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
- Knowlegment 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: C\textsubscript{18} (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% KH\textsubscript{2}PO\textsubscript{4}·3H\textsubscript{2}O): dimetilformamide (85:15)  
- Flow: 1 mL/min;  
- Injection volume: 20 µL;  

**B2**
- Column: C\textsubscript{18} (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% KH\textsubscript{2}PO\textsubscript{4}·3H\textsubscript{2}O): 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.
Methods:

Absorption spectrum of beta-carotene
# RESULTS

Antioxidant vitamins (dried bee pollen)

<table>
<thead>
<tr>
<th>Vitamins (μg/g)</th>
<th>C</th>
<th>E</th>
<th>β-carotene</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>114 ± 1.62</td>
<td>38.64 ± 2.72</td>
<td>6.65 ± 0.29</td>
</tr>
<tr>
<td></td>
<td>124 ± 3.94</td>
<td>16.27 ± 0.38</td>
<td>3.14 ± 0.09</td>
</tr>
<tr>
<td></td>
<td>340 ± 11.4</td>
<td>20.54 ± 1.30</td>
<td>5.05 ± 0.03</td>
</tr>
<tr>
<td></td>
<td>126 ± 4.88</td>
<td>18.42 ± 0.47</td>
<td>77.88 ± 5.01*</td>
</tr>
<tr>
<td></td>
<td>127 ± 2.08</td>
<td>21.06 ± 1.76</td>
<td>25.19 ± 1.80</td>
</tr>
<tr>
<td></td>
<td>144 ± 4.49</td>
<td>32.27 ± 1.53</td>
<td>17.83 ± 1.91</td>
</tr>
</tbody>
</table>

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

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

From: Melo I. L. P. & Almeida-Muradian, L. B.
### Chemical Composition (%)

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

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

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

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

B complex vitamins (dried bee pollen)

<table>
<thead>
<tr>
<th></th>
<th>Vitamin B&lt;sub&gt;1&lt;/sub&gt; (mg/25g of pollen)</th>
<th>Vitamin B&lt;sub&gt;1&lt;/sub&gt; (% RDI)</th>
<th>Vitamin B&lt;sub&gt;2&lt;/sub&gt; (mg/25g of pollen)</th>
<th>Vitamin B&lt;sub&gt;2&lt;/sub&gt; (% RDI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PG</td>
<td>0.25*</td>
<td>20.8</td>
<td>0.62*</td>
<td>47.70</td>
</tr>
<tr>
<td>PH</td>
<td>0.17</td>
<td>14.1</td>
<td>0.48*</td>
<td>36.90</td>
</tr>
<tr>
<td>PI</td>
<td>0.16</td>
<td>13.3</td>
<td>0.64*</td>
<td>49.20</td>
</tr>
<tr>
<td>PJ</td>
<td>0.18*</td>
<td>15.0</td>
<td>0.51*</td>
<td>39.23</td>
</tr>
<tr>
<td>PK</td>
<td>0.16</td>
<td>13.3</td>
<td>0.44*</td>
<td>33.85</td>
</tr>
<tr>
<td>PL</td>
<td>0.16</td>
<td>13.3</td>
<td>0.44*</td>
<td>33.85</td>
</tr>
<tr>
<td>PM</td>
<td>0.20*</td>
<td>16.7</td>
<td>0.51*</td>
<td>39.23</td>
</tr>
<tr>
<td>Mean</td>
<td>0.18</td>
<td>15.10</td>
<td>0.52</td>
<td>40.00</td>
</tr>
<tr>
<td>RDI</td>
<td>1.2 mg/day</td>
<td></td>
<td>1.3 mg/day</td>
<td></td>
</tr>
</tbody>
</table>

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

* Source of the vitamin  (B<sub>1</sub> = 17.5 % RDI)  (B<sub>2</sub> > 33.85% RDI)

From: Arruda, V. A. S. and Almeida-Muradian, L. B.
Polinic analysis

**Anadenanthera sp**

(B1 and B2)

**Eucalyptus sp**

(C)

**Philodendron sp**

(D) type

**Areceaceae**

(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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CAPES

FIOCRUZ
Thank you!

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