Session 8 - Products

The Value of Honey Bees as Pollinators in North Carolina

Honey Bees as Pollinators

Many crops require insects to move pollen from one flower to another. Pollination ensures fruit set, proper development, more fruit, and viable seed. **Honey bees** are the **most important insect pollinator** for crops grown in North Carolina.

- Vegetable and fruit crops that require honey bees include cucumbers, blueberries, watermelons, apples, squash, strawberries, melons, and peaches.
- Forage crops that benefit from honey bee pollination include alfalfa, cotton, peanuts, and soybeans.
- Averaged over the last five years, honey bees have directly accounted for approximately **$96 million** in annual fruit and vegetable production (67.9%) and approximately **$186 million** in total annual crop productivity (24.5%) (see Table 1).

Since the mid-1980s, honey bees have been plagued by two exotic parasitic mites that can kill entire colonies if left untreated. The result has been a **dramatic drop** in the state's **honey bee population.**

- The estimated number of **managed** hives in the state has declined from a high of 180,000 hives before the mite introduction to **only 100,000 hives** currently.
- Most **wild honey bee colonies**, which also served as pollinators, **have been wiped out** by these mites.

It is now necessary that growers of bee-dependent crops **rent hives** to ensure proper and successful pollination.

- Pollination rentals often require **pollination contracts** between growers and beekeepers to ensure an adequate number of honey bees in the crop during the bloom period.
- An estimated **240,000 hives will be required for pollination in 2007** (see Table 2), which exceeds the number of managed hives in the state. Thus it is vital to **contract pollinators well ahead of the date they are needed**.

To **locate beekeepers in your area**, contact your local Cooperative Extension center (http://www.ces.ncsu.edu/local-county-center/) or the NC Department of Agriculture & Consumer Services (http://www.ncagr.gov/plantindustry/Plant/apiary/index.htm).

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	Total Value of Production ($1000s of dollars)							Value Attributable to Honey Bees ($1000s of dollars)					
Fruits and Vegetables	**2002**	**2003**	**2004**	**2005**	**2006**	**D**	**P**	**2002**	**2003**	**2004**	**2005**	**2006**	**5 Year Avg.**
Apples	22,205.000	17,103.000	16,630.000	13,859.000	19,799.000	100%	90%	19,984.500	15,392.700	14,967.000	12,473.100	17,819.100	16,127.280
Blueberries	22,534.000	34,777.000	2,235.000	36,702.000	48,745.000	100%	90%	20,280.600	31,299.300	29,011.500	33,031.800	43,870.500	31,498.740
Brambles	583.440	938.250	1,003.920	1,003.920	1,025.280	80%	90%	420.077	675.540	722.822	722.822	738.202	655.893
Cucumbers (fresh)	12,075.000	13,260.000	11,340.000	8,400.000	13,299.000	90%	90%	9,780.750	10,740.600	9,185.400	6,804.000	10,772.190	9,456.588
Cucumbers (pickled)	23,490.000	23,612.000	19,404.000	19,952.000	10,260.000	90%	90%	19,026.900	19,125.720	15,717.240	16,161.120	8,310.600	15,668.316
Grapes	2,934.000	2,989.000	3,366.000	3,653.000	4,624.000	10%	10%	29.340	29.890	33.660	36.530	46.240	35.132
Melons	20,000.000	20,000.000	20,000.000	20,000.000	20,000.000	80%	90%	14,400.000	14,400.000	14,400.000	14,400.000	14,400.000	14,400.000
Peaches	3,500.000	2,400.000	2,940.000	5,100.000	5,115.000	60%	80%	1,680.000	1,152.000	1,411.200	2,448.000	2,455.200	1,829.280
Pumpkins	2,000.000	2,000.000	2,000.000	2,000.000	2,000.000	90%	10%	180.000	180.000	180.000	180.000	180.000	180.000
Squash	10,260.000	8,430.000	9,000.000	9,860.000	11,480.000	90%	10%	923.400	758.700	810.000	887.400	1,033.200	882.540
Strawberries	19,125.000	15,300.000	15,840.000	18,525.000	19,440.000	20%	10%	382.500	306.000	316.800	370.500	388.800	352.920
Watermelons	9,503.000	6,825.000	6,300.000	7,259.000	12,960.000	70%	90%	5,986.890	4,299.750	43,969.000	4,573.170	8,164.800	5,398.722
Subtotal (% of total value)	***148,209.440***	***147,634.250***	***140,058.920***	***146,313.920***	***168,747.280***			***93,074.957 62.8%***	***98,360.200 66.6%***	***90,724.622 64.8%***	***92,088.442 62.9%***	***108,178.832 64.1%***	***96,485.411 64.2%***
Forage Crops													
Alfalfa (hay)	5,000.000	5,940.000	3,120.000	106,080.000	115,872.000	100%	60%	3,000.000	3,564.000	1,872.000	63,648.000	69,523.200	28,321.440
Cotton (lint)	163,263.000	322,051.000	253,286.000	315,910.000	281,424.000	20%	80%	26,122.080	51,528.160	40,525.760	50,545.600	45,027.840	42,749.888
Cotton (seed)	25,704.000	37,692.000	41,795.000	38,548.000	3,945.000	20%	80%	4,112.640	6,030.720	6,687.200	6,167.680	631.200	4,725.888
Peanuts	45,990.000	73,280.000	77,112.000	56,448.000	49,459.000	10%	20%	919.800	1,465.600	1,542.240	1,128.960	989.180	1,209.156
Soybeans	174,305.000	306,180.000	257,550.000	222,329.000	274,176.000	10%	50%	8,715.250	15,309.000	12,877.500	11,116.450	13,708.800	12,345.400

	Total Value of Production ($1000s of dollars)							Value Attributable to Honey Bees ($1000s of dollars)					
Subtotal (% of total value)	***414,262.000***	***745,143.000***	***632,863.000***	***739,315.000***	***724,876.000***			***42,869.770 10.3%***	***77,897.480 10.5%***	***63,504.700 10.0%***	***132,606.690 17.9%***	***129,880.220 17.9%***	***89,351.772 13.7%***
TOTAL (% of total value)	***562,471.440***	***892,777.250***	***772,921.920***	***885,628.920***	***893,623.280***			***135,944.727 24.2%***	***176,257.680 19.7%***	***154,229.322 20.0%***	***224,695.132 25.4%***	***238,059.052 26.6%***	***185,837.183 23.2%***
D = Dependency of crop on insect pollination for fruit set P = Proportion of insect pollinators that are honey bees													
Resources: Delaplane, K. S. and D. F. Mayer. (2000). *Crop Pollination by Bees*. CABI Publishing, Cambridge. McGregor, S. E. (1976). *Insect Pollination Of Cultivated Crop Plants*. Agriculture Handbook No. 496, USDA-ARS, U.S. Gov. Print. Office, Washington, DC. Morse, R. A. & N. W. Calderone. (2000). *The value of honey bees as pollinators of U.S. crops in 2000*. Bee Culture 128: 1-15. National Agricultural Statistics Service													

Table 2. Estimated number of hives required for North Carolina pollination in 2007.

		Estimated Values for 2007	
Crop	**Recommended Hives/Acre**	**Acreage**	**Number of Hives Needed**
Apples	1.5	6,740	10,110
Blueberries	3.0	5,240	15,720
Brambles	0.8	245	196
Cucumbers (fresh)	2.2	5,510	12,122
Cucumbers (pickled)	2.2	78,360	172,392
Melons	1.5	4,000	6,000
Peaches	0.2	1,200	240
Pumpkins	1.5	1,500	2,250
Squash	1.5	3,730	5,595
Strawberries	3.5	1,460	5,110
Watermelons	1.8	6,090	10,962
TOTAL		***114,075***	***240,697***

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THE AMERICAN APITHERAPY SOCIETY INC.

Raw honey has been used for its medicinal value for thousands of years by many cultures. Hippocrates, the father of medicine, wrote of the medical uses of honey. All the major religious texts mention the health benefits of honey. Raw honey—honey which has not been filtered, heat-treated, or processed—is not just a healthy food. It is a powerful medicine when taken internally or used topically. The favorable effects of raw honey as a natural medicine for a wide variety of ailments are well known in folk medicine and are beginning to be documented in the modern scientific literature.

Its chemical composition makes it easier to digest than regular sugar, and its metabolism does not stimulate insulin secretion to the same degree as does sugar. Thus honey can be used in small amounts as a healthy substitute for regular sugar and artificial sweeteners. It also contains small amounts of protein, vitamins, minerals, and enzymes.

Common indications for oral ingestion of honey include: insomnia, anorexia, stomach and intestinal ulcers, constipation, osteoporosis, and laryngitis. A clinical trial in Saudi Arabia found honey to relieve dyspepsia (chronic indigestion). It was also found to help heal bleeding ulcers and GI inflammation. Manuka honey from New Zealand was found to inhibit the growth of H. pylori, the bacteria that is sometimes responsible for the development of ulcers. Research has confirmed honey's ability to act as a broad-spectrum antibiotic, as well as its antifungal and antiviral properties.

Indications for the external application of honey include treatment of athlete's foot, eczema, lip sores, and both sterile and infected wounds resulting from accidents, surgery, bed sores, or burns. In many countries, including France and Germany, physicians recommend using honey as a first line of defense against burns, superficial wounds, and in some cases, even deep

lesions such as abscesses. Wounds treated with raw honey generally heal faster and with less scarring than with conventional treatments. Raw honey is a natural and painless antiseptic. It kills germs because it is hydrophilic, meaning it absorbs or attaches to water in its environment thus dehydrating any bacteria it comes in contact with. In addition, honey contains an enzyme called glucose oxidase. This enzyme is converted to hydrogen peroxide, which is another powerful anti-microbial agent. In a 1991 study, honey was compared with silver sulfadiazine, the standard treatment for burn patients, and the results were astounding. Only 8% of patients treated with honey developed infections, compared to 92% of those treated with the silver sulfadiazine.

In addition to the previously mentioned medicinal uses for honey, it has also been shown to reduce the average size of postoperative scars significantly, treat cataracts and conjunctivitis, normalize the digestive microflora, calm the nerves, and facilitate sleep. These are just a few of the many uses for honey.

(from material provided by Andrew Kochan, MD, 6-08)

Beeswax

Not Just Honey!

When you think of bees you think of honey, right? Did you know bees produce a variety of beneficial products other than honey? Read on for more information on these products.

Beeswax

The word wax describes a large variety of substances of plant and animal origin, as well as man-made products, which are mostly petroleum derivatives. Natural waxes are not single substances, but a mixture of various long-chain fatty acids and a variety of other constituents, depending on their origin. Wax from the honeybee has an extremely wide spectrum of useful applications and occupies a very special position among waxes.

For centuries, beeswax was appreciated as the best material for making candles. The wrappings of Egyptian mummies contained beeswax and beeswax has long found use in medicinal practices and in creams and lotions. Of all the primary bee products it has been, and remains, the most versatile and most widely used material.

Production of wax

Young bees in the hive, after feeding the young brood with royal jelly, take part in the construction of the hive. Engorged with honey and resting suspended for 24 hours together with many other bees in the same position, 8 wax glands on the underside of the abdomens of the young bees secrete small wax platelets. These are scraped off by the bee, chewed and masticated into pliable pieces with the addition of saliva and a variety of enzymes. Once chewed, attached to the comb and re-chewed several times, they finally form part of this architectural masterpiece, a comb of hexagonal cells, and a 20 g structure, which can support
1000 g of honey. Wax is used to cap the ripened honey and when mixed with some propolis, also protects the brood from infections and desiccation. Together with propolis, wax is also employed for sealing cracks and covering foreign objects in the hive. The wax collected by the beekeeper is that which is used in comb construction. Frame hive beekeeping produces wax almost exclusively from the cap and top part of the honey cells.

Wax collection and processing

There are several ways of collecting beeswax. More commonly in frame hive beekeeping, wax is rendered from the capping removed during honey extraction. This produces a very high quality, light colored wax. Light colored broken combs provide the next quality of wax, whereas old black brood combs yield the smallest proportion and lowest quality of wax. Scrapings from sidewalls and the bottom board contain very high proportions of propolis and should not be mixed with better quality waxes. They can be used in swarm traps, for hive wood treatments, or in other preservatives for wood.

Different qualities of wax can be produced by separating new white honeycombs from darker ones or from those with portions of brood. Since whole combs are harvested and crushed or pressed, the proportion of wax per kilogram me of honey (10-15%) is much higher than with frame hive beekeeping, where the yield is only 1-2%. Before processing, all comb or wax pieces should be washed thoroughly to remove honey and other debris. Wax can be separated in solar

wax melters, by boiling in water then filtering, or by using steam or boiling water and special presses.

Wax should never be heated above 85 C. If wax is heated directly (without water) or above 85 C discolorations occurs. Direct exposure of wax to hot steam results in partial saponification.

Physical characteristics of beeswax

Virgin beeswax, immediately after being secreted, elaborated and formed into comb, is white. It becomes darker with use inside the hive as pollen, silk and larval debris are inadvertently incorporated.

The melting point of beeswax is not constant since the composition varies slightly with its origin. Various pharmacopoeias give a range of 61-66C or more commonly, 62-65 C. Its relative density at 15 C is 0.958 – 0.970 g/cm3 and its electrical resistance ranges from 5×1012 to 20×1012 Ohm m. Its thermal conductivity coefficient is 2.5 x d10-3 Jcm/s°Ccm2. The saponification value of beeswax is 85-100.

Beeswax is an inert material with high plasticity at a relatively low temperature (around 32 C). Beeswax is also insoluble in water and resistant to many acids, but is soluble in most organic solvents such as ether, benzine, benzol, chloroform, and turpentine oil and after warming, in alcohol and fatty oils. Ghedda waxes from the Asian honeybee species are described as softer and more plastic. The melting point of wax from three Meliponid (stingless bee) species ranged between 64.6 and 66.5 C.

The composition of beeswax

Pure beeswax from Apis mellifera consists of at least 284 different compounds. Not all have been completely identified but over 111 are volatile. At least 48 compounds were found to contribute to the aroma of beeswax. Quantitatively, the major compounds are saturated and unsaturated monoesters, diesters, saturated and unsaturated hydrocarbons, free acids and hydroxy polyesters. There are 21 major compounds, each making up more than 1 % of the pure unfractionated wax. Together they account for 56% of the wax. The other 44% of diverse minor compounds probably account for beeswax's characteristic plasticity and low melting point (Tulloch, 1980).

Various plant growth-promoting substances, such as myricil alcohol, triacontanol, gibberellin GA3 and a rape oil steroid have been detected in and isolated from beeswax. They described at least 11 proteins in the freshly secreted wax scales of A. mellifera capensis worker bees and 13 proteins in the wax combs of A. m. scutellata and A. m. capensis.

Beeswax is considered safe for human consumption and has been approved as an ingredient in human food in the USA. It is inert, i.e. it does not interact with the human digestive system at all and passes through the body unaltered. However, substances dissolved or encapsulated in wax are slowly released. This property is exploited in many medicinal preparations.

The physiological effects of wax

Because it is inert, beeswax has no direct effect on humans or larger animals. However, its indirect effects can be very strong. If mixed with medicinal drugs or poisonous baits, wax preserves the active materials longer and releases them slowly. It can be used to create thin non-corrosive, non-allergenic protective films on many surfaces from metals to fruits and human skin. Thus it protects against external damage such as corrosion and abrasion as well as against

moisture loss. It is a good electric insulator and, when saponified with borax, allows the mixture of very stable and smooth emulsions for cosmetics. Even in small concentrations it improves other formulations in the same way.

A very small anti-inflammatory and antioxidant activity can be observed in beeswax due possibly to some inclusions of propolis or other minor ingredients.

The uses of wax today

In the past, beeswax had a wide range of uses. Though in many cases beeswax can be replaced with cheaper, synthetic waxes, its very special characteristics, medicinal benefits, plasticity and aroma ensure its continuing use. The trend for more natural products in cosmetics may also increase its use. Presently, there is a scarcity of beeswax in industrialized countries, at least seasonally.

In beekeeping

In countries with frame hive beekeeping, the majority of locally produced beeswax is consumed by beekeepers for the making of wax foundations. Bees will not accept foundation made of synthetic waxes such as paraffin wax. In order to reduce damage during hive management and honey extraction in centrifugal extractors, foundation sheets are reinforced with wire either by the beekeeper (frame per frame) or by the manufacturer who embeds the wire into the foundation sheet.

For candle making

Beeswax was the major raw material for candles until the development of cheaper petroleum products such as paraffin wax. Since beeswax has a higher melting point than most paraffin waxes (most of which melt between 480 and 68C) beeswax candles remain straight at higher ambient temperatures. If wick size is correctly proportioned with respect to the diameter of the candle, they are less likely to drip than candles made from other materials. Waxes with a melting point above 88C do not perform well during burning.

For metal castings and modeling

Because of its plasticity, beeswax is easily formed and carved. It maintains its shape well even over very long periods of time as proven by wax sculptures found in ancient Egyptian graves. Its relatively low melting point permits easy and complete removal from casting moulds. The hollow space left in these moulds can then be filled with molten metal. Modeling in wax, or ceroplasty is a well developed art used also for scientific models in important collections around the world.

In cosmetics

The unique characteristics of beeswax give a certain solidity to emulsified solutions, facilitate the formation of stable emulsions and increase the water holding capacity of ointments and creams.

Beeswax not only improves the appearance and consistency of creams and lotions but is also a preferred ingredient for lipsticks, because it contributes to sheen, consistency and colour stabilization. Other cosmetic applications are found in cold creams (8-12% beeswax content by weight), deodorants (up to 35 %), depilatories (hair removers, up to 50%), hair creams (5-10%), hair conditioners (1-3%), mascara (6-12%), rouge (10-15%), eye shadows (6-20%) and others. Borax is the classic emulsifier, available in most pharmacies. Today's "high-chemistry" cosmetics use a large array of other synthetic emulsifiers. The chemical process on which the emulsification is based is the saponification of the acids in beeswax, i.e. the result is technically soap. The associated cleansing effect is exploited in so-called cleansing creams, which are very much like simple skin creams.

Food processing

Beeswax has been used in a variety of products and processes from packaging to processing and preservation. It has also been used as a separation agent in the confectionary industry and in cigarette filters. A common application for beeswax is the protection of containers against the effects of acids from fruit juices or honey. Steel drums for storage and shipment of honey have to be treated to prevent corrosion and dissolution of iron. The treatment involves expensive food grade paint, a plastic liner made from a food grade plastic film or a thin coat of beeswax.

Industrial technology

A patent describes a material for encapsulating electrical and electronic apparatus for use in high moisture or chemically active environinents.
Another patent describes the preparation of a material for embedding or electrically insulating circuits of high and ultra-high frequency. The mixture of 10-30% ceresin wax, 55-65 % beeswax and 15-25 % ethyl cellulose has a high melting point, is very hard at high temperatures, very strong when cold and can be remelted. A patent for an anti-corrosion rust inhibitor describes the incorporation of one or more different waxes, including beeswax. Other effective coatings contain beeswax; one such is composed of 90% mineral jelly and 10% beeswax. In other formulations, beeswax may be used as a binder, particularly if lubricant characteristics are required or if mixtures have to be ingested. Beeswax has also been used to decrease viscosity and improve slip-casting properties when casting glass under pressure. For agricultural pest control, beeswax has been an ingredient of slow release pellets of pyrethrum pesticides.

Textiles

Textiles and papers can be waterproofed with various products containing beeswax. Emulsions containing beeswax for leather treatment.

Varnishes and polishes

A varnish made from dammar resin and beeswax to be used for paintings and for art restoration. If propolis is included, the suitability of the locally available material should be tested.

Printing

In the old art of etching or engraving, beeswax was used as a protective surface coating. Wax was applied to a heated metal plate. The excess drained off while the remaining wax solidified into a thin film through which the design was drawn. The application of concentrated nitric acid or a mixture (1:8 by volume) of concentrated hydrochloric and nitric acids for a few minutes etched away the exposed metal and left the engraved part ready for negative printing. Today, liquid asphalt is normally used instead. Beeswax was part of a liquid protective coating for plastic lithography plates and also for automobiles. Glass can be etched with hydrofluoric acid after protecting those areas with beeswax, which are to remain clear.
Various inks, pens, markers and even carbon paper often contain small amounts of beeswax for typewriter ink includes a recipe of 1 part Japan wax or beeswax, 1 part Hitaide resin 503, S parts fluorescent granules (pigment) and 0.02 part Emulgen PP 150 (an emulsifier).

Medicine

As a coating for drugs or pills, beeswax facilitates ingestion but retards dissolution of the enclosed compounds until they reach the digestive tract. Beeswax can also be prepared as a mixture with the drug and then functions as a time-release mechanism, releasing the drug over a longer period of time.
One such suppository base (a substance which allows slow release of another substance) has been developed on the basis of 5% beeswax, 5% palmitic acid and 90% of Nubon, a semi-synthetic hydrogenated vegetable oil. This was used initially with chloramphenicol. In another preparation, beeswax alone served as the carrier for the drug. On an experimental basis nalidixic acid suspended in beeswax remained longer in the blood of tested animals after oral application than when the acid was administered directly. With another drug, the antihistamine chlorpheniramine maleate, various mixtures of glyceryl monostearate, stearic acid, lactose and higher proportions of beeswax had been successfully tested as a base. Many more examples can be found in pharmaceutical and medical literature. Each drug application requires its own specific modifications of the rudimentary base formulation.
Chewing dark comb (but not the old, black brood comb) without honey, brood or beebread is known to be effective against colds. It was shown that even the wax fractions of propolis have antiviral activities. Older combs contain among many other things a good portion of propolis.
Beeswax can be used to fill capsules with equal amounts of drugs or other ingredients of various granule sizes. The granules of drugs are made adhesive by coating them with molten wax (about 90g molten wax for 3kg of granules), fat or glycerol, by spraying with liquid paraffin or by mixing them with powdered wax or fat and heating. After thorough mixing the hard capsules are pressed with their open end into an evenly spread layer of the mixture. This process can also be adapted to making pills with pollen. A mixture of equal parts melted beeswax and honey is recommended for treating cracked hooves of animals. It should be applied after the cracks have been thoroughly cleaned.

Others

Other products in which beeswax provides some improvement and in which it is a traditional ingredient, include grafting wax, crayons, floor and furniture polish, general purpose varnish, sealing wax, corrosion prevention, protective car polishes and sewing thread- especially for sail and shoe making.

The fact that plant growth stimulators have been isolated from beeswax favours it over synthetic substitutes for use as a grafting wax. An Indian study on A. cerana wax suggests that its triacontanol content may be an economical alternative source for this plant growth stimulator.

Many other applications for beeswax, in cosmetics and pharmaceuticals may benefit also from the presence of minor components, which have not yet been thoroughly investigated.

Storage

Beeswax should only be stored in its rendered, clean form. Before rendering, it will quickly be attacked by wax moths, which are able to destroy large quantities of wax in short periods of time. Clean wax in large blocks is not attacked by wax moths.

Storage should be in cool dry places and never in the same room with any kind of pesticide. Wax will slowly crystallize over time and as a consequence become harder, but this process is reversible without any damage, just as with crystallized honey. Wax can be stored for very long periods of time without losing its major characteristics as items from Egyptian graves more than 2000 years old have shown.

The added ingredients affect the storage requirements of products made with beeswax. Polishes containing only mineral or non-vegetable oils can last for years

Quality control

Beeswax, when sold in solid blocks should always both be clean and have the color and odor characteristics. Though adulteration is easy (usually with cheap paraffin waxes), its detection is only possible with chemical tests.

Quality standards for wax are set in most countries according to their pharmacopoeias. A few industries like the Japanese cosmetic industry but also the American Wax Importers and Refiners Association specify their own limits. These have to be obtained from the respective industry representations or trade publications. Such standards may vary considerably from country to country and manufacturer to manufacturer.

To detect adulteration, a number of tests may have to be conducted. The simplest is to determine the melting point, by measuring the temperature at which the first liquid wax appears during very slow heating. It should be between 61 and 66C or preferably between 62 and 65 C. However, values within this range are not a guarantee of purity.

Determining the saponification cloud point is an officially accepted, sensitive method for determining adulteration. The method is limited to detecting quantities greater than 1 % of high melting (80-85 C) paraffin waxes, or more than 6% of low melting (50-55 C) paraffins. The test measures the amount of hydrocarbons, which saponify (turn into soap) in a specific amount of ethanol and give a clear solution. If the solution becomes clear at or below 65 C, the wax is probably unadulterated with paraffin. If it is adulterated, the solution will turn clear only at a higher temperature. The saponification cloud point is not suited to detect adulteration with carnauba wax, but gas liquid chromatography (GLC) can detect the 6% of free C32 alcohol (an alcohol molecule with 32 carbon atoms) contained in Carnauba wax. Beeswax only contains very little.

It was also suggests that GLC can be used to detect adulteration of beeswax with as little as 1 % of petroleum hydrocarbons from low melting paraffins, but not for detecting low levels of high melting paraffin waxes.

Pharmacopoeia list ester values from 66 to 82 but most beeswaxes range between 72 and 80. It was suggested that values of 70 to 80 are most typical. Acid values range from 16.8 to 24 and ratios between ester and acid values are fairly stable and narrow, mostly between 3 3 and 4.2. The ratios can change after excessive heating and can exceed 4.2 with heating to 100 C for only

24 hours, while the ester and acid values might remain within set limits. Ester and acid values in waxes from other Apis species may be significantly different.

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Pollen

Not Just Honey!

When you think of bees you think of honey, right? Did you know bees produce a variety of beneficial products other than honey? Read on for more information on these products.

Pollen

Bee Pollen

Bee pollen contains about 30% protein, 55% carbohydrates, 1 % to 2% fat, 3% minerals, and trace vitamins. Components vary depending on plant source, geographic region, harvest methods, and season of the year. It may contain up to 100 vitamins, minerals, enzymes, amino acids, and other substances, but the physiologic benefit of many of these components is unclear. Some bee pollen supplements also contain 3.6% to 5.9% vitamin C.

Bee pollen is available as capsules, chewable tablets, topical creams (in combination with other moisturizers), jelly, liquid (manufactured bee pollen extract, vegetable glycerin, and grain neutral spirits), powder, raw granules, soft gel caps, and tablets. It's available in products such as Health Honey and Super Bee Pollen Complex.

Benefits And Uses of Bee Pollen

Bee pollen is used to enhance athletic performance, minimize fatigue, and improve energy.

It may relieve or cure cerebral hemorrhage', brain damage, body weakness, anemia, enteritis, colitis, constipation, and indigestion. Bee pollen may be beneficial in treating chronic prostatism and relieving symptoms of radiation sickness in those being treated for cervical cancer. It may also be an effective prenatal vitamin, and may aid in weight loss.

Although bee pollen is used to treat allergic disorders, such use isn't recommended because bee pollen commonly causes allergic reactions.

Administration

* Granules: One manufacturer recommends taking 1 teaspoon or more by mouth every day; another recommends starting with 1 granule at lunchtime and increasing by 1 granule with each meal until 1 teaspoon is taken at every meal (may be sprinkled on food or mixed in a drink)
* Liquid: 10 to 12 gtt of extract may be added to 8 oz of water and taken by mouth two to three times a day .
* Oral use: 1 to 3 g may be taken by mouth every day .
* Powder: 1 to 2 teaspoons (5 to 10 g) by mouth every day; may be consumed as sold or may be blended or mixed with other foods .
* Soft gel cap: 1 cap or more may be taken by mouth every day .

* Tablets: Dosage varies depending on the formulation and manufacturer. Tablets may be swallowed whole or taken dissolved in a mixture with warm water and honey.

Side Effects of Bee Pollen

Those with sensitivity or allergies to pollen should avoid use. Those with allergies to apples, carrots, or celery should use with caution because of the potential for adverse reaction.

No known interactions are reported with bee pollen.

Clinical considerations

* Overall, bee pollen hasn't been found to have significant nutritional or therapeutic benefit over more easily and safely administered nutritional products.
* Some bee pollen products also contain bee propolis extract, vitamins, and numerous other ingredients.
* Doses as low as 1 tablespoon can cause acute anaphylactic reactions. Ask patient how much herb he uses daily.
* Patients taking bee pollen for longer than 3 weeks may experience chronic allergic symptoms such as hypereosinophilia and neurologic and GI complaints; however, such symptoms are likely to resolve after the patient stops taking the bee pollen.
* Inform patient that bee pollen should be taken between meals, with a full glass of water.
* Tell patient to remind prescriber and pharmacist of any herbal or dietary supplement that he's taking when obtaining a new prescription.
* Advise patient to consult his health care provider before using an herbal preparation because a treatment with proven efficacy may be available.

Research summary

The effects of pure bee pollen on memory have not been investigated, but clinical trials of a Chinese herbal medicine containing bee pollen have been conducted in China and Denmark . The improvements in memory seen in the Chinese study were not significant, and in the more recent double blind placebo-controlled crossover study in Denmark , no improvements were found.[1]

[1]www.OnlinePhysicians.org

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Honeybee venom is produced by two glands associated with the sting apparatus of worker bees. Its production increases during the first two weeks of the adult worker's life and reaches a maximum when the worker bee becomes involved in hive defense and foraging. It diminishes as the bee gets older. The queen bee's production of venom is highest on emergence, which allows her to be prepared for immediate battles with other queens.

When a bee stings, it does not normally inject all of the 0.15 to 0.3 mg of venom held in a full venom sac (Schumacher et al., 1989 and Crane 1990, respectively). Only when it stings an animal with skin as tough as ours will it lose its sting – and with it the whole sting apparatus, including the venom sac, muscles and the nerve center. These nerves and muscles however keep injecting venom for a while, or until the venom sac is empty. The loss of such a considerable portion of its body is almost always fatal to the bee.
Used in small doses however, bee venom can be of benefit in treating a large number of ailments. This therapeutic value was already known to many ancient civilizations.

Honeybee venom is a clear, odorless, watery liquid. When coming into contact with mucous membranes or eyes, it causes considerable burning and irritation. Dried venom takes on a light yellow color and some commercial preparations are brown, thought to be due to oxidation of some of the venom proteins. Venom contains a number of very volatile compounds which are easily lost during collection.

88% of venom is water. The glucose, fructose and phospholipid contents of venom are similar to those in bee's blood (Crane, 1990). At least 18 pharmacologically active components have been described, including various enzymes, peptides and amines. Detailed information on the components is available in the Krell document noted below.

(taken from Krell, R.,"Value-Added Products from Bee-Keeping,"
FAO Agricultural Services Bulletin #124, 1996)

Products of Beekeeping

Not Just Honey!

When you think of Bees, you think of honey, right? Did you know bees produce a variety of beneficial products other than honey. Read on for more information on these products.

Propolis

Propolis, sometimes known as bee glue is a thick, sticky resin that bees collect from tree buds and use to cement holes in the hive and defend it against invading parasites and diseases. Traditional healers from South America, China, Japan, and Eastern Europe have valued propolis as a remedy for such ailments as gum problems and dental health, skin issues and oral sores, as well as viruses and the common cold. [1]

What is Propolis used for?

Propolis displays strong antimicrobial activity and has been used as a chemotherapeutic agent since ancient times. It was used in folk medicine as early as 300 BC for medical and cosmetic purposes, and as an anti-inflammatory drug and wound-healing agent. More recently, it has been reported to possess antibacterial, antiviral, and antifungal properties. Propolis has shown local anesthetic, anti-ulcer, anti-inflammatory, immunostimulant, and hypotensive properties. It also shows tumor-inhibiting properties in laboratory tests. Proponents of the use of propolis suggest that it stimulates the immune system, thereby raising the body's natural resistance to infection. It has been advocated for both internal and external use.

Antimicrobial

In laboratory tests, studies have shown broad spectrum antimicrobial activity of various propolis extracts, although activity was highest in gram-positive bacteria and yeasts. Synergism with certain antibiotics has been demonstrated.

In human clinical studies, propolis has been investigated for its activity against Helicobacter pylori, chronic vaginitis, genital herpes, and periodontal and respiratory tract infections. A clear therapeutic role for propolis is difficult to validate because of variations in antimicrobial action, which are dependent on geographical origin and extraction methods employed.

Anti-inflammatory

Animal studies show propolis to have anti-inflammatory effects. A clinical study of the effect of propolis in patients with asthma demonstrated a reduction in the frequency of asthma attacks, and an increase in breathing function.

Other uses

Propolis extracts have been investigated for their antioxidant properties. Study results have been inconsistent. The antioxidant activity of propolis is one of the rationales for its proposed antitumor and liver protective activity. Clinical studies on the antitumor and liver-protective activities of propolis are lacking. Animal studies show some immunostimulatory and modulatory effects.

Miscellaneous uses

Propolis is used as a mouthwash, toothpaste, and throat lozenge because of its purported antibacterial and anti-inflammatory activities. In a small clinical study, propolis mixed with mulberry leaf decreased blood sugar levels in patients with type 2 diabetes.

What is the dosage of Propolis?

There is no clinical evidence to support specific dosage recommendations for propolis.

Is Propolis safe?

Contraindications have not yet been identified.

Pregnancy/nursing

Information regarding safety and efficacy in pregnancy and lactation is lacking.

Interactions

None well documented.

Side Effects

Allergic reactions with skin and mucous membrane irritations have been reported. Sensitization to propolis also has been reported.

Toxicities

Information regarding toxicology is lacking.[2]

References

1. Edited from Solutions, a publication by the College of Agricultural, Food and Natural Resource Sciences. ©2004-2007 Regents of the University of Minnesota. All rights reserved.

2. Propolis. Review of Natural Products. factsandcomparisons4.0 [online]. 2006. Available from Wolters Kluwer Health, Inc. Accessed April 19, 2007.

Session 8 - Products

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Royal jelly is a milky substance produced by the hypopharyngeal and mandibular glands of nurse bees between their 5th and 15th days of age. All bee larvae are fed royal jelly for the first three days after being laid. After that only the larvae designated to be the queen are fed royal jelly. The components of royal jelly help the queen mature into a large, fertile and longer-living bee. Worker bees live from 4-6 weeks, whereas the queen lives up to 6 years and lays 2.5 times her weight in eggs a day. This is due to royal jelly's powerful effects on the bee's endocrine, hormonal, and metabolic systems.

The Chinese are the world's largest producers and consumers of royal jelly. Royal jelly has played a key role in traditional Chinese medicine, and is still used today to prevent and ameliorate a wide variety of medical conditions. These include, but are not limited to: anxiety, arteriosclerosis, arthritis, bone fractures, asthma, depression, fatigue, lack of sexual desire, hair loss, impotence, insomnia, liver and kidney disease, stomach ulcers, menopausal symptoms, varicose veins, a weak immune system, high and low blood pressure, and a variety of skin conditions. Royal jelly, which is high in B vitamins, has a metabolic stimulating action, which aids in the processing of proteins, carbohydrates, and lipids. It also increases oxygen consumption, improving endurance and decreasing fatigue. As a powerful antioxidant, royal jelly decreases levels of free radicals which are thought to cause aging. Royal jelly has a direct effect on the adrenal glands leading to an increased secretion of adrenaline which can be cardioprotective. With its protective effects on the cardiovascular, pulmonary, and immune systems, it is no wonder royal jelly is a prized commodity in many cultures.

The effects of royal jelly on specific conditions may be amplified when taken in combination with other bee products. One recently discovered property of royal jelly is its ability to provide protection against the negative side effects of chemo and

radiation therapies, especially when given with propolis. This combination can also be used with positive effects for viral infections including shingles and hepatitis.

While there is still much to be learned about royal jelly, there are many recent studies from Europe and Asia which show how useful it can be. A Japanese study found that royal jelly has an anti-fatigue effect in exercising mice. In China and Russia, royal jelly was effective in treating chronic viral and bacterial infections, anorexia, varicose veins, and stomach ulcers. During a flu epidemic in Yugoslavia, it was noted that those who consumed royal jelly daily were less likely to get the flu. A study done in Egypt in 1995 revealed that royal jelly was capable of killing several kinds of bacteria, including E. coli. In another study it was found that people taking 50-100 milligrams of royal jelly per day decreased total serum cholesterol by 14% and lipids by 10%.

Royal jelly helps promote collagen synthesis and is beginning to be found in many topical dermatologic products. Royal jelly is also used in healing from prolotherapy treatments and other injuries.

(from material provided by Andrew Kochan, MD, 6-08)

An interesting article about Freezing Royal Jelly: http://apitherapy.blogspot.com/2009/02/royal-jelly-should-be-frozen.html

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Normally, the term **beebread** refers to the pollen stored by the **bee**s in their combs. The **beebread** has already **bee**n processed by the **bee**s for storage with the addition of various enzymes and honey, which subsequently ferments. This type of lactic acid fermentation is similar to that in yoghurts (and other fermented milk products) and renders the end product more digestible and enriched with new nutrients. One advantage is almost unlimited storability of **beebread** in comparison with dried or frozen pollen in which nutritional values are rapidly lost. The natural process carried out by the **bee**s can more or less be repeated artificially with dry or fresh **bee**-collected pollen. It is important however, to provide the correct conditions during the fermentation process.

"Of note: While allergy to **Bee** Pollen is frequently encountered, allergy to **Beebread** is very rare."

(taken from Krell, R.,"Value-Added Products from **Bee**-Keeping," FAO Agricultural Services Bulletin #124, 1996)

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