Uluslararası İleri Doğa Bilimleri ve Mühendislik Araştırmaları Dergisi
Sayı 7, S. 428-431, 6, 2023

Araştırma Makalesi

IJANSER
https://as-proceeding.com/index.php/ijanser
ISSN: 2980-0811

International Journal of Advanced Natural Sciences and Engineering Researches
Volume 7, pp. 428-431, 6, 2023

Research Article

Holocene Data on Fossil Pollen of Dipsacaceae Plants, Central Albania.

Admir Jançe [1,*], Anila Jançe [2], Gëzim Kapidani [3]

[1] *"European University of Tirana", Tirana, Albania*
[2] *"Barleti" University, Tirana, Albania*
[3] *"Tirana University", Tirana, Albania*

[*] *(adi_jance@yahoo.it)*

(Received: 12 July 2023, Accepted: 24 July 2023)

(5th International Conference on Applied Engineering and Natural Sciences ICAENS 2023, July 10 - 12, 2023)

ATIF/REFERENCE: Jançe, A., Jançe, A. & Kapidani, G. (2023). Holocene Data on Fossil Pollen of Dipsacaceae Plants, Central Albania. *International Journal of Advanced Natural Sciences and Engineering Researches*, 7(6), 428-431.

Abstract **–** The Holocene data on fossil pollen given in this scientific paper were obtained from the underground analysis of the Elbasan city, an ancient city located in Central Albania. In this paper, data are given on the evolutionary line that representatives of the Dipsacaceae family have followed over the years. Based on archeological studies of the Elbasani underground, the described time coincides with the New Holocene period. As the primary goal of this paper, we have given the connection between the distribution of fossil pollen of Dipsacaceae plants over the years. The data on the Dipsacaceae fossil pollen were analyzed during the period September-November 2022, and are presented for the first time.
Based on the data obtained after performing the chemical and statistical analysis of the fossil pollen of Dipsacaceae plants, we have obtained very interesting results, such as the finding of Dipsacaceae family palynomorphs in all analyzed soil samples from the depth to the surface. We also ascertain and have identified 442 fossil pollens that appear with a constant and stable tendency of their presence from the depth to the soil surface.
Based on the obtained results, we are of the opinion that: the change of the vegetation over the years for the analyzed area is mainly related to the human influence on the cultivation of important and necessary plants and fruit trees, after the in-depth analysis that was made on foreign and local literature, no other factors are found. with an important influence on the Central Albania flora.

Keywords – Holocene, Fossil Pollen, Dipsacaceae Family, Palynomorphs, Soil Samples, Elbasan.

I. INTRODUCTION

The scientific work that we have carried out and presented below presents the palynological features of the New Holocene deposits for Elbasani Town positioned in Middle Albania.

Paleopalynology represents an interdisciplinary science, which is closely related to the biological sciences (mainly botany), but also geology.

Pollen has been proven to be stored for years in underground layers, since the outer wall or exine of pollen grains is extremely resistant [1], [2].

Paleopalynology deals with the study of pollen and spores deposited in organic sediment, and above all this science includes the study of current and fossil palynoforms [3], [4].

Based on the fossil pollen study, it is possible to make an important contribution to the cultivation

and use of plants over the years, ascertaining the manner and nature of the nutrition of our ancestors as well as the agriculture evolution [5].

This paper provides important data that contribute to the reconstruction of paleoflora, paleoclimate, stratigraphy of the New Holocene, etc. [2], [6], [7].

In this scientific paper that we have undertaken, we have conducted the study of the vegetation distribution during the Holocene period, giving the factors that have had their influence on the flora transformation, always focused on the Dipsacaceae plants evolution [4], [6]-[8].

We highlight that there are no similar studies carried out by foreign and local researchers about the fossil spores and pollen data for Dipsacaceae plants in the Holocene deposits, for Elbasan area, where the study was carried out.

So, the microfossils of these family plants have not previously been studied in the Elbasan [6], [7].

We can say: paleopalynological data obtained lead an important contribution on the presentation of origin and evolutionary line of the cultivation and use of these family plants. [6], [9].

Dipsacaceae palynomorphs enumeration was performed using light microscopy at 1000x magnification.

The undertaking essence of this scientific paper was to present the relationship between the quantitative presence of fossil pollen and the evolutionary line over the years that has occurred with Dipsacaceae plant representatives.

II. Materials and Method

Paleopalynological tests are mainly used, offering an accuracy, for the paleoclimate and palaeoecological studies of the Quaternary period, and therefore the Holocene period [10], [11].

Through the study and analysis of fossil pollen, we can judge the transformation of the natural environment and the human influence on this transformation [12], [13].

The physics-chemical composition of the pollen enables it to be successfully stored and extracted from the soil sediments where it is deposited.

Mainly for fossil pollen processing, almost all methods used consist of physical and chemical processing of 1 gram of soil sediment [2], [3], [6].

Afterwards, the fossil pollen extracted from the soil sediments is analysed qualitatively and quantitatively.

During this study, we took 16 soil samples in the field, during the October-November 2022 period, starting from 0.25 m to 4 meters deep, where the distance between sampling was 0.25 m.

From the paleopalynological test that was performed on all the samples, it was found that all the soil samples contained a significant amount of organic matter that appears suitable to continue with the fossil pollen analysis.

A. *The Erdtman method of acetolysis*

The soil sampling is based on Erdtman method [14], [15]. To get better results first mix $1cm^3$ soil with 10ml KOH (10 %).

Erdtman acetolyze method consists of processing the material with an acetolyze mixture, acetic anhydride $(CH_3COO)_2$ and sulfuric acid (H_2SO_4) in a 9:1 ratio.

We cleaned with distillate water and mixed it with acetolyze solution, until a neutral environment is obtained.

The emasculation process is followed by a centrifugal process for three minutes (3000 rotation/minute).

The acetolyze method is widely used in paleopalynology; because it gives better visibility over the spores and pollen compared with the other methods used during the microscopic observation process [6], [7], [14], [15].

B. *Fixing the prepared compounds*

The fixture of prepared composites was realized by using the method of glue-preparations through gel-glycerin, which was prepared based on the Kisser method [16] by using 50 gram of gelatin, 175 ml of distillate water, 150-gram glycerin, 7-gram phenol (crystals).

The composite was isolated to the edges of microscope slide with spray or paraffin and after 3 days it was ready to be used and stored.

III. Results

On table 1 are given the data about the spores' number for Dipsacaceae family conform to the depth and is presented also the total number of palynoforms for this family.

The maximum spores' number of Dipsacaceae family (32 spores per sample) is taken in 2.25 m of depth while the minimum number, 22 spores, is taken in the bottom respectively 4 m of deepness.

On figure 1 is clearly shown the constant and sustainable trend of the total number of

Dipsacaceae Family representatives from the bottom near to the surface, with the exception of the samples 8 where it is observed one slight decrease in number (exactly in 2.25 of depth), also is clearly shown a constant presence on the number of spores for this family almost throughout the depths in a constant manner. In samples 6, 8, the Dipsacaceae spores' number undergoing an immediate increase.

Table 1. Dipsacaceae palynoforms according to the deepness.

Sample	**Years** ***after AD***	**Depth** ***(meters)***	**Dipsacaceae Palynoforms**
1	0	4	22
2	100	3.75	24
3	200	3.5	23
4	300	3.25	25
5	400	3	25
6	500	2.75	28
7	650	2.5	28
8	800	2.25	32
9	950	2	30
10	1100	1.75	31
11	1250	1.5	31
12	1400	1.25	30
13	1550	1	29
14	1700	0.75	30
15	2850	0.5	28
16	2000	0.25	26
Total number of spores			442

Based on the data presented in table 1 the spore's total number of Dipsacaceae family is 442 spores.

IV. DISCUSSION

Based on the obtained data, the permanent trend of Dipsacaceae plants from the depth of the soil towards the surface is clearly expressed, this phenomenon shows that the stability in the presence of representatives of the Dipsacaceae family should be dedicated to the human influence in the cultivation of this family plant.

Climate can be a factor that can cause changes in the way land is used, also human societies can cause complex impacts on the environment [17].

Also, the surface samples show a presence in decline number of fossil pollen obtained, a phenomenon which also contradicts the fact that the newest forms of pollen can be preserved better than the older ones, which belong to the deep samples.

Interesting is the fact found in samples 8, which corresponds to the depth of 2.25 m, where an immediate increase in the fossil pollen of the Dipsacaceae family is observed. Since after reviewing the literature, no data on important climate factors were found in this period, the year 800 AD, which may have influenced the change of the vegetation, we have relied on the medieval history of Albania [18].

In this period, it is claimed that this period is related to the brutal exterminating wars of the Bulgarian and Serbian occupation, which led to a great decrease in the population and the city lost the economic importance it had until then.

Dipsacaceae (or the family of fungi) is otherwise known as the family of the order Dipsacale, which includes about 350 species of herbs and perennial or biennial shrubs distributed in eleven genera. The species of this family today are placed in the Caprifoliaceae family, otherwise known as honeysuckle [19]. The family-level classification of Caprifoliaceae and other plants in the botanical order Dipsacales have been significantly revised in the last two decades.

Flowering plants are mostly shrubs and vines: rarely herbs. They include some ornamental garden plants grown in temperate regions and can be either evergreen or deciduous [20].

The presence in all the samples and the stability tendency of the Dipsacaceae palynoforms, with the transition from the samples of the depths to the surface, may indicate that the human factor has had an important impact on these plants, mainly related to the cultivation of plants of this family over the years in Elbasan area. This phenomenon is also supported by the fact that throughout this period these plants are always present.

Many species are widely cultivated for their ornamental leaves, flowers, and fruits. Ornamental varieties of Dipsacaceae are grown in gardens for their showy flowers, fruits, and leaves.

The plants of this family are mainly hardy shrubs or vines of ornamental value, many of which are well-known garden shrubs, such as species belonging to the genera *Abelia, Lonicera* and *Weigela*. While the species *Valerianella locusta* is cultivated for food use. Meanwhile, we also mention representatives that appear as weeds *(Lonicera japonica)* [21], [22].

Nowadays, Elbasan city is presented with different plants, mainly filled with olive

plantations, generally cultivated fruit trees, and a very rich flora with vegetation.

A special and indisputable importance is the influence of ecological and human factors on the spread of pollen grains.

The quantitative data presented on the fossil pollen of the Dipsacaceae family show the evolutionary direction of its plants over the years.

V. CONCLUSION

• Dipsacaceae family Palynoforms show a permanent tendency of their presence from depth to surface direction.

• Representatives of the Dipsacaceae family are present in all analyzed samples.

• Since Elbasan has not had strong climatic factors that could have influenced the change in vegetation, it is thought that the change in vegetation that has occurred over the years is due to human influence.

REFERENCES

[1] E. Paccini, and M. Hesse, *Pollenkitt- its composition, forms, and function*, Flora200, pp. 399–415. 2005.

[2] E. Pacini, and G. Franchi, *Il polline: Biologia e Aplicazioni*, *Quaderni di biologia*, Bologna, Vol. 12, pp. 8–53, 1978.

[3] K. Faegri, and J. Iversen, *Textbook of Pollen Analysis*, 4th ed. Wiley., Chichester, 1989, p. 328.

[4] O.K. Davis, *Preliminary pollen analysis of Neogene and Quaternary sediment of The Great Salt Lake U.S.A.*, Proceedings Pliocene Conference, AASP Contribution, Arizona, Vol. 34, pp. 227–240, 1999.

[5] V.M. Bryant, and R.G. Holloway, *Archaeological palynology in Palynology: Principles and Applications*, (ed. J. Jansonius, D. C. McGregor) American Association of Stratigraphic Palynologists Foundation, Dallas, Vol. 3, pp. 913–917, 1996.

[6] A. Jance, A. Jance, and G. Kapidani, *Pteridophyta landscape through Holocene epoch in Elbasan, Albania.* Plant Cell Biotechnology and Molecular Biology (PCBMB), Vol. 22 (15-16), pp. 34-40, 2021.

[7] A. Jance, and A. Jance, *Caryophyllaceae Holocene layout in Elbasan City – Albania*. International Journal of Environmental Pollution and Environmental Modelling - IJEPEM, Vol. 1 (2), pp. 29-33, 2018.

[8] P.D. Moore, and J.A. Webb, *An illustrated Guide to Pollen Analysis, Department of Plant Sciences*, King's College, London, Vol. 133, pp. 216–217, 1978.

[9] C.E. Forest, *Paleoaltimetry incorporating atmospheric physics and botanical estimates of paleoclimate*, Bulletin of the Geological Society of America, Vol. 111, pp. 497–511, 1999.

[10] B. Huntley, and I.C. Prentice, *Holocene vegetation and climates of Europe*, University of Minnesota, Minneapolis, pp. 136–168, 1993.

[11] J.R. Allen, B. Huntley, and W. A. Watts, *Weichselian palynostratigraphy, palaeovegetation, and palaeoenvironment: the record from Lago Grande di Monticchio*, southern Italy, Quaternary International, Vol. 74, pp. 91–110, 2000.

[12] K.E. Behre, *The interpretation of anthropogenic indicators in pollen diagrams*, Pollen et Spores, Vol. 23, pp. 225–245, 1981.

[13] Y. Miras, F. Laggoun-Défarge, P. Guenet, and H. Richard, *Multidisciplinary approach to changes in agro-pastoral activities since the Subboreal in the surroundings of the "nurse d'Espinasse"* (Puy de Dôme, French Massif Central), Vegetation History and Archaeobotany, Vol. 13, pp. 91–103, 2004.

[14] G. Erdtman, *The acetolysis method, A revised description*, Svensk Botanisk Tidskrift, Vol. 54, pp. 561–564, 1960.

[15] G. Erdtman, *Handbook of palynology. An introduction to the study of pollen grains and spores*, Hafner Publishing Company, New York, 1969, p. 486.

[16] J. Kisser, *Bemerkungen zum Einschluss in Glycerin-Gelatine, Zeitschrift fur Wissenschaftliche Mikroskopie*, Berlin, Vol. 51, pp. 372–374, 1935.

[17] A.M. Mercuri, L. Sadori, and P. Uzquiamo Ollero, *Mediterranean and north- African cultural adaptations to mid-Holocene environmental and climatic changes*, The Holocene, Vol. 21, pp. 189–206, 2011,

[18] C. Hasanaj, S. Islami, M. Korkuti, F. Prendi, E. Shukriu, and S. Anamali, *Historia e Shqipërisë*, 2004, p. 667.

[19] Group of Authors, *The Angiosperm Phylogeny Group*, An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III, Botanical Journal of the Linnean Society, Vol. 161 (2), pp. 105–121, 2009. https://doi.org/10.1111/j.1095-8339.2009.00996.x

[20] U. Hofmann, and V. Bittrich, *Caprifoliaceae (with Zabelia incert. sed.)*. In: Kadereit, J., Bittrich, V. (eds) Flowering Plants. Eudicots. The Families and Genera of Vascular Plants, Springer, Cham. Vol. 14, pp. 117-129, 2016. https://doi.org/10.1007/978-3-319-28534-4_7

[21] W.H. Zhang, Z.D. Chen, J.H. Li, H.B. Chen, Y.C. Tanga, *Phylogeny of the Dipsacales s.l. based on chloroplast trnL-F and ndhF sequences.* Mol. Phylogenet. Evolution, Vol. 26, pp. 176–189, 2003.

[22] L. Xu, L. Lu, D.Z. Li, H. Wang, *Evolution of pollen in Dipsacales*. Plant Divers. Resources, Vol. 33, pp. 249-259, 2011.