

SEED GERMINATION STUDY ON WILD STRAWBERRIES

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Abstract. The aim of the research was to investigate the way in which homeopathic remedies and magnetic field, influence the germination experiment of *Fragaria Vesca L.* (wild strawberry) in vitro. Applying homeopathic treatment and magnetic field proved to make a difference in germination, growing and development of wild strawberry plants. The Dr. Schuessler's 12 tissue salts (homeopathic treatment) had a positive influence on the germination process and the exposure to magnetic field had an inhibitory influence. These types of treatment can be an alternative for plant development without changing the quality of plants and soil.

Keywords: *Fragaria vesca L.*, germination, agro-homeopathy, magnetic field, Schuessler's salts.

INTRODUCTION

The wild strawberries are widely known to humans since prehistoric times and became popular only after the plant was brought to Europe in the 16th century. The wild strawberries are widely adapted to different types of agro-climates across the temperate to subtropical regions of the world (Sharma, Pandey, and Pandey n.d.).

The substantial use of synthetic fertilizer in agriculture is causing environmental problems. We are at the point that we need to find alternative substances that would increase plant development without changing the quality of plants and soil, and agro-homeopathy could be the answer to these problems (Nuruzzaman et al. 2016).

Agro-homeopathy is one of the newest subjects in agricultural research. Latterly various scientific studies showed that homeopathic treatments can influence physiological properties of plants. The homeopathic medicines can influence the enzymatic activities, sugar, protein and chlorophyll content in plants. The use of homeopaths has helped to reduce or eradicate biotic or abiotic stress. In case of biotic stresses, activities of various homeopathic remedies had an antimicrobial, anti-insecticidal and antifungal effect. Also homeopathic remedies can influence the plant growth, the phytochemical composition and the quantity of secondary metabolites (Pereira et al. 2019).

The homeopathic dilution of homeopathic medicines can be used for different purposes like: seed germination, soil health, growth of seedlings, flowering, fruiting, stress management and protection against diseases. It is important to select the right homeopathic drugs and its potency and also the correct dilution of the drug. The wrong drug selection can manifest detrimental effects on plant cultivation. Higher

dilution of homeopathic remedies (1:500 or 1:1000) with water is more efficient for plants. It is important to select the right homeopath medicine and its potency. Agro-homeopathy can be an efficient and a low cost alternative that can increase the farmers income by decreasing the input cost of synthetic fertilizers and insecticides (Sen 2018).

Agro-homeopathy has been changing conventional agriculture to agro-ecological, with the application of homeopathic remedies in different concentrations, using the Homeopathic Pharmacopoeia guidelines proposed by Hahnemann in 1810. The Similia principle of Christian Friedrich Samuel Hahnemann has a significant importance in plant model (Pereira et al. 2019).

In the late 1800's Dr. Wilhelm Schuessler investigate the ash residue to better understand the human body. He found 12 minerals in the ash and in cells throughout the body and he deduces that these 12 minerals were the foundation for the body structure and fundamental to the operation of all tissues and organs. Dr. Schuessler's 12 tissue salts, support the functions of cells, water balance (sodium-potassium balance), oxygenation, detoxification, elasticity and nutrition. The 12 basic cell salts include: Calcium Fluoride, Calcium Phos, Calcium Sulphate, Kali Mur, Kali Phosphate, Kali Sulphur, Natrum Phosphate, Natrum Sulphur, Natrum Mur, Ferrum Phosphate, Magnesia Phosphate, Silicea(Ekairb 2017).

Lately, many researchers have used magnetic field in different experiments as individually or in combination with other factors with the purpose to acquire high quality plant purpose material and to resolve the insufficient aspects of plant growth. The experiments that were carried out so far showed the positive and/or negative effects of magnetic field on various plant characteristics (Alpsoy and Unal 2019).

It was shown in several experiments that the magnetic field led to changes in physiological and cytological effects and shows a positive effect of magnetic stimulation on the seeds. Numerous studies were carried on the germination of seeds under magnetic effect in numerous crops such as tobacco, lentil, spinach, tomato and okra. However, no research was done on the subject of the effect of magnetic field on the germination of wild strawberry seeds. The purpose of this experiment is to determine the effects of different stationary magnetic field treatments applied to wild strawberry seeds on some germination parameters and plant growth (Alpsoy and Unal 2019).

MATERIAL AND METHODS

For the efficiency of the germination process, the seeds were put through several operations: cleaning, sorting and removing the seeds that weren't proper with the purpose to obtain seeds with higher biological and physical properties. The wild strawberries seeds were exposed to the magnetic field by using a Helmholtz coil and the time of exposure of the samples was 20 minutes. There were taken randomly 100 seeds of *Fragaria vesca* (with 4 replicates) for both trial tests. The wild strawberries seeds were tested for germination capacity using Linhardt type dishes and blotting paper as bed type for germination. The germination conditions were optimal in terms of air, humidity and temperature. The seeds germinated gradually, at different periods

of time, depending on the treatment they have been subjected to during the experiment. The percentage of germination was calculated by dividing the number of seeds germinated to the total number of seeds and then multiplying by 100.

Water-soaked seeds were kept over moist filter paper in covered ceramic vessels which were divided into four groups:

- 1) Unstressed and untreated control seeds in sterile distilled water
- 2) Seeds treated with Homeopatin (90% ethanol, homeopathic control)
- 3) Seeds treated with Dr. Schuessler's salts dilution D6 (90% ethanol)
- 4) Seeds were exposed in magnetic field, we perform all process with this constant parameters and the time in magnetic field exposure was 20 minutes.

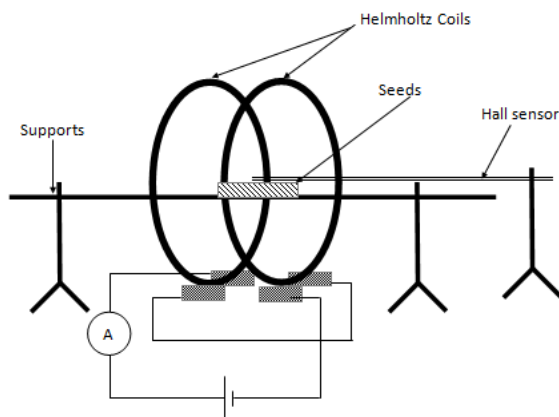


Fig. 1 Seed exposure in magnetic field $B = 2.2$ Gauss, $I = 0.34$ A, 20 minutes

Dr. Schuessler's 12 tissue salts and Homeopatin were diluted with distilled water 1:100 before use for treatment. No fertilizers and pesticides were applied in the plots under experiment. The seeds that received treatment with homeopathic remedies and Homeopatin, the homeopathic dose were given once a week during the 35 experiment trail.



Fig. 2. Linhardt type germination dish with *Fragaria vesca* seeds (original)

RESULTS AND DISCUSSIONS

After applying homeopathic treatment with Dr. Schuessler's 12 tissue salts, a positive influence on the germination process was observed. The germination

processes began in the seventh day of the study and until the 10th day, 50% of the seeds were germinated with little difference between homeopathic control, homeopathic treatment and control. Between 10th and 21st day of the trail there was a plateau for the germination process and a development of the plants.

In the 21st day 58% of the seeds that were treated with Schuessler’s 12 tissue salts had 3-5 leafs and they had double in size compared with the homeopathic control and the control. In the 35 day the seeds treated with Schuessler’s 12 tissue salts achieved 85% germination, 4-5 leaves and double in size compared to the homeopathic control and the control. Both control lots stopped the germination process in the 14th day of the trail and at the end of the experiment they were half the size of the lot that was treated with Schuessler’s 12 tissue salts.

The lot of seeds that were exposed to magnetic field had a 99% inhibitory effect on the germination process of the wild strawberries seeds.

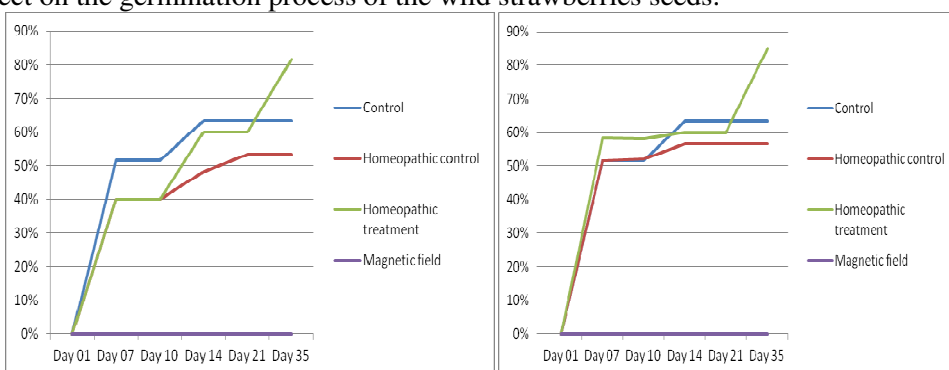


Fig. 3. Germination process of *Fragaria vesca* seeds study 1 and study 2

Between 14th and 21st of the experiment, there were signs of a moderate fungal infection in the control lot. The number of moldy seeds and germinates with disease symptoms were increasing. In the control lot, 33% of the germinated plant died. The seeds treated with Schuessler’s 12 tissue salts and the seeds from the lot that was exposed to the magnetic field had far less fungal damages. Between 21st and 35 day there were signs of severe fungal infection.

At the end of the study 1 as you can see in figure 4, the control lot was having only a percent of 16.66% of germinated plants that survived the fungal infection. The homeopathic control had a survival rate of 30%. The seed that were exposed to the magnetic field had a survival rate of 60%. And the seeds that were treated with Schuessler’s 12 tissue salts had and survival rate of 73%.

At the end of the study 2, as you can see in figure 4, the control lot was having only a percent of 33.33% of germinated plants that survived the fungal infection. The homeopathic control had a survival rate of 60%. The seed that were exposed to the magnetic field had a survival rate of 82%. And the seed that were treated with Schuessler’s 12 tissue salts had a survival rate of 85%.

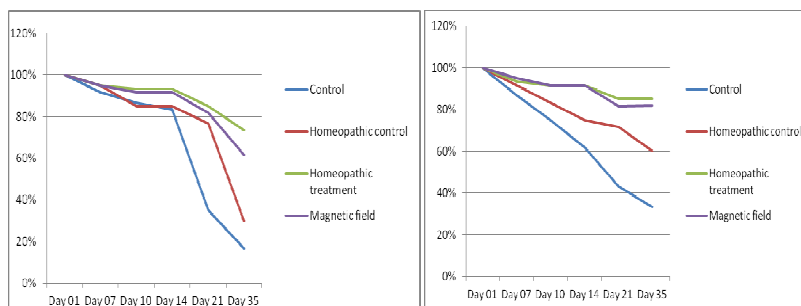


Fig. 4. The influence of fungal infection on germinated seeds of *Fragaria vesca* in study 1 and study 2

CONCLUSIONS

It is concluded that Dr. Schuessler's 12 tissue salts promoted growth of wild strawberry plants in vitro conditions. Homeopathic treatment of the 12 tissue salts proved to be beneficial, with notable differences for germination, plant growth and protection against fungal infection.

Applying magnetic field proved to have a 99% inhibitory effect on the germination of *Fragaria vesca* seeds. This effect could be beneficial and applied as an organic herbicide for the type of plants that are not wanted in certain plantations. The exposure of seeds to the magnetic field had a beneficial effect of protection against fungal infection.

However, further studies are required for better understanding of the mechanism of this magnetic effect and homeopathic treatments. Therefore, it is recommended that the researchers establish detailed studies in which more factors are taken into deliberation in order to understand the unknown particulars of these subjects.

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