

PHENOLIC COMPOUNDS AND THEIR DYNAMICS IN DRONE BROOD WITH PROPOLIS

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Abstract

Drone brood and propolis contain a number of compounds with antioxidant activity. If the composition of the drone brood includes primarily unsaturated compounds and sulfhydryl groups, then propolis contains a large number of flavonoids and other phenolic compounds. The introduction of propolis in the composition of the drone brood product allows enriching the product with phenolic compounds, so that it can satisfy a significant part of the human need for these compounds. The stability of phenolic compounds during storage increases in proportion to the amount of propolis introduced. The prospective use of all tested products, the amount of propolis is limited only by the organoleptic properties of the product.

Key words: *drone brood, propolis, flavonoids, antioxidants*

Introduction

Drone brood and propolis are bee products with a high content of antioxidants. If TP contains such antioxidants as unsaturated compounds and sulfhydryl groups, then propolis is predominantly flavonoid and other phenolic compounds. In accordance with GOST 28886-90, the mass fraction of flavonoid and other phenolic compounds in propolis should be at least 25%. On the human body, flavonoids have a capillary-strengthening, antioxidant, analgesic and anti-inflammatory effect. Flavonoids are able to bind heavy metal ions, eliminating their catalytic action; they also weaken lipid peroxidation processes, interrupting free radical processes. There are reports of anti-tumor effects of flavonoids (Muravyova, 1981; Vahonina, 1992). The P-vitamin effect, which is the ability to eliminate the increased fragility of capillaries and reduce the permeability of their walls, was discovered in the 1940s, after which interest in flavonoids increased sharply. The cardiotropic effect consists in improving the energy metabolism of the myocardium by increasing the utilization of glucose, increasing the efficiency of utilizing oxygen, saturating the myocardium with potassium ions. The hepatoprotective effect is due to an increase in the antitoxic function of the liver, anti-inflammatory, membrane stabilizing and antioxidant effects. The choleretic effect is caused by an increase in the production and secretion of bile by hepatocytes. The antispasmodic effect of flavonoids is more pronounced in relation to coronary, less cerebral vessels, bronchi, biliary tract, intestines, uterus. The use of the combination preparation covers a significant portion of the vitamin P requirement. In Romania, Sicomed produces the drug Apilarnilprop based on lyophilized drone brood with propolis. One tablet contains 10 mg of lyophilized apilarnil and 7 mg of propolis. Along with apilarnil,

apilarnilprop is indicated for a wide range of disorders: neuropsychic, digestive, infectious-allergic and others (Ilieshiu and Kravchenko, 1983).

Elistratov and Trifonov (2011) patented a dietary supplement for food to normalize cerebral circulation, memory, increase resistance to mental and physical stress, reduce the fragility of blood vessels. Also, under the influence of dietary supplements, the rheological properties of blood are improved. The active components of the supplement are drone brood, dried and crushed rose hips and buckwheat herb, collected during the flowering period as a component that is a source of flavonoids (Elistratov and Trifonov, 2011).

Materials and methods

The object of the study was a dry, adsorbed drone brood (DB) using an adsorbent consisting of 96 parts of lactose and 4 parts of glucose. The ratio of the homogenate TR and the adsorbent is 1: 5. We also investigated a product containing these components, with the addition of 1, 2 and 3% by weight of the adsorbent of a thick propolis extract. The mass fraction of flavonoids and other phenolic compounds was determined in the alcoholic extract of the product spectrophotometrically at a wavelength of 400 nm in a fresh product after 6 months, 1 and 2 years of storage.

Results and discussion

Organoleptic properties were assessed in prepared samples of adsorbed drone brood with the addition of propolis extract. With an increase in the content of propolis extract from 1 to 3%, the spicy aroma characteristic of propolis increases. The product, containing 1% propolis extract, has a sweet taste with a barely perceptible bitterness. The product with 2% propolis extract has a sweet taste with a noticeable bitterness, and with 3% - a sweet taste with a pronounced bitterness, slightly spicy.

In dry adsorbed drone brood, the mass fraction of flavonoid and other phenolic compounds is $0.24 \pm 0.026\%$, with the addition of 1% propolis, the content increases to $1.05 \pm 0.067\%$, 2% of propolis - $1.34 \pm 0.052\%$, 3% of propolis - $2.14 \pm 0.04\%$.

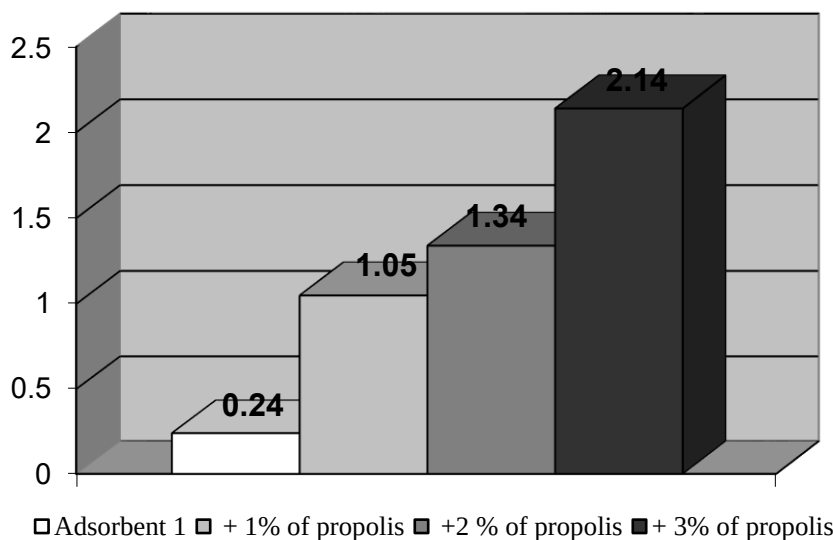


Figure 1. Mass fraction of flavonoid and other phenolic compounds of drone brood with different contents of propolis extract

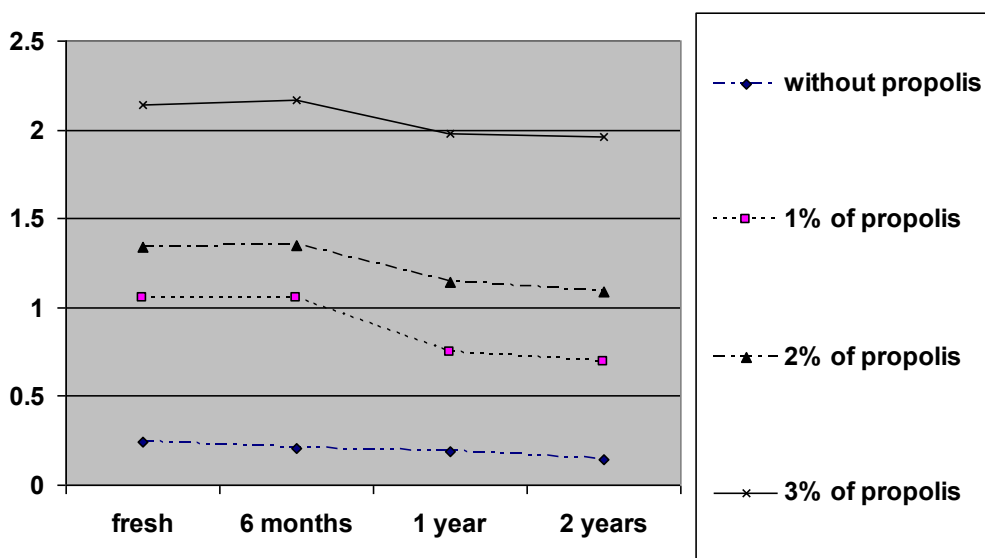


Figure 2. Mass fraction of flavonoid and other phenolic compounds of drone brood with different contents of propolis extract during storage

The mass fraction of flavonoid and other phenolic compounds in the dry adsorbed drone brood decreases during storage. After 6 months, it is $90.61 \pm 1.81\%$ of the initial, after 1 year - $79.87 \pm 1.44\%$, and after 2 years - $60.06 \pm 2.38\%$. In drone brood with the addition of 1% propolis after 6 months - $100.02 \pm 1.54\%$, after 1 year - $71.16 \pm 0.97\%$ and after 2 years - $65.95 \pm 1.74\%$. With the addition of 2% propolis after 6 months - $100.68 \pm 0.12\%$, after 1 year - $84.77 \pm 2.84\%$ and after 2 years - $81.25 \pm 3.10\%$. With the addition of 3% propolis, after 6 months - $101.23 \pm 0.57\%$, after 1 year - $92.66 \pm 1.27\%$ and after 2 years - $91.71 \pm 1.06\%$. An interesting pattern is observed: after 6 months, the mass fraction of phenolic compounds in drone brood with the addition of propolis slightly exceeds the initial value. This excess is the greater, the greater the content of propolis. Subsequently, the mass fraction of phenolic compounds in all samples decreases. The decrease in the mass fraction of phenolic compounds is the less, the higher the content of propolis in the samples.

Table 1. Dynamics of the content of flavonoid and other phenolic compounds during storage

Variant	Flavonoid and other phenolic compounds		
	Storage 6 months	Storage 1 year	Storage 2 years
Without propolis	90.61 ± 1.81	79.87 ± 1.44	60.06 ± 2.38
DB+1 % of propolis	100.02 ± 1.54	71.16 ± 0.97	65.95 ± 1.74
DB 2 % of propolis	100.68 ± 0.12	84.77 ± 2.84	81.25 ± 3.10
DB +3 % of propolis	101.23 ± 0.57	92.66 ± 1.27	91.71 ± 1.06

Conclusions

Thus, when propolis is added to the product based on drone brood, the mass fraction of flavonoid and other phenolic compounds increases significantly. The mass fraction of phenolic compounds in the dry adsorbed drone brood without the addition of propolis decreases continuously during storage. When propolis is added during the first 6 months, this indicator changes slightly, and then decreases the more slowly the more propolis is in the product.

References

Vahonina, T.V. (1992): Pchelinaya apteka/ T.V. Vahonina – SPb.: Lenizdat, 190s.

GOST 28886-90 Propolis. Tekhnicheskie usloviya.

Ilieshiu, N.V. (1983): Primenenie drazhe Apilarnil i Apilarnilprop v kachestve natural'nyh tonicheskikh i troficheskikh produktov pchelovodstva v terapevticheskikh vitaliziruyushchih celyah/N.V. Ilieshiu, M. Kravchenko// XXIX mezhdunarodnyj kongress po pchelovodstvu. – Buharest: Apimondiya, 394-398.

Muravyova, D.A. (1981): Farmakognoziya/D.A. Murav'yova. – M.: Medicina, 1981. – 656s.:il.

Pat. 2415610 RF MPK A23L1/30. Biologicheski aktivnaya dobavka k pishche/

Elistratov D.G., V.N. Trifonov (2011) Opubl. 10.04.2011.