



Herbal extraction, using the example of alfalfa and chili pepper



1. Introduction

Herbal medicine, also called botanical medicine or phytomedicine, refers to the use of any plant's seeds, berries, roots, leaves, bark, or flowers for medicinal purposes. Long practiced outside of conventional medicine, herbalism is becoming more mainstream as up-to-date analysis and research show their value in the treatment and prevention of disease. Plants had been used for medicinal purposes long before recorded history. For example, ancient Chinese and Egyptian papyrus writings describe medicinal plant uses. Indigenous cultures (e.g., African and Native American) used herbs in their healing rituals, while others developed traditional medical systems (e.g., Ayurveda and Traditional Chinese Medicine) in which herbal therapies were used systematically. Scientists found that people in different parts of the globe tended to use the same or similar plants for the same purposes.



The industrial processing of medicinal and aromatic plants starts with the extraction of the active components using one or other technology. In case of essential oils, which represent a heterogeneous mixture of widely varied chemical constituents, the extraction processes for the production of essential oils from aromatic plants and extracts from medicinal plants differ widely and the best results are obtained by modifying and adapting the general extraction process to a particular medicinal and aromatic plant.

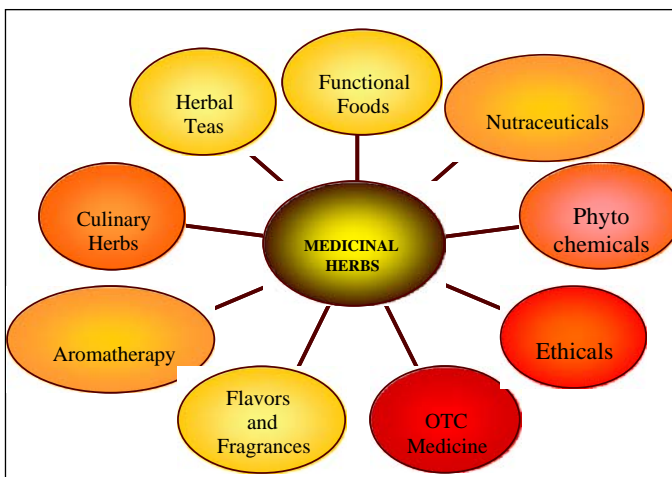
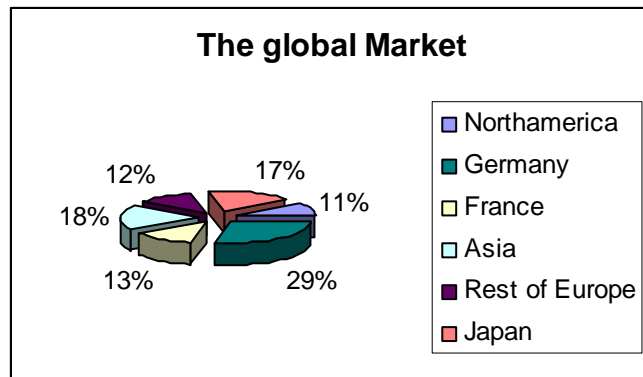
2. Market

The global trade in herbals has an estimated value of US\$12 billion, with trade in crude medicinal plants exceeding US \$800 M and trade in herbal extracts and semi-finished raw materials exceeding US \$8 billion.

The main product areas within the Herbal sector in an international context include: Pharmaceuticals – which is further divided into Medicinal and Aromatic plants, Medicinal and Vegetable Saps and Extracts, and Vegetable Alkaloids valued at about US\$8 billion. Spices and Herbs – valued at US\$3 billion in and Cosmetics – valued at about US\$1.5 billion in.

As you can see beside, Europe, especially Germany, is a very big market for herbal applications.

The following diagram gives you an overview of the different sub-sectors of the Herbal Industry.



The Herbal Products industry comprises a number of inter-related sub-sectors including herbal Teas, Functional Foods, Nutraceuticals, Phytochemicals, ethical OTC medicines, flavors and fragrances, Aromatherapy, culinary herbs and spices.

2. Herbal extraction-Process Technology

There are many processes patented through out the world for commercial extraction of plant ingredients. The general techniques of extraction of medicinal plants include maceration, infusion, percolation, digestion, decoction, hot continuous extraction (soxhlet), aqueous-alcoholic extraction by fermentation, counter current extraction (CCE), microwave assisted extraction, ultrasound extraction (sonication), supercritical fluid extraction (SFE), phytonic extraction (with hydro-flouro-carbon solvents), etc. For the aromatic plants, three types of hydro-distillation techniques (water distillation, steam distillation, steam and water distillation), hydrolytic maceration followed by distillation technique, expression method and enfleurage method (cold fat extraction) may be employed. Some of the latest methods of extraction for aromatic plants include head space trapping technique (HSTT), solid phase micro-extraction (SPME), protoplast extraction technique (PET), micro-distillation, thermo-micro-distillation, and molecular distillation techniques.



The following illustration shows an exemplary production process for herbal extraction. There exist different scales and techniques depending on the herbal application.

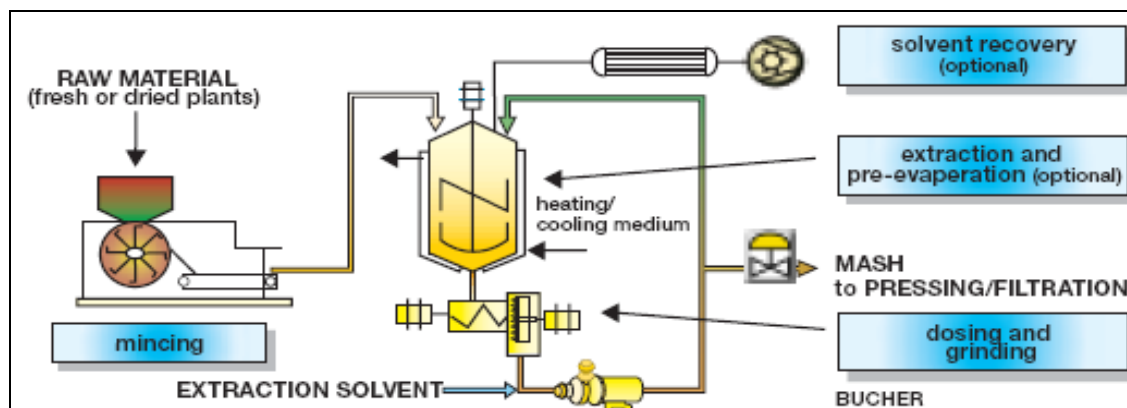


Figure 1: Bucher Foodtech Turbo Extraction

The illustration shows the Grinding of the dried plant and simultaneous accelerated extraction with solvent (e.g. water, ethanol + water, methanol + water) This process has the following advantages:

- quick extraction as compared to percolation (more than 10 times faster)
- high possible yield of active substance (similar to percolation)
- good blending of plant material and extract by recirculation process
- integrated solvent recovery possible (evaporation of alcohol after extraction)
- warm extraction possible (higher yield and accelerated extraction)
- clear extract in combination with cross flow filtration (no intermediate storage for sedimentation, no need of chemical additives for sedimentation)
- homogeneous particle size (adjustable according to the product)

3. Operation of alfalfa and chili pepper

The following subchapters show the possibilities of herbal extraction using the example of chili pepper and alfalfa. These two plants offer diverse interesting commercial applications.

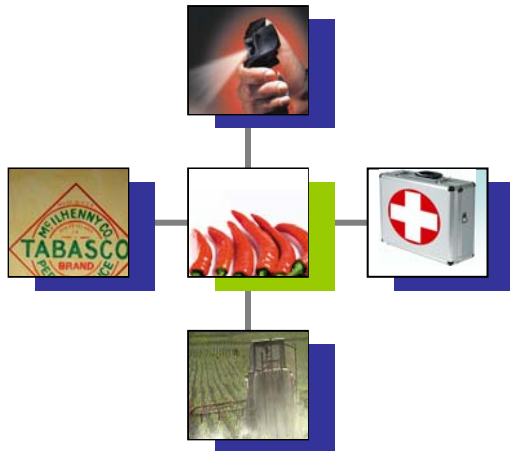
3.1 chili pepper – capsaicin

Introduction:

Capsaicin is a purified extract from chili peppers. It is unique to chili peppers and is not found in any other plant, animal, or mineral. Capsaicin is a capsaicinoid, a family of chemicals found in these peppers which induce the feeling of heat upon ingestion. There are five other major capsaicinoids, however, capsaicin is the most prevalent and strongest. Capsaicin retains its original potency despite time, cooking, or freezing. Capsaicin is a chemical compound which stimulates chemoreceptor nerve endings in the skin, especially the mucous membranes.



Applications:



1. Most of us know the application of capsaicin as a food integrant or foods add on. Because of the burning sensation caused by capsaicin when it comes in contact with mucous membranes, it is commonly used in food products to give them added spice.
2. Another application of capsaicin is medicine, especially in the pain

therapy.

The desensitizing effects of capsaicin provide promise for pain therapy.

The net effect of the desensitization of the neurons which send pain signals is a reduction of substance P release. This hinders the ability to send neuralgic and arthritic pain signals to the brain.

3. Capsaicin is also the active ingredient in riot control and personal defense pepper spray chemical agents. When the spray comes in contact with skin, especially eyes or mucous membranes, it is very painful, and breathing small particles of it as it disperses can cause breathing difficulty, which serves to discourage assailants.
4. Capsaicin is also used to deter pests. A common example is the use of ground-up or crushed dried chili pods in birdseed to deter squirrels, since birds are unaffected by capsaicin. Insects that feed on pepper, most aquatic organisms (most notably sharks), and related plants are also unaffected.

3.2 Alfalfa

Introduction:



Alfalfa is considered the “**Queen of Forages**” worldwide and is unrivalled among forage crops due to its combination of high quality, high yield, stand persistence, wide adaptation, biological nitrogen (N) fixation, and soil benefits. Alfalfa is one of the most palatable forages, providing high energy and protein for dairy cows as well as other types of livestock. It is an “engine of human food production,” eventually transformed into milk, cheese, meat, wool, and even honey. It provides a livelihood to thousands of farmers, contributes to wildlife habitat, protects the soil, and provides open spaces. It is the first choice of many farmers and ranchers as the premier perennial forage legume.

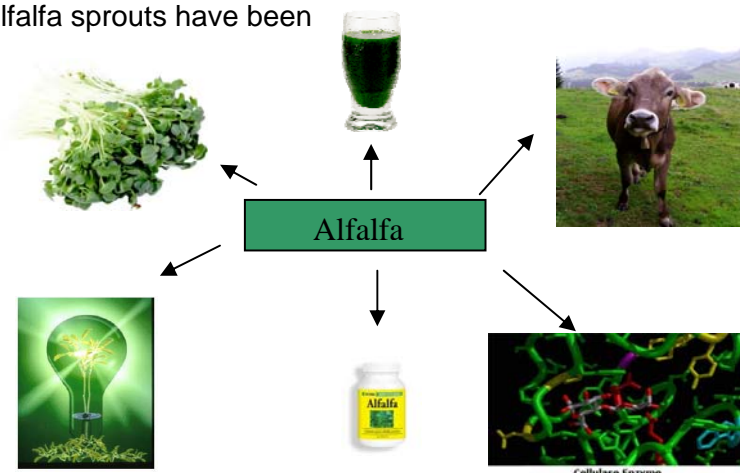
Applications:

Because of the various ingredients found alfalfa a bright spectrum of application.

1 For human consumption - alfalfa sprouts have been used for human consumption for decades. They are most often used in salads and on sandwiches.

2 Biofuels - Biofuels include ethanol, biodiesel, and other hydrocarbons achieved either through a fermentation or gasification process using biomass.

3 Generation of electricity- A feasibility study in Minnesota, conducted by the Northern States Power Company and the US Department of Energy and USDA, analyzed the potential of using alfalfa as an environmentally, and economically sustainable, renewable source of energy for the production of electricity.



4 Protein extraction - Potential exists to take advantage of the high quantity and quality of protein and sell it as a purified product while feeding the extracted leaves and stems and cattle. The extract is 55% protein, has a good balance of fat and traces minerals, and is high in xanthophyll content. The amino acid balance is very good for no ruminants and is used for poultry rations to provide protein.

5 In the herbal medicine – as a dietary supplement and for treating anemia, diabetes, to extend appetite and contribute towards weight gain, as a diuretic for increased urination, for indigestion and bladder disorders, alfalfa can also be used as an estrogen replacement in order to increase breast milk and to mitigate premenstrual syndrome, and to lower blood cholesterol levels.

4. Ensymm service concerning herbal extraction

Ensymm can help you to plan and realize your herbal extraction project. Referring to this look at the ensymm profile, ensymm benefits and ensymm project roadmap as follows.

Profile:

Ensymm is a consulting company based in Duesseldorf/Germany. Our company offers Technology Transfer, Project Management and Consulting for companies, governmental organization and universities. We have a strong network of more than 30 suppliers in the EU, Iran and India and 15 cooperation offices worldwide. Beside our expertise for managing your project puzzle, we are specialist for Turnkey Plants (Transfer of Technology and Equipment) and Outsourcing. The transfer of technology contains the areas:

- Biotech processing
- Pharmaceutical processing
- Chemical processing
- Food processing

So we have the pleasure to provide you with new and fresh ideas for preparing your company for future challenges and developing its marketing and sales strategy for the global competition.



Benefits:

- Client design offer
- Local support
- State of art Technology
- Feasible production capacity
- Offers designed for the budget of investors
- Competence team for:
 1. Business and scientific issues
 2. Supervising for engineering, installation and production
 3. Inspection and guarantee for used plants
 4. Coordination of the Project from A-Z
 5. Quality control
 6. Advisory related to the project
 7. After sales services
- Project coordination from A-Z
- Support for raw material and technical services
- Support for formulation and compounding
- Support for certification and validation for approvals



Roadmap:

1. Our email with a short introduction along with an abstract and general budget plan
2. Signing a MOU
3. Delivery of a detail proposal with list of equipment, machinery, raw material, general feasibility calculation and references.
4. Meeting between client and our supplying/technology team.
5. Further decision for signing a project contract



Could we intrigue you?