

CHANGES OF *ARTEMISIA* POLLEN CONCENTRATION IN ZONGULDAK ATMOSPHERE

SENOL ALAN, TUGBA SARISAHIN, AYSE KAPLAN

ABSTRACT. In this study, changes of *Artemisia* pollen concentration in Zonguldak atmosphere were monitored during 2015. Pollen collected using Hirst pollen and spore trap, and were counted on full area. Then concentration of pollen was expressed as pollen/m³. The concentration was compared with meteorological factors. In 2015, pollen index was 46.6. The peak value was recorded on 9th July with 6.5 pollen/m³. Minimum temperature was found as the most effective meteorological factor (-0.427, p<0.01). The other meteorological factors that effective on pollen concentration were maximum temperature (-0.399, p<0.01), average temperature (-0.393, p<0.01) and air pressure (0.393, p<0.01).

1. INTRODUCTION

Asteraceae family which is included about 20 thousand species is considered as one of the biggest plant family in the literature. The family also includes highly allergenic plants such as *Artemisia* (Mugwort) and *Ambrosia* (Ragweed) that they cause respiratory disease in humans. These genera can cause allergic symptoms that can seriously threaten human health [1].

Artemisia is one of the most common allergenic plant that its pollen observed in the atmosphere of many cities in Europe, North America and Asia in late summer and beginning autumn. *Artemisia* genus contains several species which are caused allergy [2]. Because this plant also can distribute in both urban and rural areas, allergenic properties of their pollen is high [3]. It has been reported that pollination season of Mugwort covers between July-September [4]. Pollination period of *Artemisia* plant also overlaps more or less with those of *Ambrosia* plant. Therefore, considering the prevalence of skin prick tests, Ragweed prevalence increases in the parallel with Mugwort.

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In this study, changes of *Artemisia* pollen and its relationship between meteorological factors in atmosphere of Zonguldak city were evaluated during 2015.

2. MATERIALS AND METHODS

Zonguldak city is situated in Western Black Sea region of Turkey. It's population is about 110.000. Settlement is mainly accumulated in coastline due to hilly topography. Climate of Zonguldak is evaluated as oceanic. Average annual total precipitation is 1218.1 and average temperature is 13.6. Vegetation is mainly composed of forests that made of deciduous trees.

Volumetric Burkard pollen and spore trap was used for collection of pollen. The sampler was placed on the roof of building (about 50m) where placed in Farabi Campus of Zonguldak Bulent Ecevit University. The slides which represent each day from June to August were prepared from melinex tape that was changes weekly. Full area was counted and converted to pollen/m³. Spearman's rank correlation test was used comparing pollen concentration and meteorological factors by using SciPy python package [5].

Meteorological data were obtained from Turkish State Meteorological Service and compared with pollen concentrations by using Spearman's rank order correlation test. The Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) modelling system was used to comparing wind directions on the peaks days with route of air masses on these days [6].

3. RESULTS AND DISCUSSION

Total pollen index of *Artemisia* was 46.4 during 2015. The highest pollen concentration was recorded on 9 July with 6.5 pollen/m³ (Figure 1). It was found that length of pollen season of *Artemisia* was 50 days (25 June- 13 August). Besides the first pollen peak, another peak was also recorded on 2 August about one 25 days after the first one.

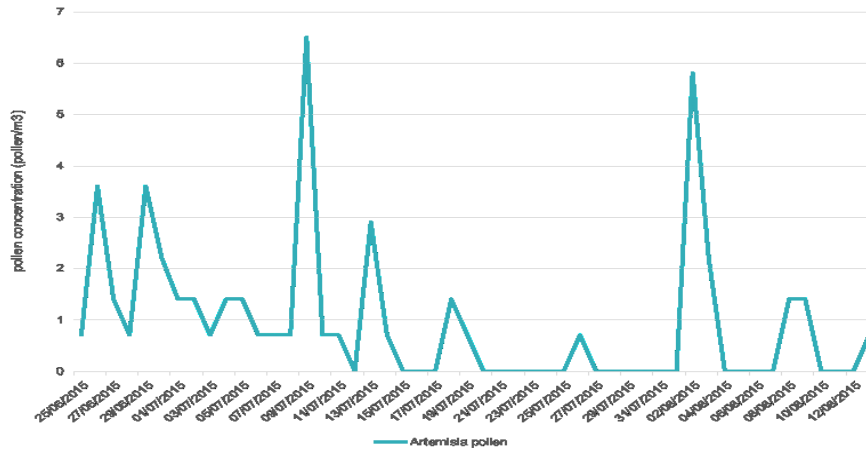


FIGURE 1. Changes of daily *Artemisia* pollen concentration during 2015.

In the result of correlation analysis, temperature (Average, Max and Min.) and air pressure was found to be correlated with pollen concentration (Table 1). While negative correlation was found between temperatures and pollen concentration, positive correlation was found with air pressure.

TABLE 1. Results of correlation analysis between *Artemisia* pollen and some meteorological factors.

	Average Temp.	Max. Temp.	Min. Temp.	Air pressure	Relative Hum.	Rainfall
Pollen	-0.393 **	-0.399 **	-0.427 **	0.393 **	-0.062	0.165

In order to explain effect of wind direction on pollen concentration, wind directions recorded during pollen season were classified according to its frequency. Although the most frequent wind direction was southeast, majority of pollen concentration were recorded on the days in which the second frequent wind direction recorded. It was also found that wind direction of the peak day was NW, and on the second peak day was ESE (Table 2).

TABLE 2. Results of correlation analysis between *Artemisia* pollen and some meteorological factors.

Direction	Frequency	Average pollen	Total pollen
NW	9	1.8	16.5
ESE	8	1.2	9.4
N	5	1.3	6.4
WNW	6	0.8	5
SE	10	0.4	3.5
NNE	4	0.5	2.1
NNW	4	0.5	2.1
SSE	1	1.4	1.4
NE	1	0.0	0
W	1	0.0	0

The back trajectories prepared by using the Hysplit analysis were used for demonstrating relationship between wind direction and air mass routes. While the majority of air mass on the first peak day reached to Zonguldak from west, on the second peak day route of air mass was generally from east (Figure 2).

The back trajectories on the peak days were clearly indicate hilly topography of Zonguldak. It can be seen that the air masses were bordered with the hills which lays in parallel to Black Sea. Because similar result was already obtained with Poaceae pollen, this could be characteristic of cities on Black Sea coastal line [7]. It was reported that *Artemisia* pollen concentration in Zonguldak atmosphere was 33, 36, 36 pollen/m³ respectively during 2007-2009 [8]. Considering previous studies in Zonguldak province, it is observed that *Artemisia* pollen concentration tended to increase over the years. This can be associated with global climate changes. This

also means that concentration of *Artemisia* pollen allergen such as Art v 6 that shows cross-reactivity with Amb a 1 from *Ambrosia artemisiifolia* will getting higher in near future. If this assumption evaluated with overlapping of pollen season of *Ambrosia* and *Artemisia*, the duration of allergic diseases caused by these pollen will increase in the near future.

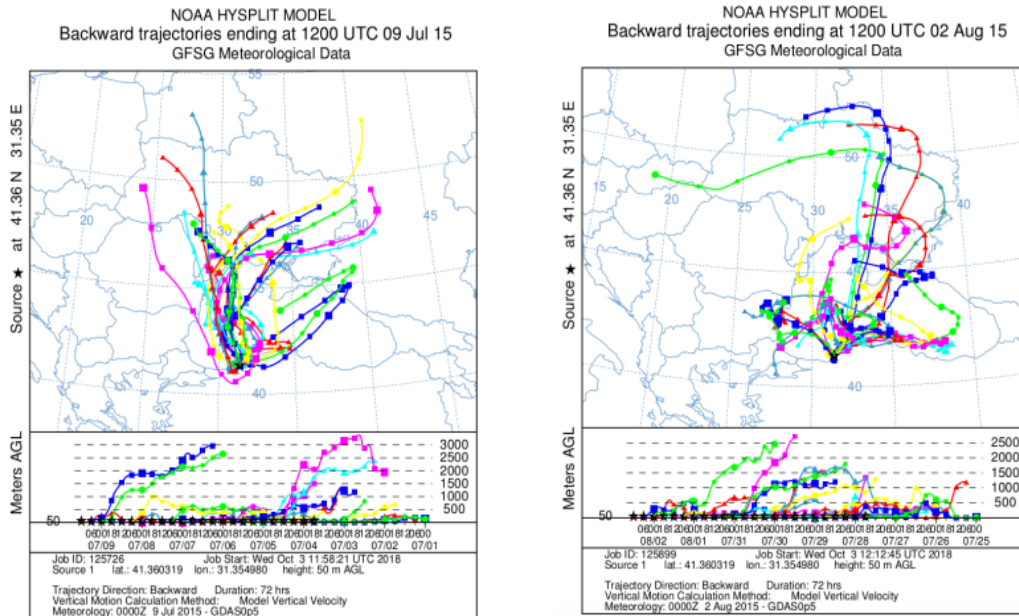


FIGURE 2. Route of air masses that reached to Zonguldak on the peak days. a. 9 July, b. 2 August.

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