

“THE PAST, PRESENT AND FUTURE OF BOTANICALS - A SCIENTIFIC OVERVIEW”

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ABSTRACT

The use of plants in medicine and in the cosmetic and toiletry industry is as old as man. Our certainty can only go back as far as the earliest recorded knowledge, but in those writings from ancient China and the time of the Egyptians we find countless references.

Plants were used for everything from religious incense, to herbal medicine and cosmetics. Some of these old recipes are examined for their potential efficacy and to see whether we can substantiate their claims using today's knowledge and experience.

The paper considers a number of European preparations from the Middle Ages to the present day, examines the plants used and the phytochemicals responsible for their benefit. Typically (for the present day scenario) Aloe vera, Chamomile, and other plants used in modern medicine are discussed.

INTRODUCTION

The growing of medicinal plants is well known in Europe, especially in Hungary, Czechoslovakia, Roumania and the countries of the old ‘Eastern Block’. The knowledge of how to obtain the best from the plant is well understood, and they are farmed in traditional ways to maximise the yields of the active constituents that they contain.

In some cases, the plant does not suit traditional farming methods and the plant has to be ‘wild crafted’ or collected from the wild, if it is to be used for its medicinal virtue.

Our European friends would not take kindly to their herbal medicine being called a “quack remedy”, nor does this traditional form of treatment deserve such a label. The preparations that are available have been successful in their purpose for countless generations and stand up to the rigours of scientific scrutiny. The pharmaceutical giants would not be flooding into this part of the world offering venture capital and exclusivity deals, if there was not a quick and lucrative financial profit to be made.

A RECIPE FROM THE PAST

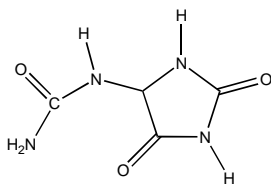
There are hundred upon hundred of old recipes, the example chosen comes from the Physicians of Myddvai, it was chosen because it dates from the 12th century and is a good recipe of its type^{1,2}.

Take the Feverfew, Bruisewort[†], also Ribwort Plantain (*Plantago lanceolata*), Common Plantain (*Plantago officinalis*) and finally Sage (*Salvia officinalis*) in equal portion of each, bruise them briskly in a mortar, and boil in unsalted butter,

till the butter disappears, then strain well and keep in a box. Anoint any bruise with this.

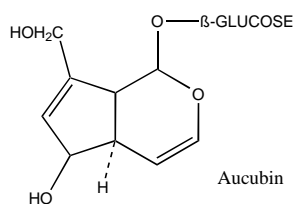
[[†]Bruisewort can apply to three herbs, Daisy (*Bellis perennis*), Soapwort (*Saponaria officinalis*) and Comfrey (*Symphitum officinale*), though experience would suggest that it is the latter of the three that is used.]

All of these herbs are well cited for the treatment of problem skin conditions. Comfrey contains one of the richest natural sources of allantoin, which is described in Merck³ as a topical vulnerary and skin ulcer therapy.



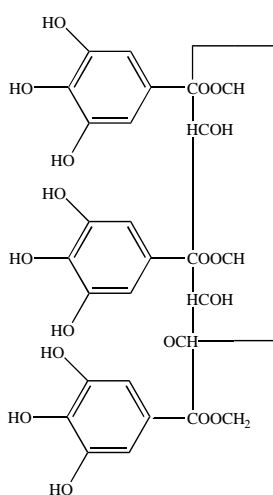
ALLANTOIN

Both Ribwort Plantain and Common Plantain are well cited in the literature for their beneficial effect on sores, treatment of wounds, bruises and insect bites^{4,5,6,7}. They contain a high mucilage content rich in polysaccharides as well as a number of alkaloids (such as aucubin, indicaine, plantagonine etc.).



Aucubin

Sage is another well-respected herb for problematic skin conditions^{8,9,10}, and the oil most certainly possesses antiseptic action.



A tannin

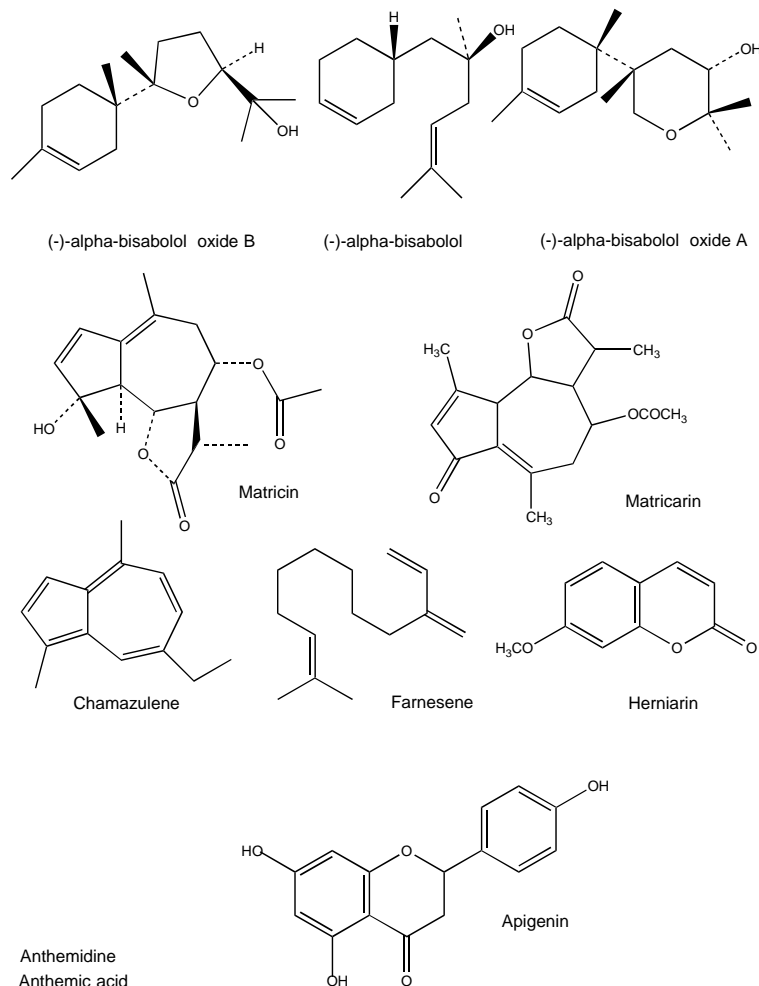
Some of the beneficial properties may be attributed to the tannins, which give the plant its astringency, and flavonoids which would account for some of the vulnerary virtues.

Thus these materials pounded together in an ointment would most certainly give a preparation, that from a scientific and pharmacological, would provide great benefit for the conditions cited. The reason for using butter, was that this provided a natural w/o emulsion base.

It can be seen that the application of modern scientific knowledge to these old formulae can provide justification for the materials used and at the same time ascribe active components to the benefits.

A MODERN DAY FORMULA

There are many products on the market today which rely on herbal actives, while at the same time carry a pharmaceutical license. One example uses German Chamomile (*Matricaria recutita*), though interestingly the British variant is prepared from the Roman Chamomile (*Anthemis nobilis*), both of these daisies are from the Compositae family and surprisingly the constituents are remarkably similar.



Chamomile has many properties attributed to it. It is anti-inflammatory and soothing to the skin and has been proven to speed the healing process^{11, 12, 13}. A number of components have been identified that are responsible for this action.

In the oil it is the presence of α -bisabolol, bisabolol oxides, matricin, and azulene.

Whereas in the aqueous extraction it is the apigenin or apigenin-7-glucoside, that has the anti-inflammatory properties. This flavonoid is found widely throughout the plant world and would explain why there are many plants that have this soothing action.

FUTURE PLANT FORMULAE

The future never looked brighter for the medicinal plant world and one only has to look at existing drugs (see Appendix I)¹⁴ to realise that there is already a wealth of products on the market which contain active plant materials.

These are some of the medicinal plants that have been of key importance in recent times.

The yew (*Taxus baccata*) particularly the Pacific Yew, *Taxus brevifolia* is employed for its taxol content, which is being used very successfully as a chemotherapy treatment for breast and ovarian cancer.

Another plant that has recently made the headlines is Bluebell or *Endymion nonscriptus*, which contains lectins that can bind to sugars, and specifically to the glycoprotein gp120, the characteristic surface glycoprotein of HIV.

While we are thinking of spring flowers, we should spare a thought for the Snowdrop or *Galanthus nivalis*, which is a rich source of galanthamine. This plant drug has been investigated by Shire Pharmaceuticals for Chronic Fatigue Syndrome and may have some benefit to patients suffering from Alzheimer's Disease.

On the subject of this very distressing disease, it has been clinically proven that Tobacco or *Nicotiana tabacum* can help these patients, especially in the partial restoration of the brain's organisational ability. The nicotine interferes with the tyrosinase pathway?

Another plant that has been heavily promoted for improving mental acuity is that of the Maidenhair tree or *Ginkgo biloba*, where the ginkgolides seem to have their effect by improving cerebral blood flow.

The main interest in cosmetics and toiletries is the use of topically applied materials.

Tea Tree oil

Let us first look at the family of *Melaleuca*. This is a very useful family, which includes Niaouli (the Paper Bark Tea Tree) or *Melaleuca quinquenervia* synonym *Melaleuca viridifolia* - an important perfumery oil, Cajuput (the Swamp Tea Tree) or *Melaleuca leucadendron*, which is another perfumery oil. However, it is the *Melaleuca alternifolia* which is the Tea Tree and used as an antiseptic.

The aborigines knew about this plant three thousand years before we did, some fresh water lakes were considered sacred, because they would cure a number of skin diseases. The water of these lakes was tinged a brown colour, from the tannins it contained, which came from the tea trees that grew around the lake margin. Never dismiss the folk lore or ethnobotanical use of plants, in most cases the traditional use of these trusted remedies can stand up to technical scrutiny and clinical trial.

Tea tree is quite a potent antiseptic, and if one uses the Rideal Walker test, then one finds that it is about 11 times more potent than phenol, but without the potential to produce skin burns. The chloroxylenol in Dettol has a value of about 60 compared to phenol. It is the complex blend of terpenes, sesquiterpenes and their corresponding alcohols that give tea tree these properties¹⁵.

A 5% tea tree oil cream was tested against a similar cream containing 5% benzoyl peroxide in a single blind randomised trial. The tea tree performed as well as the benzoyl peroxide, and though the effect was slower, the patients using tea tree experienced less side effects. The action is more than likely due to its ability to knock out *Propionibacterium acnes*¹⁶. Both treatments produced significant improvements after 3 months. Benzoyl peroxide was more effective in non-inflamed lesions. But fewer patients reported unwanted effects, including dryness, itching, stinging, burning and redness, with tea tree oil (44% versus 79% for benzoyl peroxide). The oil, extracted from *Melaleuca alternifolia*, contains antimicrobial plant terpenes, and may be a valuable alternative to orthodox treatment¹⁷.

The oil has also been tested for vaginal candidiasis, topical skin infections (such as athlete's foot¹⁸) and clearing of *Staphylococcus* infections. It has also been used for Trichomal vaginitis and other vaginal infections¹⁹.

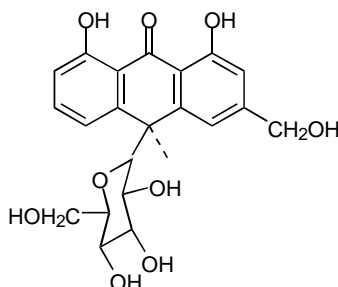
Aloe vera gel

Most pharmacists will be familiar with the dried aloes or *Aloe ferox*, which is a dried extract of the whole plant used as a rather drastic purgative. However, this is not the species of plant which is of most interest from a topical viewpoint.

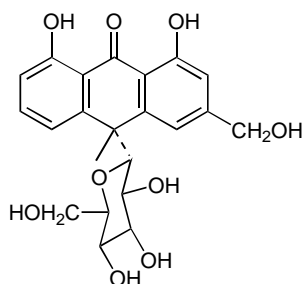
The plant most renowned for its skin care properties is *Aloe barbadensis* Miller, where only the inner gel obtained from the inner, colourless, mucilaginous parynchema (or tubular leaf cells) is used. Every precaution should be taken to ensure that only the gel is taken, since the outer leaf contains anthraquinones, such as aloin and barbaloin, which are known skin irritants.

BARBALOIN or ALOIN A

10-(1',5'-anhydroglucosyl)-aloe-emodin-9-anthrone

**ISOBARBALOIN or ALOIN B**

10-(1',5'-anhydroglucosyl)-aloe-emodin-9-anthrone



These two chemicals are present as a mixture of:

10-C-β-L-glucosyldiastereo isomer of aloe-emodin anthrone and

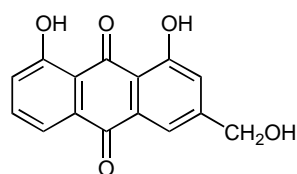
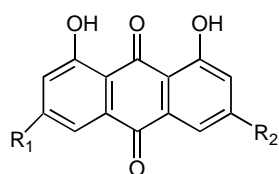
10-C-β-D-glucosyldiastereo isomer of aloe-emodin anthrone

They are present at 25-40% or 500mg/100g in the prepared aloe vera gel.

ANTHRAQUINONE DERIVATIVES

R₁	R₂	Chemical Name
H	CH ₃	CHRYSOPHANOL
H	CH ₂ OH	ALOE-EMODOL
H	COOH	RHEINE
H	CH ₃	EMODOL

Table 1

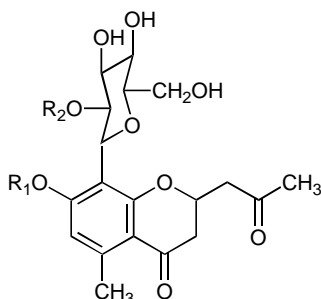
**ALOE-EMODIN or ALOE-EMODOL**

3-Hydroxymethyl anthraquinone, 1,8-dihydroxy-3-hydroxymethyl-9,10-anthracenedione, typically present at 2.05-2.2% in the aloe vera gel.

ALOERESIN A, ALOERESIN B and ALOERESIN C

R ₁	R ₂	Chemical Name
H	p-coumaroyl	ALOERESIN A
H	H	ALOERESIN B
Glucosyl	p-coumaroyl	ALOERESIN C

Table 2



It was folklore that first came to the attention of many researchers. The gel was used for the severe Roentgen burns experienced by some of the early researchers investigating x-rays²⁰. Later, after the dropping of the atomic bombs on Hiroshima and Nagasaki, the plant was dispensed as a treatment for severe radiation burns.

The plant then came to be investigated for other sources of burns, and anecdotal evidence exists for the treatment of animals which suffered severe thermal burns^{21, 22, 23}, that otherwise would have perished had it not been for the intervention with aloe vera gel.

Today, we are looking at aloe vera gel for prophylactic use in patients undergoing radiotherapy treatment to ablate the skin reactions that can occur during radiotherapy at day 3 (a primary 'sun burn-like' erythema) and then at day 10 (when a secondary erythema can develop). Professor Sato in Japan has successfully carried out animal trials in this area^{24, 25}, and further studies are about to be undertaken in the UK. Further work has been published by Strickland at the Anderson Cancer Centre in Texas, who examined the prophylactic effect of aloe vera gel in UV-induced erythema²⁶. In addition, there are numerous studies to support the clinical use of aloe vera gel in wound healing and in the treatment of burns^{27, 28, 29, 30}.

The chemical entities responsible for this effect are still being defined, however, in all likelihood it is the complex polysaccharides, mannose-6-phosphate, and sugars that are the key agents. There is a possibility that it is the presence of gibberelline (a hormone growth regulator) that is in part responsible for some of the beneficial properties. In reality, it is very likely it is the entire synergistic combination that is important in wound healing.

CONCLUSIONS

There is a tremendous future for the use of medicinal plant materials in cosmetic and toiletry products. Those marketeers who insist on the use of totally inappropriate plants for their products at trivial levels are undermining the serious scientific benefit that can be obtained by using the right plant at the right level.

It would be as well to remember that a plant should not be just a pretty picture on a bottle, it is a chemical factory capable of producing chemicals beyond the scope and skill of even the most accomplished chemist.

Used at high doses it is perfectly capable of physiological action on the skin, while at lower levels it can provide soothing and protective benefits that can be both claimed and substantiated using scientific methods.

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