

Development of energy bars with bee pollen and bee bread

Cátia Vilares¹, Andreia Tomás¹, Paulo Russo-Almeida², Vítor M. R. Martins¹, Miguel Vilas-Boas¹

¹Centro de Investigação de Montanha (CIMO), Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300-253 Bragança, Portugal;

²Laboratório Apícola - LabApis^{utad} - Universidade de Trás-os-Montes e Alto Douro (UTAD), Departamento de Zootecnia, Apartado 1013, 5000-801 Vila Real.

Abstract

Bee pollen and bee bread are two beehive products with high nutritional value, result of the presence of proteins, amino acids, fatty acids, carbohydrates, vitamins, minerals and phenolic compounds. Therefore, these products can be considered as excellent ingredients for energy bars.

The study focused on the formulation of different energy bars with compositional variation of pollen and bee bread. Additionally, the composition included almonds, walnuts, hazelnuts, common in Trás-os-Montes region, and ingredients such as white quinoa, sesame and oat flake.



Introduction

Energy bars are food products with high energy and nutritional value, with high consumption rates in our days. As a rule, they are purchased by consumers of dietary supplements, particularly by athletes in situations of effort, who need fast assimilation foods and a concentrate source of energy. These bars are usually the result of pressing mixtures of cereals, fruits and nuts, which are added through a syrup of glucose and honey, among others. The objective of this work focused on the development of different formulations of energy bars that incorporate bee products with characteristics that respond to the nutritional needs of consumers in situations of intense physical effort, integrating high protein contents and carbohydrates of rapid assimilation, such as bee pollen and bee bread, rich in protein and fiber, and honey, rich in fructose and glucose. The first stage of the work, namely, the nutritional analysis of the ingredients and the sensorial acceptability of the bars are presented in this poster.

Materials

- ❖ Infra-red balance
- ❖ Muffle
- ❖ Soxhlet method
- ❖ Kjeldahl
- ❖ Enzymatic-gravimetric method
- ❖ HPLC - RI

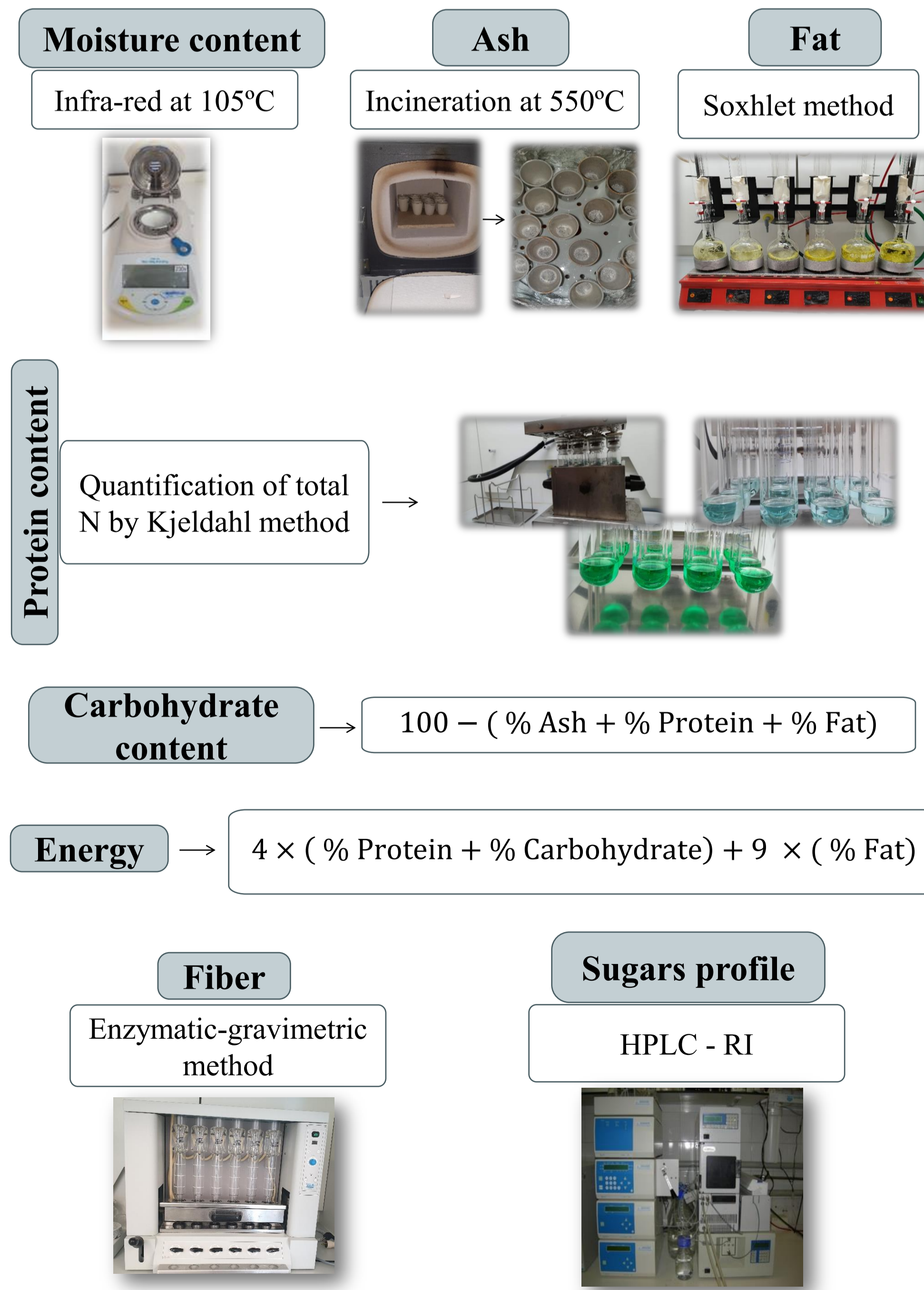
Raw material

- ❖ Bee pollen
- ❖ Bee bread
- ❖ Honey
- ❖ Dry fruits (almond, walnut, hazelnut)
- ❖ Oat flake
- ❖ Sesame seed
- ❖ White quinoa

Solvents and reagents

- ❖ Petroleum ether;
- ❖ Ethanol;
- ❖ Diethyl ether;
- ❖ Acetonitrile (HPLC quality);
- ❖ Sulfuric acid
- ❖ Boric acid
- ❖ Hydrochloric acid
- ❖ Anhydrous disodium phosphate
- ❖ Monobasic disodium phosphate monohydrate
- ❖ Acetone
- ❖ Sodium hydroxide
- ❖ Green bromocresol indicator
- ❖ Methyl red
- ❖ Metal catalyst

Methodology



Results

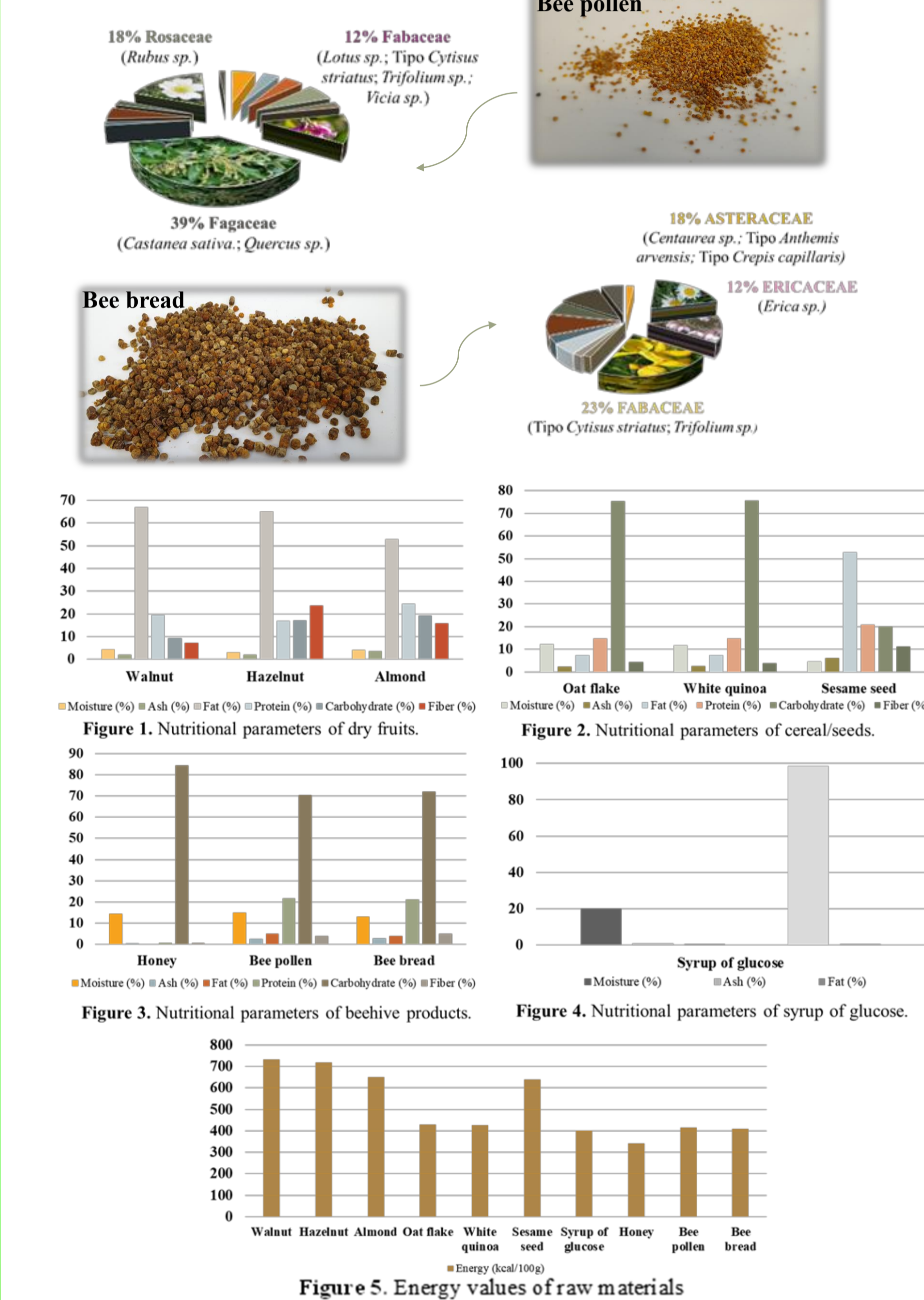


Table 1. Sugar profile of raw materials used for the preparation of energy bars (values expressed as a percentage on a dry basis).

Samples	Fructose (%)	Glucose (%)	Sucrose (%)	Trehalose (%)	Turanose (%)	Maltulose (%)	Maltose (%)
Walnut	n/d	n/d	5.59 ± 0.28	n/d	n/d	n/d	n/d
Hazelnut	n/d	n/d	10.65 ± 0.70	n/d	n/d	n/d	n/d
Almond	n/d	n/d	9.44 ± 0.30	n/d	n/d	n/d	n/d
Oat flake	n/d	n/d	3.07 ± 0.14	n/d	n/d	n/d	n/d
White quinoa	n/d	n/d	8.08 ± 0.75	n/d	n/d	n/d	n/d
Sesame seed	n/d	n/d	1.44 ± 0.01	n/d	n/d	n/d	n/d
Syrup of glucose	0.41 ± 0.00	39.12 ± 0.00	n/d	19.19 ± 0.00	n/d	n/d	n/d
Honey	48.36 ± 0.20	40.54 ± 0.17	n/d	1.93 ± 0.09	3.51 ± 0.70	3.50 ± 0.53	4.61 ± 0.80
Bee pollen	37.69 ± 0.16	26.89 ± 0.37	18.15 ± 0.09	0.81 ± 0.18	1.52 ± 0.11	n/d	n/d
Bee bread	41.45 ± 0.08	20.28 ± 0.31	2.30 ± 0.19	n/d	n/d	n/d	n/d

Table 2. Sensorial analysis for the different energetic bars formulations, measure as general acceptancy.

Formulations of energy bars	Minimum	Maximum	Average	Formulations of energy bars	Minimum	Maximum	Average
Oat flake, pollen, walnut	3	8	4.9	Oat flake, bee bread, walnut	3	7	5.5
Oat flake, pollen, hazelnut	4	9	5.8	Oat flake, bee bread, hazelnut	4	8	6.7
Oat flake, pollen, almond	5	8	6.3	Oat flake, bee bread, almond	5	8	5.9
Sesame seed, pollen, walnut	3	8	6.0	Sesame seed, bee bread, walnut	4	9	6.4
Sesame seed, pollen, hazelnut	4	9	6.2	Sesame seed, bee bread, hazelnut	4	9	6.6
Sesame seed, pollen, almond	4	9	7.1	Sesame seed, bee bread, almond	4	9	6.4
White quinoa, pollen, walnut	3	9	6.5	White quinoa, bee bread, walnut	4	8	5.9
White quinoa, pollen, hazelnut	5	8	7.0	White quinoa, bee bread, hazelnut	4	8	6.7
White quinoa, pollen, almond	4	8	6.5	White quinoa, bee bread, almond	4	7	5.5

Conclusion

The results of the pollen analysis for bee pollen and bee bread, identified as the predominant origin the Fabaceae family (21%) and Fagaceae family (39%), respectively. In nutritional terms, bee pollen showed a higher content of moisture, proteins, fat, and energy when compared to bee bread. In opposition, the bee bread had a higher content of ash, fiber, and carbohydrates. The sugar profile for bee bread highlighted the high fructose content when compared to pollen. For the dry fruits, walnuts showed a high fat content, while almonds have presented high levels of protein and carbohydrates. The hazelnut, on the other hand, was characterized by its rich fiber and sucrose contents. Regarding seeds, the sesame seed exhibited the highest contents of ash, fat, protein, energy, and fiber. For the sugar profile, the seeds only contained sucrose, with the highest value found in white quinoa. According to a sensory analysis (Table 2), the panel acceptability was good for all the energy bars, with the two highest scores registered for the formulations containing pollen, particularly those with white quinoa/hazelnut and sesame seed/almond combinations.

Recommendations

- ✓ Use new cereal or seeds in order to obtain a more nutritious and tasty cereal bar;
- ✓ Modify the percentages and types of sweeteners used in order to study how they influence the structure of the cereal bar;
- ✓ Evaluate how the formulation of energy bars can affect their chemical stability.
- ✓ Introduce our bars to a company so that they can enter the market, and thus diversifying the consumption of these beehive products.

Acknowledgements

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