

Influence of Climatic Factors on the Composition and Production of Apilarnil from the Southern Area of Romania

Teodora COLȚA¹, Cristina-Florentina Văduva¹, Roxana Antoaneta SPULBER¹, Eusebiu Cristian Florea¹

¹Institute for Beekeeping Research and Development, 42 Ficusului Blvd, 013975, Bucharest-1, Romania, e-mail: teodora.colta@icdapicultura.ro

* Corresponding author: roxana.spulber@icdapicultura.ro

Abstract: Apilarnil, a nutrient-rich apicultural product derived from drone larvae, is valued for its high content of proteins, lipids, and bioactive compounds. Its composition is strongly influenced by environmental factors, particularly climatic conditions such as temperature, humidity, and floral availability, which affect both bee development and hive productivity.

This study evaluates the impact of climatic variability on the composition of apilarnil collected from four regions in southern Romania (Caras-Severin, Ilfov, Giurgiu, and Tulcea). Moisture, lipid, protein, and ash content were analyzed, revealing significant regional differences. Samples from warmer and drier areas showed lower moisture and higher lipid content, while those from more humid regions exhibited increased moisture and moderate variations in protein levels. Differences in ash content indicated variability in mineral composition influenced by environmental conditions. FT-IR spectroscopy confirmed the presence of proteins, lipids, and carbohydrates.

These results highlight the significant influence of climatic factors on both the composition and production of apilarnil, emphasizing the need to consider current climate change trends in the sustainable management and valorization of apicultural products.

INTRODUCTION

Apilarnil is a biologically active bee product obtained from drone larvae, valued for its rich nutritional composition, including proteins, lipids, minerals, and bioactive compounds. The quality and production of apilarnil are strongly influenced by environmental conditions, particularly climatic factors such as temperature, humidity, and floral resource availability.

Climate variability can affect bee colony development and may lead to changes in the physicochemical characteristics of bee-derived products. In the context of current climate change, understanding these influences is essential for the sustainable management and valorization of apicultural products.

This study investigates the relationship between climatic conditions and the composition of apilarnil collected from different regions of southern Romania using physicochemical analysis and FT-IR spectroscopy.

MATERIAL AND METHOD

SAMPLE COLLECTION

- ❖ Four regions in southern Romania: Caras-Severin, Ilfov, Tulcea, Giurgiu
- ❖ Drone larvae collected using standard apicultural practices

SAMPLE PREPARATION

- ❖ Analyses performed on fresh apilarnil and lyophilized (freeze-dried) apilarnil
- ❖ Lyophilization ensures better stability, prevents degradation and allows comparability between samples
- ❖ Samples stored under controlled conditions until analyses

PHYSICOCHEMICAL ANALYSES

- ❖ Moisture – oven-drying to constant weight
 - ❖ Lipids – Soxhlet extraction
 - ❖ Proteins – Kjeldahl method
 - ❖ Ash – muffle furnace incineration
- #### FT-IR SPECTROSCOPY
- ❖ Mid-infrared region: 4000-400 cm⁻¹
 - ❖ Identification of functional groups
- #### CLIMATIC PARAMETERS
- ❖ Averages temperature (°C)
 - ❖ Relative humidity (%)
 - ❖ Data collected for each region

RESULTS AND DISCUSSIONS

Table 1. Physicochemical parameters for fresh and lyophilized apilarnil

Region	Moisture (% g/g)		Ash (% g/g)		Proteins (% g/g)		Lipids (% g/g)	
	Fresh	Lyophilized	Fresh	Lyophilized	Fresh	Lyophilized	Fresh	Lyophilized
Caras-Severin	69.8	5.7	1.05	3.82	9.23	32.17	5.67	18.54
Ilfov	68.5	5.15	1.2	3.55	9.68	33.76	6.53	19.22
Tulcea	67.4	4.82	1.68	3.04	10.12	34.08	7.02	19.93
Giurgiu	67	4.06	1.82	2.85	10.83	34.62	7.32	20.08

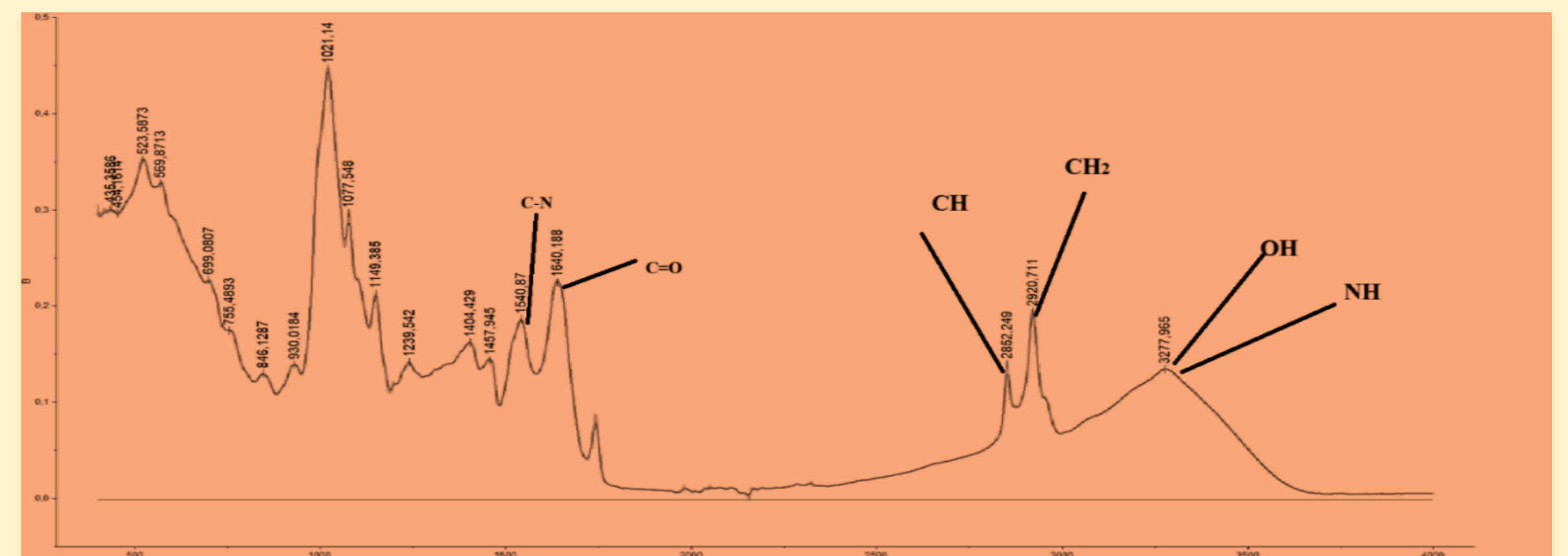


Fig. 1 FT-IR spectra for lyophilized apilarnil

Carbohydrates 1020-1075cm⁻¹ (C-O) Amide II 1450-1550cm⁻¹ (C-N) Amide I 1550-1650cm⁻¹ (C=O) Lipids 2850-2920cm⁻¹ (C-H) Amines 3250-3500cm⁻¹ (N-H)

IDENTIFIED BANDS

- Proteins: Amide I, Amide II, Amines
- Lipids: C-H stretching, C=O stretching
- Carbohydrates: C-O stretching

Apilarnil composition varied according to climatic conditions, food resources, and geographical origin. Fresh samples from southern Romania showed higher protein, lipid, and ash content (table 1) compared to values reported for Transylvanian apilarnil (protein: 7.23%, lipids: 3.80%, ash: 0.94%).

Both fresh and lyophilized samples exhibited higher protein and ash levels than those reported for the Banat region. Compared to fresh apilarnil, lyophilized samples exhibited approximately three-fold higher protein and lipid contents, highlighting the effect of freeze-drying on sample concentration and stability.

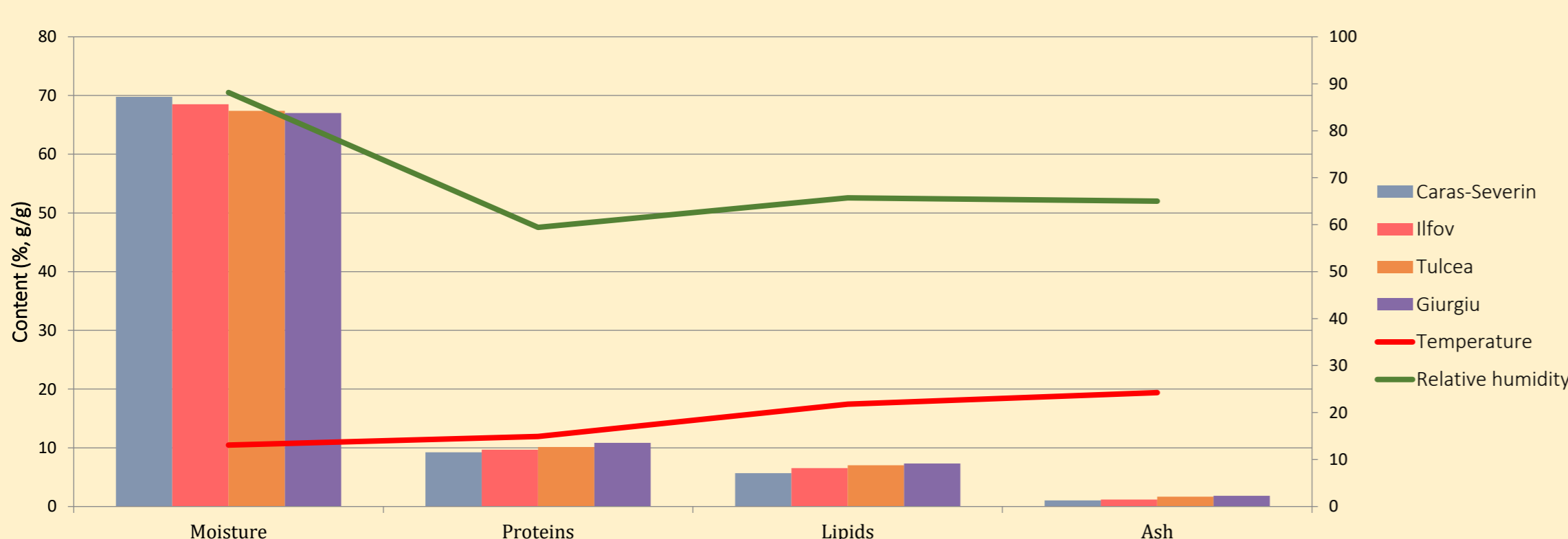


Fig. 2 Climatic factors and chemical composition of fresh apilarnil from southern Romania

A slight inverse correlation was observed between average temperature and apilarnil moisture content, with warmer regions (Giurgiu, Tulcea) showing lower water percentages and increased protein and lipid levels. These variations may be associated with enhanced floral productivity and the availability of nutrient-rich pollen during warmer periods. In contrast, higher humidity (Caras-Severin) was associated with increased moisture content and lower protein values.

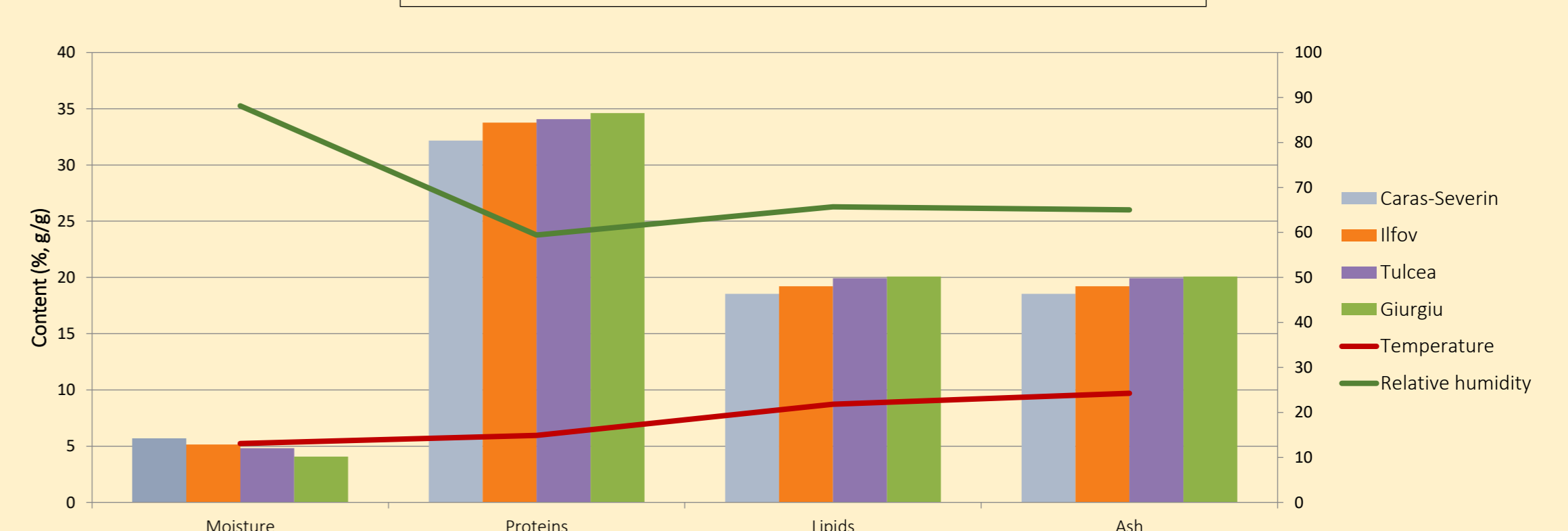


Fig. 3 Climatic factors and chemical composition of lyophilized apilarnil from southern Romania

CONCLUSIONS

- Climatic factors, especially temperature and humidity, have a strong impact on the composition and production of apilarnil.
- Regional differences suggest that climatic conditions and environmental characteristics may significantly influence the nutritional composition and quality of apilarnil.
- These findings support climate-adapted valorization of apilarnil as a high-value natural product.