

## *Ocimum basilicum* L.: PRESENCE, INFLUENCE AND EVOLUTION IN HUMAN CONCERNS EVER

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### Abstract

*Ocimum* L. genus includes about 160 species and varieties, and one of the most popular is *Ocimum basilicum* L. Cultivated for over 1000 years, common basil is a valuable aromatic and medicinal plant, widely used both in traditional and in scientific medicine, in the perfume and food industry, in cosmetics, organic farming, landscaping and the plant product has profound religious significance, serving as an object of worship. This paper aims to present in a synthetic manner the most important implications of the species *Ocimum basilicum* L. in human preoccupations ever, highlighting the potential of its use in various fields. By choosing as a research method based on the observation and study of literature, an overview will highlight its main aspects concerning origin, history and the spreading area, the organ used, chemical composition, biological features, requirements for climate and soil, therapeutic actions and uses. Finally, the authors propose the diversification of usability of the studied species, by opening new approach perspectives for the future studies.

**Keywords:** *Ocimum*, *Ocimum basilicum* L., phytotherapy, organic farming

Two thirds of the world's population still uses herbs as a first choice to treat diseases, underlining the important role of phytotherapy. But besides the realm of medicine, several mass-consumed eatables and stimulants also have beneficial side-effects. For example, coffee and tea are both stimulants and refreshers, but they are also a rich source of fluorine, while ginger, a popular beverage in England, alleviates indigestion (Németh I., 2012)

In different parts of the world herbs have been used to treat the same problems. Similarities in herbal medicine are evident despite the fact that American Indian culture was isolated from European, Egyptian, Chinese and Indian influences until the 15th century. In this context, the paper aims to present in a synthetic manner the most important implications of the species *Ocimum basilicum* L., culture prevalent in many areas around the globe, in human preoccupations ever highlighting the potential of its use in various fields.

At the same time we want to show the importance and the need of an investment for ecological products having a practical use of the growing this medicinal herb. Investing in the future depends to a great extent on the way and the concept that we choose to follow, which can meet many of the requirements imposed, with a positive reflection on average and long term, concerning both the environment and the health of human

beings. We think that the favorable context of the development of organic farming is due, largely, to the consumer who cares about having healthy products available and better respect the environment. Also, the use of organic products is necessary especially in the cultivation of medicinal herbs to ensure high yields.

### MATERIAL AND METHOD

The species *Ocimum basilicum* L. belonging to the Labiatae family, is an herbaceous annual plant. *Ocimum* L. genus includes about 160 species and varieties (*O. basilicum* var. *crispum*, *O. basilicum* var. *balatum*, *O. basilicum* var. *comosum*, *O. basilicum* *minimum* – *Viridis*, *Violaceum* (figure 1), *Violacrispum*, *O. canum* Sims, *O. gratissimum* L., *O. sativum* L., *Ocimum americanum*, *Ocimum tenuiflorum* L. - *Geniosporum* *tenuiflorum*, *Ocimum album*, *Ocimum* *brachiatum*, *Ocimum flexuosum*, *Ocimum* *frutescens*, *Ocimum gratissimum*, *Ocimum* *hirsutum*, *Ocimum inodorum*, *Ocimum* *monachorum*, *Ocimum sanctum*, *Ocimum* *sanctum* *hirsuta*, *Ocimum tomentosum*, *Ocimum* *villosum*, *Ocimum virgatum*, *Plectranthus* *monachorum*, *Plectranthus striatus* (figure 2) etc.), and one of the most popular is *Ocimum basilicum* L. (figure 3).

The research method was based on the observation and a broad range of scientific literature, which is included in the references. Information from literature was collected through documentation and consultation papers directly in the library. Also, much of the information was collected through keywords sought in international databases, being consulted

articles published in national and international journals.



Figure 1 *Ocimum minimum violaceum*



Figure 2 *Ocimum sanctum* L.



Figure 3 *Ocimum basilicum* L.

## RESULTS AND DISCUSSIONS

### The history, the spread and the etymology of the name

The sweet basil, an aromatic plant, with relaxant effects, was brought to Europe by Charlemagne and was cultivated as a medicinal herb in gardens around monasteries. In the old pre-Christian cultures, in the Middle East and especially in Palestine, basil was considered a sacred plant, used for religious purposes being preserved until the Christianisation of Europe (Borloveanu M., 2014).

Basil is possibly native to India China, Sri Lanka Island, Asia, Africa and the Subtropics and has been cultivated in many parts of the world. In Romania, it is grown in gardens in the south and west of the country: Dobrogea, Bărăgan, Oltenia, Timiș Plain, Burnuz Plain, Crișurile Valleys and The Maros/Mureș Valleys (Robu T., Milică C., 2004; Stan N.T., Stan T.N., 2006).

A Greek legend says the basil has been always considered a plant which heals every wound, as it healed a dragon's wound during a fight. Legends about holy basil plant have their divine origin and miraculous properties that come from distant times. Highly valued through the ages of most of the European people, basil is considered a sacred plant, a plant of the soul that brings prosperity and health (Borloveanu M., 2014).

Origin of the word basil can be found in the Greek basileus, which means king, royal, due to its extraordinary flavor. Name basil has the same source in many European languages, but we can mention some variations: "Basilika" in Icelandic, "Vasiliki" in Russian, "bosilok" in Albanian, "bazzalikom" Hungarian, "bazalka" Czech, "Basel" in Provençal, "Basilica" in Basque, "basil" in Romanian, "Vasilikos" in Modern Greek. In the colonial era, the name was transferred in several African languages, such as "besobila" Amharic (Dauzat A. et al, 1964, cited: Barbu I., 2007)

The French name "herbe royale" and the Dutch "Konings kruid" come from the same source (both meaning royal grass).

Iberian names of basil, "albahaca" in Spanish, "alfabrega" in Catalan and "albaraka" in Arabic Basque loans are in the form of original Arabic "al-habaqa". In Arabic nowadays, habaq became rarely used, being replaced by "Raihan" who has relatives in many other Oriental languages, such as "rezhan" in Turkish, "Rehan" in Hebrew, "Rehani" the Georgian "dhaihan" in Kurdish and "Rihanna" in Farsi.

Indian names for Basil, "Tulsi chettu" in Telugu, "Tulasi" in Tamil and "Tulsi" in Hindi are derived from the Sanskrit "Tulasi" (I. Barbu, 2007). It is usually associated with the symbol of the soul of the just man who, with aging gives a strong odor, because this plant has the largest and most pleasant scent when it is dry more than when it is green.

### Plant parts used, chemical composition

Basil is used in the form of *Herba Basilica* - part of the plants, flowers and young shoots, fresh or dried.

The flowers, leaves, young shoots / branches contain:

- essential oils, (0,05-0,2%) which differed considerably with regard to the seasons of the year or chemotype, with a total of 29 compounds: *Monoterpene hydrocarbon*: Limonene (figure 4), *cis*- $\beta$ -Ocimene (figure 5); *Oxygenated monoterpenes*: linalool (38%, figure 6), metil chavicol (25%), cineol, eugenol, geraniol, camphor, ocimen, pinen, cariofilen; (Robu T. et. Al., 2004); metil cinamate,  $\beta$ -sitosterol, anetol (Crăciun F. et al, 1977);

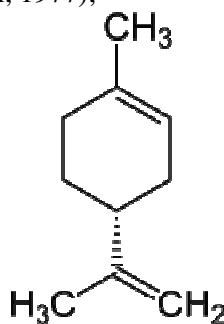


Figure 4 Limone Formula

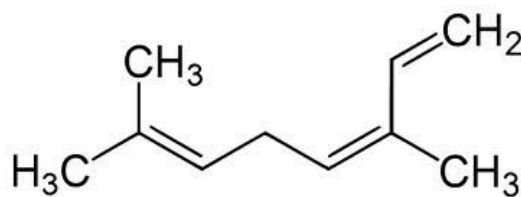


Figure 5 *cis*- $\beta$ -Ocimene

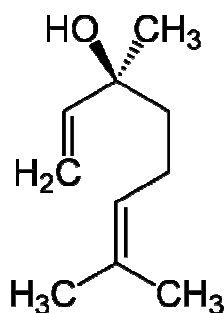


Figure 6 Linalool formula

*Monoterpene hydrocarbon*: Limonene, *cis*- $\beta$ -Ocimene; *Sesquiterpene hydrocarbon*:  $\alpha$ -Copaene,  $\beta$ -Cubebene,  $\beta$ -Caryophyllene,  $\alpha$ -Bergamotene,  $\alpha$ -Humulene,  $\gamma$ -Muurolene, Germacrene D,  $\beta$ -Selinene, Bicyclgermacrene,  $\gamma$ -Cadinene, (-) Calamenene; *Oxygenated sesquiterpene*: Spathulenol, Caryophyllene oxide, Viridiflorol, Cadinol, *epi*- $\alpha$ ,  $\beta$ -Eudesmol,  $\alpha$ -Cadinol,  $\alpha$ -Bisabolol; (Hussain A.I. and al., 2007)

- tannins (5%),
- triterpenic saponins;
- organic acids (caffeic, rosemary);
- fatty acid (oleanolic, ursolic);
- minerals; (Robu T. et al., 2004);

Volatile oil content increases with the withering (Esdorn 1950 cited: Păun et al., 1988). Thus, there is mention of the volatile oil content ranging from 0.1 to 0.9% (Bondrescu R., 1982).

Sweet basil (*Ocimum basilicum* L.) seeds produce a thick layer of mucilage around the pericarp within minutes after hydration. Mucilage is most prevalent among plant species adapted to surviving in arid sandy soils, though its significance in determining ecological fitness is unclear. The mucilage produced by seeds is reported to be composed of cell-wall polysaccharides that are deposited in testa pericarp cells during development (Crăciun Fl. et al, 1977; Teleuță A., 2008; Zhou, D., 2012).

Some studies looked that the potential of the intensely purple pigmented basil available as culinary ornamentals prompted an examination of eight commercial cultivars as a potential new source of anthocyanins. The anthocyanins present in purple basil were analyzed utilizing high performance liquid chromatography, spectral data, and plasma-desorption mass spectrometry (Phippen and all, 1998). Fourteen different anthocyanins were identified. Eleven of the pigments were cyanidin based with cyanidin-3-(di-p-coumarylglucoside)-5-glucoside as the major pigment. Three minor pigments based on peonidin were identified. Purple basil can be an abundant source of acylated and glycosylated anthocyanins and could provide a unique source of stable red pigments to the food industry. (Simon, J.E. and al., 1999)

### Some biological characteristics and requirements

Basil is a thermophilic species, which freezes at 0 ° C and 15-20 ° C germinate well. The plants are growing under optimal conditions at 25 ° C. The average daily high temperature (25-28 ° C) and low atmospheric humidity during flowering

contribute to the accumulation of volatile oil (Hotin et al., 1967 cited.: Păun E. et al, 1988; Roman Gh. V., 2012).

Species manifest excess moisture requirements due to shallow root system distribution. Basil is one of the light-loving species, contributing to good plant growth and volatile oil accumulation.

For the aromatic plant cultivation, medicinal and ornamental recommended nutrient rich land, avoiding poor soils, heavy clay and salty soils. Hotin and Șulfișhin (1963) mentions that basil should be grown on soils with a pH of 4.5 to 7% (as cited: Păun E. et al, 1988).

### Forms of frequent use and new proposals

Cultivated for over 1000 years, common basil is a valuable aromatic and medicinal plant, widely used both in traditional and in scientific medicine in the perfume and food industry, in cosmetics, organic farming, landscaping and the plant product has profound religious significance, serving as a object of worship year.

The aerial parts of the plant basil are of importance both in human medicine and in the veterinary. In terms of pharmacodynamics, basil is less studied by us. In traditional medicine, its active principles give several therapeutic properties such as:

- stomachic, carminative, anticolitic, antispasmodic, emetics (for nausea), digestive incentives and anorexia, slightly laxative, vermifuge;
- pectoris, expectorants, antitussives;
- toning the nervous system, soothing minor tranquilizers;
- diuretics, galactogoge (stimulates the secretion of milk);
- inflammatory, antimicrobial, antifungal, antibacterial, antiseptic, healing;
- starters, eupeptic, comforting (Robu T. et al., 2004; Bojor O. et al, 2007, Hofigal, 2009, Roman Gh. V., 2012).

As a medicinal herb, basil is used to treat various types of diseases: respiratory diseases, digestive diseases, cardiovascular diseases, renal and genitals diseases, throat and mouth, central nervous system, rhinitis, inflammation of eyes and ears to stimulate women's lactation with dermatitis (T. Robu et al, 2004).

As a contraindications, we wish to pointed out that due to the very high content of methyl chavicol it cannot be used in aromatherapy at the most inhalations with herbal infusion. So the essential oil is irritant to the skin and mucosa (Bojor O. et al, 2007).

The most common forms of use are: infusion of Herba dried and ground, decoction of Herba dried and ground, decoction of the seeds, syrup, basil, macerate the basil in white wine, the juice of Herba fresh essence of basil; the external use - concentrated decoction, juice of fresh Herba, Herba dry powder and finely ground, poultices of crushed fresh leaves, basil cream, holy water.

Among the many uses, some of them are manufacture of perfumes, shampoos, cosmetics, toothpaste, ingredient in soaps and detergents, seasoning food, flavored vinegars, liqueurs corrector taste in wine vinegar, syrup, food, flavoring teas, decorative gardens and parks. Basil is a major honey plant.

In Orthodox religious worship, Sanctification basil is used in holy water seas at the Theophany Feast, and whenever it commits Minor holy water. With a bunch of basil or thread that is for preparation holy water immersed in holy water, holy water purifying spread and holiness of a place or objects, machines, etc. as a means of sharing God's blessing. Also in official pronouncements from Christian homes, water is blessed with a bunch of basil and metal or wooden crosses. In this case, it symbolizes the good perfume world gracious things above, where the power of the Holy Cross and Holy Spirit drives out all disturbing descent, suffering, helplessness, misunderstanding, fear, despair etc. As you know, great holy water can be stored for a long time clean dishes without diminishing its purifying qualities. Basil, known as a plant with antiseptic properties, yet is indispensable. Sanctification water is coming through the grace of the Holy Spirit, invoked by the bishop or the priest's prayer. Using basil is related to a practical necessity - spraying places, spaces and faithful with holy water. Because of its cups, this plant is ideal for sprinkling holy water, increased by a nice smell.

Related to this, there is another liturgical use of basil on the third Sunday of Lent and at the Feast of Holy Cross. Holy Cross, adorned with flowers and basil, is taken in procession in the holy altar in the middle of the church and then shall remain open for worship by believers. There is also a theological interpretation, but purely practical.

Basil sits and icons symbolizing God's protection over the house and the people who live there and the multitude of gifts of the Spirit, which pours Christian baptism, by true faith, good deeds and the Christian virtues that must adorn our souls.

As a condiment food, the Basil is an important ingredient of the Italian pasta sauce, called *pesto* (Németh I., 2012). Also it is use in soups, salads, raw vegetables, sauces, fish dishes (marinated), meat and meat products (sausages,

sausages), venison, dried beans and sauerkraut, which are digested more easily and acted in disinfection intestines in combating stomach spasms and printing a balsamic taste evoking a mixture of lemon, cloves, cinnamon and black pepper. The seasoning as Herba harvested before flowering, dried and finely ground, plus thyme and rosemary least, is used instead of black pepper without causing burning in the digestive tract. It is also flavored preserves, pickles, marinadele, add the butter, omelets, cheese (T. Robu et al, 2004; Cernei-Manea E., 2013).

Dried basil leaves are used in winter; Dried and powdered flowering plant, can replace cloves. It can be kept fresh in oil (Legnano, L.P., 1996). To provide all this year basil can be frozen (Gedda A., 2010)

The seeds collected in September-October are aromatic; Store in opaque containers in dry conditions.

Finally, we propose the diversification of the use of the studied specie, by opening new approach perspectives for the future studies. I would like to mention in this context, the use of basil mixed with other aromatic or medicinal herbs (ex. Cajun) to obtain a new recipe for stuffed cabbage rolls condiment, to obtain “Tea of Examination period for students” and an organic insecticide.

Also, the florets of basil are used to scent linens.



Figure 7 Experimental field (*Ocimum basilicum* L.), USAMV, Iasi

The high variation of basil cultivars to damage by Japanese beetles suggests the presence of an active ingredient that either could be useful in commercial traps or serve as a deterrent (Simon, J.E. et al., 1999).

Basil is known for banish some insects such as mosquitoes (Gedda A., 2010). It is recommended to place the potted basil window.

Also, combined with lavender flowers, insects are kept away (Legnano, LP, 1996).

In our experiments conducted in 2015 (figure 7) I wish to highlight other actions of basil as insecticide in combination with other herbs (eg. *Satureja hortensis* L.). Macerate obtained after distillation could be used successfully to combat

several pests, such as aphids from culture of marigold (figure 8).



Figure 8 Culture of marigold (*Calendula officinalis* L.) – Experimental field USAMV Iasi

Under the same experimental field, research is conducted on issues *Ocimum basilicum* L. allelopathy of the species in the prevention and combating of disease or pests in other species (eg. *Calendula officinalis* L.).

To establish the medical implications of basil are accomplished numerous in vitro tests. We mention in this regard results from a group of researchers from India, on “Potential Anti-inflammatory Properties of Crude Alcoholic Extract of *Ocimum basilicum* L. in Human Peripheral Blood Mononuclear Cells” (Selvakkumar C., 2007). *Ocimum basilicum* L. is a well-known perennial herb in Indian medicine used to treat various disorders like upper respiratory tract infections and wound healing. Primarily these researchers investigated the anti-inflammatory activity of crude extracts of *Ocimum basilicum* using peripheral blood mononuclear cells (PBMC) of healthy individuals. *Ocimum basilicum* crude methanolic extract showed a good inhibitory effect on the proliferative response of PBMC in mitogenic lymphocyte proliferation assays. Their results showed that *Ocimum basilicum* crude methanolic extract inhibits the key proinflammatory cytokines and mediators, which accounts for its anti-inflammatory effect.

Sudan is one of the countries severely afflicted with malaria. The spread of resistance of the malaria parasite *Plasmodium falciparum* to currently used antimalarial drugs calls for continued efforts to discover new ones. The specie *Ocimum basilicum* L., which grows widely as a rainy season wild annual plant, is used, limitedly though, as one of the folk remedies of malaria in Sudan. In one recently study (Mabubu J.I., 2015), crude ethanol extracts of the leaves of wild basil caused 100%, 79.8% and 49% inhibition of the growth of *P. falciparum*, at doses of 500, 50 and 5 g/ml, respectively, when tested in vitro using RPMI 1640 media. Subsequent work focused on Sesquiterpene lactones present in the ethanol extract of basil, isolated as a group by the method of Harborne (1989) and further separated by preparative TLC, yielding 11 individual compounds. These separated compounds were

evaluated for potential antimalarial activity by assaying their in vitro inhibition of dihydrofolate reductase (inhibitors of this enzyme deprive protozoa, as well as bacteria, of reduced folates, carriers of one-carbon fragments required for the biosynthesis of nucleic acids). Inhibition of DHFR was carried out using a commercially available DHFR enzyme (Sigma Co., USA) and spectrophotometrically following the coupled conversion of NADPH to NADP<sup>+</sup>. Of the eleven compounds, eluted from TLC plates and tested, two were inhibitory to DHFR, resulting in specific activities of 17.2 and 8.7 mole/min/mg protein. Further work is underway.

Another important study is about the evaluation of in Vitro Anticancer Activity of *Ocimum Basilicum* (Behbahani M., 2014). This investigation was carried out to study the relationship between presence of cytotoxic compounds in *Ocimum basilicum*, *Alhagi maurorum*, *Calendula officinalis* and their parasite *Cuscuta campestris*. The cytotoxic activity of the pure compounds was performed by MTT assay against breast cancer cell lines (MCF-7 and MDA-MB-231) and normal breast cell line (MCF 10A). The induction of apoptosis was measured by the expression levels of p53, bcl-2, bax and caspase-3 genes using quantitative Real Time PCR. Three active fractions were detected by nuclear magnetic resonance as lutein, lupeol and eugenol, respectively, in *C. officinalis*, *A. maurorum* and *O. basilicum*. In conclusion, all the data indicated that the epoxide forms of lupeol, lutein and eugenol are potential drug candidates for inducing apoptosis in human breast cancer cells.

## CONCLUSIONS

*Ocimum Basilicum* L. is a species widely known in the world and in Romania. Its importance in cooking recipes, cosmetics, medicine and the ecological adaptability to pedoclimatic conditions from our country, recommends insistently for a study in a mixture with other medicinal plants of the same genus or species, thus multiplying the forms of uses.

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