



Vitamins in Bee Polen

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Introduction

- Bee pollen → food supplement
- Healthy → high protein content
- Composition → variation according to vegetal species, environment conditions, age and nutritional state of the plant when pollen is under development
- Food Composition Tables / Literature
- Knowledge of chemical composition → tipifying the product obtained in different regions
- Method development



Objective

Study of vitamin composition of bee pollen loads

- beta-carotene (provitamin A)
- B Vitamin Complex
- Vitamin C
- Vitamin E



Material and Methods:

Fresh/dried bee pollen (SP/Brazil)
(Storage 0 – 1 year)



- Beta-carotene = Open Column Chromatography
- B Complex Vitamins }
• Vitamin E } HPLC
- Vitamin C (AOAC – titrimetric method)



Methods:



B1

- Conversion from Tiamin to Tiochrome
- Column: C₁₈ (5 μm/125 x 4,0 mm) with pre-column (5 μm/4x4 mm) Lichrospher;
- Detection: fluorescence: Ex 368 nm; Em 440 nm.
- Mobile phase: buffer phosphate pH 7.2 (0,228% KH₂PO₄·3H₂O): dimetilformamide (85:15)
- Flow: 1 mL/min;
- Injection volume: 20 μL;

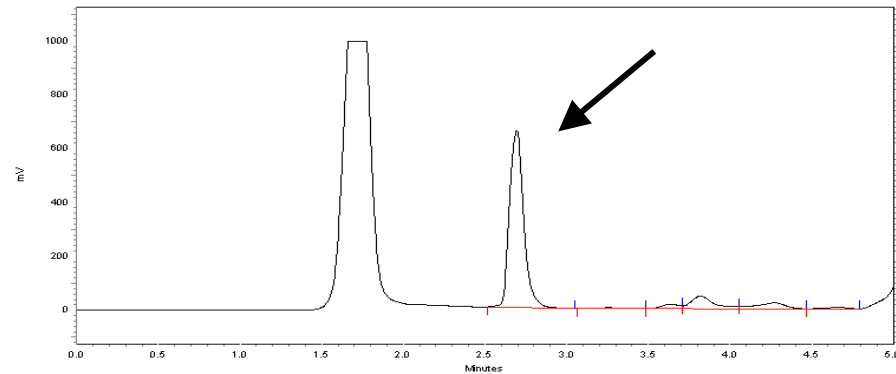
B2

- Column: C₁₈ (5 μm/125 x 4,0 mm) with pre-column (5 μm/4x4 mm) Lichrospher;
- Detection: fluorescence Ex 450 nm; Em 530 nm.
- Mobile phase: buffer phosphate pH 7.2 (0,228% KH₂PO₄·3H₂O): dimetilformamide (85:15)
- Flow: 1.5 mL/min;
- Injection volume: 20 μL;

Methods:

Vitamin E (alpha-tocopherol)

- Mobile phase: hexane :isopropanol (99:1);
- Flow: 2 mL/min;
- Column: Shim-pack CLC-Sil (M) 25 cm;
- Detection: fluorescence: Ex 295 nm ; Em 330 nm nm.



Chromatogram of alpha-tocopherol

RESULTS

Antioxidant vitamins (dried bee pollen)



Vitamins ($\mu\text{g/g}$)		
C	E	β -carotene
14 ± 1.62	38.64 ± 2.72	6.65 ± 0.29
24 ± 3.94	16.27 ± 0.38	3.14 ± 0.09
40 ± 11.4	20.54 ± 1.30	5.05 ± 0.03
26 ± 4.88	18.42 ± 0.47	$77.88 \pm 5.01^*$
27 ± 2.08	21.06 ± 1.76	25.19 ± 1.80
44 ± 4.49	32.27 ± 1.53	17.83 ± 1.91

Results in raw base with mean \pm SD
(n = 3)

* Source of pro-vitamin A
23% RDI for women

From: Melo I. L. P. & Almeida-Muradian, L. B.

Chemical Composition (%)

	Moisture	Proteins	Lipids	Ashes
A	2.56 ± 0.05	24.91 ± 0.88	4.81 ± 0.16	3.17 ± 0.00
B	2.03 ± 0.14	26.45 ± 0.52	4.46 ± 0.20	3.21 ± 0.01
C	2.99 ± 0.04	28.28 ± 0.44	4.53 ± 0.08	3.30 ± 0.03
D	2.18 ± 0.03	21.22 ± 0.18	5.69 ± 0.22	2.90 ± 0.00
E	2.82 ± 0.10	19.98 ± 0.12	5.27 ± 0.32	3.00 ± 0.00
F	1.50 ± 0.05	20.68 ± 0.33	5.18 ± 0.13	2.89 ± 0.01

Results in raw base with mean ± SD (n = 3)

All results are in accordance with the regulations from; Brazil, France and Argentina

RESULTS

B complex vitamins (dried bee pollen)



	Vitamin B ₁ (mg/25g of pollen)	Vitamin B ₁ (% RDI)	Vitamin B ₂ (mg/25g of pollen)	Vitamin B ₂ (% RDI)
PG	0.25*	20.8	0.62*	47.70
PH	0.17	14.1	0.48*	36.90
PI	0.16	13.3	0.64*	49.20
PJ	0.18*	15.0	0.51*	39.23
PK	0.16	13.3	0.44*	33.85
PL	0.16	13.3	0.44*	33.85
PM	0.20*	16.7	0.51*	39.23
Mean	0.18	15.10	0.52	40.00
RDI	1.2 mg/day		1.3 mg/day	

Results in raw base with mean \pm SD (n = 3)

* Source of the vitamin (B₁ = 17.5 % RDI) (B₂ > 33.85% RDI)

From: Arruda V. A. S. and Almeida-Muradian J. B.

Polinic analysis

(A)

Anadenanthera sp

(B1 and B2)

Eucalyptus sp

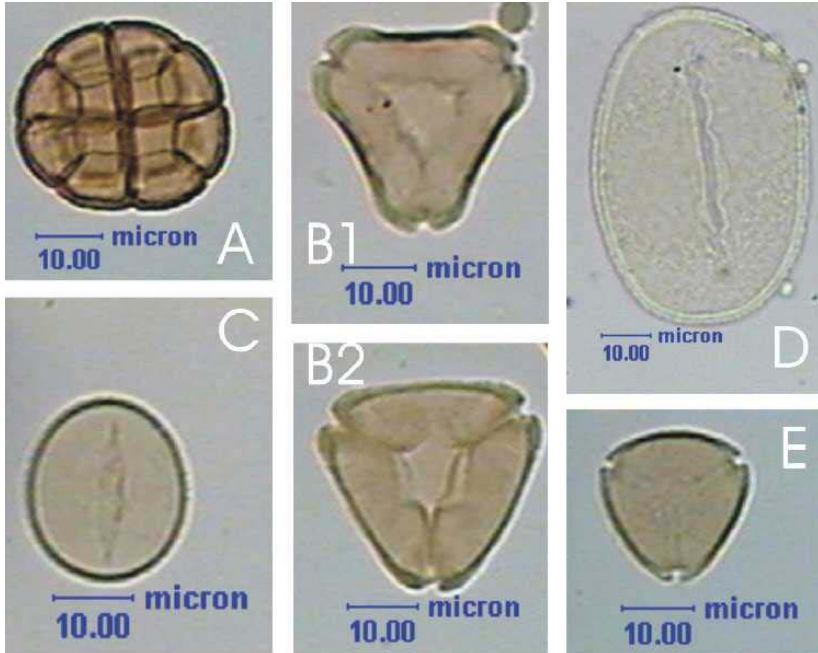
(C)

Philodendron sp

(D) type

Areaceae

(E) type



Source: MS Dissertation of Karla Oliveira *Myrcia*

Next steps:



- Analyse all vitamins after one year with different storage conditions (dark, light, freezer)
- Analyse other B complex vitamins:
 - Vitamers of B₆ (piridoxol, piridoxal and piridoxamine)
 - Vitamers of PP (nicotinic acid and nicotinamide)

Acknowledgments

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C A P E S

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Thank you!

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