

Pollens In The Atmosphere Of Bartın,Turkey And Relationships With Meteorological Parameters

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Abstract: An aeropalynological study was performed in Bartın in 2003 and it is aimed to help physicians with the diagnosis and treatment of airborne pollen grains causing allergic diseases. Samples which came from Yalı and Balamba in Bartın have been analyzed in two different stations by using Durham-gravimetric method's application. The plant taxa of the pollen grains in Bartın atmosphere has been determined and after their identifications are being morphologically made, their microphotographs are taken. The amount of the pollen grains in Bartın atmosphere has been measured as cm² units with respect to the specified area within weekly and monthly periods by the help of the microscope slides placed in Durham instrument and the results obtained are shown through graphics. The results are compared with the meteorological factors. The monthly pollen calendar is prepared.

Keywords: Pollen, Meteorology, Bartın- Turkey, Pollen-calendar, Durham-gravimetric method

I. Introduction

Most of the microorganisms such as pollens, spores, bacteria and viruses in the air might be the agents of an illness. These spores and pollens provoke allergic reactions on some sensible bodies. This allergic illness caused by pollens and spores is called "polinosis". It is needed to determine the diagnosis of allergic pollens and spores sweeping through the air, find out the type of the plant they belong to and frame pollen calendars indicating changes in the concentrations in terms of months, in order to be successful in the treatment and diagnosis of the "polinosis illnesses". In many of the cities, both the names and the numbers of the pollens are announced to the public daily and hourly by means of media [1]. In addition to having knowledge of quantity and pollen morphology, it is urgent to determine, classify and be familiar with the vegetation around, to be victorious in diagnosis and treatment of some allergic illnesses like asthma and hay fever.

Airborne pollen studies were initiated by Aytuğ et al. (1974) in Turkey and pollen calendar for 1966-1968 was prepared. There are many studies related with pollens in atmosphere with meteorological factors such as Istanbul [2], Ankara [3,4,5], Samsun [6], Kütahya [7], Bartın [8], Zonguldak [9], Sydney, Australia [10], Germany [11]; Braga, Portugal [12], Lugo, Spain [13], Tenerife, Canary Island [14]. During the year 2003, an atmospheric study was held in different stations in order to find out the pollen calendar of Bartın by applying a gravimetric method.

II. Material And Methods

II.1. Sampling location

Bartın is located in West Black Sea Region, between 41° 53' North Latitude and 32° 45' East Longitude. The city measures 2143 sq. km. Altitude changes between sea level and 55 m [15]. Bartın has mild climate (Black Sea Climate) with very warm summers and cool winters. Its closeness to the sea and parallel mountain ranges leads to the decrease of temperature differences in the coast, the increase of humid and the effect of air mass from Balkan.

II.2. Air sampling

The studies were undertaken from to 2003 in Bartın city. In this study, a gravimetric method and a Durham sampler were used (Figure 1). The Durham sampler was located at 1.50 m. height above ground level. Slides placed in the Durham sampler were changed weekly before exposure and the slides were covered with petroleum jelly. The slides were examined weekly under the light microscope. Slides were covered by two cover slips of 24x24 mm size and hence pollen grains were determined on a 1152 mm. square area.

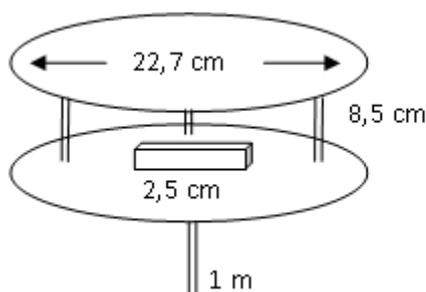


Figure 1. Durham sampler

The identification of pollen taxa was done with the help of reference slides which were prepared from the plants of Bartın at different periods of the year, prepared according to the wodehouse method (1965) [16]. The reference slides were deposited at the Palynology Department of Gazi University. Identification was also followed using the books on palynology [1, 17, 18,19,20, 21,].

II.3. Meteorological data

Among the meteorological parameters, from the Bartın Meteorological Directorate (Table 1, *Figure 2*).

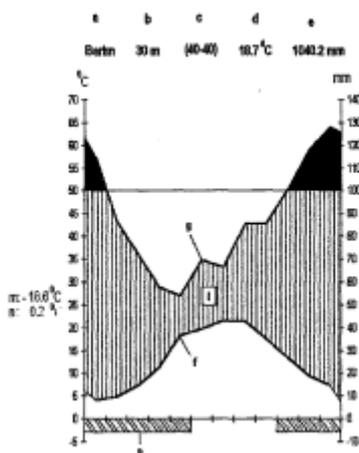


Figure 2. Bartın's climate diagram (2003)

- a: Weather station
- b: Height of weather station (m.)
- c: Temperature and precipitation observation year
- d: Average annual temperature (°C)
- e: Average annual precipitation (mm.)
- f: Temperature curve
- g: Precipitation curve
- I: Humid season
- m: The lowest temperature average of the coolest month
- n: Absolute minimum temperature (°C)
- r: Possible frost months

Table 1. Meteorological parameters between 2003

Values/Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Yillik Ortalama
Avg.Temperature (mm)	6.6	2.8	3.5	9.4	16.3	20.2	22.2	22.1	17.2	14.4	9.2	5.1	12.4
Avg. Total Precipitation (mm)	123.9	112.4	68.1	54.6	8.3	0.0	71.3	6.5	89.3	119.1	100.7	109.6	863.8
Daily the highest precipitation amounts (mm)	45.0	17.7	17.7	11.4	5.2	0.0	32.7	3.6	14.9	43.6	23.8	41.0	45.0
Average humidity %	85.6	82.1	79.9	77.5	75.8	64.1	73.2	72.9	83.4	81.6	85.0	85.2	78.9
Avg. Wind Speed (m/sec)	1.0	1.8	1.5	1.7	1.7	1.9	1.7	1.7	1.4	1.6	1.0	0.9	1.5

II.4. Statistics

The Khi-kare test applied to the pollen quantities found in Balamba and Yalı stations helped us to evaluate the pollen quantities statistically.

35 terms were used while applying the test. It was aimed to compare both two stations (Balamba and Yalı) with the help of the test.

Although both of the stations had 35 terms, while trying to find the range of scattering of the places to be compared, it was found $35-1=34$ with the formula ; $n-1$.

Khi-kare result was found $x^2 = 1,77$

Khi-kare result ; $x^2 : 1,77$

Range of scattering ; $df:34$

Two hypotheses were stated as H_0 and H_1 . It was aimed to accept one and deny the other according to the results of the Khi kare test.

H_0 : There is no difference in the pollen quantities between the stations.

H_1 : There is a difference in pollen quantities between the stations.

The most suitable α number was accepted as $\alpha =0,01$ and the result 1,77 was seen higher than the number 0,01. That is why H_0 was denied. The result showed us that the places studies hold have a great importance to find out the pollen quantities

III. Findings And Results

The studies were held in 2003, by means of the Durham pollen picking device placed in two different study areas. In the atmospheric study of Bartın, pollens belonging to 20 taxa of tree and bush forms and of which 14 taxons of herbaceous forms were found. % 69 tree and bush taxa pollens, % 14 Poaceae pollens, % 15 other herbaceous taxa pollens and % 2 unidentified pollens make up the total pollen quantity (Table 2, Figure 3). Quantities of the taxa according to the months were given in figure 4.

As mentioned above, % 69 of the total pollen quantity is covered by pollens of 20 taxa in the form of tree and tree-like. The percentage shows some changes in some of the studies held in some other cities of Black Sea Region, that is, % 84 for Zonguldak and % 72,33 for Bartın (1995-1997). While having a study in a different station in Bartın between the years in 1995 and 1997, we came across with a new type Geranium, apart from the study we held in 2003. But in 2003, we came across with Aceraceae, Cyperaceae, Polygonaceae and Moraceae families as new types.

Table 2. The percentages and the quantity of the pollens belonging to tree and tree-like types, Poaceae and other herbaceous plants.

Plant group	Total Pollen Quantity (fg)	Percentage
Tree	61343	69
Poaceae	11971	14
Herbaceous	13478	15
Other	1635	2

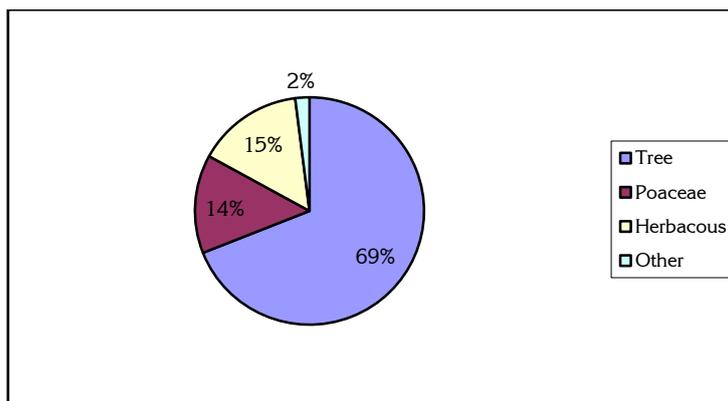


Figure 3. The percentages of the pollens belonging to tree and tree-like types, Poaceae, other herbaceous taxa and unidentified ones.

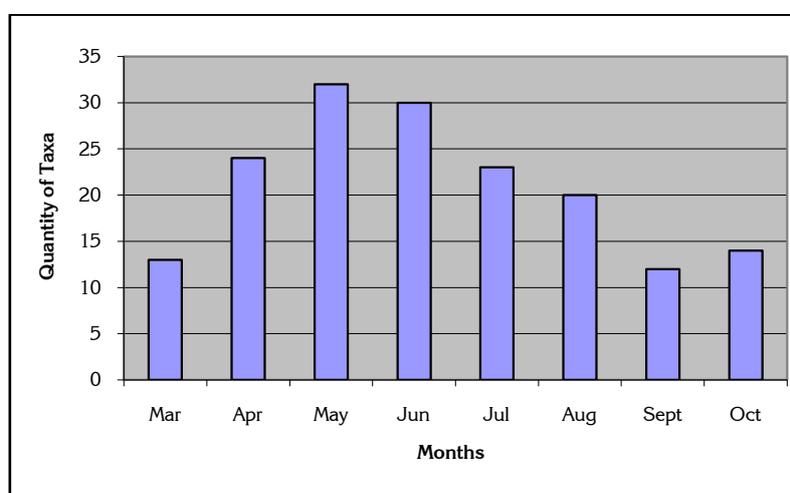


Figure 4. The changes in the quantity of taxa of pollens monthly

The types of pollen presented in the atmosphere of Bartın are shown in the form of pollen calendar (Figure.5), based on the counts made in 2003. The following taxa produced the greatest amounts of pollen in the atmosphere of Bartın.

Aceraceae : The pollens were first met at the second week of April. The second week of June was the last period of that type to be seen.

Betulaceae : The quantity of this type showed an increase after March and reached its peak in May because of the gradual increase in temperature and decrease in the amount of rain. Corylus pollens planted around was also seen in the atmosphere after the third week of March.

Boraginaceae : The pollens belonging to this family were seen after the first of April. The last week of September was the last period met with this type.

Caryophyllaceae : The pollens of this family seen rarely in the atmosphere were first met at the first week of May, and lastly at the first week of October.

Campanulaceae : The family which is met rarely in the atmosphere was first seen at the first week of May and lastly at the third week of July.

Chenopodiaceae : The pollens belonging to this family was seen mostly in August. This difference in the quantity between the stations is not just because of the nature of this region but also because of some types planted in the gardens around. That is why we met more pollens in Yalı station.

Compositae : The pollens being a part of this family were seen both in two stations between March and October.

Cruciferae : The pollens of this family were mostly seen in May.

Cupressaceae : The pollens of this family was seen in April when the speed of the wind showed an increase.

Cyperaceae : The pollens were met between April and June.

Ericaceae : Being in the northern slopes facing the sea in the natural vegetation of Bartın, the pollens of this family were seen during a long period starting from April to the third week of October.

Fagaceae : The pollens belonging to this family were observed starting from April to the end of August and reached at the percentage of 20,42 of total pollen quantity both in two stations.

Since being close to the natural vegetation, the pollens of *Fagus* family found in the highest quantity in Balamba Station are not so considerable when it comes to its allergic effects. It only covered % 4.83 of total pollen quantity and that of % 2.76 was seen in Balamba Station. But *Quercus* pollens covering % 14,96 of total pollen quantity was mostly seen in Balamba Station with the percentage of 9,60. As a result of the data, it was classified as the most dangerous when it is thought in terms of allergic effects.

Juglandaceae : Although the pollens of this family showed some differences in both two stations, they were mostly seen in Yalı Station. Planting *Juglans* around the gardens near the station might be shown as a reason of this. The allergic effect of these pollens is stated as medium.

Labiatae : The pollens were seen at the maximum level in both stations during May.

Legüminosae : The pollens of this family were seen during a period between the third week of April and October. Since they are planted around, the pollens of the family which are entomogam were mostly seen in Yalı Station and covered % 0,59 of total pollen quantity.

Moraceae : The pollens can be seen between the first weeks of May and September. But they are mostly seen in May because of the increase in the temperature and a considerable decrease in the amount of the rain when it is compared to April.

Oleaceae : The pollens were seen during the period between the third week of March and the last week of June.

Pinaceae : The pollens were seen between the last weeks of March and October. Being the first in Bartın atmosphere when it comes to the pollen concentration, they were mostly seen in May. During the months mentioned above, the quantity of the pollens showed an increase since the temperature and speed of wind were high and the amount of rain was low. Not only the reasons mentioned but also having trees belonging to Pinaceae family and spreading many pollens increased the quantity they covered in total pollen quantity.

Plantaginaceae : The pollens were seen between the last week of March and the second week of October.

Platanaceae : The pollens were seen between the first week of April and the last week of July.

Poaceae : The pollens of this family were first seen at the third week of March. Polinization continued until the end of October. The quantity of the pollens reached their maximum level at the third week of May both in two stations.

Polygonaceae : The pollens belonging to this family were seen during the period starting at the second week of May and having an end at the third week of July.

Ranunculaceae : However the pollens were seen between the first week of April and the fourth week of August, the pollens were mostly seen in Yalı Station. The reason of having the pollens more in Yalı Station was finding the samples more in the gardens around the station.

Rosaceae : The pollens of this family were first seen at the first week of April and lastly at the last week of October. The reason of seeing this type of pollen during a long period might be growing that type as a plant for decoration and also having lots of fruit trees.

Salicaceae : *Populus L.* pollens from Salicaceae family were first seen at the third week of March. It was last seen at the second week of June in the atmosphere. *Salix L.* pollens were seen between the third week of March and the first week of June.

Tiliaceae : The pollens belonging to this family were seen between the fourth week of April and the last week of October. Having no rain and with the highest speed, the pollens reached their maximum level in June compared to whole year.

Ulmaceae : The pollens were seen between the third weeks of March and May.

Umbelliferae : They were seen between the first week of May and the second week of September

Urticaceae : The pollens belonging to this family were seen between the second weeks of May and October. Being also a period of blossoming, the speed of the wind together with rain had a great affect in the quantity of pollens to be seen in June.

		March	April	May	June	July	August	September	October
Aceraceae	Balsambala								
	Yalini								
Betulaceae	Balsambala								
	Yalini								
Corylus	Balsambala								
	Yalini								
Boraginaceae	Balsambala								
	Yalini								
Campauleaceae	Balsambala								
	Yalini								
Caryophyllaceae	Balsambala								
	Yalini								
Chenopodiaceae	Balsambala								
	Yalini								
Compositae	Balsambala								
	Yalini								

%16,02) were the ones seen mostly in the city. The pollen calendar and the association with meteorological factors may be useful to physicians in helping to diagnose and treat allergic patients, and advise precautions

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