The Rhône valley and beyond, a spreading area for Ambrosia: 98 years of pollen counts

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In France there is a rumour about *Ambrosia* pollen counts

« They are increasing »…

- Of course, we know that short ragweed is spreading in our country…

- The **aim** of the study is to try to evaluate the changing tendency of *Ambrosia* pollen counts in the **polluted areas**: Rhône valley but also **beyond**.

- Are studied: **the weekly season average**
  **the weekly pollen peak**
  **the length of the allergic risk**
  **the length of the invalidating allergic risk**
Our material is a Cour’trap

- This sensitive pollen trap allows for significant measurements as from 0.1 pollen grains per m³ of air.
- It has been operating at Lyon-Bron since 1982.

So, AFEDA has defined in 1990, thresholds and a pollen peak:

- "T.0.1 – T.5 – T.100 " are corresponding to a weekly pollen concentration average/m³ of air,
- Threshold 5 is reached when rate is ≥ 5 pollen grains: it starts the period of the allergic risk,
- Threshold 100 is reached when rate is ≥ 100 p. grains: it starts the period of the invalidating allergic risk,
- So we have defined the length of the allergic risk and the length of the invalidating allergic risk.
We present two kinds of results

1. Areas where measures were realized in 1984 and later, beyond the Rhône valley: Nevers, Ambérieu-en-Bugey
   on the Rhône valley: Lyon-Bron, Montélimar.

2. Other areas that were not included in the 1984 project: beyond the Rhône valley: Vichy, Dijon, Angoulême, Lyon-Saint-Exupéry,
   on the Rhône valley: Vienne, Valence.
The Rhône valley

In France, the Rhône valley is situated on each side of the Rhône river downstream from Lyon.

2 elements favoured ragweed spreading around Lyon:
• the wonderful extension of the city to the East.
  Urbanisation progressively took the place of the polluted cultures that before being built-up became fallow lands or abandoned lands during one season or more;
• then, spreading to the South. 5 kinds of means of communication drove to the Mediterranean Sea: the Rhône, national roads: N7 and N86, a motorway, the French high-speed train.
After the first measures realized in Lyon in 1982 and 1983, 1984 measures showed that in France, Lyon was the area the most polluted by *Ambrosia* pollen.

1) Areas where measures were realized in 1984 and later

beyond the Rhône valley:
Nevers, Ambérieu-en-Bugey

on the Rhône valley:
Lyon-Bron, Montélimar
Nevers: 190 km North-west Lyon and Rhône valley. Since 1984 to 2007, weekly season average: increase 2.5 times

2007 - 2011 36 weeks (+9 in 1984)

Weekly season average: decrease
Weekly pollen peak: decrease

Length of allergic risk: decrease
Length of invalidating allergic risk: nil

Lyon March 28-29 2012
Ambéria: 46km North-east Lyon and Rhône valley
Since 1984 to 2005, wsa: increase 5 times
2005-2011 63 weeks (+9 weeks in 1984)
Weekly season average: moderate increase
Weekly pollen peak: moderate increase
Length of the allergic risk: increase
Length of the invalidating allergic risk: stable
Ambrosia pollen evolution in Drôme department: Montélimar, 1984-2011

1998 no rain pollen peak

Weekly average concentration/m³

Year


R² = 0.0352

R² = 0.001

Weekly pollen peak
Weekly seasonal average 32-39

Ambrosia pollen evolution in Drôme department: Montélimar, 1995-2011

1998 no rain pollen peak

Weekly average concentration/m³

Year


R² = 0.0352

R² = 0.001

Weekly pollen peak
Weekly seasonal average 32-39

Rhône valley:
Montélimar
134 km South Lyon

Since 1984 to 1995
Weekly season average:
increase: 2.5 times 1995-2011
135 weeks (+9 in 1984)

- Weekly season average: stable
- Weekly pollen peak: decrease
- Length of allergic risk: increase
- Length of invalidating allergic risk: stable
Ambrosia pollen evolution in Rhône department: Lyon-Bron

\[ R^2 = 0.4304 \]

Weekly average concentration/m

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<tbody>
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<td>60</td>
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<td>140</td>
<td>150</td>
<td>160</td>
<td>170</td>
<td>180</td>
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</tbody>
</table>

Weekly average concentration/m

1982-2011, Wsa & pollen peak: decrease

Ambrosia pollen evolution in Rhône department: Lyon-Bron

\[ R^2 = 0.0747 \]

\[ R^2 = 0.134 \]

Weekly seasonal average

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<td>550</td>
<td>600</td>
<td>650</td>
<td>700</td>
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Weekly pollen peak

Length of allergic risk: decrease
Length of invalidating allergic risk: decrease

Common Agricultural Policy

A pollen evolution: Lyon-Bron, later

\[ R^2 = 0.8701 \]

\[ R^2 = 0.0174 \]

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Length of allergic risk: decrease

Rhône valley: LYON-Bron: 270 weeks (+ 9 in 1984)
1982-2011, Wsa & pollen peak: decrease
So for the areas measured in 1984, when there are later measures, we see that:

- till the first analysis, Ambrosia pollen concentrations increased: from 2.5 to 5
- on the contrary, from the last years (5 to 10) tendancy is a decrease

Ambrosia pollen evolution in Rhône department: Lyon-Bron

\[ R^2 = 0.1339 \]

\[ R^2 = 0.033 \]
Other areas that were not in the 1984 project:

beyond the Rhône valley:
Vichy, Dijon, Angoulême

on the Rhône valley:
Vienne, Valence
Vichy, Dijon, Angoulême: every criteria increases, except one that is stable

Ambrosia pollen evolution in Allier department: Vichy

- Weekly seasonal average
- Weekly pollen peak

\[ R^2 = 0.8526 \]

Ambrosia pollen evolution, Allier department: Vichy

- Length risk allergic
- Length invalidating allergy risk

\[ R^2 = 0.7866 \]

Ambrosia pollen evolution in Côte d’or department: Dijon

- Weekly seasonal average
- Weekly pollen peak

\[ R^2 = 0.5035 \]

Ambrosia pollen evolution, Côte d’Or department: Dijon

- Length risk allergic
- Length invalidating allergy risk

\[ R^2 = 0.4135 \]

Ambrosia pollen evolution in Charente department: Angoulême

- Weekly seasonal average
- Weekly pollen peak

\[ R^2 = 0.0573 \]

Ambrosia pollen evolution, Charente department: Angoulême

- Length risk allergic
- Length invalidating allergy risk

\[ R^2 = 0.2632 \]
Ambrosia pollen evolution in Isère department: Lyon-Saint-Exupéry, 1996-2011

**Récidive:** $R^2 = 0,4181 \quad R^2 = 0,11$

**Weekly season average:** decrease

**Pollen peak:** decrease

**Length of allergic risk:** decrease

**Length of invalidating allergic risk:** decrease
2001-2002, 24 weeks
Only two years because Vienne mayor (Isère deputy) suppressed the budget of the pollen trap when he became the mayor. There is no pollen trap in Vienne now.

Weakly season average: decrease
Pollen peak: decrease, 304 – 284 pollen/m³

Length of allergic risk: decrease, 10 - 7 weeks
Length of invalidating allergic risk: decrease, 5 - 3 weeks

We cannot conclude on 2 years

We also studied Aubenas in Ardèche (Montélimar latitude) in 2001, one year
Pollen peak was 39/m³, Length of allergic risk was 4 weeks
Rhône valley: Valence
100 km South Lyon

1997-2008:
108 weeks

Weekly season average: stable
Weekly pollen peak: increase

Length of allergic risk: stable
Length of invalidating allergic risk: decrease

Even in this very polluted town, 3 criteria on 4: decrease or are stable
<table>
<thead>
<tr>
<th>Criterion evolution</th>
<th>0</th>
<th>Decrease</th>
<th>Stable</th>
<th>Moderate increase: $r^2&lt;0.1$</th>
<th>Increase: $r^2&gt;0.1$</th>
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</thead>
<tbody>
<tr>
<td>Weekly season</td>
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<td>Ambérieu</td>
<td>Vichy</td>
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<td>Dijon</td>
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<td>Vienne</td>
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<td>Weekly pollen peak</td>
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<td>Length of the allergic risk</td>
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<td>Length of the invalidating allergic risk</td>
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Blue: studied in 1984  Black: not studied in 1984  Red less than 5 years
Conclusion: the rumor about the increase of pollen counts is not justified on these sites

We have results for 10 sites, 98 years, 882 weeks, 40 criteria. Criteria decrease, are stable or they moderately increase in 28 cases. They were nil in 4 cases. They increase in 8 cases:

for Valence and Montélimar, the other criterions are good

for the other towns, Vichy, Dijon, Angoulême: the number of years is insufficient for a conclusion.

Ambérieu is to take in account.

<table>
<thead>
<tr>
<th>Areas</th>
<th>Number of years</th>
<th>Number of weeks</th>
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<tbody>
<tr>
<td>Vienne</td>
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</tr>
<tr>
<td>Angoulême</td>
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<tr>
<td>Dijon</td>
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<tr>
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<tr>
<td>Valence</td>
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<tr>
<td>Montélimar</td>
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<tr>
<td>Lyon-Saint-Exupéry</td>
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<td>144</td>
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<tr>
<td>Lyon-Bron</td>
<td>30</td>
<td>270</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>98</strong></td>
<td><strong>882</strong></td>
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</table>
Thank you