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TREBALL DE RECERCA

Homoeopathy as an alternative to agrochemicals



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ABSTRACT

This research aims to investigate the usefulness of homeopathy for plant growth or if agrochemicals should always be used when the plant has growth problems. This paper is about the different treatments of homeopathy in plants, more specifically about homeopathy as a complement, which would normally be treated with agrochemicals. With a practical part based on experimentation with thirty cherry tomato plants, where the growth of 30 plants is studied, but fifteen of them have been treated with homeopathy, and the other 15 plants will have no treatment. The hypothesis is that the treatment will be successful and the plants that have been treated with the homeopathic solution will grow faster than the others. The findings were that the treatment was successful, and the treated plants grew perfectly and without any complications.

Resumen

Esta investigación tiene como objetivo averiguar la utilidad de la homeopatía para el crecimiento de las plantas o si los agroquímicos deben usarse siempre cuando la planta tiene problemas de crecimiento. Este trabajo habla de los diferentes tratamientos de la homeopatía en las plantas, más concretamente de la homeopatía como suplemento, que normalmente se trataría con agroquímicos. Con una parte práctica basada en la experimentación con treinta plantas de tomate Cherry, donde se estudiará el crecimiento de 30 plantas, pero quince de ellas han sido tratadas con homeopatía, y las otras 15 plantas no tendrán ningún tratamiento. La hipótesis es que el tratamiento será exitoso y las plantas que han sido tratadas con la solución homeopática crecerán más rápido y mejor que las otras. Las conclusiones fueron que el tratamiento tuvo éxito, y las plantas tratadas crecieron perfectamente y sin ninguna complicación.

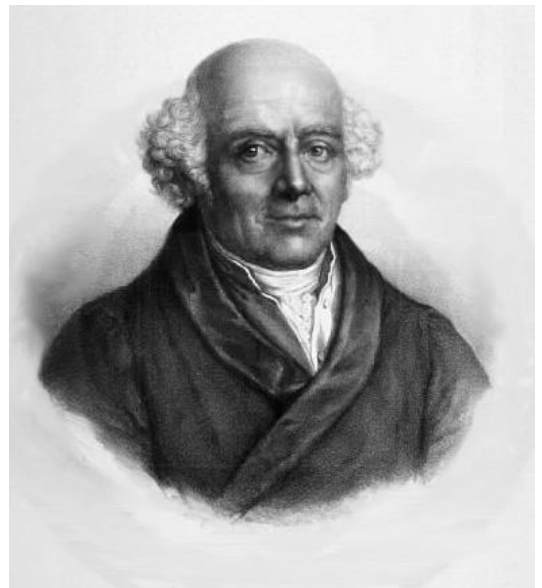
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“Homoeopathy rests solely on experience. Imitate me but imitate me well and you will see in each step the confirmation of my affirmation.”

Samuel Hahnemann



INTRODUCTION

“The changes that occur in material substances, especially medicinal ones, through trituration with non-medicinal powder, only when dissolved, by means of agitation with the non-medicinal fluid, are so incredible, that they approach miraculous, and it is the reason for contentment that the discoveries of these changes belong to Homeopathy.” Samuel Hahnemann.

Nowadays, we live in a world where the problems we have concerning plants are dealt with through chemical treatments. The purpose of this study is to try to find a solution and avoid the use of agrochemical treatments on plants, as they are very harmful to the environment, to animals and to people who grow them and who eat them. These homeopathic treatments are being used as they are better for the environment, as they are all natural products.

This paper consists of two parts on, the one hand, the theoretical part of the study, in which the following subjects are presented: firstly, a detailed explanation of what homeopathy is, its history as well as an explanation of its creator. Subsequently, in the following section, being the main focus of the research, explaining homeopathy as a treatment and supplement for plants. In this section the treatments currently used when there is a pest are explained, the drawbacks of those treatments and the reason why Agrohomeopathy should be used, and its origin is likewise explained. In the third and last section of the theoretical part we find the explanation of the plant used to make the experimentation of the treatment, in this section we have talked about its origin, its benefits and the specific type of tomato that has been used for the practical part.

As far as the practical part is concerned, 30 tomato plants were planted, and their growth was monitored. Then, when they reached the desired point of growth, the treatment created specifically to function as a supplement and help the tomato plants grow healthily was applied.

The objectives of this project are: To know the functioning of homoeopathy and Agrohomeopathy, the homoeopathic treatment on plants, and see if the parallel growth of tomato plants, treated and untreated, in a controlled environment.

The hypothesis is that the homoeopathic solution applied to tomatoes will make a difference in tomato growth compared to those to which nothing is applied.

1 HOMOEOPATHY

Homoeopathy is a treatment based on the idea of “like cures like”. The origins of these treatments date from the late 18th century, they were created by Samuel Hahnemann, in spite of the fact that concepts similar to homoeopathy already existed. These treatments became popular in the 19th century, one of the reasons is because of their epidemic success, but the popularity of them declined during the majority of the 20th century. Later on, in many parts of the world, it became increasingly popular in the late 20th and early 21st centuries.

This kind of treatments have been highly controversial over the years due to the fact of actually diluted drug use. A significant body of clinical research, including random clinical trials and meta-analyses of such trials, aims that homoeopathy has a non-placebo effect.

1.1 WHAT IS HOMOEOPATHY

The first thing to know is that homoeopathy is a type of alternative medicine. The name alternative medicine refers to practices and medicines that are not part of orthodox medicine, procedures or drugs that are usually administered by healthcare professionals. Examples of alternative medicine include acupuncture, hypnosis, yoga, meditation, tai chi, and homoeopathy, which is the subject of this report.

Having clarified that homoeopathy belongs to the group of alternative medicine and what this means, let's dig deeper into what homoeopathy is and what it is based on.

Homoeopathy is a system of natural medicine that believes that the disease that makes you ill, is the treatment that can cure you. It's a medical treatment based on the belief that the body can cure itself. However, it's about understanding how the person's mind, body, and spirit are affected as a whole when he/she suffers from an illness. The principle expresses the possibility of treating a disease with the infinitesimal dose of the substance that, in ponderable use, can provoke in healthy patients a pathological picture like the disease that is being treated.

Those who practice it, use tiny amounts of natural substances, such as plants and minerals. That is the idea behind homoeopathy, a curative treatment which is effective in people, animals, and plants. This treatment can be complementary, or you can take it as an alternative to orthodox medicine¹.

But the importance is not the sick part of the disease, but the whole person. Homoeopathic medicines stimulate the body's self-regulating mechanisms to initiate the healing process.

1.1.1 The way homoeopathy works

The basic belief behind homoeopathy is “like cures like”. In other words, homoeopathy is something that brings on symptoms in a healthy person who can treat an illness with similar symptoms.

During the appointment, the homoeopathic doctors also called “homoeopaths” will ask several questions, including ones about your mental, emotional, and physical health. Then they will prescribe the remedy that matches the best with all the symptoms the person presents. Homoeopathy is a therapeutic method that prevents, relieves, or cures illnesses using natural medication.

Homoeopaths will weaken these ingredients by adding distilled water or alcohol. They then agitate the mixture as part of a process called "potentization". It is believed that this step will transfer the healing essence. Homoeopaths also think that the lower the dosage, the more powerful the medicine is.

1.1.2 The products homoeopathy is made of

These treatments are mainly made from substances obtained from plants, animals and minerals are used mainly, in very small concentrations dissolved in water or alcohol (they can also be prepared by trituration in lactose), shaken in a very specific way.

¹ Which means that homoeopathy is different from traditional treatments.

Homoeopathic medicines are made from plant extracts, such as Belladonna, Pulsatilla or Arnica. They can also be made from mineral substances such as phosphorus or sulfur. Lastly, homoeopathic medicines can also be obtained from substances of animal origin, such as bees or cantharides.



Figure 1. Belladonna
(rtve.es)

1.2 HISTORY OF HOMOEOPATHY

Homoeopathic treatments began in the late 18th century and were developed by Doctor Samuel Hahnemann.

There were several reasons why he decided to create this new treatment, but the most important one was that Doctor Hahnemann was unhappy about the state of medicine in his time, particularly with some practices, such as bloodletting, so he began investigating a way to improve the medicine of his time, the reason is because thought that the type of medicine he had learned, did more harm than good to patients most of the time.

So, he began studying the work of Doctor Anton von Störk, which investigated the toxic effects when ingesting some substances, Hahnemann begun testing substances to determine their effect on a healthy individual, assuming that they would cure the very disease they caused. His research led him to agree with Dr. von Störk that the toxic effects of the substances he had investigated were often similar to certain medical conditions.

He then began to develop methods of diluting the medicines he tested in order to reduce their toxic effects. Hahnemann claimed that these dilutions when prepared with the technique he had created, that consisted of "potentization", which is based on dilution and vigorous shaking, were then effective in mitigating the same symptoms in the sick.

1.2.1 Dr. Samuel Hahnemann

Christian Friedrich Samuel Hahnemann, better known as Doctor Samuel Hahnemann, was born in Meissen, Germany, on April 10th, 1755, he was a Saxon physician and the inventor of the system of alternative medicine, homoeopathy. He developed homoeopathy because he was concerned about certain treatments of his time, such as purging, bloodletting, etc., which caused extreme pain to patients.

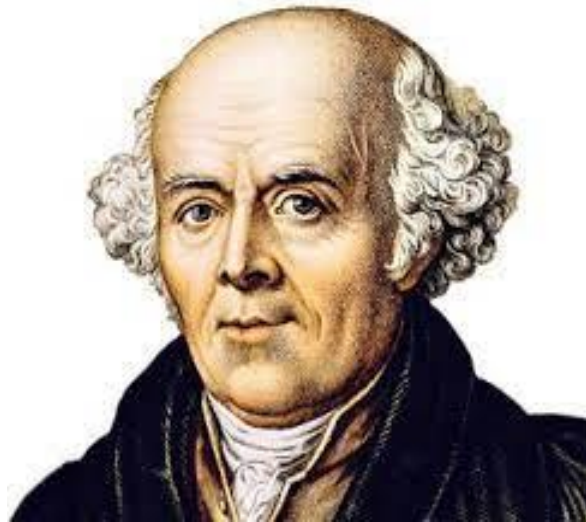


Figure 2. Samuel Hahnemann.
(biografiasyvidas.com)

His work started when he first published an article on the homoeopathic approach in a medical journal in 1796. After a series of additional essays, he published "Organon of the Rational Art of Healing" in 1810, which was followed by four additional editions titled The Organon of the Healing Art, the very first systematic treatise to contain all of his detailed instructions on the subject. This work was followed by more Organon editions.

1.2.2 The way Hahnemann reached the idea of homoeopathy

He came up with the idea of this method by taking regular doses of Cinchona bark².



Figure 3. Cinchona.
(quinfica.com)

Hahnemann realized that the cinchona bark caused the same symptoms as malaria, but on a lower level. This led him to think that small amounts of those substances that produced certain types of symptoms could cure diseases with similar effects.

Consequently, he established two basic principles of homoeopathy:

- 1- Patients with certain symptoms can be treated with remedies that produce the same symptoms in a healthy individual (similar cures).
- 2- Homeopathic remedies retain their properties through a series of repeated dilutions that increase their potency.

The basic principle of homoeopathy is that the similarity of a substance can cause certain symptoms, and the differences in a healthy individual can cure or alleviate similar manifestations in a sick person.

Hahnemann, the inventor of the homoeopathic method, began his research using relatively high doses of medicinal substances and found that this caused, at least initially, an aggravation of his patient's problems. To avoid these reactions, he began to use smaller and smaller amounts of the substances in the doses and, as he observed positive therapeutic effects, he decreased them.

² The bark of the cinchona tree (*Cinchona officinalis*) possesses various natural alkaloids, which have antipyretic properties.

1.3 THE EFFECTIVENESS OF HOMOEOPATHY

The efficacy of homoeopathy has been extensively studied. However, there is no better high-quality evidence that homoeopathy is proven to be 100% effective or not as a treatment for any health condition.

In December 2002, a British meta-study³ reviewed a series of investigations that evaluated the effectiveness of homoeopathic medicines by comparing two groups: one given homoeopathic remedy and one given placebos.

The British study concluded that the reviewed studies did not provide evidence in favour of homoeopathy: no condition was found to respond better to homoeopathic treatment than to placebo treatment. Likewise, no homoeopathic remedies were found that were shown to achieve any clinical effect different than a placebo⁴ one.

But, on the other hand, in 2015, the National Health and Medical Research Council of Australia published another meta-study incorporating a review of 57 meta-studies, totaling 176 individual research reports on the evidence for the efficacy of homoeopathy.

The study concluded that there is unreliable evidence of the effectiveness of homoeopathy. In addition, no well-designed trial with sufficient participants provided evidence that homoeopathic treatments caused more health benefits than placebo.

³ A meta-study is a review of several scientific studies on the same topic.

⁴ Placebo is a substance that is not designed to have therapeutic value. In other words, by themselves, they do not seek to cure a disease. Placebos are used in medical studies to measure the effectiveness of a medicine.

But, on the other hand, there is scientific evidence that substances from which homeopathic medicines are prepared do persist into the finished products in the form of nanoparticles from the source material. They consist of a kind of agglomerates of the substances, most of them less than 15 nm⁵ in diameter. The discovery must be considered in the emerging science of nanotechnology and is important in explaining the mechanism of action of homeopathic medicines.

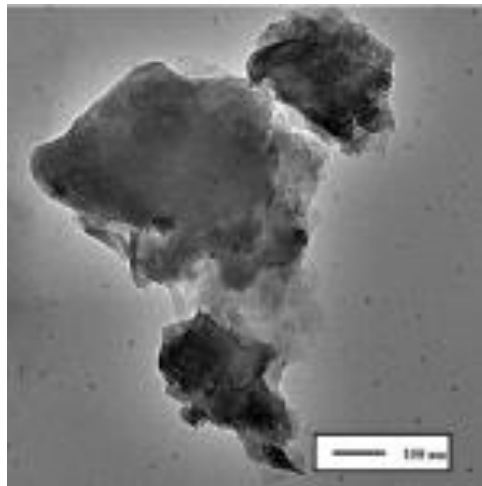


Figure 4. Pulsatilla nanoparticles at 15ch dilution
(homeos.org)

1.4 DISSOLUTIONS OF HOMOEOPATHY

The Mother Tinctures⁶ or raw materials that are used to make homoeopathic treatments with hydroalcoholic solutions of mineral substances, animals, or vegetable substances have to be diluted to reduce their toxic power.

This procedure has been carried out since the creator of homoeopathy, Samuel Hahnemann announced the Law that he created, which is known as the Law of Similitude.

The solutions are shaken vigorously so that the water molecules and the active principle that has been introduced into the solution are reconfigured.

⁵ 1 nm or nanometer = 1 millionth of a millimeter

⁶ Mother tincture is referred to a simple mixture of a botanical extract with a specific amount of alcohol.

1.4.1 The method used to make homoeopathic treatments

Homoeopathy performs a process known to its practitioners as "potentization" where a substance is diluted in alcohol or distilled water and then shaken vigorously in a process called "succussion". Insoluble solids, such as quartz and oyster shells, are diluted by trituration in lactose.

To prepare a homoeopathic "medicine" what is done is to dilute the active principle and shake it. In this way, you would take 1 part of the bee venom, dissolve it in 99 parts of water and, then the important part, shake it vigorously. This is called "succussion".



Figure 5. The basic idea behind the recipe
(sciencebasedlife)

Once this is done, we have what is called a 1CH⁷ solution. The process is repeated, taking again a part of the dilution, dissolving it again in 99 parts and shaking it. If we do this 6 times, we will have a 6CH dilution, very common in modern homoeopathic medicines, but considered a low dilution. Those of medium dilution can reach 30CH and those of high dilution up to 200CH.

Finally, take some sucrose and lactose tablets and soak them in this solution.

⁷ Hahnemann's concentration



Figure 6. Mitos y timos del agua: Homeopatía.

(iagua.es)

Homoeopathic medicines can be given in different forms, these are liquid, granules, powder, or tablets.

1.4.2 Whether it is or not unethical to use homoeopathy

The most important and potentially unethical effect that should be considered for not using or prescribing homoeopathy is the fact that some people use this type of medication instead of using traditional medication that is for sure known that works. This is only a problem if the person has a very serious condition that without the proper medicine could lead to the patient's death.

Homoeopathic medicines should only be used when the person has a minor illness or condition, such as a headache or a cold, but never as an alternative to the traditional medicines that the doctor prescribes.

This type of medicine could be used as a supplement in the case that the person is treating a major disease that requires taking traditional medicines whose effectiveness has been proven and visible in other patients with the same type of disease. What could be used as an example, in this case, cancer, whatever treatment the doctor has recommended should be followed (if the person is willing to do it) and homoeopathy should be used as a supplement if the person is not feeling well because of the treatment.

1.4.3 In which cases could the treatment do more harm than good

Homoeopathic treatments can improve patient outcomes. Some studies have found that patients who use homoeopathic treatments tend to use fewer antibiotics and nonsteroidal anti-inflammatory drugs. So, this fact proves that homoeopathy does not do more harm than good, as it helps patients use fewer chemicals.

Homoeopathic medicines may contain a large amount of an active ingredient, such as a heavy metal, which can be dangerous. For this reason, the FDA warned against using homoeopathic teething tablets and gels because of possible health risks to infants and children, but only in this case, homoeopathy would be dangerous. The problem could be led if, as we mentioned before, when homoeopathic treatments are used instead of effective therapy or used with children if it's not prescribed.

The problem would come if a person self-prescribes a medication that he/she does not need, that is why the medication should be taken after it has been prescribed by a medical professional.

1.5 THE REASON HOMOEOPATHIC TREATMENTS ARE MORE USED THAN REGULAR ONES

Homoeopathy is now much more popular for several reasons, one of them being that these natural remedies do not cause side effects in the person taking them, the other one being that they are very easy to administer, whether in liquid solutions, creams, or pills.

As well the Global Organization of health supports the practice and the research of homoeopathic therapies and encourages the construction of study programs to introduce homoeopathy in public health services, which has proved the importance of this type of therapy.

1.6 THE USE OF HOMEOPATHY WORLDWIDE

Homeopathy is very widespread throughout the world. According to a 2004 WHO⁸ document, it is the most popular unconventional form of treatment in countries with an annual per capita income of more than US\$15,000. On the European continent in which homeopathy is highly popular, according to a report commissioned by the European Parliament, 3 out of 4 inhabitants are familiar with it and 29% use it.

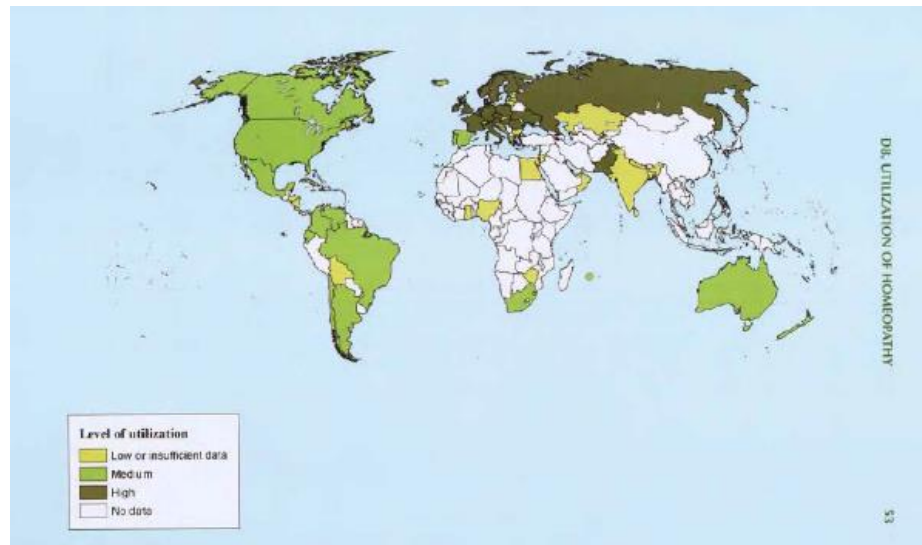


Figure 7. Use of homeopathy in the world, according to WHO (2004)
(homeos.org)

Examples include countries such as Argentina, France, and Spain. In Argentina, according to a survey proposed by the Clarin newspaper, 93% of respondents know it, 40% have ever used it and 16% use it regularly.

In France, 36% of the population regularly uses homeopathy and 44% of health professionals use it, including 95% of general practitioners, dermatologists, and pediatricians.

In Spain, one third of the population uses or has used homeopathy and 82% of this claim to be satisfied or very satisfied with the results obtained.

⁸ World Health Organization (OMS)

1.7 DISEASES HOMOEOPATHY TREATS IN PEOPLE

The diseases that homoeopathy cures include both acute and chronic pathologies as well as palliative care. But normally, homoeopathic treatments are used for illnesses such as the flu, diarrhoea, migraines, anxiety, ear infections, or the side effects of aggressive treatments such as chemotherapy, these are some of the diseases that homoeopathy treats, but there is a long list of them, bellow is a more extensive list of some of the most common health problems that homoeopathy can treat.

Homoeopathy is used for a wide range of health issues, such as:

- Allergies, such as food allergies
- High blood pressure
- Mental health conditions, such as depression, and stress...
- Asthma
- Rheumatoid arthritis
- Auto-immune diseases, such as celiac disease, Sjogren's syndrome, or Ankylosing spondylitis.
- Degenerative diseases, for example, Osteoporosis, or Osteoarthritis
- Premenstrual syndrome or menstrual disorders
- Hay fever
- Dermatitis (another type of allergic reaction, typical in the skin)
- Acute or seasonal diseases

It can also be used to treat smaller problems like bruises, scratches, toothache, headaches, nausea, coughs, and colds.

1.7.1 Medications that can be used with human patients

Argentum nitricum: used for digestive and nervous disorders.

Calcarea carbonica: useful in back pain, joint pain, bone fractures...

Graphites: great remedy for metabolic and skin problems.

Ignatia Amara: used in emotional problems.

Phosphorus: is essential in nervous disorders such as anxiety and digestive problems.

Sepia Officinalis: remedy for female problems due to hormonal imbalances (premenstrual syndrome, menopause...).

Silicea terra: used in cases of migraine, nervous problems, some skin, and bone problems.

1.8 BENEFITS OF USING HOMOEOPATHY

What this system wants, is to give a natural point of view on a new treatment of the different pathologies, leaving aside traditional medicine.

The natural medicines that are used in the treatments of homoeopathy can be consumed by breastfeeding infants, pregnant women, and even children or babies who have been prescribed the medication by a doctor can be given the homoeopathic treatment they need. This is because they do not interfere with other types of medicine that the person is having, as well that they don't produce side effects.

Another reason to use homoeopathy instead of regular medicine is that these treatments do not make us dependent on drugs (because these treatments do not use chemicals), that is what happens if you abuse the medicines that we have nowadays because of traditional drugs.

1.9 RISKS TO BE CONSIDERED NOWADAYS

In general, most treatments are safe, and the risk of serious adverse side effects is extremely low because these treatments are so diluted that they hardly are likely to have any side effects. But there are still certain risks: sometimes homoeopathic medications may contain large amounts of an active ingredient, such as heavy metals.

1.9.1 Toxicity on homoeopathic treatments

Most homoeopathic medicines are non-toxic if diluted properly and do not contain alcohol. The problem comes when the treatments aren't properly diluted, and then they can cause toxicity, adverse reactions, and allergic reactions.

Some of the products contained in homoeopathic medicines could be quite dangerous if found in nature. The Bella Donna, Aconitum, poison ivy and strychnine can be toxic. Other potentially dangerous ingredients include other poisonous plants, crushed bees, arsenic, and other heavy metals. However, in practice, homoeopathy dilutes the product so much that there may be no active ingredient in the final product.

Because the amount of substance they possess is sufficiently low for toxicity not to be possible, homoeopathic medicines are non-toxic.

1.9.2 Viability of homoeopathic dissolutions

To determine a treatment plan for an individual, a homoeopath will consider all of the patient's symptoms (physical, mental, and emotional) then, they will identify the remedy that is able to produce, in a healthy person, the symptoms most "like" those from which the person suffers. The physician may also advise general lifestyle and dietary changes as part of the treatment plan.

Homoeopaths indicate how sometimes symptoms may temporarily worsen before improving. This "aggravation" of symptoms may be part of the homoeopathic treatment. However, you should inform your homoeopath and your doctor if you have reactions.

1.10 WHAT TO EXPECT FROM A HOMEOPATHIC TREATMENT

The response to homeopathic treatment has some distinguishing characteristics. In first place, it requires a certain amount of time to become apparent, which varies depending on the seriousness and time of development of the disease, and on the capacity of the patient's organism to react. In chronic conditions the response time is measured in days or weeks. In acute problems, in minutes or hours.

Another important characteristic is that the response is generally gradual, with ups and downs. In long-term diseases, longer treatment time leads to deeper and more stable improvements, and the patient usually simultaneously perceives a progressive increase in overall well-being.

Discontinuation of homeopathic treatment is not followed by the disappearance of the rebound effect⁹. If the patient has responded favorably, it usually continues well for sometimes long periods of time, depending on the nature of the problem.

1.11 MOST ASKED QUESTIONS ABOUT HOMOEOPATHY

1.11.1 The duration of homoeopathic treatments

Homoeopaths generally recommend that remedies be taken for no more than 2 or 3 days, although some people may need only 1 or 2 doses before they begin to feel better. In some cases, homoeopaths may also recommend a daily dose. Take one serving and repeat every half hour, as needed, until you see improvement. The frequency of use of the medication will vary from day to day, depending on your physical and emotional state and external stressors.

The homoeopath will be the one to determine the duration of the treatment, as with regular medication.

⁹ A rapid recurrence of symptoms

1.11.2 Whether there are or not side effects

Homoeopathic remedies are in general considered safe, and the risk of a severe adverse side effect arising from taking these remedies is considered to be small.

The labelling of lower attenuation products that may be of concern will include appropriate warnings. Some homoeopathic products are restricted to prescription sales to ensure they are used correctly to avoid any problems.

They can be safely taken with other conventional medicines and are often recommended as an adjunct to other treatments. Homoeopathic medicine provides one of the safest methods of self-care.

This type of remedies is generally considered to be well-tolerated, although allergic reactions (such as rashes) have been reported. Some people also find that their symptoms worsen at the start of treatment, but as mentioned before, this aggravation of symptoms can be part of the treatment.

In 2012 it was detected that in the previous 33 years only 1159 cases of adverse reactions to homoeopathic medicines had been reported worldwide, 90% of them mild, including some caused by the suspension of other treatments and others caused by medicines that were not genuinely homoeopathic.

1.11.3 If approved by the FDA

FDA¹⁰ recognizes that consumers may use various types of unapproved drugs, such as homoeopathic pharmaceuticals, to treat or alleviate various diseases and conditions. These products are often marketed as natural alternatives to approved prescription and over-the-counter pharmaceuticals and are widely available on the market. Yet, homoeopathic products are marketed without FDA review and may not meet modern standards for safety, efficacy, quality, and labelling. The FDA uses a risk-based approach to monitor these products and evaluate reports of adverse effects.

¹⁰ The Food and Drug Administration (FDA) is responsible for protecting public safety by guaranteeing the safety, effectiveness, and protection of human health products.

1.11.4 Legalization of these treatments in Spain

In 2018, the Spanish government announced its plans to eradicate alternative medicines such as acupuncture or homoeopathy from healthcare centers.

The proposal, unveiled by the Ministers of Science and Health, aims to avoid the "potential harmful effects" of these practices when they are used as an alternative or complement to a treatment that is based on "evidence and scientific rigour," the government said in a statement.

But for the moment, eradication in Spain is not planned for 2022, so the purchase and consumption of homoeopathic medications is still legal.

1.11.5 All-natural medications

Homoeopathic medicines - known as "remedies" - are made from natural resources (for example, plants and minerals), they also are environmentally friendly and cruelty-free. Most are available over the counter at grocery stores, pharmacies, health food stores, homoeopathic pharmacies, and online. They are also very affordable.

Some examples of plants used for homoeopathic medications include:



Calendula officinalis: Is used because of its strong antiseptic, anti-inflammatory and healing properties. It aids in the protection of the skin from radiation, helps to heal inflammations, burns, bites, wounds, and infections related to tropical diseases.

Figure 8. *Calendula officinalis*
(articulo.mercadolibre.cl)

Echinacea purpurea: Studies have shown that this plant has immunostimulatory properties of the immune system cells. Its healing qualities increase the production of proteins that strengthen the immune system. It stimulates the formation of leukocytes, helping prevent infections and heal wounds.



Figure 9. *Echinacea*
(wikipedia.org)



Strychnos nux-vomica: It helps in all kinds of stomach discomforts due to the high depurative power that this remedy has. It aids in diseases such as: gastroenteritis, hemorrhoids, constipation, nausea, diarrhea, vomiting, and heartburn, among others. It also helps with headaches and back pain. It is also used for depression problems and feelings of frustration; it helps insomnia and nighttime awakening.

Figure 10. *Strychnos nux-vomica*
(wikipedia.org)

Atropa belladonna: It possesses diuretic, analgesic, and sedative properties. It can be administered in tablets, capsules, or homoeopathic drops. It is useful for treating diseases such as Parkinson's, rheumatism, neuralgia, and asthma.



Figure 11. *Atropa belladonna*
(wikipedia.org)



Valeriana officinalis: It is a natural sedative, special for curing sleeping disorders through homoeopathy. Its soothing properties are used for the treatment of anxiety and stress.

Figure 12. *Valeriana officinalis*
(educalingo.com)

2 HOMEOPATHY AS A SUPPLEMENT FOR PLANTS

2.1 AGROCHEMICALS

Agrochemicals do their job in protecting plants and are widely used in agriculture, such as insecticides and fertilizers, but the effect of these on the soil where the crop is planted not only affects the plants, but also spreads into the air and seeps into the water, contaminating rivers, lakes, as well as food crops. That is why it is necessary to reduce its use since it is not indispensable, because there are other methods to maintain the plants. And the irresponsible use of agrochemicals causes problems for different populations and their organisms.

2.2 PESTICIDES

A pesticide is that substance or mixture of substances intended for the following purposes:

- To prevent, destroy, control, or repel a pest.
- It can also be used as a growth regulator for plants.
- Or it can also be used as a nitrogen stabilizer.

2.2.1 Pesticide classification in agriculture

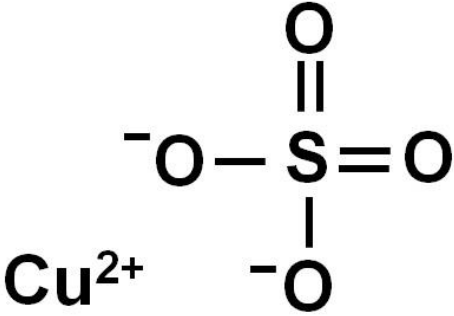
There are several different types of pesticides and each one is used to combat specific pesticides, which are heterogeneous groups of chemical substances with different domestic and agricultural applications. Pests are born from the mixture of about 600 active substances combined among them, together with some "inert ingredients"¹¹. Here are a few examples:

¹¹ Inert ingredients: Those substances or materials that, when combined with the active ingredients for the preparation of formulations, make it possible to modify their dosage or application characteristics.

Algaecides: There are used to kill algae or to slow their proliferation. Algaecide is a chemical substance used as a preventive, it prevents the appearance of algae or eliminates them when already present, they are most commonly found in water.

An example of algae removal is when algae appear in the pool, causing the water to become greenish in colour due to inadequate pH and chlorine levels or unfavourable light and temperature conditions.

Figure 13. Sulfato de cobre (II)
(lifeder.com)



Antimicrobials: Are used to combat germs and microbes such as bacteria and viruses. Antimicrobial pesticides are a very important public health tool, this is due to their use in hospitals, schools, and food preparation facilities... They are used to prevent the spread of disease-causing germs.

These kinds of pesticides are classified by the type of microbial pest for whom they are intended to be effective.

There are different uses for this type of pesticide, some products are designed to control the growth of pests such as algae or odour-causing bacteria that do not pose a threat to human health.

While other products are specifically intended to sanitize, disinfect, or sterilize surfaces from potentially harmful microbes, such as those found in blood or body fluids.

There can be found antimicrobial pesticides in a wide variety of formulations, such as toilet sanitisers and chemicals for pools...

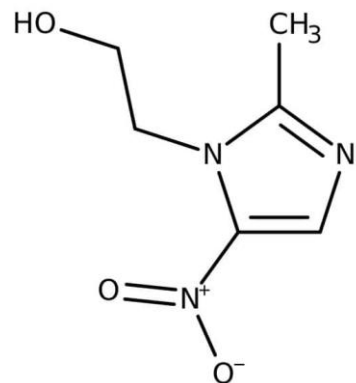


Figure 14. Metronidazol
(fishersci.es)

Herbicides: A herbicide is a chemical used to eliminate unwanted plants, such as weeds. They aim to avoid the problems related to the presence of certain species of plants by delaying or interrupting their development.

Within this type, we can distinguish two types of herbicides, residual and foliar herbicides. The former is applied to the soil, generating a toxic layer that eliminates weeds as they germinate. On the other hand, foliar herbicides are directly applied to the plant to be eliminated, with a difference between contact herbicides, which are those that only affect the part of the plant with which they come into contact, and synthetic herbicides, which reach the roots by penetrating the sap flow.

We also find herbicides based on their mode of action. According to this second classification, herbicides can be classified into two groups, those that indiscriminately attack all kinds of vegetation, and those with selective action, which are the ones that focus on a specific species.

The second variety is more commonly used when crops are at an advanced stage. On the contrary, those belonging to the first group are more used on roads or in urban areas.

Lastly, we find herbicides depending on the time of their application. Depending on the time of application of the product, there are pre-sowing products, which are used prior to sowing, and post-sowing herbicides, which are intended for use after sowing. Within this last type of post-sowing, there are two groups: pre-emergence herbicides applied before the crop has sprouted and post-emergence ones, which are applied once the crop has germinated, and the weeds have started to develop.

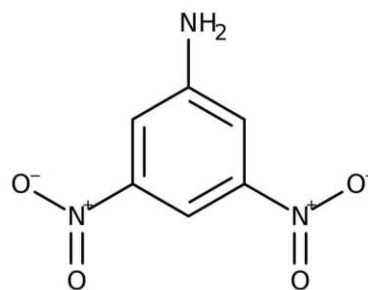


Figure 15. 3,5-Dinitroanilina
(fishersci.es)

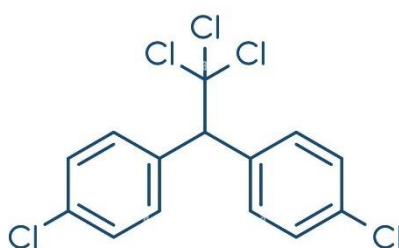
Insecticides: An insecticide is a chemical compound used to control or kill disease-carrying insects.

We find different types of insecticides, depending on their chemical composition or their method of penetration, they are classified into two types, organic insecticides (those containing carbon) and inorganic insecticides.

Organic insecticides are those that target the central nervous system or the ones that disrupt insect growth. These insecticides can contain organophosphorus compounds (such as malathion), organochlorine compounds (such as DDT), carbamates, pyrethrum, synthetic pyrethroids, insect growth regulators and fumigants.

There are two kinds of inorganic insecticides, silica insecticides, and boric acid insecticides. The former is a desiccant agent, which absorbs the wax layer of the insects and causes the animals to dehydrate and suffocate. On the other hand, boric acid is an absorbing wax, like a stomach poison. They are useful in insect control when kept dry and placed in the proper place and concentration.

When using these types of insecticides, other types of insects, such as bees, must be taken into account, as they play a crucial role in the ecosystem, and therefore the use of insecticides must be informed and consider their effect on the environment.



DDT

Figure 16. DDT
(alamy.es)

Rodenticides: A rodenticide is a chemical compound used to eliminate, control, or repel the permanence and reproduction of rodents. In its beginnings, it was frequently used in the agricultural field, but now it is also used at the domestic level.

Some rodenticides are anticoagulant poisons that are eaten by rodents orally and act through their bloodstream. To achieve this, they inhibit the vitamin K enzymes responsible for clotting.

They usually eliminate the rodent due to strong and spontaneous haemorrhages 2 to 4 days after ingestion.

Other types of non-coagulant venom act differently.

After oral ingestion of bromethalin, for example, the nervous system is affected producing ataxia¹². When zinc phosphide, comes into contact with gastric mucous membranes it releases a lethal gas that will affect the kidneys, heart, and liver.

And cholecalciferol causes an uncontrolled elevation of calcium levels in the bloodstream and death will be due to organ failure.



Figure 17. Bromethalin
(alamy.es)

¹² Ataxia consists of poor muscle control that causes involuntary movements and may cause difficulty walking and with balance.

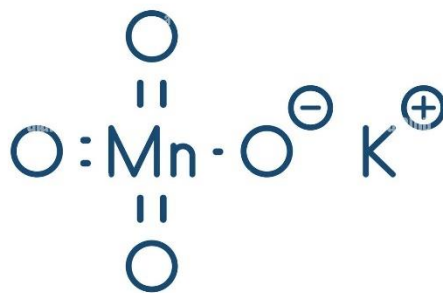
Fungicides: A fungicide is a particular type of pesticide that controls fungal diseases by inhibiting or killing the fungus that causes the disease. Not every fungal disease can be adequately controlled with fungicides.

Fungi are neither plants nor animals. They are multicellular living beings that absorb nutrients from other organisms and act as decomposers and that is why the use of fungicides is necessary. The most common are molds, yeasts, and mushrooms. They carry out putrefaction processes and the resulting product of that decomposition is what they eat that damages crops.

We can find two types of fungicides:

Of contact: They act in a superficial way and are not absorbed; therefore, they help avoid affectations in the leaves and the fruits.

Systemic: They reach the interior through the root system or roots, stems and leaves, so the possibility of the fungus developing is reduced. It is a product designed to protect from the inside. Once the active ingredient is absorbed, it will spread throughout the stems, leaves, and roots as a kind of exterminator that will prevent the pathogen from establishing itself. It should be applied at the first symptoms of disease or when environmental conditions (such as humidity) are observed to favour the development of fungal cells.



potassium permanganate

Figure 18. Potassium permanganate
(alamy.es)

2.2.2 The safety of using pesticides

All pesticides have some level of toxicity, just like any other substance. And even the least toxic products can cause serious health issues if someone is exposed to enough of them. The health risk not only depends on how toxic the ingredients are but also on the amount, duration, and the concentration of the product to which one is exposed.

Depending on the intended use of agrochemical products, various types of pesticides can be found, and each one of them is specialized according to the pest they are intended to attack. For example, if there is a plague of insects, insecticides will be the agent that will eliminate them, the same goes for fungi and fungicides and many more.

The ideal agrochemical should kill the enemies for which it is designed and be harmless to humans, and neither should it have any effect on the animals and plants for which it is not intended to control. DDT, for example, was a remarkable insecticide that affected numerous pests, although it also affected beneficial insects and even wild birds that could not breed satisfactorily due to the accumulation of DDT when they consumed insects affected by this insecticide.

2.2.3 The effect agrochemicals have on children and pets

Even the least toxic products can cause health problems if an animal is exposed enough of them. The risk of health problems depends not only on how toxic the ingredients are but also on the quantity of product exposure.

Some animal species can be more susceptible than others to the effects of certain pesticides.

Children are at greater risk than adults for health problems from pesticide exposure because their internal organs are still developing and maturing. Children can come into contact with pesticides in many ways, as they can be found neatly stored or applied in your home, backyard gardens or lawns, childcare centers, schools, parks, or on pets. Young children love to put their hands in their mouths. They also crawl and play on the ground, grass or in spaces that may have pesticides on them.

Because pesticides are found in so many places in the environment, the amount of exposure can increase very quickly. It is easier for animals and little kids to ingest pesticides, so are mostly affected by them.

2.2.4 Illnesses caused by agrochemicals

Studies indicate that the use of chemical pesticides may be related to various diseases such as cancer, leukaemia, Parkinson's, asthma, and neuropsychological and cognitive disorders, among others.

In addition, it points out that the health impact will depend on exposure, concentration, and age group (children, pregnant women, agricultural workers, and the elderly).

The most common diseases when it comes to agrochemical exposure are:

- Cancer: Several studies link pesticides to bladder, colon, breast, and lung cancer, among others. Exposure to some herbicides (such as imazethapyr and imazapyr banned in the EU) increases the risk of meningioma, bladder cancer and colon cancer.
- Asthma: Clinical and epidemiological studies have associated pesticides with asthma due to irritation, inflammation, immunosuppression, or endocrine disruption.
- Diabetes: Exposure to organophosphate pesticides and metabolites increases the risk of developing type 2 diabetes.
- Parkinson: Studies suggest that occupational exposure to pesticides may increase the risk of having the disease. Parkinson's disease is related to pesticides (insecticides, fungicides, and herbicides). Chronic exposure to metals and pesticides would lead to the disease at a younger age concerning patients relative to patients with no family history of the condition.

2.2.5 The difference in safety between pesticides and natural products

While pesticides and agrochemicals can improve crop yields and productivity, they can also damage the environment in the long term, contaminating groundwater, soil, soil fertility, and even the air. They can harm other beneficial soil microorganisms, such as insects and plants, and can be toxic to animals (such as fish and birds).

It's clear that the use of pesticides has an impact on the environment and ecology, which is why government regulations have been tightened and made more stringent. And today, there are many safer ways to keep pests away from crops, such as in the UK, farmers plant grass clumps to divide their fields giving a home to beetles and spiders in an attempt to protect nearby crops against insect pests such as aphids. That is why it is much safer to use, more natural products.

2.3 AGROHOMEOPATHY

Agrochemical alternatives are required, and one of the most important is homeopathy, which is defined as scientific knowledge that uses homeopathic doses in agricultural production.

2.4 WHAT IS AGROHOMEOPATHY

Agrohomeopathy is the application of homeopathy to agriculture. It allows a influence the biological processes of plants and soil by balancing them, it can contribute to the natural control of pests and diseases and increase production and maintain the ecological balance of ecosystems.

The application of homeopathy in agriculture is a fairly new field, it's used to act on biological processes, accelerate or slow down the growth of plants, control diseases, and pests, and increase plant production. The use of Agrohomeopathic remedies is a natural alternative that farmers and researchers are applying to achieve organic crops, given its zero toxicity.

Homoeopathy is starting to be used in plants since it allows acting on them without contaminating them and avoiding field workers getting intoxicated and the soil where the crops are located.

Agrohmeopathy is important in the face of climate change because climate variations and certain shifts in natural cycles facilitate the emergence of pests and diseases that until recently were unknown.

2.4.1 Uses of Agrohmeopathy

The investigation of the usefulness of homoeopathy in plants is:

- The control of diseases caused by some pathogens.
- Processes of nutrient assimilation.
- Seed germination.
- Soil treatment.

It has been difficult to obtain significant results on vegetable pathogens and pests, but it has been proven to be effective in inhibiting the development of viruses by more than 73%, reducing the severity of fungal and bacterial diseases by more than 50%, and reducing the population of nematodes by more than 42%.

2.5 THE APPEARANCE OF AGROHOMEOPATHY

Agrohmeopathy emerged as a term with the work of the Austrian doctors Dr. Eugen Kolisko and Dr. Lili Noha Kolisko, traditional doctors who later worked as homoeopathic doctors and who were pioneers in Agrohmeopathy. They worked as researchers for more than 20 years and published their work, allowing objective validation of the experimental results.

When Homeopathy is applied, the defence system is normalized and the organism and plants gradually learn to return to their lost energetic balance.

2.6 AGROHOMEOPATHIC MEDICATIONS AND THEIR USES

Aconitum: used when the plant shows alterations such as being dry or wilts very quickly.

Arnica Montana: it's used as a consequence of blows, or falls, as well as to promote the good circulation of the plants which receive nutrition from the stem to the tip of the leaves.

Arsenicum Album: it's indicated in case of weak growth, as well as for the plants that remain small or the ones that dry fast.

Calcareous complex (Calcarea Carbonica, Phosphorica and Fluorica): is useful for weak plants and improves nutrient absorption. Plants that do not respond to fertilizers have slow growth and necrosis of leaf margins.

2.7 HOW TO CHOOSE THE REMEDY TO USE

As with humans, it's also important to find out the possible causes of the disease in plants. Several questions must be asked: what symptoms does the disease cause, what triggered it, is it due to a bad plant location, is there a nutrient deficiency due to inadequate care? If the causes are not discovered, the symptoms must be interpreted. The plant reacts quickly to homoeopathy and shows whether it is helping or not.

2.7.1 Things to consider when using Agrohmeopathy

- Use only one remedy, do not make mixtures.
- Dissolve the pellets in wooden, porcelain or plastic spoons.
- Water with homoeopathic water in the evening or before noon.
- Do not spray if the day is windy.

3 BLACK CHERRY TOMATOES (SOLANUM LYCOPERSICUM)

3.1 ORIGIN OF TOMATO

Tomatoes are originally from Central America and the northeastern parts of South America, specifically in the regions from Colombia to the north of Chile. But it is thought to be started eating in the southeast of Mexico two thousand years ago, the reason these are the similarities between the way Europeans and Mexicans plant their crops.

The plant was moved around the continent thanks to the villagers and then was introduced in Europe in the XVI century, this is thanks to the Spanish conqueror Hernán Cortés, which is surely the one who introduced the yellow tomato. The Spanish also distributed this fruit throughout its colonies in the Caribbean, and to the Philippines, and after that they brought it to the Asiatic continent.

3.2 WHAT TOMATOES ARE

Tomato belongs to the family of Solanaceae. It is a fruit with sometimes a really dark shade of red. It is the most planted and consumed vegetable in Spain because its production is all year long, particularly from May to November in warm climates, and from mid-July to the end of September in cold climates. This plant has been grown in Spanish gardens for the past two centuries and it has reached an incredible expansion.

These plants are grown especially in summer because of their need from heat and sunlight, but greenhouse planting makes possible the harvest of the crops all year round. Especially nowadays with new technologies, which make possible the creation of a lot of different varieties of this plant. Moreover, it's not necessary to have a lot of space to harvest them.

3.3 BENEFITS OF CONSUMING TOMATOES

Several studies have shown that tomato consumption reduces the risk of getting certain types of cancer, cardiovascular diseases, and muscular degeneration which is related to age. Tomato is the second most important vegetable, after potato, this is because it contains a balanced mixture of minerals and some antioxidants, such as vitamins C and E...

Tomatoes are a low-calorie product (about 20 kcal per 100g), so they are ideal when dieting, as they have the additional ability to increase satiety and are a good source of fiber that stimulates intestinal transit.

They are rich in antioxidants, limit the signs of ageing and are said to protect against certain cancers, such as, prostate, ovarian, gastric, and pancreatic cancers.

It is also a source of vitamin C which stimulates the immune system and reduces inflammatory symptoms and vitamin E, is a powerful antioxidant. Very rich in water, it covers a small part of the water needs. Tomato also contains a lot of potassium which is essential for the proper functioning of muscles and kidneys and helps reduce blood pressure.

3.4 SOLANUM LYCOPERSICUM

As a native of Central America, the tomato (*Lycopersicon esculentum*¹³) has been grown in orchards for a little more than two centuries, however, in this short period of time, it has reached an extraordinary expansion, especially in the Spanish country. It is a summer crop, since it needs heat to thrive, although planting in greenhouses makes it possible to obtain harvests throughout the year.

¹³ Another name for *Solanum Lycopersicum*.

Figure 19. *Solanum lycopersicum*
flower
(redzet.eu)



The yellow tomato flowers, which are the ones that indicate that the plant has entered the fruit production process, first appear on the plants when the vines are approximately 30 to 45 centimeters high.

Once the flowers bloom on tomato vines, the time it takes for fruit development varies depending on the tomato plant and several environmental factors. A typical tomato plant may take between 25 to 30 days after blossom opening for the fruit to fully ripen and mature.



Figure 20. Black cherry tomato
(exotic-plants.de)

3.5 THE DIFFERENCES BETWEEN THE DIFFERENT TYPES OF TOMATOES

Among more than 12,000 varieties of tomatoes, it is sometimes difficult to choose. Flavour, texture, hardiness, resistance to diseases and pests, earliness, presence of seeds, shape, size, and colour are elements whose importance varies for each one. Therefore, the most popular varieties of tomatoes that currently exist will be indicated. These are some examples of some of the most popular varieties of tomato.

- **Green Zebra:** a recently obtained tomato with a very original green colour with yellow stripes. The fruit, weighing between 90 and 120 g, is juicy, fleshy, and very fragrant. This variety is harvested in mid-season. It is not very susceptible to diseases, but mildew can still affect it if growing conditions are not suitable.



Figure 21. Green zebra tomato
(seednative.es)

- **Rose de Berne:** this mid-season tomato produces raspberry-coloured fruits that can reach a weight of 200 g. It is very productive but has a compact habit. There are not very susceptible to diseases, it's an easy tomato to grow. These tomatoes are juicy, sweet, and tender. They are good for both cooked and raw preparations.



Figure 22. Rose De Berne Tomato.
(huertoaspic.mx)

- **Cornue des Andes:** a tomato with a slightly drooping habit and apparently fragile stems. Robust, vigorous, and very productive, it will offer an abundance of red fruits, elongated like hot peppers, early in the season. In terms of flavour, this tomato is sweet and scented.



Figure 23. Andine cornue tomato.
(seeds-gallery.shop)

- **Yellow Pear:** an original and vigorous variety that produces bunches of yellow berries (up to 15 g) with juicy, firm and sweet flesh with just the right amount of acidity. Easy to maintain, it does not need pruning. In poorly balanced soil, it can be susceptible to apical necrosis.



Figure 24. Solanum Lycopersicum “Yellow Pear”
(gardenerspath.com)

- **Black Crimean:** a sweet, juicy, and very productive old tomato with a beautiful purple-burgundy red colour. The sewn fruits can reach a weight of 500g. This late tomato is particularly popular in southern France because it is drought tolerant.



Figure 25. Tomato “Noire de Crimée”
(growcamp.com)

- **Cuor di Bue:** the true oxheart tomato is an old, productive, semi-early variety. The fruits are smooth, heart-shaped and have a reddish orange colour with green areas on top. It is one of the best-known tomatoes. The fruits have an average weight of 300g, but they can reach a weight of 700g, and this type of tomato do not contain many seeds. This tomato is moderately susceptible to diseases.

Figure 26. Tomate Cuor di Bue
(gardenseedsmarket.com)



3.6 HOW TO TAKE CARE OF A TOMATO PLANT

Tomatoes require a lot of watering and highly fertilized soil because of their high nutrient requirements.

The tomato plant is also a very susceptible crop to many insects and diseases. There are several organic preparations to control these insects and diseases, such as nettle slurry, fermented paradise, mineral oil, potassium bicarbonate, copper, and sulfur, among others. In addition, there are many natural enemies (or beneficial insects) that we must learn to identify and conserve since they control very well many of the insects that attack tomatoes.

Tomatoes do not tolerate either too low or too high temperatures. If temperatures fall below 12 °C at night or rise above 35 °C degrees during the day, the flowers will not develop or will drop off the plant.

3.6.1 The way to a healthy tomato plant

Some very important things when planting tomatoes:

- Sun, heat, and regular watering are the essential elements of tomato cultivation.
- The addition to fertilizers helps to feed the plants so that they do not suffer from deficiencies that can lead to the appearance of diseases.
- Good plant spacing from the time of planting allows for better ventilation and limits the spread of diseases.

3.7 DISEASES THAT AFFECT TOMATO PLANTS

Numerous tomato diseases can affect tomato plants. It's very important to identify the disease in order to be able to treat it. Tomato diseases are generally divided into three categories: fungal, viral, or bacterial diseases, which can only be diagnosed by laboratory tests.

Besides diseases caused by fungi, viruses or bacteria, tomatoes can also suffer from insect pests. And the damage can vary depending on the pest.

A fungi disease can be Alternaria Stem Canker, which symptoms appear on the stems, leaves, and fruit. Black cankers with concentric zonation appear on stems near the soil line or above the ground. These cankers enlarge, girdling the stem before harvest and killing the plants. Infection results when spores that are airborne land on the tomato plants or when the plants come in contact with infested soil. The fungus releases a toxin that causes tissue between the veins of the leaves to die and become dark brown or black.



Figure 27. Alternaria Canker
(aggie-horticulture.tamu.edu)

A disease that affects tomato plants and it's created by a bacterial pathogen is Bacterial Speck, which causes, dark brown to black lesions that can appear on fruits, leaves, and stems. Tissue near the lesions becomes chlorotic and leads to the appearance of a yellow halo.

Symptoms often appear first and are most common on the most susceptible young leaves but may appear first on older leaves as well. The foliar spots appear water-soaked when they are just beginning to develop and during rainy periods. They are dark brown to black and usually small. But on the younger, developing leaves, the spots are often larger, and irregularly shaped causing the leaves to become deformed and sometimes torn.

Figure 28. Bacterial Speck
(blogs.cornell.edu)



3.8 THE LENGTH OF TIME A TOMATO PLANT LIVES

The tomato plant in the wild because is a perennial plant, that is, it can live more than one year if the external conditions are favorable. This normally happens in the places where they are native, to whose conditions they are adapted, or in other areas of similar climate.

In contrast, in worldwide tomato crops, plants usually do not last more than one year, and often less time if grown outdoors.

In temperate zones, they tend to last from early to mid-winter, when the tomato plants are planted, until the arrival of the first autumn frosts, which may occur in October or November, at which time the plants die. If the tomato plants get sick, they may not even make it to the end of the summer.

3.9 THE PLANT AFTER THE HARVEST

There are two types of tomato plant growth habits: determinate and indeterminate. Determinate-type tomato plants will grow to a genetically specified height and produce all of their fruiting flowers at one time. Indeterminate-type tomato plants continue to grow and produce fruiting flowers throughout the season.

First, to speed fruit ripening, the removal of the remaining flowers so that the plant's energy is directed toward the fruit already on the plant and not toward developing more tomatoes. Reduce water consumption and avoid fertilizer to stress the plant toward the end of the tomato growing season.

Once the decision is taken that it's time to pull the tomato plants out of the garden, the question is what to do with the tomato plants at the end of the season? It is tempting to bury the plants in the garden so they will rot and generate additional nutrients, for next year's crop. But this may not be the best idea.

There is a chance that the wilted tomato plants may have a disease, insect, or fungus, and burying them directly in the garden runs the risk of infiltrating the soil with these and passing them on to next year's crop.

4 HOMEOPATHIC PLANT TREATMENT

The practical part of this paper is to know whether or not homoeopathic treatments make a difference when applied. To try and prove that it does, 30 tomato plants were planted, 15 of them were treated with a homoeopathic dissolution, and the rest of them weren't. By treating some of the tomato plants, it was tried to verify that the given hypothesis was right.

The hypothesis is that the homoeopathic solution applied to tomatoes will make a difference in the tomato growth than those which haven't been treated with anything.

4.1 FIRST PHASE

The first phase started on the 27th of April 2022, which consisted in buying tomato or *Solanum Lycopersicum* seeds and counting these seeds, which was a total of 135 seeds.

Following the advice of the saleswoman at the store where the seeds were purchased, the seeds were placed in a container full of water for four days in order to enhance the growth of these seeds once planted.



Figure 1. Own source
Solanum Lycopersicum seeds after
being on the water.

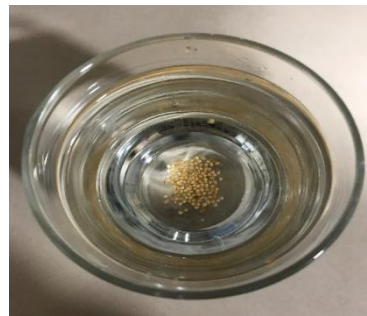


Figure 2. Own source
Solanum Lycopersicum seeds on the
water.

After the recommended four days, on May 1st, 2022, the seeds were transplanted into yoghurt pots, which had holes in the bottom, and soil inside them. A series of steps were then followed:

- First, the soil was hydrated, adding water.
- Then, the yoghurt pot was filled with the previously moistened soil up to half of the pot.
- Then, three or four seeds were placed in each pot, this was to ensure germination in all of the pots.
- Finally, the yoghurt pot was completely filled with more moistened soil, and water was added again.

Once the seed planting process was completed, the pots were covered with plastic film in order to prevent the humidity in the containers from decreasing, as well as to prevent the entering of insects and other animals. They were watered every two days.



Figure 3. Own source
Solanum Lycopersicum seeds after being planted.



Figure 4. Own source
Solanum Lycopersicum seeds on film.

After a week, on May 8th, the seeds started to sprout and grew well until May 21st, when they were transferred to the garden, where they had more space to grow.



Figure 4. Own source
Solanum Lycopersicum on May 8th.



Figure 5. Own source
Solanum Lycopersicum on May 21st.



Figure 6. Own source
Solanum Lycopersicum on May 21st.

The soil was prepared in the garden for the tomato plants to be planted but because the plants were too weak to survive the conditions in the garden, after ten days, all the plants died on June 3rd.



Figure 7. Own source
Solanum Lycopersicum plants were planted in the garden on May 24th.



Figure 8. Own source
Solanum Lycopersicum plants were planted in the garden on May 24th.

The original plan was to grow the tomato plant from the seed until the harvest, but those plants were too weak, and they weren't ready to trespass to the soil, so instead of the original plan, some already grown tomato plants were planted instead.

4.2 SECOND PHASE

The second stage of the treatment began on June the 3rd, after the purchase of approximately 30 tomato plants, which were ready to be planted directly in the garden, where they continued to grow properly.

The plants were automatically watered twice a day, once in the morning and again in the evening.



Figure 9. Own source

Solanum Lycopersicum plants were planted in the garden on June 3rd.



Figure 10. Own source

Solanum Lycopersicum plants were planted in the garden on June 3rd.

After a month, on July the 9th, some canes were installed into the tomato plants. The purpose of this procedure was that the tomato plants could grow straight and support properly on the canes. The following steps were taken for this process:

- First, you need to select the canes according to the height of the tomato plants.
- Once you have selected them, the canes have to be placed on every three-tomato plant, placing one on each side of the tomato plant in parallel.
- Once all the canes have been nailed to the ground, they are joined together parallel above the tomato plants by using a piece of rope.
- Then, another cane is placed on top of the other ones previously placed.
- Once all the canes are placed, with another rope string, one end is tied to the middle of each tomato plant and the other side is tied to the perpendicularly placed cane.



Figure 11. Own source
Solanum Lycopersicum on July 9th.



Figure 12. Own source
Solanum Lycopersicum on July the 9th after the canes were installed.



Figure 13. Own source
Solanum Lycopersicum on July 9th with the rope and canes installed.

4.3 THIRD PHASE

The third and last phase of the homoeopathic treatment began on July 25th, with the flowering of the plants.

Figure 14. Own source
Solanum Lycopersicum on July 25th.



Four days after visualizing the flowering of the plant, on July the 29th, the treatment prepared the day before was applied.

The treatment was carried out with Arnica Montana 30ch. This type of homoeopathic medication, as mentioned before, it's used as a consequence of blows, or falls, as well as to promote the good circulation of the plants which receive nutrients from the stem to the tip of the leaves.



Figure 14. Own source
Arnica Montana.

The treatment was applied to only half of the tomato plants, that is to say, fifteen, which was carried out through the following steps:

- The first step was to buy homoeopathy at the pharmacy. Which cost about 5€, and 8 L of distilled water.

- In half a litre of distilled water, the homoeopathy beads are dissolved.



Figure 15. Own source
Arnica Montana on 0,5 liters of distilled water.

- Once they are dissolved, the remaining 7,5 liters of distilled water are added to obtain again the initial 8 liters.

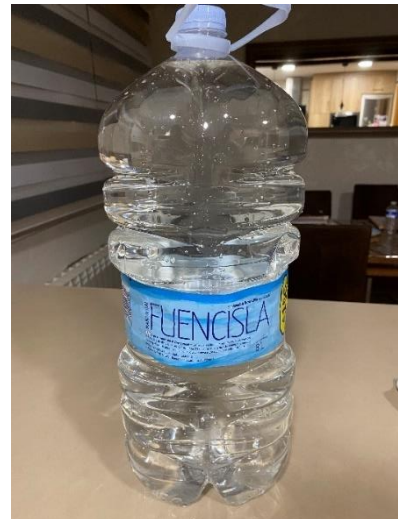


Figure 16. Own source
The 8 liters of distilled water with the homoeopathic beads on a bottle.

- The 8 L were divided in half, 4 liters of these were watered directly to the tomato plants and the remaining 4 liters were sprayed on the leaves of the tomato plants using a pressure sprayer.



Figure 17. Own source
The pressure sprayer with which the treatment was placed on the leaves.

On August the 20th, the tomato plants had tomatoes, but they were still green, and they still had some time left to complete their growth.



Figure 18. Own source
The tomatoes on the 20th of august.



Figure 19. Own source
The tomatoes on the 20th of august.



Figure 20. Own source
The tomatoes on the 20th of august.

After almost a whole month (2nd of September) of the homoeopathic treatment application, at this point, the tomatoes were ready to harvest.



Figure 21. Own source
The tomatoes on the 2nd of September.



Figure 22. Own source
The tomatoes on the 2nd of September.



Figure 23. Own source
The tomatoes on the 2nd of September.



Figure 24. Own source
The tomatoes on the 2nd of September.



Figure 25. Own source
The tomatoes on the 2nd of September.

On the images that we can see on the previous page, are of the tomato plants to which the homoeopathic treatment was applied, those 15 plants that received no treatment, the tomatoes grew in the same way as the other ones, but at a certain point, they started growing at a slower pace and started to rot, whereas the tomatoes that were treated grew well throughout the whole treatment process.

It is very common that some or even all of the first fruits that set on the tomato plant spoil due to fungal infestation of the plant, which makes it necessary to quickly remove all the affected parts. Losing the first batch is a major delay. But with the treatment, this did not take place and there was no need to waste the time waiting for the rotting plants to do the whole process all over again.



Figure 26. Own source
Harvested tomatoes October
the 17th.



Figure 27. Own source
Harvested tomatoes on October
the 17th.

Normally, tomato plants are pulled in mid-October because more plants will not grow due to the low temperatures, however, in this particular case tomatoes were harvested up to the third week of November.



Figure 28. Own source
Tomatoes on the 20th of November

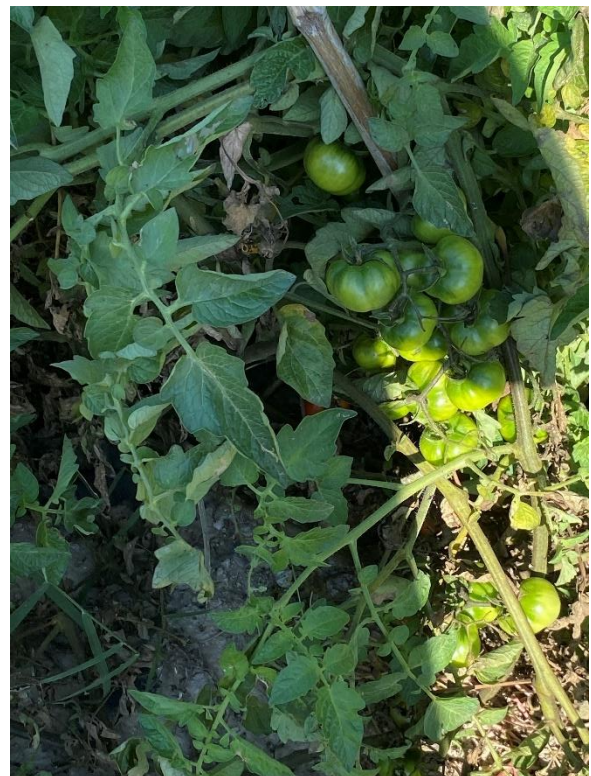


Figure 29. Own source
Tomatoes on the 20th of November

CONCLUSION

After analyzing in detail, the results obtained in the plants with the homeopathic treatment, and the plants that did not have it, we can conclude that the hypothesis was corroborated, since a significant difference has been seen between the plants with the treatment and those that did not have it.

After applying the homeopathic treatment to the tomato plants, grew without any problem from the application until the time of harvesting the tomatoes once they were ready. On the other hand, those tomato plants to which the treatment was not applied, first became infected and all the tomatoes rotted, so while the treated tomato plants were producing fruit ready to pick and consume, not having used any chemical during their growth, those untreated plants to which the treatment was not applied, had to restart the growth of tomatoes, and to obtain the fruit it was necessary to wait longer, since they had to go through the process of fruit growth again.

Thus, there is a confirmation that the hypothesis about homeopathy producing a difference in the growth of tomato plants is indeed true.

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