

## Caryophyllaceae Holocene Layout in Elbasan City – Albania

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**Abstract:** The study is performed in Elbasani region; cities in which many biological studies carried out in recent years. Palynological information featured in this paper are provided in earth depositions of last XX centuries - last Quaternary or last period of New Holocene.

Through this study we try to provide paleopalynological information for the layout of this family during Holocene period, for the geographical location in which the Elbasan city is located.

The goal of this presented paper is to provide information about the Holocene distribution of Caryophyllaceae spores and pollens, bearing in mind that different ground depths correspond to certain time periods. For this purpose, we taken different sediment samples in each station, every 25 cm from the surface up to 4 m deepness. Approximate data about sedimentation rate are given, from about 1.87 mm/yr (during 1500 years at the Basilica of Bezistani) and up to 2.5 mm/year at the depths 2.8-4 m (0-V centuries).

Paleopalynological information given for this family are provided for the first time exclusively in this work and does not exist any similar work of this nature and for this family in the Albanian Palynology literature.

Sample treatment and microscopic examinations were carried on at the Study University “La Sapienza”, Rome. Survey and palynomorphs photos it was carried on using Motic BA310 microscopes with 1000x magnification.

In conclusion we can say that the data provided is sufficiently clear for the Holocene layout of this family.

**Keywords:** Caryophyllaceae, Holocene, Palynological, Palynomorphs, Elbasan City.

### INTRODUCTION

This paper belongs to Palynology discipline which is the Science linked to geology and botanical sciences, is a discipline that primarily deals with the study of chitinozoans, acritarchs, scolecodonts and what interests us the fossil palynoforms<sup>[1-2]</sup>.

In the study we have undertaken we tried to give enough paleopalynological data of New Holocene deposits in Elbasani town. Fossil pollen can be stored very well and be clearly identifiable, as the outer wall of the grains called the “exospores” or “exine” is extremely resistant to the passage of time<sup>[3-4]</sup>. By comparing the exine characteristics of fossil spores and pollen, we can judge the type of plants they represent<sup>[5-7]</sup>.

We say with full responsibility that there are no similar studies by foreign or local researchers for Caryophyllaceae fossil palynomorphs in Holocene deposits in Elbasan city<sup>[8-9]</sup>. The data provided by the fossil pollen provide us a considerable help on the cultivation of plants necessary for man, the way of feeding and the agriculture origin over the past years<sup>[10]</sup>. This nature of study gives important information for the reconstruction of paleoclimate, paleoflore and Holocene stratigraphy<sup>[1-2]</sup>.

If we study the Holocene pocket we are able to provide important information about the factors and their impact on the alteration of the flora in Elbasan city, in the case of our study focused on evolution of Caryophyllaceae family<sup>[5,8-9,11]</sup>.

Survey and palynomorphs photos it was carried on using Motic BA310 microscopes with 1000x magnification. The quantitative data of Caryophyllaceae Family palynomorphs deposited on the ground shows the direction of evolution of this plant over the times.

### MATERIALS AND METHODS

By paleopalynological data we are able to judge for human influence in the transformation of the natural environment<sup>[12]</sup>. Paleopalynologic check is often used with great results for paleoecologic-paleoclimates studies of Holocene period<sup>[13]</sup>.

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From the palynological control, it resulted that all the samples contain a considerable amount of organic matter, which is sufficient enough for pollen analysis. In essence, all the processing methods of soil material, agree in principle with the processing of 1 gram sediment <sup>[1-8]</sup>.

We have collected 16 sediment samples with a distance of 25 cm from each to 4 m of depth.

**Acetolysis method of Erdtman.**

The method chosen for the soil samples processing is that of Erdtman <sup>[14-15]</sup>. Erdtman acetolyze method consist on treatment of the material with an acetolyze mixture, acetic anhydride (CH<sub>3</sub>COO)<sub>2</sub> and sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) in a 9:1 report.

On purpose to get better results first treat 1cm<sup>3</sup> soil with 10ml KOH (10%). We cleaned it with distillated water and mixed with acetolyze ingredients, until is created a neutral environment. Acetolyze method is commonly used in the palinology as it provides a clear view on the pollen and spores during the microscopic observation <sup>[1,5,8-9,14-15]</sup>.

**Fixture of prepared composites.**

The fixture of prepared composites was completed by using the method of glue-preparations through gel-glycerin based on the Kissler method <sup>[16]</sup> by using 50gr of gelatin, 175ml of distillate water, 150gr glycerin and 7gr phenol. The composite was isolated with paraffin and after 3 days it was ready to be used and stored.

**RESULTS AND DISCUSSIONS**

For determining the approximate age of the samples for the analyzed stations in Elbasan city we relied on the dating of the archeological objects found near them. Through them we have also extracted the average coefficient of river sedimentation in a year.

Concretely for the archeological object of the Bezistani Basilica dating to the 5<sup>th</sup>-6<sup>th</sup> centuries BC, discovered in depth at about 2.8 m, the approximate average sediment coefficient for 1,500 years was calculated, which was found to be about 1.87 mm sediment/year.

**Table 1.** Spores' number by to the depth

Sample	Depth(meters)	Number of spores (Caryophyllaceae)
1	4	29
2	3.75	30
3	3.5	40
4	3.25	41
5	3	45
6	2.75	45
7	2.5	41
8	2.25	42
9	2	48
10	1.75	42
11	1.5	46
12	1.25	42
13	1	46
14	0.75	48
15	0.5	51
16	0.25	49
Total number of spores		685

While in the 4 m depth meet archeological objects (Illyrian tomb) that coincide with the beginning of the Roman period that we have considered as the beginning of our era.

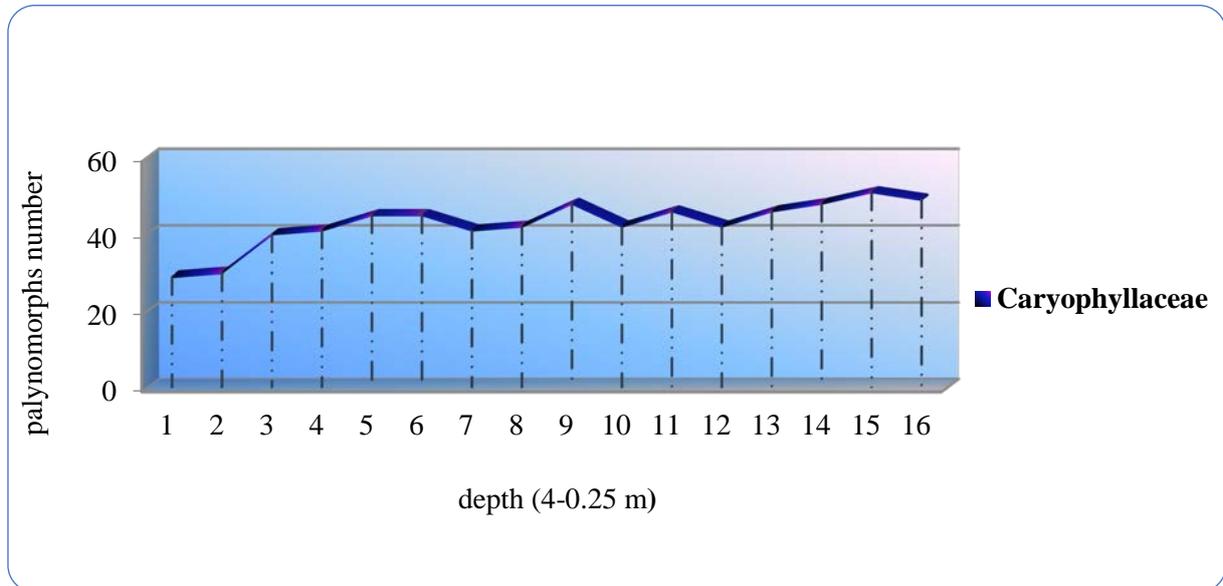
Based on these data we conclude that the average sedimentation coefficient for the depth of 2.8 m to 4 m has been about 2.5 mm sediment/year <sup>[8]</sup>.

On Table 1 are given the data about the number of palynomorphs for Caryophyllaceae family conforms to the depth and the total number of spores for this family. The maximum spores' number of Caryophyllaceae family (51 spores per sample) is taken in 0.5 m of depth while the minimum number of 29 spores, is taken in the bottom respectively 4 m of depth.

If we look at Figure 1, it is obvious that the upward trend of Caryophyllaceae family palynomorphs from the bottom near to the surface.

As shown in Figure 1, all Caryophyllaceae family palynomorphs from the bottom toward the surface are present and tend to increase their overall presence. Based on the data presented in table 1 the spore's total number of Caryophyllaceae family is 685 palynomorphs.

Caryophyllaceae family (the pink or carnation - order Caryophyllales), part of flowering plants, comprising some 86 genera and 2,200 species of herbaceous annuals and perennials, mainly of north temperate distribution [17-18].



**Figure 1.** The palynomorphs distribution of Caryophyllaceae family by to the deepness

The pollen morphology is a significant factor used by taxonomist for the Caryophyllaceae families [19-20]. During studies on the Caryophyllaceae pollen morphology (Figure 2) has come to the conclusion that the pollen are usually medium sizes ranging from 25 to 50  $\mu\text{m}$ , also showing presence of various type of exine such as spinulose, spinulose-microperforate and semireticulate [21].

Dianthus is the most valued horticultural, in which involves the carnation, mainly cultivated by landscape gardener and also sown in Europe for use in perfumes; sweet William, an old-fashioned garden flower for the cottage or grass [22].



**Figure 2.** Caryophyllaceae family pollen (1500x) (Source: Jançe, 2014).

The increase of the representative's presence of Caryophyllaceae family near to the surface should be linked with human impact for the transformation of the natural landscape through cultivation of ornamental and useful plants in Elbasani town [8].

It is known that many species of Caryophyllaceae family are grown as ornamental plants, and some species are widespread weeds. Starting from this fact as well as from palynomorphs presence in all the samples of different depths we can say that the human impact on the cultivation of the Caryophyllaceae family as ornamental plants and above all given the geographical position of Elbasani town, being defined as a zone of the field, justify the fact of notable presence for Caryophyllaceae family plants.

The quantitative palynomorphs records of Caryophyllaceae family clearly indicating the direction of its evolutionary. Flora for Elbasan City today is represented mainly by fruit trees and a diverse plant in general cultivated as accompanying plants. Undoubtedly, the human activity plays an important role in this emerging biodiversity and the continuous transformation of the city's flora and the entire region.

## CONCLUSIONS

- The Caryophyllaceae palynomorphs are always present to all depth samples and have an upward trend of their overall presence from the profoundness to the superficialities.
- The attendance at all stations and depths of the Caryophyllaceae palynomorphs can be explained by the fact that these plants have been always present in the area of Elbasani town cultivated by humans as a decorative plants or as widespread weeds.
- The average sedimentation coefficient is about 1.87 mm/yr (during 1500 years at the Bezistani Basilica) and up to 2.5 mm/year at the depths 2.8-4 m (0-V centuries).

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