

A GUIDE TO THE COMPOSITION AND PROPERTIES OF PROPOLIS

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Dr. Ștefan Stângaciu is a doctor in medicine, passionately interested in apitherapy. He struggles with all his forces for enlarging the applicative sphere of this method of treating and healing the diseases of mankind. The propolis is among the hive products that are largely used in apitherapy. In 1977, Dr. Ștefan Stângaciu published a book with the same title as above, divided into four parts, of which you will find in APIACTA the second and the third parts. Those who are interested in the whole work are kindly requested to direct themselves to the author's address (see end of article).

PART II – The main substances of propolis and their properties

Flavonoids

- anti-microbial properties (Ghisalberti, 1979);
- anti-inflammatory, increase the activity of ascorbic acid (Vitamin C) and action on capillary vessels (Ravina, 1969);
- anti-oxidant;
- decrease the permeability of capillaries (“vitamin P action”) (Szent-György et al., 1936);
- stabilizes the collagen through inhibiting the hyaluronidase;
- anti-haemorrhage;
- influence *in vitro* of some flavonoids on the enzymatic metabolism of mucopolysaccharides from saphenous veins (Niebes and Laszt, 1971)

Chrysin

- gives also the colour of beeswax (Jaubert, 1926);
- tumor cytotoxicity (Hladon et al., 1987);
- anti-*Helicobacter pylori* (Itoh et al., 1994)

Apigenin

- healing of gastric ulcers (The Hive and the Honey Bee, 1992)

Acacetin

- anti-inflammatory (Bankova et al., 1983)

Quercetin

- histaminopexic activity (Di Maggio and Ciaceri, 1961);
- anti-viral (König and Dustmann, 1985);
- strengthening capillaries (Budavari, 1989);
- anti-tumoral activity (Matsuno Tetsuya, 1991);
- spasmolytic (The Hive and the Honey Bee, 1992)

Kaempferide

- spasmolytic (The Hive and the Honey Bee, 1992);
- anti-*Mycobacterium phlei*;
- anti – acid resistant micro-organisms

Kaempferol-7,4'-dimethyl ether

- anti-mycotic

Ermanin

- anti-mycotic

Galangin

- bacteriostatic activity (Villanueva et al., 1964; Pepeljnjak, 1982);
- anti-microbial and anti-mycotic (Metzner et al., 1979);
- anti-*Helicobacter pylori* (Itoh et al., 1994)

Pinocembrin

- bacteriostatic activity (Villanueva et al., 1970);
- anti-mould (Miyakado et al., 1976);
- anti-*Blastomyces* (Metzner et al., 1977);
- anti-microbial and anti-mycotic, *in vitro*, and in external use (Metzner et al., 1979);
- anti-*Candida* (Metzner and Schneidewind, 1978);
- local anaesthetic (Painz and Metzner, 1979);
- anti-*Helicobacter pylori* (Itoh et al., 1994)

Pinobanksin

- anti-microbial and anti-mycotic (Metzner et al., 1979)

Pinobanksin-3-acetate

- anti-microbial and anti-mycotic (Metzner et al., 1979)

Pinostrobin

- local anaesthetic (Painz and Metzner, 1979)

3',4'-dihydroxyflavonoids

- strengthening capillaries (The Hive and the Honey Bee, 1992)

Flavan-3-ols

- strengthening capillaries (Roger, 1988)

Pectolinarigenin

- spasmolytic (The Hive and the Honey Bee, 1992)

Luteolin

- antiviral (König and Dustmann, 1985);
- healing of gastric ulcers (The Hive and the Honey Bee, 1992)

Artepillin C

- anti-tumor effect; anti-leukemic effect

Eriodictyol

- helping pulmonary insufficiency;
- prevention of acute pulmonary insufficiency

Pinosylvin (3,5-dihydroxystilbene)

- anti-microbial against *Bacillus subtilis* and *Bacillus cereus*;
- anti-mycotic against *Mycobacterium phlei* and *M. Smegmatis*

Ferulic acid

- anti-bacterial effect (gram-positive and gram-negative micro-organisms) (Villanueva et al., 1970) (Cizmarik and Matel, 1970, 1973);
- agglutinant effect (useful in treating slowly healing wounds by the help of a soft propolis extract);

- collagenic effect (described in 1938);
- promote build-up of collagen and elastin (two essential components in the matrix of connective tissues);
- permeates propolis

Isoferulic acid

- anti-*Staphylococcus aureus*

Benzoic acid

- bacteriostatic and bactericide effects (Janes and Bumba, 1978);
- balsamic and antiseptic (Vanhaelen and Vanhaelen-Fastré, 1992)

Cinnamic acid

- anti-*Staphylococcus aureus*

Cinnamic acid derivatives

- increase the cicatrization and the regeneration of epithelium

Isopentyl ferulate

- anti-influenza virus A/Hong Kong (H3N2) *in vitro*;
- inhibits the production of hemagglutinins *in ovo*

Cinnamylidene acetic acid

- anti-microbial against *Bacillus subtilis*, *Bacillus cereus*, *Escherichia coli*;
- anti-mycotic against *Mycobacterium phlei*, *M. Smegmatic* and *Candida albicans*

Aromatic acids and their esters

- anti-fungal and anti-bacterial properties;
- *p-Coumaric acid benzyl ester*;
- anti-microbial and anti-mycotic (METZNER et al., 1979)

Caffeic acid

- antiviral (König and Dustmann, 1985);
- anti-bacterial activity on some gram-positive and gram-negative microorganisms (Villanueva et al., 1970) (Cizmarik and Matel, 1970, 1973);
- anti-inflammatory (Bankova et al., 1983)

Prenyl caffeate

- potential contact allergen

3-methyl-but-2-enyl caffeate

- antiviral activity

Caffeic acid esters

- local anaesthetic (Paintz and Metzner, 1979)

Caffeic acid phenethyl ester

- anti-tumoral activity

Methyl caffeate

- tumor cytotoxicity or inhibition (Inayama et al., 1984; Grunberger et al., 1988)

Methyl feruleate

- tumor cytotoxicity or inhibition (Inayama et al., 1984; Grunberger et al., 1988)

Diterpenoid of clerodan

- anti-tumoural activity;
- anti-bacterial

Pterostilbene

- anti-diabetic (non-confirmed) (The Hive and the Honey Bee, 1992)

Volatile compounds (etheric oils)

- anti-microbial activity;
- Bisabolol;
- anti-inflammatory

Volatile substances in beehive air

- anti-hay fever

Amino acids

- *Arginine* – stimulates mitosis and enhance protein biosynthesis (Gabrys, 1986);
- *Proline* – promote build-up of collagen and elastin (two essential components in the matrix of connective tissues) (Gabrys, 1986)

Minerals

Even in very small doses (oligo- or trace-elements), the minerals are very important for the cellular metabolism.

Every biological or physiological process who takes place in the body of man or animals needs spur elements; they participate in the proteins, fats and glucidic balance and also in the protein syntheis, in the thermic balance, in haematopoesis, osteogenesis, in cellular multiplication and in immunobiologic reactions.

It has been established that there are 24 spur elements in the human blood, 23 of them being present in propolis; if the spur elements are sufficient in our body several organs and/or biological processes will function properly; the spur elements selectively accumulate in different organs of the human body:

- *zinc* especially in the sexual glands, hypophysis and pancreas;
- *copper* in the liver and bone marrow;
- *cadmium* and *molybdenum* in the kidneys;
- *nickel* in the pancreas;
- *strontium* in the bones;
- *manganese* and *chromium* in the hypophysis.

The biological activity of many spur elements is linked with their synergetic action together with enzymes and vitamins:

- *iron* is part of the composition of the breathing enzymes;
- *zinc* is present in the enzymes which make up the glucide and protein balance; zinc helps to the decrease of cholesterol in the blood;
- *manganese* is related to the vitamin B1; the effect of vitamin B1 increase if there is enough manganese in the body;
- *cobalt* is related to the vitamin B12 and the formation of bone tissues; it is an useful adjuvant in the treatment of some liver diseases, hypertronic disease (high blood pressure) and glaucoma.

The physician B.M. Hecht showed that the addition in food of cobalt, iodine and honey intensifies the phagocytosis of the white blood cells and increases the resistance of the body to infectious diseases.

- *copper* is actively linked with the vitamins A, B, C, E and with the nicotinic acid, it helps in healing endarteritis and skin diseases.

PART III – Pharmacological properties of the main propolis substances

Anti-microbial substances in propolis (Schneidewind et al., 1975: flavones and flavanols (Ghisalberti, 1979):

Flavones

- chrysin ;
- tectochrysin;
- 5-hydroxy-4', 7-dimethoxyflavone ;
- rhamnocitrin ;
- galangin ;
- galangin-3-methyl-ether (5,7-dihydroxy-3-methoxyflavone);
- isalpinin;
- pectolinarigenin;
- quercetin-3,3'-dimethyl ether

Flavanones

- pinostrobin;
- pinocembrin;
- alpinetin;
- alnusitol;
- pinobanksin;
- 3-acetyl-pinobanksin;
- pinobanksin-3-acetate;
- sakuranetin;
- 5-hydroxy-4', 7-dimethoxyflavanon

Aromatic acids and their esters

- benzoic acid;
- p-coumaric benzyl ester;
- p-coumaric acid benzyl ester;
- caffeic acid;
- an ester of caffeic acid with an aromatic alcohol

Cinnamic acid derivatives

- cinnamylidene acetic acid;
- anti-microbial against *Bacillus subtilis*, *Bacillus cereus*, *Escherichia coli*

Heteroaromatic compounds

- pinosylvin

Volatile compounds (etheric oils)

Anti-bacterial activity

- pinocembrin;
- pinobanksin;
- isalpinin;
- galangin;
- aromatic acids and their esters:
 - ferulic acid;
 - caffeic acid.
- a diterpenoid of clerodan

Anti-Staphylococcus aureus

- cinnamic acid ;
- isoferulic acid ;
- caffeic acid

Anti-Escherichia coli and Streptomyces aureofaciens

- several UV absorbing substances from propolis

Anti-mycotic substances

- aromatic acids and their esters;
- kaempferol-7,4'-dimethyl ether;
- ermanin (5,7-dihydroxy-3,4'-dimethoxyflavone);
- pinobanksin-3-acetate;
- pinocembrin;
- p-coumaric acid benzyl ester;
- a caffeic acid ester;
- caffeic acid;
- sakuranetin;
- pterostilbene;
- pinosylvin (3,5-dihydroxystilbene);
- cinnamylidene acetic acid:
 - anti-mycotic against *Mycobacterium phlei*, *M. smegmatis* and *Candida albicans*.

Anti-Candida activity:

- pinocembrin;
- cinnamylidene acetic acid

Anti-Mycobacterium phlei

- kaempferide (kaempferol-4'-methyl ether) (3,5,7-trihydroxy-4'-methoxy-flavone)

Anti-acid resistant micro-organisms

- kaempferide

Anti-mould substances

- pinocembrin (Miyakado et al., 1976)

Anti-Blastomycetes

- pinocembrin (Metzner et al., 1977)

Antiseptic substances:

- benzoic acid (Vanhaelen and Vanhaelen-Fastré, 1992)

Antiviral substances (König and Dustmann, 1985)

- caffeic acid;
- 3-methyl-but-2-enyl caffeate (Amoros et. al., 1994);
- luteolin;
- quercetin;
- 7-methoxyquercetin;
- 3,7-dimethoxyquercetin

Antiherpetic activity

- isopropylalcohol extract of propolis

Anti-influenza virus A/Hong Kong (H3N2) (in vitro) + inhibition of the production of hemagglutinins in

ovo

- isopentyl ferulate

Tumor cytotoxicity or inhibition (Grunberger et al., 1988; Inayama et al., 1984)

- caffeic acid phenethyl ester (methyl caffeate, methyl feruleate);
- caffeic acid phenethyl ester; quercetin and a diterpenoid of clerodan (Matsuno Tetsuya, 1991 cited by Yamamoto, 1996);
- artepillin C;
- chrysin (Hladon et al., 1987)

Local anaesthetic

- pinocembrin (Paintz and Metzner, 1979) ;
- pinostrobin (Paintz and Metzner, 1979);
- caffeic acid esters (Paintz and Metzner, 1979)

Strengthening capillaries

- quercetin (Budavari, 1989) ;
- 3',4'-dihydroxyflavonoids ;
- flavan-3-ols (Roger, 1988)

Decrease the permeability of capillaries (vitamin P action)

- flavonoids (Szent-György et al., 1936)

Anti-haemorrhagic activity

- flavonoids

Influence in vitro on the enzymatic metabolism of mucopolysaccharides from saphenous veins

- some flavonoids (Niebes and Laszt, 1971)

Spasmolytic activity

- quercetin;
- kaempferide;
- pectolinaringenin

Anti-inflammatory activity

- caffeic acid (Bankova et al., 1983);
- acacetin (Bankova et al., 1983);
- bisabolol (Marinescu 1982);
- flavonoids (Marinescu, 1982)

Anti-oxidant activity

- flavonoids

Hystaminopexic activity

- quercetin (Di Maggio and Ciaceri, 1961)

Anti-leukemic cells

- artepillin C

Anti-diabetic (unconfirmed)

- pterostilbene

Healing of gastro-duodenal ulcers

- luteolin;
- apigenin;
- pinocembrin, galangin and chrysin (anti-*Helicobacter pylori*) (Itoh et al., 1994)

Helping pulmonary insufficiency (Aviado et al., 1974)

- eriodictyol

Prevention of acute pulmonary insufficiency

- eriodictyol

Stimulating mitosis and enhancing protein biosynthesis

- arginine (Gabrys, 1986)

Promoting build-up of collagen and elastin

- proline (Gabrys, 1986);
- ferulic acid (1938); (Cizmárik and Matel, 1971, 1978)

Agglutinant effect

- ferulic acid (Cizmárik and Matel, 1971, 1978)

Balsamic effect

- benzoic acid (Vanhaelen and Vanhaelen-Fastré, 1992)

Cicatrization and regeneration of the epithelium

- cinnamic acid derivatives

Wound healing

- phenolic acids;
- flavanoids

Allergy

- prenyl caffeate

Anti-hay fever

- volatile substances in beehive air

Tissues, organs related to the minerals from propolis

Arteries: copper

Bones: strontium, cobalt

Bone marrow: copper

Eyes: cobalt

Hypophysis: zinc, manganese, chromium

Kidneys: cadmium, molybdenum

Liver: copper, cobalt

Pancreas: zinc, nickel

Sexual glands: zinc

Skin: copper

Biological activities of spur elements from propolis

The spur elements have a synergetic action together with enzymes and vitamins.

Iron

- is part of the composition of the breathing enzymes

Zinc

- is present in the enzymes which make up the glucide and protein balance;
- zinc helps to the decrease of cholesterol in the blood

Manganese

- is related to the vitamin B1; the effect of vitamin B1 increase if there is enough manganese in the body

Cobalt

- is related to the vitamin B12;
- intensifies the phagocytosis of the white blood cells and increases the resistance of the body to infectious diseases (the physician B.M. Hecht showed that by adding in food of cobalt, iodine and honey)

Copper

- is actively linked with the vitamins A, B, C, E and with the nicotinic acid

Diseases treatable by the spur elements from propolis

Endarteritis: copper

Glaucoma: cobalt

High Blood Pressure (Hypertonic disease): cobalt

Hypercholesterolemia: zinc

Infectious diseases: cobalt

Liver diseases: cobalt

Skin diseases: copper