

Short communication

Comparison between pollen counts at ground and at roof level in Basel (Switzerland)

Ruth M. Leuschner

Department of Research, Kantonsspital, Hebelstr. 20 CH-4031 Basel Switzerland
(fax: +41 61 2652254)

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Abstract

Measurements of pollen frequency were made using two identical pollen traps, one situated at ground level and one at the height of about 30 m. There was no special difference between the results for the two traps in 1995, apart from an excess of pollen in the ground level trap originating from trees growing near the trap. In 1996 there was also a greater amount of birch pollen, this time at the roof level. There was also a great difference in the time at which the pollen first appeared between the two years, especially in the early spring.

1. Introduction

In 1973 Raynor et al. made improved measurements of ragweed (*Ambrosia*) pollen frequency at different heights from ground level to 108 m. Also Jung et al. (1990) and Wahl et al. (1991) sampled mugwort (*Artemisia*) pollen at different heights. We wanted to know if there was also a difference in pollen numbers between a garden and the top of a building, because in a previous study the apparatus used was not identical, so the results were not really comparable (Leuschner, 1994).

2. Materials and methods

Two identical Burkard pollen traps were situated at the Basel Cantonal Hospital, one on the flat roof at about 33 m above the ground and the other in the garden of the hospital at about 1.2 m. The number of pollen grains per cubic meter of air per day was measured with both traps in 1995 from January to the end of September and in 1996 from January to the beginning of June.

3. Results

The absolute numbers of pollen grains trapped in 1995 were 77,684 on the roof (Figure 1) and 99,138 in the garden (Figure 2). The list of occurrence of pollen on the roof and in the garden in 1995 (Table I) shows the numbers for the different species. Considering pollen from individual species, it is noticeable that for instance more oak pollen (*Quercus*) was trapped at the lower level in the garden as compared to the roof. The difference is even more striking for pine (*Pinus*) even as the suction volume was exactly the same in the two traps. In the case of grasses (*Poaceae*), birch (*Betula*), hazel (*Corylus*), and alder (*Alnus*) there are no marked differences between the two sites.

Measurements were made in 1996 from January to the 5th of June: on the roof there were 56,328 and in the garden 54,795 pollen grains. (Because of difficulties with the pump of the trap in the garden in June and July it was not possible to make further comparisons).

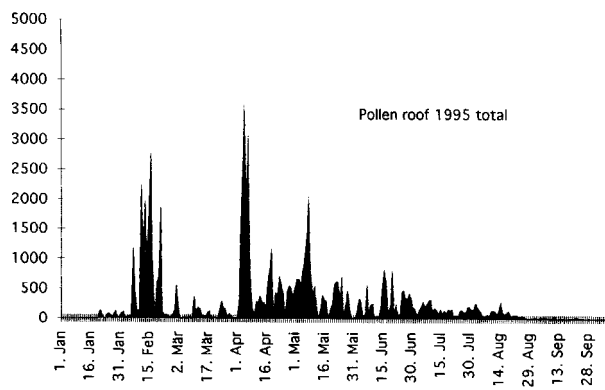


Figure 1. Pollen results roof 1995.

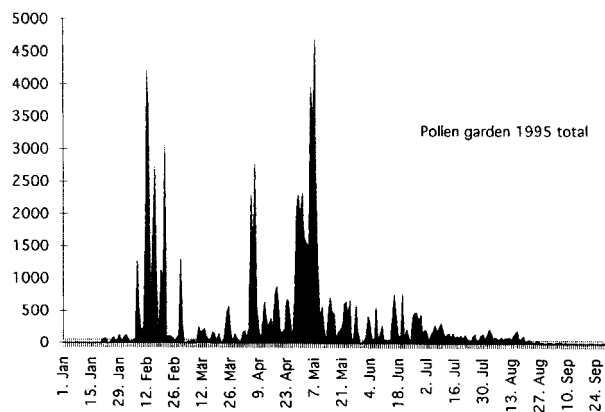


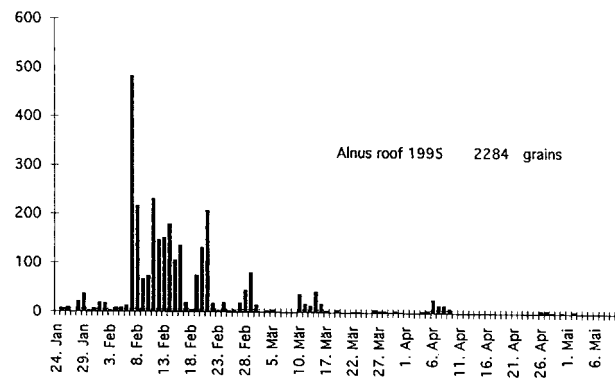
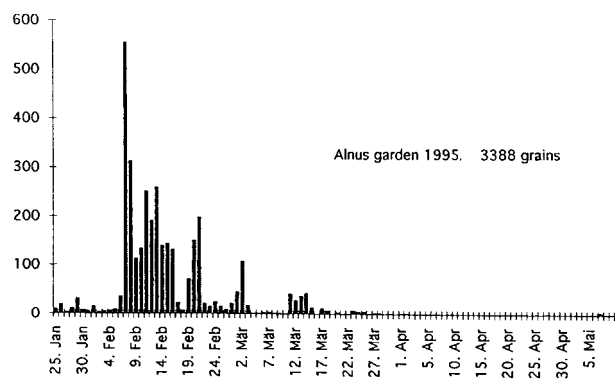
Figure 2. Pollen results garden 1995.

Discussion

If we now compare the pollen frequencies of 1995 from (*Alnus*) the alder, (*Corylus*) the hazel, (*Betula*) the birch, and (*Quercus*) the oak with those of 1996 there are remarkable differences to be seen. In

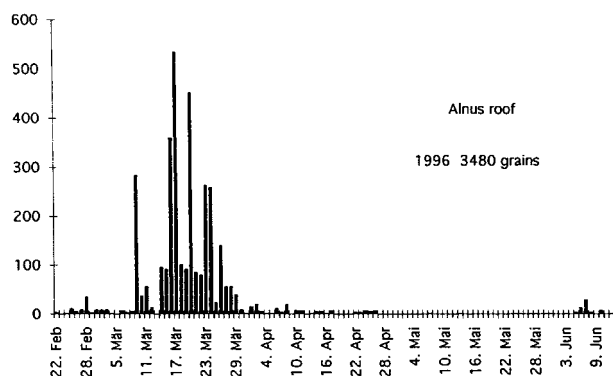
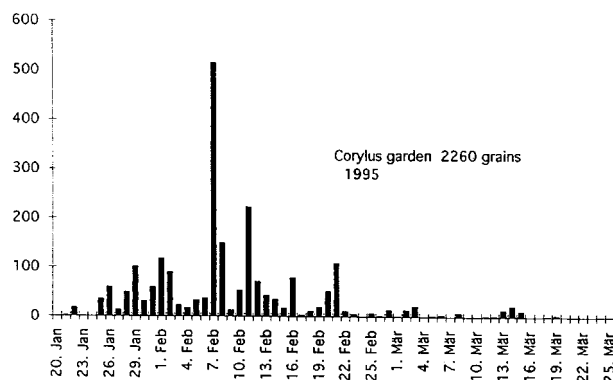
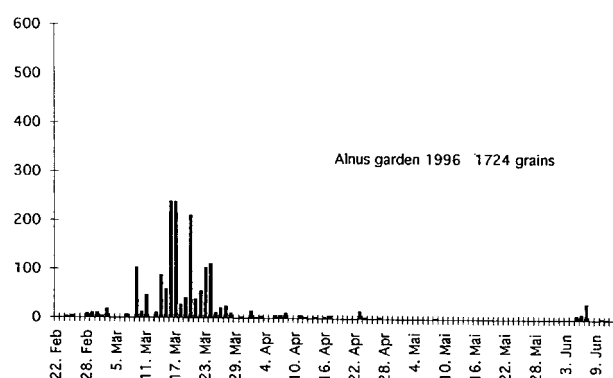
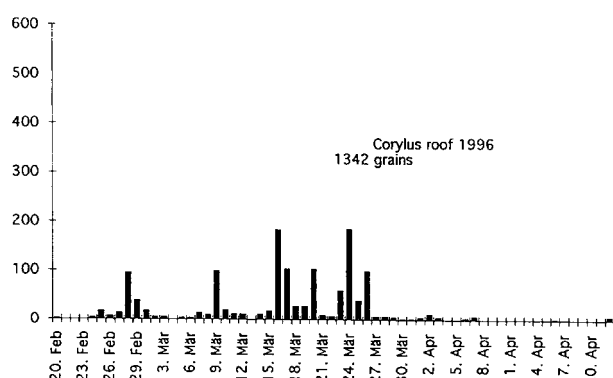
Table 1. Occurrence of pollen on the roof and the garden in 1995

		Roof	Garden
Total	1/1–30/9	77.648	99.138
<i>Quercus</i> (Oak)	12/4–2/6	5.740	12.816
<i>Pinus</i> (Pine)	17/4–12/7	4.038	18.426
Poaceae (Grass)	22/4–26/8	9.714	8.850
<i>Betula</i> (Birch)	12/3–22/5	5.384	4.154
<i>Corylus</i> (Hazel)	20/1–23/3	19.26	22.60
<i>Alnus</i> (Alder)	24/1–8/4	22.84	33.88
Total without <i>Quercus</i> and <i>Pinus</i>		67.870	67.896

Figure 3. *Alnus* roof 1995.Figure 4. *Alnus* garden 1996.

Spieksma et al. the *Betula* pollen its trends and fluctuations are described. In a further paper the statistical data and the mean periods of pollen will be discussed, with weather data.

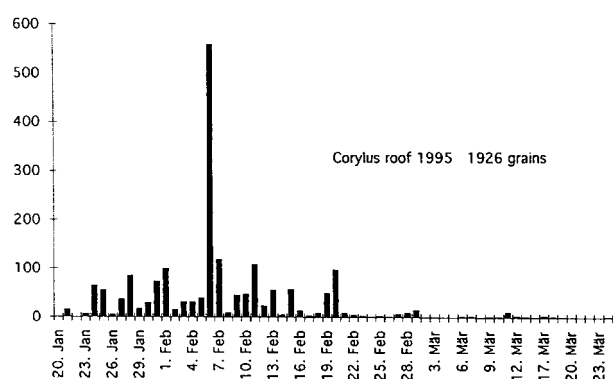
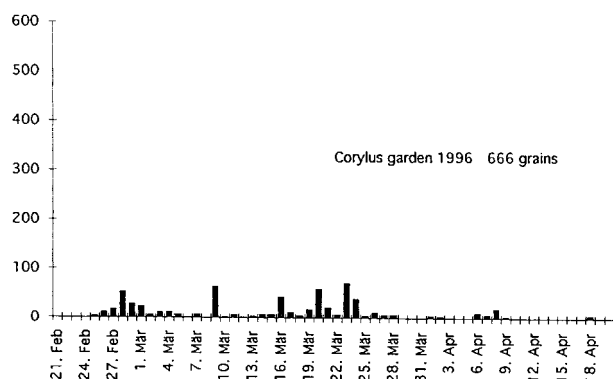
Firstly, *Alnus* the alder: it is striking that in the first year the measurable distribution began on the 24 January (Figures 3 and 4), in the second year only on about 22 February, (Figures 5 and 6) thus about one month later. The amounts of emitted pollen were also different. On the roof, there were 2,284 grains in 1995 and 3,480 grains in 1996. Conversely, the amounts in the garden were 3,388 in the first year (Figure 5) and only 1,724 pollen in the second one. Besides this, in 1996 (Figures 5 and 6) we can observe that about seven weeks after the main curve at the end of April a smaller amount of *Alnus* pollen appears in early June. This represents the *Alnus viridis* pollen coming from the Southern Black Forest, where these shrubs are flowering at this time. (In the other parts of Switzerland they also come at the same time, but from the Alps.) In our country the alder in early spring is nearly always *A. glutinosa* and *A. incana*.

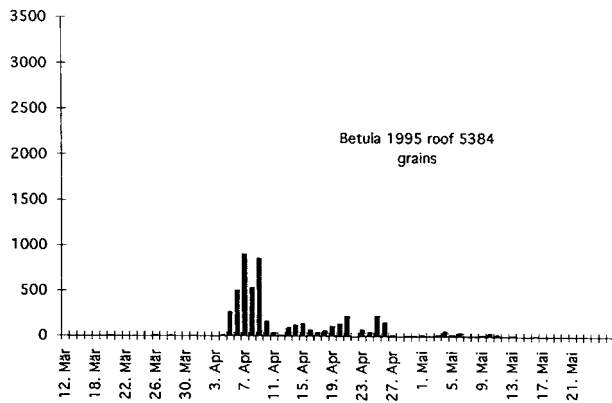
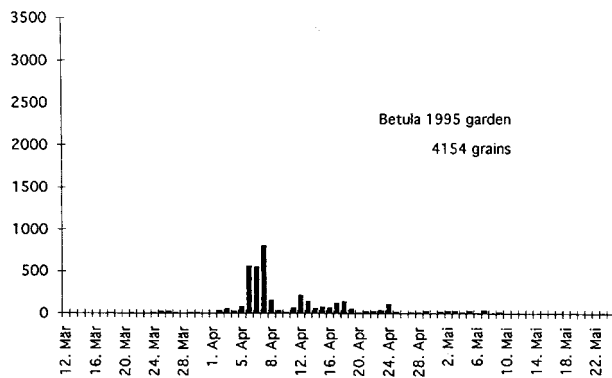
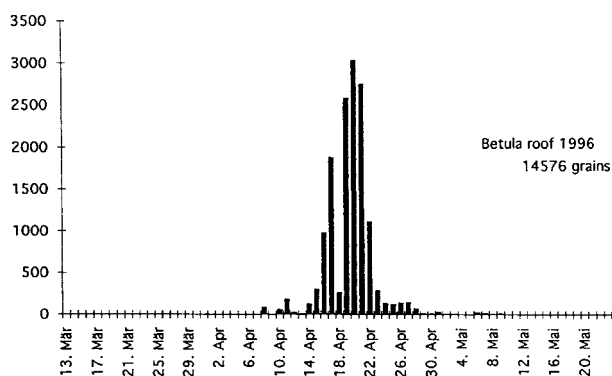
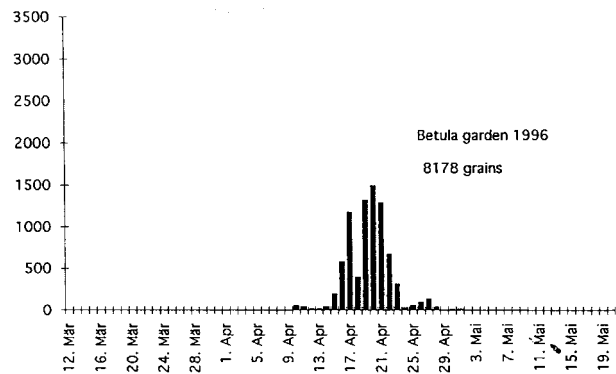
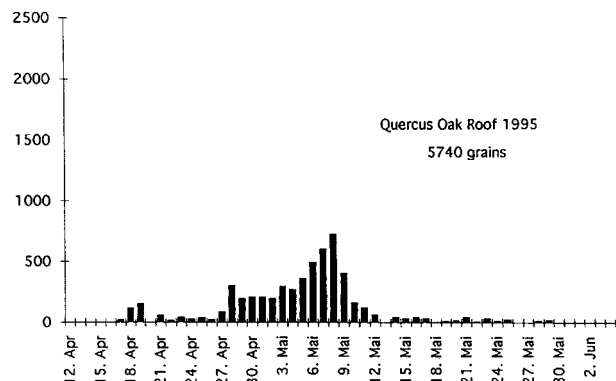
Figure 5. *Alnus* roof 1995.Figure 8. *Corylus* garden 1995.Figure 6. *Alnus* garden 1996.Figure 9. *Corylus* roof 1996.

Looking at *Corylus*, the hazel, we can make similar observations: in 1996 pollen frequency of this plant starts about one month later than in 1995. It is remarkable that in 1995 the 6th (Figure 7) and the 7th (Figure 8) of February show the highest number of pollen grains of the year. The pollen harvest of the hazel was much higher in 1995 than in 1996 (Figures 7, 8, 9, and

10). Whereas, the numbers in 1995 were 1926 (roof) and 2,260 (garden), in 1996 they were 1,342 and 666 respectively.

In *Betula* (birch) the two results of 1995 are not very different (Figures 11 and 12). It is therefore remarkable that in 1996 the results of the pollen numbers collected on the roof are much higher than in

Figure 7. *Corylus* roof 1995.Figure 10. *Corylus* garden 1996.

Figure 11. *Betula* roof 1995.Figure 12. *Betula* garden 1995.Figure 13. *Betula* roof 1996.Figure 14. *Betula* garden 1996.Figure 15. *Quercus* roof 1995.

the garden: 14,576 compared to 8,178 grains (Figures 13 and 14). There are no birch trees in the garden but several outside of the hospital. Besides, it seems that 1996 is a year with high *Betula* pollen frequency, as can occur at irregular intervals (Spieksma et al., 1995).

Concerning *Quercus*, the oak, the contrary seemed to have occurred: much pollen in 1995 in the garden (Figure 15) and less on the roof (Figure 16). There was also a rather low pollen flight in 1996 at both locations (Figures 17 and 18). There are several oak trees in the garden. This had given 12,816 pollen grains in the garden trap compared to 5,740 on the roof (1995). But in 1996 the amount in the garden was only 5,344 grains. So, it seems that we could speak of a “Mastjahr” in 1995, that means in several not regularly following years more pollen and also more seeds of certain trees – especially of the oak – are produced. In those years farmers used to fatten their pigs in the woods with the great amount of acorns (Leuschner, 1974).

Pinus (pine) and the *Poaceae* (grasses) also began with their flowering about two weeks later in 1996 than in 1995. However, the data of their curves have not been drawn, because of a defective motor in the trap in the garden – as already mentioned. For this reason no comparison of these two pollen types was possible.

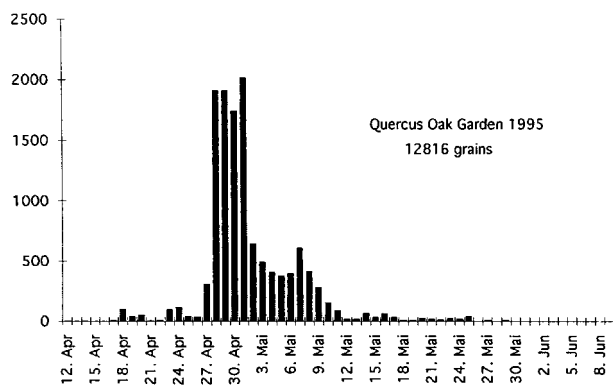


Figure 16. Quercus garden 1995.

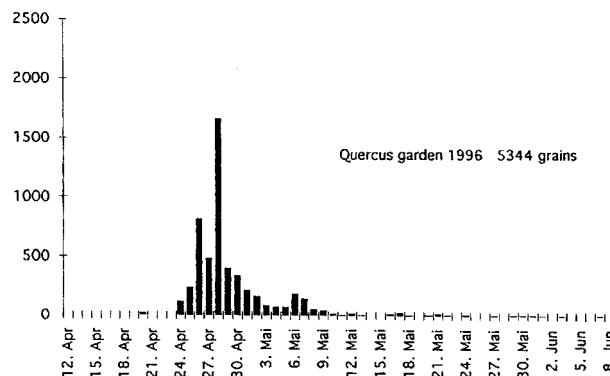


Figure 18. Quercus garden 1996.

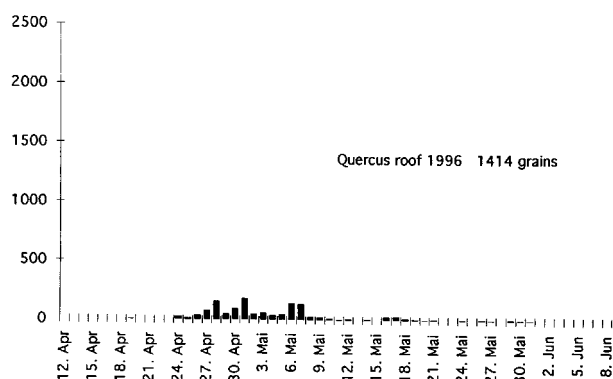


Figure 17. Quercus roof 1996.

5. Conclusions

The differences in pollen frequencies between roof and garden in one year are not very great apart from the situation of special trees near the traps. The difference from year to year is much more relevant in the pollen calendar of each year.

Acknowledgements

The results of pollen frequencies on the roof from 1995 and 1996, which I counted myself, are published with the permission of the Swiss Meteorological Institut in Zürich.

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