



Phyto Essential Oils Ltd

INSTALMENT 2:

This is a summary of how scientists divide, name and classify life-forms which we call “organisms”. Also, how we classify and name lavender and other essential oil plants and where it all fits in.

I cannot just launch into essential oil plants before explaining how other organisms are divided and classified. There are libraries written on this subject and it is a complex science indeed. The study of plants is called “botany” and, again a huge amount of time and numerous publications are written globally on this subject alone.

Lavender and other essential oil plants are life forms.

Let's begin by looking at how everything which is life and which is non-life is sorted out. Scientists just love to divide life into categories and name and classify everything. It is a good idea really as it means we can all talk to each other and know what we are referring to !

Let's start in outer space. It is as good a place as any to start !

Pretend you are in outer space, looking at the Earth. You will see two things, land and water. Now let's divide these 2 first divisions. Water includes oceans, seas, lakes and rivers. Land includes mountains, plains, deserts, jungles, forests, polar regions and cultivated land.

Now, let's get in closer. We can see life-forms and non-life forms. Non-life forms are gases, pure water, metals etc. Let's leave non-life forms out for now and just focus on life-forms

Because there are so many life forms, the generic term is “organism”. Think about insects, animals, birds, fungi, reptiles, fish, plants, micro-organisms (“micro” means small, so for example bacteria and fungi), beetles, worms and algae. The list is very long indeed.

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Lancashire, L40 9RG
Tel: 01704 880996
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It is not known how many organisms there are on the Earth but it has been estimated to be about fifteen million. And, as science progresses, more are found and more are becoming extinct.

How do we tell one organism from another ? Did you know, for example, there are currently over 400 different kinds of lavender plant ?. We have no idea how many bacteria there are or how many different beetles ! So how do we divide and name organisms ?

ASIDE....as a school girl we had to study science (botany, biology, physics, chemistry) and as soon as the lesson started, I would just throw my pen down, look out of the window and wonder what we would be having for tea! Now, completely reformed, I can't get enough knowledge. Education may well be wasted on the young.

If you are undertaking a course in Aromatherapy, Complementary Therapies, Medical Herbalism or are just interested then you will hear the term "botanical authentication", and you should see the latin name detailed for each essential oil you purchase. The correct identification of plants means that we are extracting a genuine oil and not a potentially toxic one from a similar plant.

Using the correct plant for it's medicinal value (by Medical Herbalists) is vital. In fact, historically, the naming of plants and their classification was undertaken mainly by herbalists. It was also important to know which plants and which plant part (eg seeds, bulbs, tubers, berries) we could eat and which would not subsequently poison us !

SCIENCE: The study of science, typically, was divided into subject areas. These included Botany, Biology, Chemistry and Physics. Over the last 30 – 40 years, as science has progressed, these original divisions have increased. So, today we have Biochemistry ("bio" meaning life), Earth Sciences, Geology, Biomedical Sciences, Microbiology, Pharmacy, Pharmacology, Astronomy etc.

Historically the need for classification was vital for our lives. Grouping organisms into categories was the only way humans could understand the vast numbers which exist. More importantly, how we could distinguish predators, food, mates, fuel, building materials and medicines to name a few. Plants and animals which are vital for our lives.

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A picture of German chamomile (*Matricaria recutita*) which can be misidentified with Stinking Mayweed which contains an essential oil which can be toxic. In fact, in trials undertaken it was found that the oil of Stinking Mayweed (a common weed in UK soils) caused allergic reactions in all people in the trial (23) when massaged with this toxic oil. German chamomile essential oil is expensive because the oil is only found in the yellow part of the flower.

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This is a picture of a trichome (it is like a bubble) on the flowers which contain the essential oil. This is a magnification of about 500. If you were to squeeze the flowers, you would fracture this "bubble" and the oil and aroma would be released.

Think about this – the problem of classifying plants is enormous. Currently we probably know about 500 000 green plants plus over 100 000 fungi.

Let's get back to lavender and essential oil plants.

How do we divide organisms and where does lavender fit in ?

ASIDE...scientists and botanists still search the globe for new medicines from plants and this is called an "ethnobotanical survey".



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HOW WE DIVIDE ALL ORGANISMS

We start with Kingdoms. If you look at the Earth from near space, many plants and animals are visible. At the same time, many organisms are invisible, eg bacteria, some fungi and viruses (which are difficult to describe).

I will describe, briefly, the Kingdom names. I have left out viruses for now. We are interested in plants (lavender and other essential oil plants), animals (humans as we use essential oils), bacteria and fungi (as essential oils are anti-bacterial and anti-fungal).

We have 5 Kingdoms so far. But please be aware that the science of taxonomy and classification is very complex indeed and I have just taken the basics for our purposes. Over the centuries, libraries have been written covering the area of taxonomy and classification and much is still being written. In fact, there may well be disagreement about the inclusion of certain organisms in specific categories.

KINGDOM	SOME EXAMPLES INCLUDED
PLANTS	mosses, ferns, conifers, flowering plants
ANIMALS	sponges, jellyfish, molluscs, worms, fish, reptiles, birds, mammals, Insects
FUNGI	mushrooms, bread molds, yeast
MONERA	bacteria
PROTISTA	slime molds, algae

Animals and plants are believed to have arisen by a process of evolution. If you have a dog as a pet, then all domesticated dogs are thought to be derived from wolves. Those that are closely related in the evolutionary process would be expected to share certain fundamental features in common. So, for example, a male wolf could mate with a female dog but not with a cat.

So, those that are distantly related would not be expected to do so as they do not share those fundamental features. In classifying organisms a biologist aims to group them according to their evolutionary closeness to one another. The science of classification is known as taxonomy. We all know that trees are plants, but a tree is not the same as a lavender shrub. So, where do we start ?

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THE TAXONOMIC HIERARCHY

Organisms are grouped together into progressively larger groups, creating a kind of hierarchy. Thus genera are grouped together into families, families into orders, orders into classes, classes into phyla, and phyla into kingdoms. Intermediate divisions are sometimes used, for example, between a phylum and a class.

It is customary to name organisms by their genus and species. The generic name is written first followed by the specific name and Latin is used. For example humans are *Homo sapiens* and a particular group of lavender *Lavandula angustifolia*.

Aside.....when classification began. scientists started to use Latin. We use Latin because it was the basis of many European languages. Again, it means we can all speak to each other and plants are not named in English, French, Dutch, German, Spanish, Swedish etc etc.

First of all let's look at lavender, a well-known plant which produces the most popular essential oil for Aromatherapy. Plant taxonomy and classification is arguably the most complex of sciences !

TAXONOMIC GROUP	PLANT EXAMPLE (LAVENDER)
KINGDOM	Plant
PHYLUM	Angiosperm
CLASS	Asteraceae
ORDER	Lamiales
FAMILY	Labiatae
GENUS	<i>Lavandula</i>
SPECIES	<i>angustifolia</i>
COMMON NAME	Peter Pan, Ashdown Forest, Princess Blue

Lavender belongs in the plant kingdom and in the phylum "angiosperm" which means plants which bear seeds. The class "asteraceae" and order "lamiales" and family "labiate" describe the characteristics of the plants in this phylum by the leaves and flowers. For example, leaves which emerge opposite to each other and the flowers have, typically, petals fused onto an upper and lower lip.

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Aside...there are thought to be over one quarter of a million seed plants on the Earth and a further two thousand species are found annually. There are over two thousand species of rose.

The labiates include basil, mint, rosemary, sage, savoury, marjoram, oregano, thyme, lavender and various other shrubs and weeds.

The genus *Lavandula* has many species, subspecies and hybrids. For example *Lavandula spicata* otherwise known as "spike lavender". I have named three different lavenders in the species *angustifolia* but there are over one hundred and twenty known.

Aside....some cultivated plants (ie not wild plants) have been bred by plant breeders and there are national and international regulations covering the rights of the plant breeder, eg roses, orchids.

Let's look at a human.

TAXONOMIC GROUP	ANIMAL EXAMPLES
Kingdom	animal
Phylum	chordate
Class	mamalia
Order	primates
Family	hominidae
Genus	homo
Species	sapiens
Common name	human

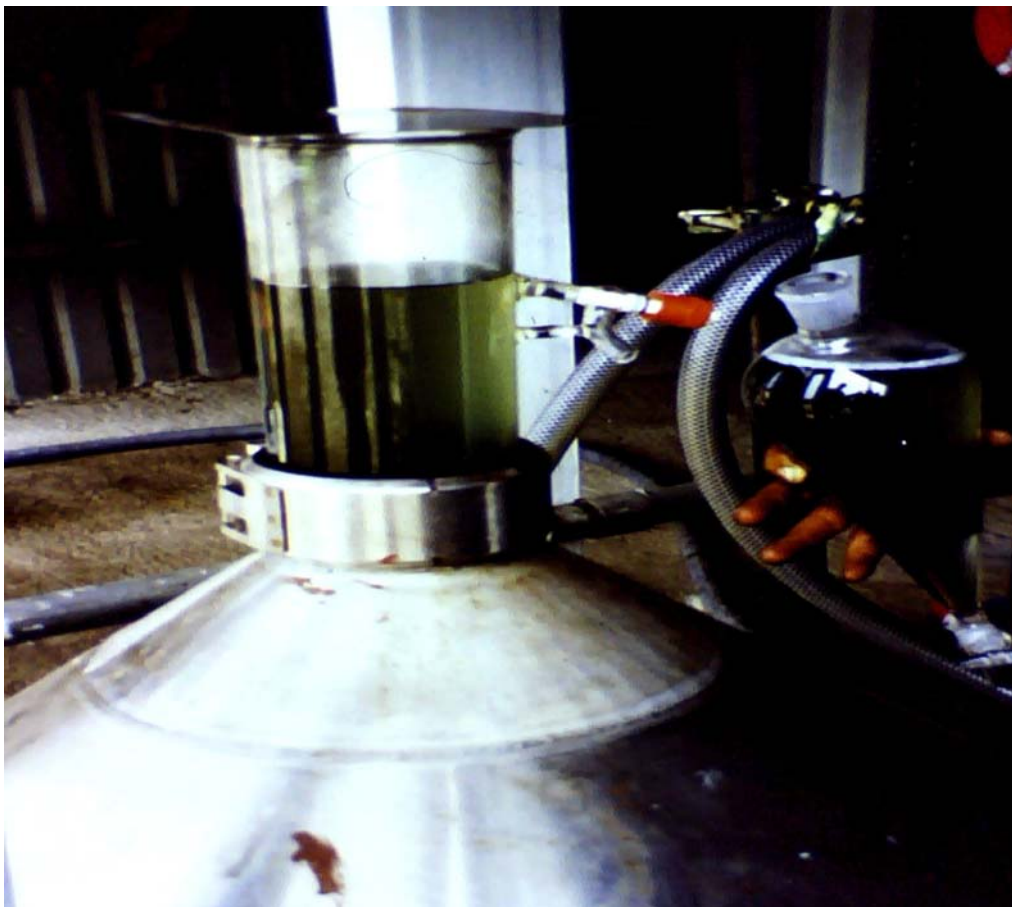
So we start with the animal kingdom. The phylum can have 3 sub-phylla, but "chordate" means that at some stage in the life of these organisms they have had a hollow dorsal nerve chord. Class "mamalia" means mammals which are organisms which grow their young inside of the female body. Order "primates" and family "hominidae" include monkeys, gorillas, orang-utangs and humans. The genus "homo" includes modern humans and all other species of the genus which are now extinct. "Sapien" is today's modern human being.

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It follows, that as one progresses down the hierarchy, the smaller the number of organisms belonging to each group and the more they have in common.

Thus a phylum may contain a large number of organisms, held together by certain fundamental features but at the same time displaying a wide range of variety. On the other hand, the different members of a genus may be so similar as to be virtually indistinguishable except by an expert.



Peppermint essential oil, extracted from Mentha piperita var Black Mitcham post extraction. The whole farm would smell of peppermint and we were all alert and on our toes! A very under-rated oil in my opinion. I put it in my briefcase and handbag and carry around with me. Very good if going on a long car journey or times when we all need to be alert without feeling nervous! Very good for congestion too.

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LAVENDER AND OTHER ESSENTIAL OIL PLANTS

Essential oils are made by plants. Millions of plants cover the globe and it is an ever-changing situation. Plant material is removed by human, animal and microbial (bacterial and fungal) activity and is continuously replenished by new plant growth which represents the world's most extensive and complex chemical activity.

It is estimated that below one percent of all the species of higher plants produce aromatic products known as essential oils. These essential oil-producing plant species are generally scattered in a random way throughout the plant kingdom although certain families contain many oil-producing species, for example the labiates.

Lavender, a woody shrub, is almost universally recognised for its distinctive aroma and has been planted and used from almost the beginning of civilisation. Currently it is number four on the list of all the essential oils produced on the globe.

Lavender is a very versatile herb plant and, apart from being extensively used in gardens, it is employed for use in candles, herb pillows, diffusers, bouquets, sachets, soaps, wreaths, incense and potpourris. The essential oil is utilised to create perfumes, tinctures, bath oils and as a culinary seasoning.

Lavender essential oil is probably the most popular one used in Aromatherapy and its properties (validated by modern medicine) have been shown to be effective against insomnia, hyperactivity, bacteria, fungi, airborne molds and numerous other disease-causing factors.

There are, for example, over 350 different species of thyme plants and most thyme essential oil is from *Thymus vulgaris*. Thyme was used over three and a half thousand years ago for embalming corpses ! It is, in my opinion, an exceptional essential oil and is very effective for any infections of the upper respiratory tract amongst many other uses.

Again, there are numerous different mint plants. Probably the most well-known are peppermint and spearmint. Peppermint essential oil is just wonderful for relieving nasal congestion and is very good on a burner too. Peppermint oil should not touch the skin, as it will burn, a bit like chilli. Very safe to use and effective.

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BOTANY

The study of plants is called botany and is a very old science. Botanists travelled the globe (e.g. with Captain Cook) looking for new plants and, in fact, most of our agricultural food crops originated from these plants which were brought back to the UK and introduced here as crops. For example wheat came from Egypt originally and potatoes from South America. The science of botany concentrates on the analysis of plants to understand more about the way in which plants grow and behave.

Botany is a very wide-ranging subject and covers:-

1. Biochemistry - the study of chemical reactions inside the cells of plants
2. Physiology - the study of processes and functions of all of parts of the plant
3. Genetics - - the study of heredity
4. Cytology - the study of the contents of the cell
5. Morphology - the study of the form and arrangement of the parts of the plant
6. Ecology - the study of the relationships between the plant and its environment
7. Taxonomy - the study of the way in which plants are divided into groups

Plants are botanically authenticated and this is particularly important for medicinal and aromatic plants (essential oil plants). It is absolutely vital for any plant species producing a specific product used in medicine (e.g. anti-cancer drug, anti-fertility medication, anti-inflammatory medicines) that the botanical authenticity is maintained and very elaborate methods can be used by seed suppliers and plant breeders to ensure that, for example, the flowers do not come into contact with pollen from a closely related species. This could mean changes in the genetic makeup of the plant and potential changes in the active ingredients which could lead to a loss of medicinal properties.

Most essential oils are sold claiming botanical authentication but this is the role of the grower/producer and the supplier to ensure that oils being sold are genuine. The grower depends on a specialist seed supplier (or a supplier of cuttings) for certain essential oil plants. In reality botanical authentication involves a very complex journey of scientific botanical study. Botanists must carefully examine each morphological structure on the particular plant, including the leaves, flowers, stems, seeds, roots and fruits. The flowers, in particular, are very important as they contain the parts for sexual reproduction and contain many structures including

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bracts, petals, sepals, stamens, anthers, stigmas and ovaries. They also produce the pollen which is like sperm produced in male animals.

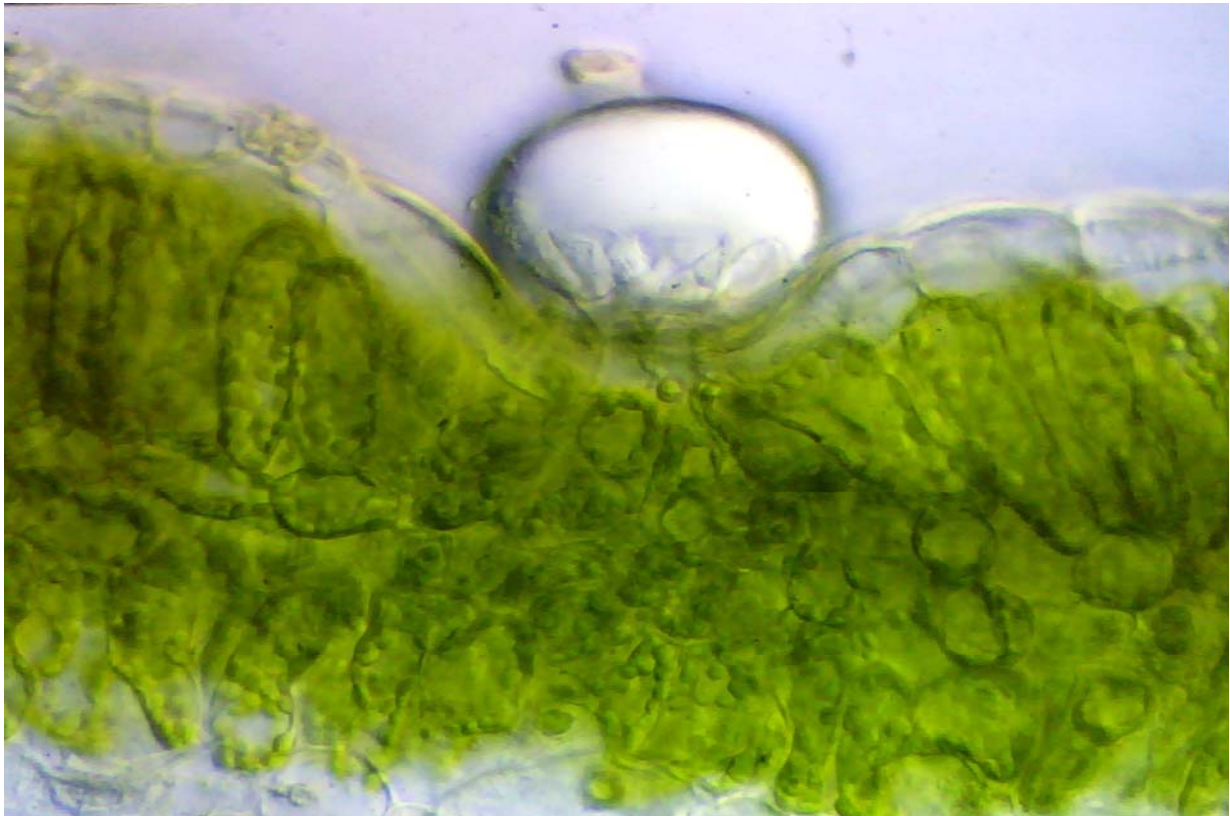


*A field of lavender, *Lavandula angustifolia*, at the point of harvest.*

This is why, when purchasing an essential oil, your supplier should be able to inform you of the specific plant being used to produce the oil in the bottle. The botanical name of the plant should be detailed in the catalogue/price list/web-site and also on the bottle, in Latin.

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Aside...a very good book to have is a Herbal. I have about 25 now and buy them in charity shops, second-hand shops and at car boot sales. Some are better than others, but it helps to understand plants and their uses.



An image of a trichome on a peppermint leaf. There may well be over one thousand of these tiny structures on one leaf. The image clearly shows the cells below the trichome (the elongated green structures) which are called epidermal cells and they contain chloroplasts. The start of life itself is in these structures as the energy of the sun hits the cell and starts a tiny electrical current. Water and carbon dioxide react together and from sugar and oxygen. Plants are very clever indeed !

Dr Jane writes.....please let me have any comments about this instalment. More information will be detailed in further instalments about essential oils and their uses. There is still much to cover. Best wishes Jane

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