Article for Soap, Perfumery and Cosmetics

NATURAL WAXES, FATS AND RESINS

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INTRODUCTION

There is no finer challenge than to find natural equivalent to synthetic materials. However, the challenge is particularly difficult for waxes, where the emphasis must be for "natural" as opposed to "naturally derived".

This paper will consider some of the old faithfuls, some of the recent introductions, and consider some that have not been extracted yet.

Any plant that can yield an oil will likely yield a wax, though it has to be accepted that the yield may not always be commercially attractive. Similarly those plants that have the ability to produce resins, will also be likely to have an associated resinous wax.

A wax can be described in the simplest of terms as a blend, of fatty acids and their derivatives, or of glycerides and their derivatives, that forms a solid at normal ambient temperatures. The individual components of higher molecular weight may alone be considered waxes, e.g. palmitic or stearic acids. It is also considered fair to include fats in the category of waxes.

The most disappointing aspect of this survey is the paucity of commercially available materials. Most of the available waxes seem to have been around since the end of the last century, and apart from these, there have been very few introductions to the chemist's repertoire.

TRADITIONAL WAXES

Carnauba or Copernicia cerifera

Already we have a clue from the Latin name cerifera, since this literally means wax-maker (examples would include Benincasa cerifera or Winter Melon and Myrica cerifera or Bayberry).

Carnauba wax comes from the Brazilian Wax Palm or Carnauba Palm Tree, and is obtained by shaking the large palmate leaves which are coated with the wax. Wax is also present on the leaf buds, which are so abundantly coated in the wax, that it falls to the ground in the height of summer and can be collected.

It has been used for generations as a component of lipstick preparations, tablet coating, furniture polishes, mascaras, scented candles, brilliantine hair dressings, etc.

Candelilla or Pedilanthus pavonis Boiss.

Similar in uses to the carnauba, this wax is obtained from a wax coating that surrounds the whole of the plant, which comes from northern Mexico or southern Texas.

There are many chemists who prefer this wax to carnauba for its structural effect in lipstick

formulation.

Beeswax or Cera alba

Another favourite ingredient of lipsticks and emulsion formulae. The oldest emulsifier was probably the beeswax/borax system used to formulate cold creams and brilliantine hair dressings.

There have been many excellent papers on beeswax, and Puleo[1,2] probably gives the best treatise on the subject. The source of the wax has great influence on its colour and attributes, in much the same way that the location of the hive is reflected in the condition and taste of the honey.

Lanolin Wax

Obtained by removing the excess oils and sebum from wool and fractionating out the waxes by molecular distillation. It is a first class material being an excellent skin emollient and at the same time provides a protective barrier. It can be used universally across emulsions and lipsticks.

The debate continues on the allergy of lanolin, with most of the evidence pointing to lanolin not being a problem. Steel[3] puts forward an excellent defence.

Jojoba or Simmondsia chinensis

This is an oil obtained from a desert shrub growing in a number of deserts and is indigenous to Arizona. The Indians and Mexicans have for a long time used Jojoba oil as a hair conditioner and restorer. The wax may be of value in the management of acne and psoriasis. The Lawrence review of Natural Products[4], gives an excellent overview of this material. Other papers include Arndt[5] and Ricks[6], who both give detailed descriptions of this unique liquid mixture of long chain linear monoesters, which is also an excellent emollient. It is the only 'liquid wax' of its type, so far as can be ascertained.

Shellac

Shellac is not obtained directly from a plant, but a tiny insect (Kerria lacca) depends on some very specialised plants on which to secrete its extraordinary resin, which is a sort of protective greenhouse for its developing young. These include Caesalpina nuga, Caesalpina sepiaria, Cajanus cajan or Congo Pea, Schleichera oleosa or Indian Kusum Tree, Lizyphus mauritiana or Indian Ber-Tree, Samanea saman or the Thailand Rain Tree. There are also other species, and it is the strain of the insect and the species of the host tree, that determines the colour and properties of the final shellac.

The papers by Penning[7], and Tannert[8], provide excellent reading.

Shellac is an excellent film former and has been used extensively in mascara formulations, there is also good evidence for its use as a hair conditioner. In the old days, when records (or should I say phonographs) used to revolve at 78 rpm, it was a fundamental constituent of their composition.

RECENT WAXES

Shea Butter or Butyrospermum parkii
Mango Butter or Mangifera indica

Borneo Tallow or Shorea stenoptera
Babassu Palm Fat or Orbygnia martiana
Oil Palm or Elaeis guineensis

West Africa has been quite a prolific source of relatively new waxes which being quite soft are referred to as butters. These waxy pastes have superb emolliency on the skin and impart a smooth velvety skin softness.

Lavender Wax or Lavandula angustifolia
Jasmine Wax or Jasminium officinale
Orange Wax or Citrus aurantium

These waxes are a waste product of the perfume oil industry, once the essential oil has been distilled from the fresh plant material. In some cases the residue is treated first with alcohol and then with water to extract every last drop of goodness. It is this residue which is available, although it is quite rare. It is also quite expensive, when one considers that absolutely everything of value has been removed!

However, these waxes are quite delightful to use, and will impart a delicate but unsophisticated fragrance to creams and lotions.

Coconut Wax or Cocos nucifera

It may be a cheat to call coconut oil a wax, but at lower temperatures it certainly forms a solid mass which melts at skin temperature. There have been a number of samples seen where the oil has been fractionated to give the higher carbon number fatty acids, and these are solid at higher temperatures.

The emollient and refatting effects are too well known to require detailed description.

Rice Bran Wax or Oryza sativa

This is prepared from Rice Bran Oil, and contains mainly fatty acids and esters of higher alcohols. It also contains vitamins E and F, as well as gamma-oryzanol, which is showing exceptional skin benefits with properties similar to vitamin E.

Avocado Wax or Persea americana

This material is rich in a phytosterol similar to the cholesterol found in lanolin. There is an excellent review in the Lawrence reviews[9]. The material again provides excellent skin emolliency, but with additional skin soothing and healing properties.

Sumach or Rhus spp

Japan wax is a vegetable fat derived from the berries of the sumac tree. It is widely called "shoro" (raw fat) in Japan, but more precisely named "haze fat" (sumac fat) from the chemical viewpoint. This wax imparts good feel to the skin, and there is substantial herbal evidence to show that this material has traditional herbal benefits when applied topically. Hutchens[11] is worthy of reading on the subject.

There are numerous species, and an exact Linnean name is being sought for this source.

For example, there is the Sweet Sumach (Rhus aromatica), from Canada and the United States, also the Smooth Sumach (Rhus glabra), which in various parts of the world is also known as the Dwarf Sumac, Mountain Sumac and Scarlet Sumac. It is also known as Indian Salt on account of the powder found on the berries. There is also a Russian species (Rhus cariaria), and it is the leaves of this species which can be irritating to the skin when touched.

FUTURE WAXES

It is not difficult to guess from where the next waxes might come, since we have already seen a number from other oil-bearing nuts and seeds.

For example, **Wheat** or Triticum spp., **Maidenhair Tree** or Ginkgo biloba, **Camellia** or Camellia spp, and **Flax** or Linum usitatissimum must offer real potential in that study.

Lupin or Lupinus albus

With the extensive research being carried out on **Lupin** or Lupinus albus as a rich source of protein from the seeds, it may well be that these investigations yield not only cattle feed, but also wax. A skin care protein based on this plant is already available. Leyel[12] has some interesting word on lupin.

Sugar Cane or Saccharum officinarum

Milliken[13] makes a reference to a wax being obtained by boiling up the stems of sugar cane. Obviously with such an abundance of the raw material, together with the acceptable aesthetics of such an idea, this would be very welcome to any consumer.

Waxes from plant protection.

We have already seen examples of where plants have been exploited for their protective coatings (e.g. candelilla and carnauba), but there must be many others that produce impermeable barriers to protect their precious moisture content from evaporating from either the fruits or the leaves.

A quick search of the data reveals (amongst many): Olive leaves, Japanese Wax Privet, Bakula Tree, Wax Gourd, Fraxinella, Barberry and a whole host of others.

Bayberry, Myrtle and Sweet Gale have all been used as sources of candle wax since earliest times and could well be the natural wax source of the future.

New waxes from seeds and fruits.

The exploitation of the seeds and fruits of various exotic palms in order to gain their fats and oils has already yielded exciting and reliable materials[14]. There must be other sources waiting to be examined.

Propolis

Propolis is found in the bee-hive, and is a tough waxy cement that is used by the bee to hold the hive together and repair any cracks. Analysis of this material shows it to be almost identical to the resin found on the leaf buds of the Birch (Betula verrucosa)[15]. There are numerous Russian studies in this area.

It is already used in alternative medicine and has been examined for its antibiotic properties, but there is likely to be even greater information appear on this material in the future.

CONCLUSIONS

This has been a brief exploration of some natural waxes, but there are still areas that have not been touched upon. For example, there are many materials being produced by "biotechnology" or fermentation techniques, and it would be surprising if these did not yield as either a product, or by-product, some wax-bearing elements.

In a short review such as this, it is impossible to give the full list of the reference material, and so a few examples have been selected to give an essence of the background literature that was consulted.

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