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# Honey Discrimination of three Portuguese Beekeepers Associations by phenolic pattern



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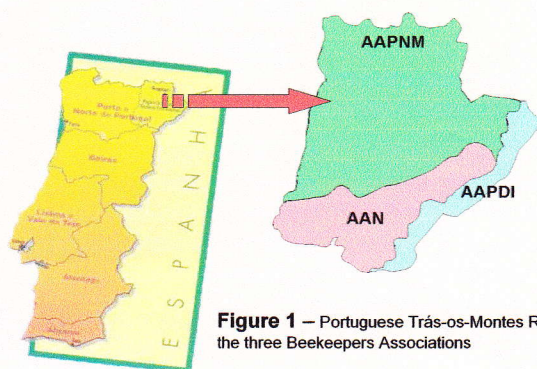


## Introduction

Phenolic compounds (phenolic acids and flavonoids) in honey are known to have healthpromoting effects as antioxidants and anticarcinogens. These compounds, considered as the phytochemical profile, have also been used as biochemical markers for the honey geographic origin. Furthermore, these components make important contributions to organoleptic properties and to its physical and chemical properties.

## Objectives

- To improve the honey's phenolic composition knowledge.
- To determine the differences between the honeys of Beekeepers Associations of Portuguese Trás-os-Montes region.
- To gather information that might add economic value to this region's honey.



**Figure 1** – Portuguese Trás-os-Montes Region and the three Beekeepers Associations

## Materials and Methods

### - Sampling

This study involved 45 honey samples of three nearby Beekeepers Associations of the Portuguese Trás-os-Montes region:

<b>AAPNM</b>	Parque Natural de Montesinho Beekeepers Association (20 samples)
<b>AAPNDI</b>	Parque Natural do Douro Internacional Beekeepers Association (11 samples)
<b>AAN</b>	Nordeste Beekeepers Association (14 samples)

### - Phenolic compounds extraction

- Amberlit XAD-2 [1].

### - HPLC analysis

- Internal standard – Hesperitin;
- Column - Merck LichroCart 125-3;
- Detector - Diode Array;
- Standards: 15 phenolic acids and 13 flavonoids.

### - Phenolic compounds identification

- Retention times and UV-spectra.

### - Common Phenolic profile

- Acids: protocatequic, p-hydroxibenzoic, caffeic, chlorogenic, vanillic, p-coumaric, ellagic, and cinnamic;
- Flavonoids: naringenin, kaempferol, apigenin, pinocembrin and chrysin.

### - Statistical analysis

- Discriminant analysis with three groups.

## Results

**Table 1** – Predominant vegetation in Beekeepers Associations Region

VEGETATION	AAPNM	AAPNDI	AAN
Castanea			
Cytisus			
Echium			
Erica			
Lavandula			
Prunus			
Rubus			
Trifolium			



## - Summary of Canonical Discriminant Functions

Variance explained by each discriminant function.

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	3,533	75,5	75,5	0,883
2	1,144	24,5	100	0,73

First 2 canonical discriminant functions were used in the analysis.

### Wilks' Lambda

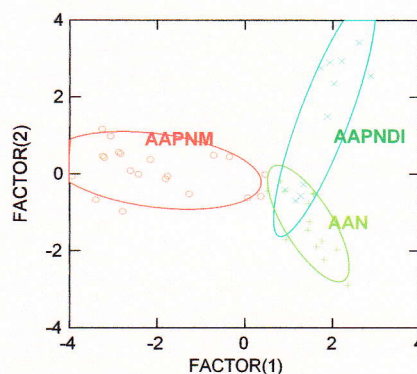
Test of Function(s)	Wilks' Lambda	Chi-square	df	Sig.
1 through 2	0,103	81,869	26	0
2	0,466	27,459	12	0,007

Honey classification of the three Beekeepers Associations based on the phenolic compound profile contents.

### Classification Results

Original	Count	Predicted Group Membership			% correct
		ORIGEM 1	2	3	
1	17	0	3	85	
2	0	7	4	64	
3	0	0	14	100	
<b>TOTAL</b>	<b>17</b>	<b>7</b>	<b>21</b>	<b>84</b>	

84.4% of original grouped cases correctly classified.



**Figure 2** - Plot of discriminant function score for phenolic compounds honey profile projected on the reduced space of the two Discriminant functions

## Conclusions

- Correct classification for 84% honey samples;
- 100% correct classification for AAN honey's samples;
- Honey discrimination of three Portuguese Beekeepers Associations by phenolic pattern is possible.
- Other information will improve identification: Pollen profile, Physical-chemistry parameters and others.

## References:

[1] – Tomás-Barberán et al, *Food Chemistry*, Volume 81, Issue 2, May 2003, 159-168