

## Lab 6: Medicinal Plant Extracts

**Extraction**, as a term is used pharmaceutically, involves the separation of medicinally active portions of plant or animal tissues from the inactive or inert components by using selective solvents in standard extraction procedures.

The products so obtained from plants are relatively impure liquids, semisolids or powders intended only for oral or external use.

**The purposes** of standardized extraction procedures for crude drugs are to get the therapeutically desired portion and to eliminate the inert material by treatment with a selective solvent known as menstruum.

The extract thus obtained may be ready for use as a medicinal agent in the form of tinctures and fluid extracts, it may be further processed to be included in any dosage form such as tablets or capsules.

The main **advantage** of herbal extracts is their ability to preserve the active constituents and their long shelf life, which could be anywhere from one to three years. They can be added to regular tea, water or juice and consumed directly, which is an easy way to add supplements into day-to-day life.

### Cold Water Extraction

Cold water extraction is the process whereby a substance is extracted from a mixture via cold water. It is a type of fractional crystallization.

The process generally involves taking a mixture of substances, dissolving them in warm water, and then rapidly cooling the mixture. The insoluble compounds precipitate out of the water, while the soluble ones stay dissolved. The solution can then be separated by filtration.

This process works by using the differences in solubility (with respect to temperature) of different substances in a mixture. It is commonly used to separate out opiate-derived drugs that have been mixed with common non-opiate-based analgesics, such as are found in Codeine/Paracetamol (Acetaminophen) formulations.

## Extracts from Dried Plant Material

Extracts made from dried plant material comprise most of the herbal extract types. The standard ratio used when making a dry herb extract, also known as a tincture, is:

- 1 part dried herb to 8 parts liquid 1:8

Essentially, making a dried herbal extract involves the same procedure. Powder the herbs in a blender or coffee mill and then combine them with 8 times (in weight) as much liquid.

### Extracts enable

- to move the healing properties of a herb into a long-lasting medium of liquid.
- Shelf life of extracts is several years as compared to the dry herb in whole leaf or large chunk root form which are only viable for about one year.
- Dosage is also easier to judge with the liquid in a dropper bottle.

## Alcohol Extracts

Ethanol also called ethyl alcohol, pure alcohol, beverage alcohol, or drinking alcohol, is a volatile, flammable, colorless liquid with the structural formula  $\text{CH}_3\text{CH}_2\text{OH}$ , often abbreviated as  $\text{C}_2\text{H}_5\text{OH}$  or  $\text{C}_2\text{H}_6\text{O}$ .

Ethanol is a psychoactive drug and is one of the oldest recreational drugs still used by humans. It can cause alcohol intoxication when consumed. Best known as the type of alcohol found in alcoholic beverages, it is also used in thermometers, as a solvent, and as a fuel. In common usage, it is often referred to simply as alcohol or spirits.

Humans discovered ethanol not long after they figured out how to put fire to good use. Today, ethanol has many uses: it can be drunk – diluted, and use it in food and other manufacturing.

- Bioethanol - or simply 'ethanol' - is an alcohol which is made by fermenting the sugar and starch components of plant materials by using yeast such as *Saccharomyces cerevisiae*.

**Food & Fuel:**

More than 98% of U.S. ethanol today is produced from grains such as corn and sorghum. This process yields both fuel and livestock feed. One-third of the grain used to produce ethanol is returned to the market in the form of livestock feed—distillers grains, corn gluten feed, and corn gluten meal.

**How is Ethanol Made?**

- Ethanol can be made from any crop or plant that contains a large amount of sugar or components that can be converted into sugar, such as starch or cellulose.
- As their names imply, sugar beets and sugar cane contain natural sugar. Crops such as corn, wheat and barley contain starch that can be easily converted to sugar. Most trees and grasses are made of cellulose, which can also be converted into sugar, although not as easily as starch.
- Ethanol extraction is a type of solvent extraction used to extract fragrant compounds directly from dry raw materials, as well as the impure oils or concretes resulting from organic solvent extraction.

Ethanol extracts from dry materials are called tinctures, while ethanol washes for purifying oils and concretes are called absolutes.

**Extracts from Dried Plant material**

The impure substances or oils are mixed with ethanol, which is less hydrophobic than solvents used for organic extraction, dissolves more of the oxidized aromatic constituents (alcohols, aldehydes, etc.), leaving behind the wax, fats, and other generally hydrophobic substances.

The alcohol is evaporated under low-pressure, leaving behind absolute. The absolute may be further processed to remove any impurities that are still present from the solvent extraction.