



International Journal of Homoeopathic Sciences

E-ISSN: 2616-4493
P-ISSN: 2616-4485
www.homoeopathicjournal.com
IJHS 2024; 8(1): 355-359
Received: 02-12-2023
Accepted: 03-01-2024

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An experimental study to analyse the efficacy of syphilinum 30 in the seed treatment of fusarium wilt of tomato plant

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DOI: <https://doi.org/10.33545/26164485.2024.v8.i1f.1090>

Abstract

Agriculture plays a vital role in the Indian economy. It contributes to about 17% to the total GDP and provides employment to over 60 percent of the population. The study aims at providing an alternative methodology in the usage of chemicals in the agriculture sector and thereby providing safer and natural methods in preventing disease in plants. The study is conducted specifically on tomato seed targeting to prevent fusarium wilt. The homoeopathic medicine Syphilinum 30 was used in the seed treatment and occurrence of Fusarium wilt in these plants were estimated. The experimental set (set1) of 25 seeds were soaked in rice gruel with Syphilinum 30. The control set (set2) was not soaked in any medicinal solution, but only in rice gruel. 15 healthy germinated seedlings from each set were separately used for the experimental purpose. In the course of growth of seedlings, the culture of *Fusarium oxysporum* sp. *lycopersici* were inoculated into soil of each grow bag. The statistical analysis of germination was estimated by germination index, which showed 12% increase of germination in the experimental group. The comparison of severity of selected signs in both sets were estimated by Student t test. The resultant experimental data showed the rejection of null hypothesis and the data favored the alternate hypothesis. That is, the Mean of the studied group are significantly different and thus statistically significant. This study showed the effectiveness of Syphilinum in treating fusarium wilt of tomato. Syphilinum 30 was thus established to produce significant result in the integrated approach of treating Fusarium wilt in tomato. The result of this experiment open window into the scope of large scale usage of homoeopathic medicine as an alternative to chemical seed treatment. This study has its maximal advantage in environmental protection and expected in providing a considerable hand into sustainable development.

Keywords: Homoeopathy, nosode, syphilinum, seed treatment

Introduction

Agriculture plays a vital role in the Indian economy. It contributes to about 17% to the total GDP (Gross domestic product) and provide employment to over 60 percent of the population. Agriculture sector in India rightly called as backbone of Indian economy. Tomato (*Solanum lycopersicum* L) belongs to genus Lycopersicon under Solanaceae family. Tomato is one of the important “protective foods” because of its special nutritive value. As it rich in Vitamin A, Vitamin C and lycopene, which provide protection against prostate malignancy, heart diseases and geriatric problems [1]. It’s also a good source of potassium, zinc, folate, protein, carbohydrate, sugar, chromium etc. The nutrient and phytochemical contents of tomatoes and its product and the bioactive components might act together to modulate disease development. Currently tomato has a higher consumption rate in more developed countries and often reoffered to as luxury crop. Fusarium wilt is a major disease of tomato which is caused by the fungus *Fusarium oxysporum* sp. *lycopersici* [2]. Fusarium wilt is found worldwide and even affects resistant tomato varieties. The fungus is soil-borne and makes its way into the plant through the roots. The disease is characterized by clearing of veinlets and drooping of petioles of young plants. In the field, this disease can appear at any time if conditions are favorable. Lower leaves show yellowing and die symptoms continue to appear on successively younger leaves. Later, the whole plant wilts and dies prematurely. After the disease has advanced for a few weeks, browning of the vascular system can be seen in a cross section of the lower stem or by removing stem tissue near the base with a knife. The disease will lead to severe wilting of the plant and decrease in yield. Seed treatment is the process of applying biological, physical or chemical agents or techniques to seed to provide protection and improve the yield of crops [3].

Therefore in the management of this ruinous disease, an attempt was made for seed treatment using Homoeopathic remedies. Agrohomoepathy is a new and growing branch of science which is known to promote yield and growth of plants [4]. This system, if proven can be a boon to farmers and the nation, as it is supposed to have little or minimal residual effect. It is supposed to be an alternative to the use of chemical fertilizers and pesticides in agriculture. But this area has not been properly utilized in the field of agriculture due to paucity of quality researches. Nosodes are one among the various homoeopathic preparations which are prepared from diseased or decomposed biological materials. Syphilinum is one of the nosodes which is prepared from syphilitic tissue and is supposed to cause and hence to cure degeneration of tissues [5, 6]. Hence the investigator intends to explore experimentally the effects of syphilinum in fusarium wilt which is a degenerative disease of tomato.

Significance of the study

Presently chemical fungicides are the main management tools for plant diseases. Though they increase the vigor of growth, its persistent use leads to toxicity of soil and development of resistance of pathogens, thus risking the whole environment. Homoeopathy is found to be a safe system with its dosage and minimum adverse events. Hence if its efficacy is proven in the field of agriculture, it will truly be a boon to the whole world with its minimal residual effects and the ease of use. Seed treatment with homoeopathic medicine is an alternative to chemical or in combination with a chemical treatment. This is expected to be one of the fastest growing seed treatment sector in the near future. It'll also be helpful to find a new method which can be used to treat the Fusarium wilt disease cost effectively and eco-friendly and improve the seed germination.

Aim of study

The ultimate aim of the research is to check the effectiveness of Syphilinum30 in seed treatment of Fusarium wilt of tomato plant. Also check the effectiveness of Syphilinum30 in enhancing germination.

Objectives of study

- To analyse the effect of the Syphilinum30 in seed treatment to prevent or to diminish the fusarium wilt in tomato.
- To analyse the effect of Syphilinum30 in seed treatment to enhance germination.

Scope of study

- It will reduce the dependency on chemical fertilizers and pesticides.
- Non synthetic and nontoxic method of crop cultivation with Homoeopathic medicine.
- Seed treatment improves germination capacity.
- Increase the production with higher resistance to Fusarium wilt.
- Seed treatment control soil borne diseases.

Indication of syphilinum in Fusarium wilt

Dwarfed & shriveled up appearance, destructive nature, Copper colored spots, Aggravation from damp weather, reddish brown eruption, extreme emaciation, damage spread rapidly are the symptoms indicated by the medicine

Syphilinum. Fusarium wilt has most of these symptoms. Thus Syphilinum can be expected to be useful in treatment of Fusarium wilt.

Nosodes are homeopathic preparations (HPs) obtained from tissues or substances associated with the targeted disease or from culture of the pathogenic agent. Nosodes are thought to modulate host resistance, easing symptoms or promoting cure [7]. A few studies have been published about the control of plant disease with nosodes. Conceptually, nosode Syphilinum interact with the plant pathogen recognition system and initiate or modulate plant resistance to Fusarium wilt.

Materials and Methods

Seeds of good variety obtained from Kerala Agricultural University, Vellayani, Kerala were used for the study. Total fifty seeds were taken as two sets of 25 seeds. Now the seeds of set 1 were soaked for 24 hours in 1 dose of Syphilinum 30 diluted in 500 ml of rice gruel. The seeds of set 2 were taken as control and was soaked for 24 hours in 500 ml of rice gruel. This soaking method procedure began on 8/05/2022. The seeds of all two sets were transferred to seedling tray filled with well decomposed coir pith and vermicompost on 9/05/2022. Based on the moisture content of the media, watering to the seedlings was done at morning and evening for the subsequent 15 days using rose cans. The seeds germinated on 4th day (13/05/2022). On fifteenth day (28/05/2022) the 30 healthy seedling (15 from experimental arm and 15 from control) were transferred into the 30 grow bags which are filled with soil, sand, coir pith and cowdung. The culture of *Fusarium oxysporum* fsp *lycopersici* which was collected from Kerala Agricultural University was used to inoculate the seedlings planted in growbags by soil drenching method after 1 month of transplanting. During their growth, all sets were observed at two days interval and their changes were noted.

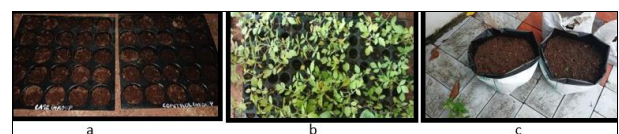


Plate 1: (a). Seeds sown in portraits (b) Tomato seedlings ready to transplant



Plate 2: *In vitro* culture of *Fusarium oxysporum* fsp *lycopersici*



Plate 3: Microscopic view of *Fusarium oxysporum fsp lycopersici*

4. Stunted growth.
5. Little or no fruit.
6. Dropping of premature leaves
7. One branch or one side of the plant is affected.
8. Falling of lower leaves,
9. Marginal necrosis
10. Plant death

Table 2: Experimental arm set-1(15 plants)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Average
Sign 1	1	1	0	0	1	1	0	0	0	0	0	1	0	2	0	0.46
Sign 2	0	0	1	1	0	1	2	1	0	1	0	1	1	0	0	0.60
Sign 3	1	1	0	2	1	1	0	0	0	1	1	0	1	0	1	0.66
Sign 4	0	0	0	0	0	3	2	0	0	0	1	1	1	0	0	0.53
Sign 5	1	0	1	1	0	3	0	0	1	1	0	1	1	2	1	0.86
Sign 6	1	0	0	0	1	0	1	1	0	0	2	0	1	1	0	0.53
Sign 7	0	0	0	1	1	1	0	0	0	1	1	1	1	0	0	0.46
Sign 8	1	1	1	0	0	0	0	0	0	0	0	2	1	1	1	0.53
Sign 9	0	1	1	0	1	1	1	0	0	1	2	1	0	0	0	0.66
Sign 10	0	0	0	0	0	2	0	0	1	0	3	1	0	0	0	0.46

Statistical analysis: Based on the mean scores of both group by student's t test

Result

Among 25 seeds selected from each set, germination occurred in varied number. The table given below depicts the ratio of number of seeds sown to the number of seeds germinated. This was calculated on (15/05/2022).

Table 1: Number of seeds planted to number of seed germinated

Sl. No	Set	Number of seeds sown	Number of seeds germinated	Germination Percentage (%)
1.	Set 1	25	19	76%
2.	Set2	25	16	64%

Table 3: Control arm set-2 (15 plants)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Average
Sign 1	1	1	1	1	1	1	1	2	0	1	1	1	2	1	1	1.06
Sign 2	1	0	0	1	1	1	1	1	1	0	0	1	0	0	1	0.6
Sign 3	2	1	1	1	1	0	0	0	3	1	0	0	3	1	1	1
Sign 4	1	0	0	2	0	1	1	0	0	1	1	1	1	0	0	0.60
Sign 5	3	1	1	1	0	0	0	1	1	1	1	1	1	2	0	0.93
Sign 6	1	0	1	2	3	0	0	1	1	1	3	1	0	3	0	1.13
Sign 7	0	0	1	1	1	1	1	1	1	1	1	0	0	1	1	0.73
Sign 8	1	1	0	1	0	1	1	3	3	3	0	1	1	1	1	1.2
Sign 9	1	1	1	0	1	1	1	1	0	1	1	1	0	1	0	0.73
Sign 10	2	2	1	2	1	1	1	3	0	1	3	0	0	1	1	1.26

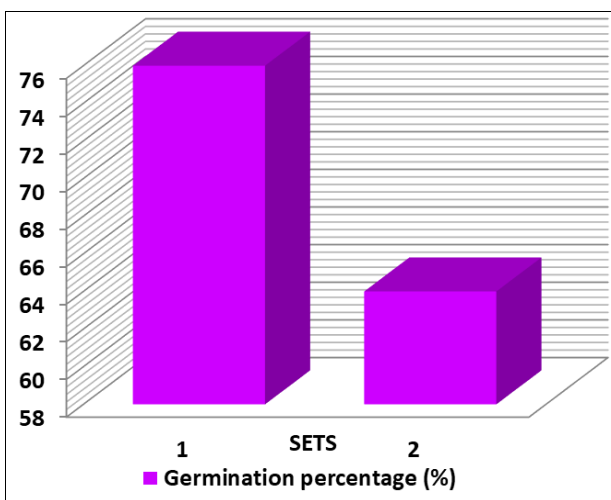


Fig 1: Germination percentage of set 1 and set 2

Disease scoring was done based on scores from the following signs as absent, mild, moderate and severe. The scoring grades from 0-3 for each signs and 0 indicates no sign and 3 indicates severe sign. The signs are

1. Slight vein clearing on the portion on young leaves followed by epinasty of the older leaves.
2. Reddish discoloration of the xylem vessels.
3. Yellowing and wilting of leaves

Observations were made from table 2&3 regarding the occurrence of number of signs in set 1 (seed treated with Syphilinum 30 in rice gruel and infected with *Fusarium oxysporum fsp lycopersici*) and set 2 (Seed soaked only in rice gruel and infected with *Fusarium oxysporum fsp lycopersici*). It has been observed that the number of signs were lower in set 1 than set 2 and also observed the declining score. That means the severe signs observed in the experimental group were reduced in intensity as compared to those observed in control group.

Table 4: Statistical Analysis

Signs	Average score (set 1)	Average score (set2)
Sign 1	0.46	1.67
Sign 2	0.6	0.6
Sign 3	0.66	1
Sign 4	0.53	0.6
Sign 5	0.86	0.93
Sign 6	0.53	1.13
Sign 7	0.46	0.73
Sign 8	0.53	1.2
Sign 9	0.6	0.73
Sign 10	0.46	1.27
Mean	0.569	0.986
SD (Standard deviation)	0.122515305	0.341148387
Variance	0.01501	0.116382222
N(sample size)	10	10

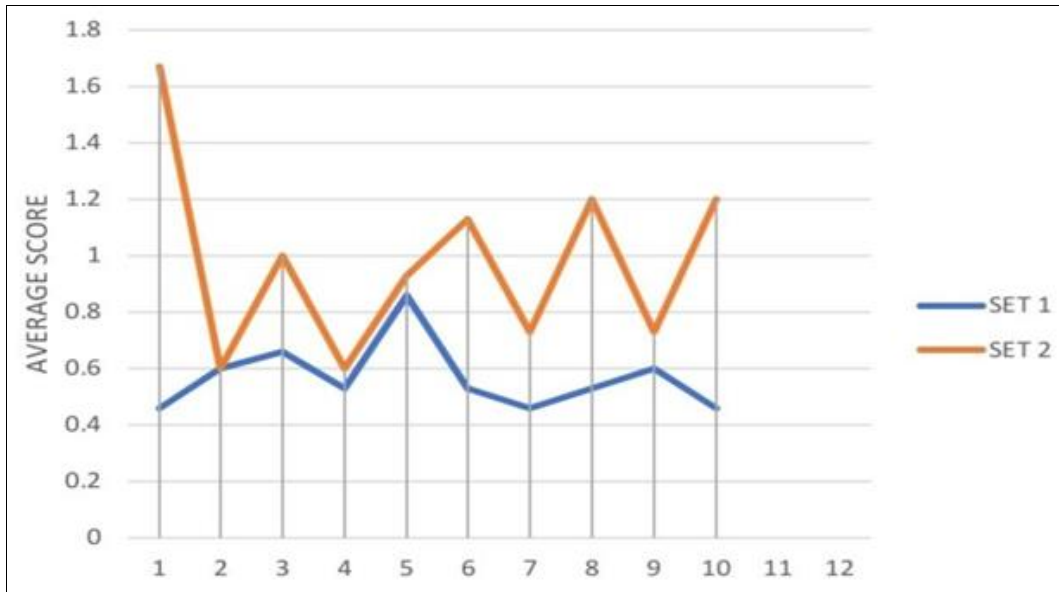


Fig 2: Signs

The severity of disease incidence were noted to be higher in the set 2 (Control group) than the set 1 (Experimental group).

- The calculated t value is from data is 3.65 from Table 4.
- Critical value is 2.10

The calculated t value is greater than critical value. The null hypothesis H^0 is rejected, that is no difference between mean. The data favours alternate hypothesis that is H^a . Means of studied group are significantly different, they are statistically significant.



Plate 5: Fusarium wilt affected tomato plant in the control group



Plate 4: Healthy tomato plant with fruiting in experimental set

Discussion

The tomato plants germinated from seeds soaked in Syphilinum 30 showed better result when the ratio of number of seeds planted to the number of seeds germinated was compared between all the two sets. The statistical analysis of germination was estimated by germination index, which showed 12% increase of germination in the experimental group. The tomato plant in set 1 showed lesser occurrence of signs, than the set 2. Severity of occurrence also reduced considerably. The plants belonging to set 1 treated using Syphilinum 30 in rice gruel shows better result for its resistance against the occurrence of Fusarium wilt. Seed treatment with Syphilinum 30 proved to be beneficial in treating Fusarium wilt. In set2, plants which were not

soaked in any medicinal preparation showed high score, which means that they show high severity of disease. There was an increased incidence of occurrence of Fusarium wilt in these plants.

Conclusion

Before the commencement of study, it was quite doubtful regarding the success of homoeopathy in treating fusarium wilt of tomato plant in the light of day today establishing synthetic treatment in agriculture sector. But after the whole study process I concluded that the homoeopathic seed treatment is as much as effective as chemical seed treatment, which have a detrimental effect to the environment. The striking point that fascinates everyone and bring them to homoeopathy is its environmentally friendly approach. The conclusion drawn from the whole study process is much worthy in illustrating the superiority of homoeopathy, not only in treating human beings, but also in dealing with infestations of plant. Homoeopathy through its wide application in field of agriculture tries to make an environmental friendly approach, as its introduction reduce the chemical treatment of plant drastically. This ensure eco-friendly management of fusarium wilt of *Solanum lycopersicon* by seed treatment of Syphilinum 30 in an effective manner, the cost effective approach that can bring a revolution in agriculture.

Conflict of Interest

Not available

Financial Support

Not available

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How to Cite This Article

Manaf MA, Janaki Krishnan TS. An experimental study to analyse the efficacy of syphilinum 30 in the seed treatment of fusarium wilt of tomato plant. International Journal of Homoeopathic Sciences. 2024; 8(1): 355-359.

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