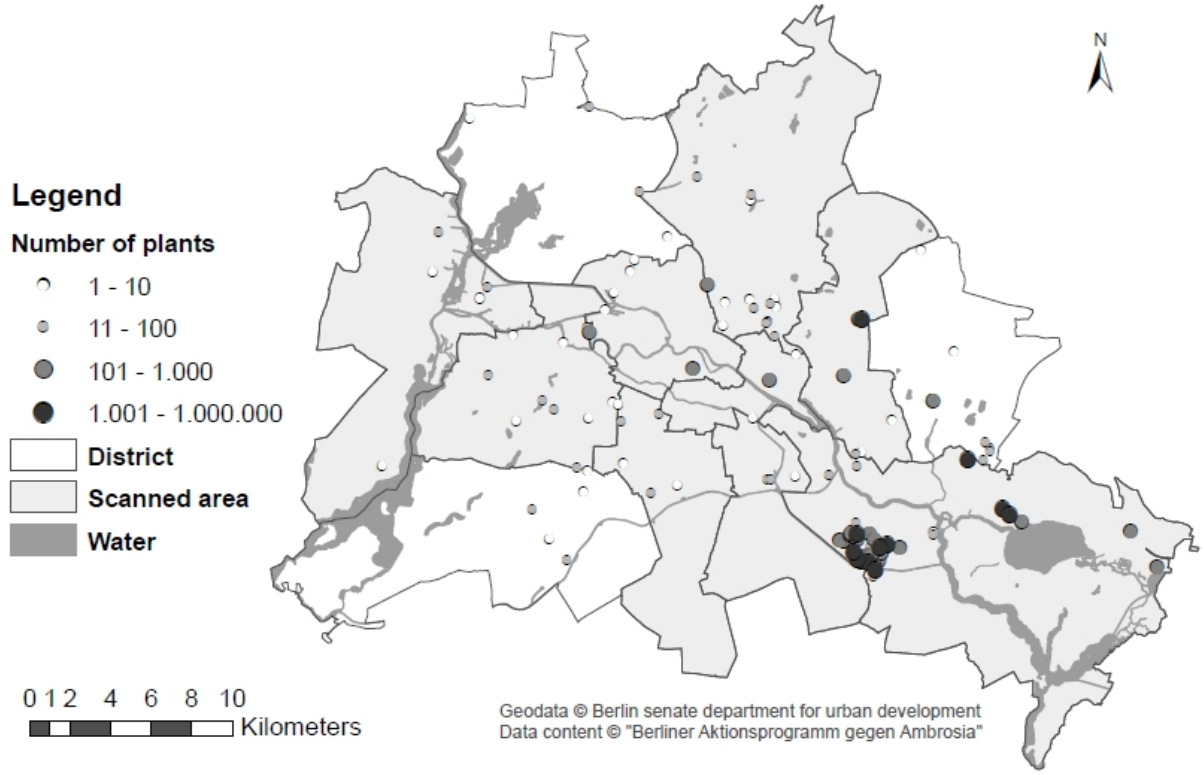

Figure 3. Ambrosia sightings not removed in 2010

The fight against *Ambrosia psilostachya* is very problematic and has not yet proven sustainable. Since ripping out the plants very often leaves rhizom residue in the ground, renewed growth is very likely in the following years (Basset & Crompton in 1975). Furthermore, the seed populations underground will be also rather high on account of their partial long-term propagation. The mowing of the large rail sites limited the pollen flight in 2010 only, but will have no lasting effect.

3.5 Pollen exposure

The Ambrosia blossoms in Berlin over the period from the end of July until the beginning of October with the main blossom in August. Furthermore, the threshold value relevant for allergy sufferers of approx. 10 pollens per m**3 air (Banken & Comtois 1992) was surpassed in 6 out of 13 years in the period from 1998 to 2010 and in 2006 even 60 pollen per m**3 air were reached. However, on account of the respective weather conditions, we can assume that the maximum values do not only come from regional sources, but also via long-distance flight, perhaps from the southeast of Brandenburg.

3.6 Health, allergy test

Since beginning of August, 2009 approx. 30 doctors have submitted their test results for evaluation. From August, 2009 to April, 2011 1866 patients were tested on their reactions to Ambrosia. Out of 1014 people who were examined in the season from August, 2009 to July, 2010 for their reactions against Ambrosia pollen, 107 people (10.6%) developed a wheal. In the case of 54 (5.3%) of those tested, the wheal was bigger than or equal in size to the histamine wheal. First data became available for the season from August, 2010 to July, 2011. Thus, in the period from August, 2010 to April, 2011 852 patients were tested from whom already 125 (14.7%) are already sensitive towards Ambrosia and 45 (5.3%) have probably developed an allergy towards Ambrosia.

From both years it is evident, that in Berlin the public allergy rate is between 10-15%. The

increase of from 10.6% to 14.7% within one year is statistically significant if the numbers for July 2011 were also to be at this level. Though no final conclusion on clinical relevance can be drawn from this test compared with Ambrosia pollen, there is a certain likelihood that approx. 5% of Berliners could already show an allergic reaction the next time they come into contact with the Ambrosia pollen.

4. DISCUSSION

Especially data derived during 2010 show that Ambrosia is already widespread in Berlin and is course to become naturalized. It is also noteworthy that the general public's sensitivity towards Ambrosia has increased in just one year. As such, respective clinical studies should be carried out. Only data acquired via the „Ambrosia Atlas" makes clear the extent of *Ambrosia psilostachya's* coverage in Berlin.
Huge habitats on disused railway sites and the high number of larger *Ambrosia psilostachya* habitats as a result of earth movement at construction sites poses a upcoming health problem, primarily in the eastern part of Berlin. The construction industry must be informed about this problem, furthermore, the awarding of public contracts could be accompanied by the provision of documents outlining the prevention of contamination of the earth by Ambrosia.

Unfortunately, the two Berlin pollen traps are set up in the city in such a way that pollen from huge habitats in the eastern part of Berlin carried by the prevailing western winds are barely measured. An experiment with passive pollen collectors should hopefully reveal insights into the pollen load in these problem areas this year.

The unchecked propagation of the Ambrosia must be controlled as quickly as possible. Only then a further significant increase in allergy sufferer' numbers and resulting costs for the health system can be prevented. Unfortunately, less „Ambrosia Scouts" will probably be made available in 2011 by the employment agencies for economic reasons, so that the success of the past years is put into question.

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