

# To Ascertain the Effectiveness of Kalium Nitricum 6C on Enhancing the Germination of Seeds and Plant Growth of Spinacia Oleracea

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## ABSTRACT

Agrohomoepathy is one of the modern approaches in the Agricultural research field. However, proper selection of a homoeopathic drug and potency, helps us to give excellent quality and quantity of yield. This study is regarding the enhancement of seed germination and plant growth of Spinacia oleracea (Spinach) by using Kalium nitricum 6C. By the end of this study Kali Nitricum shown productiveness in the germination and growth of the Spinacia oleracea (Spinach).

**Keywords:** Agrohomoepathy; Kalium Nitricum; Spinacia oleracea.

## INTRODUCTION

The science of homoeopathy has great potentials and could give a new direction that required attention of the alternative agriculture. Finding a suitable remedy for many problems in agriculture is making it feasible for farmers to use reduced or even zero inputs of herbicides and insecticides. The harvest is increased so that the inputs of artificial fertilizers can be correspondingly reduced or even almost turn down. The growth, germination can be improved and pest, bacterial or viral infection can be controlled with the help of homoeopathic science.<sup>[1]</sup>

## SPINACIA OLERACEA:

Spinach, (Spinacia oleracea), hardy leafy annual of the amaranth family (Amaranthaceae) is used as a vegetable containing high content of iron and vitamins A and C. Spinach is served as a salad green and as a cooked vegetable. It is involved in metabolism, proliferation, inflammation, and antioxidant defense. Spinach is a valuable vegetable because of its anti-cancer, anti-obesity, hypoglycemic, and hypolipidemic properties.<sup>[2]</sup> This study is regarding the enhancement of seed germination and plant growth of Spinacia oleracea (Spinach) by using Kalium nitricum 6C. After the study Kalium nitricum showed drastic influence in the germination of seeds and plant growth of Spinach.

Agriculture has various scopes, in its broadest sense using natural resources to produce assets which maintain life, like food, fiber, forest products, horticulture crops etc. Plant Agriculture mainly concerns with the cultivation of useful plants. Agricultural products have been included in the human diet since thousands of years.<sup>[4]</sup> Agriculture is the largest source of income in India and has massive economic burden on it to provide livelihood. This led to the use of chemical fertilizers and pesticides. The use of chemical products in agriculture produced harmful effects on soil and human health. Therefore, Homoeopathy has the

capability to treat the plant diseases as well as provides strength to sustain in environmental stress. It also helps in increasing the rate of germination and improves the growth of plant without any negative impact on soil and human health.<sup>[3]</sup> Spinacia oleracea (Spinach) is a leafy green flowering plant growing predominantly in Central Asia and Western Asia. It belongs to the family Amaranthaceae and order Caryophyllales. The leaves of spinach are consumed as a vegetable which can be eaten raw or through certain renovation methods like canning, freezing etc. Spinach is a plant which is grown at its first class in cool temperatures particularly the winters. It is an annual plant achieving up to 1 feet tall. The leaves are of various types like simple, alternate, and ovate to triangular. The dimensions of the leaf are 2-30cm in length and the breadth measuring 1-15cm. The large leaves are present at the base of the plant, while the smaller ones at the flowering stem. The flowers of spinach are yellow-green in color which sorts into a fruit cluster with seeds in it.<sup>[22]</sup> The nutritive value of fresh spinach, with 91% of moisture content, shows between 0.4% and 0.6% lipid content, around 2.9% protein content, and contains good levels of essential amino acids, except methionine and tryptophan. Although the carbohydrate content is very low (2%–10%), the fiber content is high (2.2%). It offers a very top-notch amount of nutrients like vitamin B6, riboflavin, folate, niacin, soluble dietary fiber, omega 3-fatty acids and minerals. It is moreover affluent with iron. Additionally, it is an excellent supply of vitamin K, flavonoids, carotenes, vitamin C, and folic acid. Few compounds in spinach functions as anticancer agent.<sup>[23]</sup> The complete year, barring for December and February, is the sowing season for spinach.<sup>[30]</sup> Spinach is a favorite vegetable among the Indians and is considered as a dietary power house. It is rich in Vitamin A, C, D, K and Folic acid. The edible leaves are rich in minerals especially iron and calcium helping in treatment of Anemia.<sup>[5]</sup> Spinach

has various pharmacological activities such as an anti-oxidant, anti-proliferative, anti-inflammatory, anti-histaminic and hepatoprotective.<sup>6</sup> Spinacia oleracea helps in the control of Diabetes, Prevention of Cancer, Maintenance of Blood pressure, Asthma prevention, Prevents Constipation and provides healthy skin and hair.<sup>[7]</sup>

Spinach can be grown on any kind of soil having applicable drainage capacity. But the best results can be obtained when grown on sandy loam and alluvial soil. It is recommended to grow in soil rich in organic matter.<sup>[24]</sup>

Spinach reduces the oxidative stress along with its hazardous influences on the physique as it accommodates antioxidant properties. Carotenoids existing in spinach is beneficial for the eyes in protection towards sunlight. Several studies have referred that ingesting spinach reduces the chances of breast cancer, prostate cancer, cervical cancer etc. Spinach includes high portions of nitrates which helps in moderating the blood pressure and reduces the hazard of coronary heart diseases. Being an exceptional source of iron, it also helps in establishing up of hemoglobin and reduces the threat of iron deficiency anemia.<sup>[29]</sup>

The application of Potassium Nitrate (KNO<sub>3</sub>) under drought conditions shows positive effects on spinach plant growth. The physiological parameters of Spinach like length, fresh and dry weights, chlorophyll pigments, carotenoids etc., improves with the supplementation of Potassium Nitrate (KNO<sub>3</sub>).<sup>[8]</sup>

Potassium functions as a transporter of nutrients for photosynthesis in Spinach which helps in promotion of early and vigorous growth there by increasing the yield. The application of potassium in Spinach results in more intensive gas exchange in leaves which further results in increase in leaf yield.<sup>[9]</sup>

Application of Nitrogen helps in higher seed yield in Spinach. Nitrogen plays a significant role in enhancing the plant growth and productivity. Nitrogen also

plays an important role in plant root systems by improving the growth and production of root hairs and lateral roots.

The quantity of nitrogen presents in the soil for make higher of spinach is now no longer sufficient. Therefore, the requirements of spinach plant are met by means of nitrogen content. Nitrogen helps in aeration of the plant. It is in phase accountable for the green color of the plant and gives resistance in opposition to pests.<sup>[28]</sup>

Potassium is decisive in improvement of Spinach plant, it makes the roots and trunk to grow more suitable and seeds, flora and leaves larger. It affords resistance towards the pests and helps in circulating the nutrients round the plant, regulating its functions.<sup>[28]</sup>

#### **Potassium Nitrate:**

Potassium nitrate is an outstanding source of potassium because of its nutritional value and contributes in plant health and yield. The synergic effect of  $K^+$  and  $NO_3^-$  facilitates the absorption of both nutrients through plant roots. Potassium Nitrate increases the resistance towards pathologies in plants. Potassium Nitrate promotes higher yields, reduces the color defects or unusual spots caused by mechanical lesions or any other sign of pathology to a minimum.<sup>[10]</sup>

According to Homoeopathic Materia Medica, Kalium Nitricum (Nitrate of Potassium) is indicated in Asthma especially Cardiac Asthmas. It has a great value in sudden dropsically swelling of whole body. It has action on Gastro intestinal system causing Inflammation with much Debility. Suppurative Nephritis is also a call for this remedy.<sup>[12]</sup>

#### **Symptoms of Kalium Nitricum in relation to Agrohomoepathy:**

Yellowing from nitrogen deficiency.

Excess or Deficiency of Potassium or Nitrogen.

Photosynthesis irregularities and fluid uptake difficulties.

Enhances the Protein content.<sup>[11]</sup>

#### **AGROHOMOEOPATHY:**

Agrohomoepathy is one the newest approaches in the field of Agricultural research. In recent years various scientific researchers have shown that potentized homoeopathic medicines can alter the physiological functions of the plants. The Similia principle of Dr. Samuel Hahnemann is also applicable in plants. Ultra-high dilutions of homoeopathic medicines can be used safely for various purposes like seed germination, betterment of soil health, seedling growth, protection against diseases etc. With proper selection of a homoeopathic drug and potency, Agrohomoepathy can be an efficient and very cost-effective alternative for farmers helping them with a good income and reduced use of chemical fertilizers and pesticides.<sup>[13]</sup> India has been ranked second place for use of fertilizers on plants after China. The use of pesticides has boosted the agricultural economy by increasing the production of food, but it also resulted in serious and harmful effects on human health and environment. One step solution for these harmful chemical compounds and their ill affects is organic farming. Homoeopathy can be an important player in this organic farming.

In modern years, a differ of look up tested that Homoeopathic drugs has the functionality to adjust the physiological mechanism of a plant. Homoeopathy in agriculture has been growing its use as the chemical fertilizers used on the plants are showing dangerous effects. It is a correct wish as it helps in working closer to organic agriculture as the Homoeopathic remedies are safer to use and moreover has the capability to set off the mechanisms of plant, animals and humans. Homoeopathic science has exquisite reap in this area and can supply new directives in the field of agriculture.<sup>[3]</sup>

#### **AIMS AND OBJECTIVES:**

To know the effectiveness of Kalium nitricum 6C on enhancing the germination

of seeds and plant growth of Spinacia oleracea.

#### OBJECTIVES:

- To know the effectiveness of Kalium nitricum 6C on enhancing the germination of Spinacia oleracea seeds.
- To know the effectiveness of Kalium nitricum 6C on plant growth of Spinacia oleracea.
- To know the effectiveness of Homoeopathy in Agriculture.

#### LITERATURE REVIEW

- Spinacia oleracea is a member of Chenopodiaceae family. Spinach is a low growing freshly leaved annual which forms a heavy rosette of broad, tender and crinkly leaves. Spinach usually prefers a cool climate. The optimum range of temperature required for its seed germination is 7 to 24C and for the best crop growth 15 to 20C is required.<sup>[16]</sup> Spinach yield per acre in India is 125 quintals in just 45 days.<sup>[25]</sup> Arunachal Pradesh, Tamil Nadu, Uttar Pradesh, Telangana, Kerala, Maharashtra, West Bengal and Gujarat are doing their industrial farming in India on a massive scale. In 2019 India provided 2,580 tons of spinach. Nutritionally Spinach is a power house of vitamins and minerals. It is also a powerful anti-oxidant. It offers a numerous health benefit and reduces the risk of many chronic diseases. Spinach is also a versatile ingredient in the kitchen. It can be eaten raw in salads or cooked in a variety of dishes, including soups, stews, quiches, and stir-fries.<sup>[16]</sup>
- Kulsumbi A. K., Sangeeta I. M., performed a study on the effect of seed priming on physiological and biochemical changes in seed quality of Spinacia oleracea. The seeds were exposed to different priming agents which include 11 treatments primed for 24 hours with seed to solution 1:2 vol/vol ratio. The results showed KNO<sub>3</sub> (1%) to be the best priming treatment to

get the maximum seed quality parameters like speed germination, root length, shoot length etc.<sup>[14]</sup>

- Borowski E., Michalek S. conducted research on the effect of foliar feeding of potassium salts and urea in spinach on gas exchange, leaf yield and quality. In a pot experiment conducted in a phytotron, the effectiveness of foliar feeding of different potassium salts in Spinacia oleracea was investigated. Potassium salts KCl, KNO<sub>3</sub>, K<sub>2</sub>SO<sub>4</sub> was applied 3 times in the form of 1%. The results showed Potassium nitrate influenced most effectively in in photosynthesis, increased leaf yield and transpiration process. The potassium salts resulted in the increased content of protein, chlorophyll, carotenoids, iron in leaves.<sup>[9]</sup>
- Research was done by Bongekile O Zikalala, Hintsu Araya about nutritional quality of baby spinach as affected by nitrogen, phosphorus and potassium fertilisation. The results obtained are, N, P and K multiplied the concentrations of total phenols, total antioxidants activity, complete flavonoids and Vitamin C with most concentrations observed at 45kg N ha<sup>-1</sup>, 45 kg P ha<sup>-1</sup> and 85 kg K ha<sup>-1</sup>. Thus, varying fertilizer usage influenced the phytochemical and nutrient supplementation magnificently on infant spinach.<sup>[15]</sup>
- The Sindh Agricultural University performed an experiment regarding the response of nitrogen on the growth and productivity of Spinacia oleracea. 5 N doses i.e., 0, 35, 70, 105 and 140 kg ha<sup>-1</sup> were applied to evaluate the growth and yield parameters of spinach. The results showed that nitrogen was helpful in increasing the growth and yield of spinach.<sup>[17]</sup>
- From the research article on drought stress alleviation by potassium – nitrate-containing chitosan microparticles confers changes in Spinacia oleracea by Syed Abu Bakr and Shah Fahad. Results revealed that potassium nitrate increased

root and shoot length, chlorophyll, carotenoids, shoot fresh and dry weights etc.<sup>[18]</sup>

- A study performed by M. E. Abou El-Nasr regarding the effect of nitrogen and potassium levels on yield, quality and nitrate accumulation in lettuce leaves. Two experiments were conducted where three N sources and four K doses were used in split plot design with four replicates. The effect of N sources showed increased growth and yield parameters. Increasing K levels showed considerable increase in growth and yield parameters.<sup>[18]</sup>
- From the studies done by Magda M. Hafez, Asmaa R. about the beneficial effects of nitrogen fertilizer and humic acid on growth, yield and nutritive values of spinach. Different levels of nitrogen fertilizer with three levels of humic acid were sprayed on spinach plant for three times in 15 days. The results showed vigorous plant growth with increased length, no. of leaves and fresh, dry weights of the plant.<sup>[19]</sup>
- An article regarding the improvement of growth, productivity and quality of spinach plants were written by Wafaa A. Fekry, Dalia A. S. Nawar. In this study, by using fertilizers with NPK resulted in increased plant height, leaf area and total yield. This could save the cost of spinach production and decrease the pollution of environment.<sup>[20]</sup>
- In an article regarding supplementary potassium nitrate in improving salt tolerance in bell pepper plants. The plants were grown in containers under high root zone salinity. Potassium nitrate was applied and the results showed bell pepper plants could overcome the effects of high salinity and the fruit yield also was high.<sup>[21]</sup>

## MATERIALS & METHODS

- Type of study: Experimental study.
- Study Design: Experimental
- Study Setting: This study was taken place in MNR homoeopathic medical

college premises in green house with good ventilation and sunlight.

- Sample size: Total sample of 20 seeds. Each group with 10 seeds to assess the parameters.

### Selection Criteria

- Red soil:  
As Spinach grows well in red soil, I have selected red soil for my study and it is taken from a nursery in and around Sangareddy.
- Seeds:  
Non hybrid seeds of *Spinacia oleracea* (Spinach) are procured from reliable local dealer.



Figure No. 1: SPINACH SEEDS

- Vermicompost.  
It is collected from Acharya NG Ranga Agricultural University, Hyderabad. Plant height of pea was significantly increased by different vermicompost levels. Under the present investigation, the maximum significant plant height was recorded under vermicompost treatment. The maximum growth of pea with the application of vermi- compost was noticed.
- Drugs:  
Kalium nitricum 6C will be procured from authentic homoeopathic pharmaceuticals industrial outlet.



Figure No. 2: KALIUM NITRICUM 6C

### ➤ METHODS:

The seeds are divided into 2 groups, each group bearing 10 seeds.

1. GROUP I – Where Kalium nitricum 6C is given to the seeds and plant.
2. GROUP II – Where no medication is given to the seeds and plant. Sunlight and nutrients will be equally supplied to both the groups.

### ➤ PROCEDURE:

- Non hybrid varieties of Spinach seeds are procured from authentic local dealer on 16/8/23.
- These seeds are sowed in soil on 17/8/23, based on the groups where group I contain 10 seeds and group II contain 10 seeds.
- All the requirements like water sunlight were provided equally for both the groups.
- All the essential nutrients were also been supplied equally.
- No other fertilizers are being used in this procedure.
- The temperature and pH of the soil is monitored regularly.
- The first group of seeds are provided with Kalium nitricum 6C and the other group is devoid of medicine. In 150 ml of water, 3-4 drops of medicine (Kali nit 6C) are added and 10 successions are to

be given. This medicated water is repeated in alternate days.

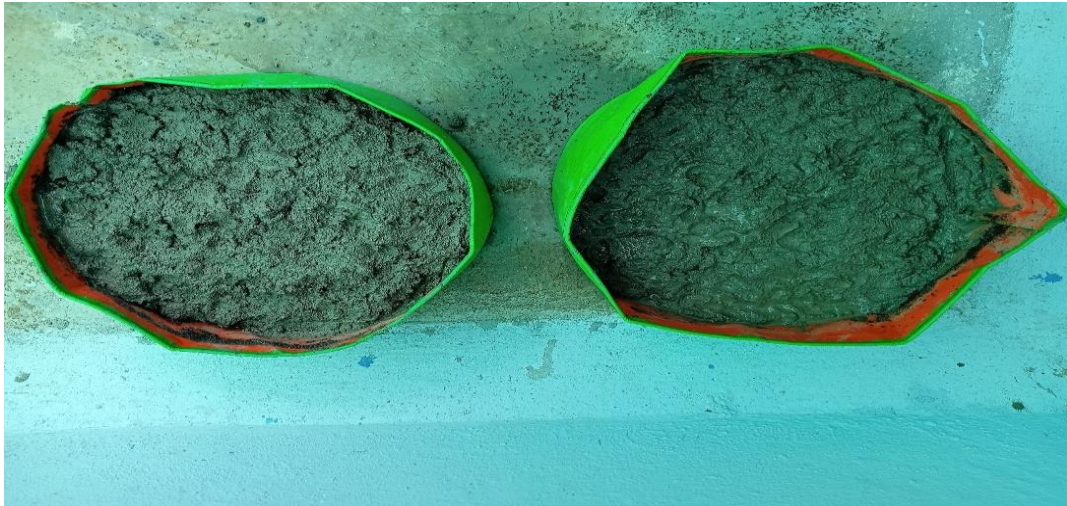
- Group I: The seeds started to germinate on 5<sup>th</sup> day i.e., on 22/8/23.
- Group II: The seeds started to germinate on 7<sup>th</sup> day i.e., on 24/8/23. Only 5-6 seeds were germinated initially later other seeds germinated but not having a drastic growth.
- The application of medicine was continued for further on Group I.
- Group I: The Plants applied with medicine had grown up to 8-12 cm in the span of 40 days after sowing of seeds.
- Group II: The plants of control group had grown up to 5-9 cm in the span of 40 days after sowing of seeds.
- The yield is collected and the following parameters are analyzed from two groups.
- Following are the parameters used to record and analyze:
  1. Seed Germination Time
  2. Height of the Plant
  3. Number of Leaves per Plant

### STATISTICAL ANALYSIS

- ❖ STUDY PERIOD: 4-6 months.
- ❖ DATA COLLECTION: Non hybrid varieties of Spinach seeds are procured from authentic local dealer.
- ❖ STATISTICAL TECHNIQUES AND DATA ANALYSIS: After study completion the results was represented by different statistical methods with proper analysis by using Paired t test.
- ❖ PLAN FOR DATA ANALYSIS: The collected data was analyzed by Paired t test.
- ❖ There is no conflict of interest

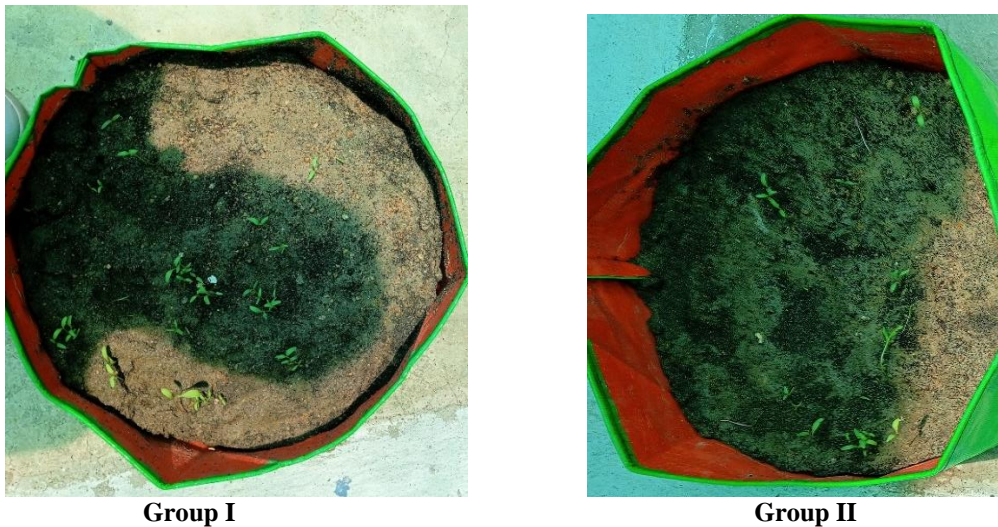
### ➤ RESULTS

Grown bags were been selected for germination and growth of spinach. On 17/08/2023 seeds of spinach were sown in the soil.



**Figure No. 3: Sowing of Seeds**

In Group I (Kali nit 6C) the seeds were germinated on 5<sup>th</sup> day i.e., on 22/8/23. In Group II the seeds were germinated on 7<sup>th</sup> day i.e., on 24/8/23.



**Fig.No-4: Germination in two groups**

In group I (Kali nit 6C) 10 saplings were seen of 10 seeds and in group II only 5-6 saplings were seen from the 10 seeds. This image is on 02/09/2023.



**Figure No. 5: Growth of Spinach in two Groups**

In both the groups all seeds i.e., 20 seeds were germinated but survival of the group I plants are more than the group II plants. This image is on 13/09/2023

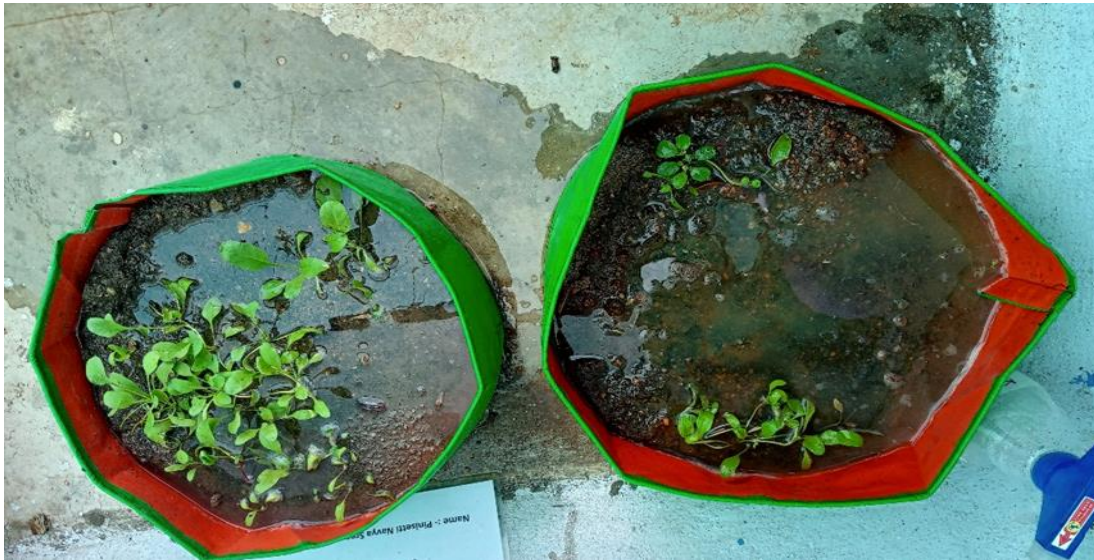


Figure No. 6: Growth of Spinach in two Groups on 13/9/23

Growth in the group I (Kali Nit 6C) plants were more than group II plants. This is on 17/9/23



Figure No. 7: Growth of Spinach in two Groups 17/9/23

Height and number leaves are more in group I plants than group II plants. This is on 22/9/23



Figure No. 8: Height of Plant in two Groups





Figure No. 9  
GROUP I - 27/9/23



Figure No. 10  
GROUP II – 27/9/23

**1. SEED GERMINATION TIME: -**

	GROUP I	GROUP II
TIME TAKEN FOR GERMINATION	5 days	7 days

Table No. 1

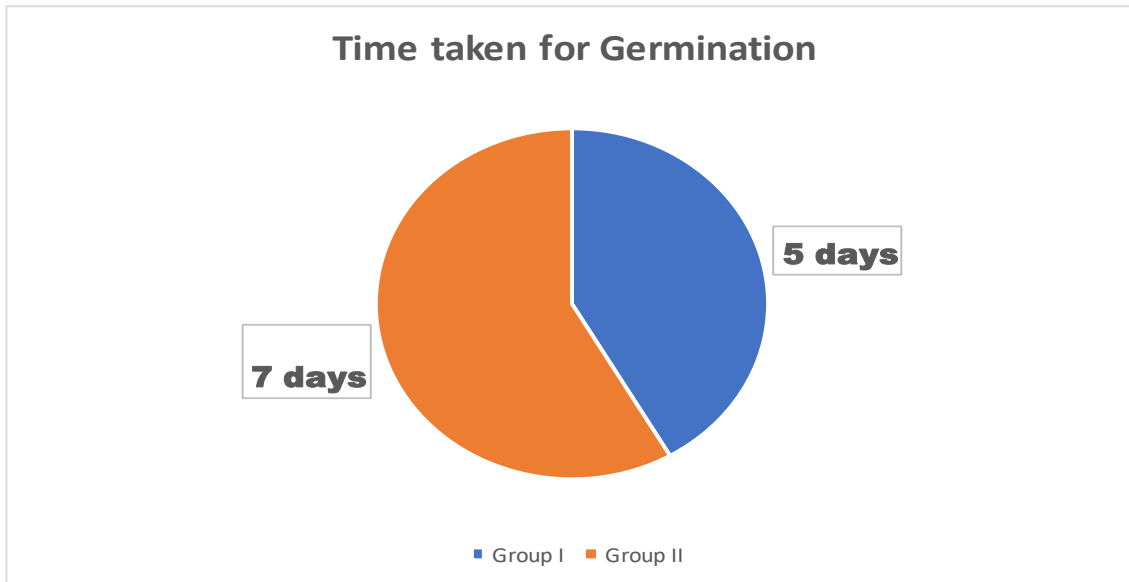


Figure No. 11

In regards to Seed Germination Time, Group I seed which are medicated with Kalium nitricum 6C germinated faster than the seeds of Group II which is the control group.

**2. HEIGHT OF THE PLANT: -**

PLANT NO.	GROUP I	GROUP II
1	12 cm	9 cm
2	9 cm	7 cm
3	8.5 cm	6 cm
4	10cm	6.5 cm
5	7 cm	5 cm
6	11 cm	6.5 cm
7	10.5 cm	3 cm
8	9.5 cm	2 cm
9	10 cm	3.5 cm
10	8 cm	3.3 cm

Table No. 2

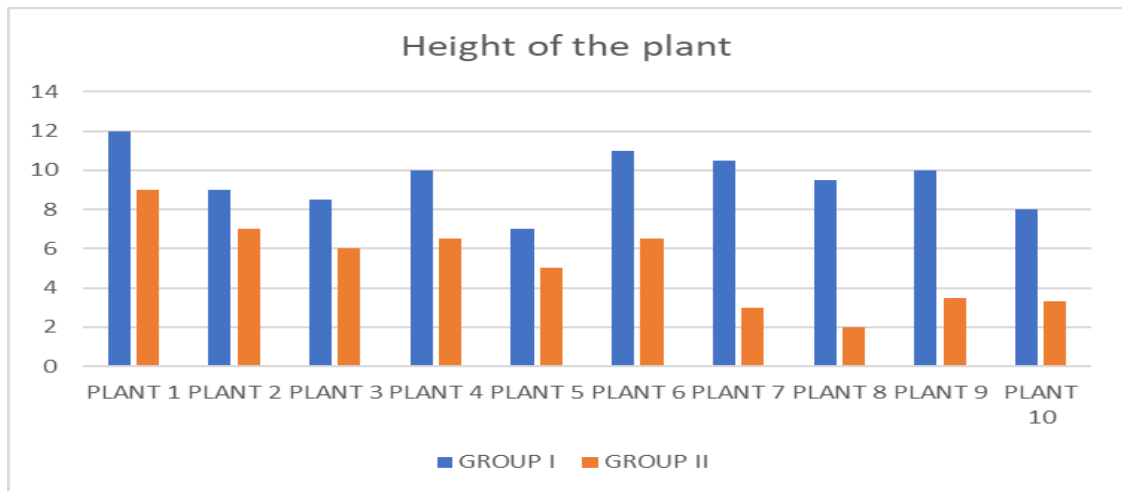


Figure No. 12

**In regards to Height of the plant:**

Group I have shown good results with Kalium nitricum 6C whereas Group II which is the control group has shown slight less growth.

t-Test: Paired Two Sample for Means		
	Variable 1	Variable 2
Mean	9.55	5.13
Variance	2.191666667	5.02456
Observations	10	10
Pearson Correlation	0.337673761	
Hypothesized Mean Difference	1	
df	9	
t Stat	4.848693297	
P(T<=t) one-tail	0.000454991	
t Critical one-tail	1.833112933	
P(T<=t) two-tail	0.000909982	
t Critical two-tail	2.262157163	

➤ **INFERENCE:** The critical value of the study on height of the plant is 1.833 at  $P < 0.05$  with degree of freedom ( $df = n-1$ ) 9. The calculated value is 4.84. As the table value is more than calculated value, Kalium Nitricum is significant in increasing height of the plant.

**NUMBER OF LEAVES PER PLANT: -**

PLANT NO.	GROUP I	GROUP II
1	4	2
2	5	3
3	3	4
4	4	3
5	6	2
6	2	1
7	4	1
8	5	1
9	4	1
10	4	1

Table No. 3

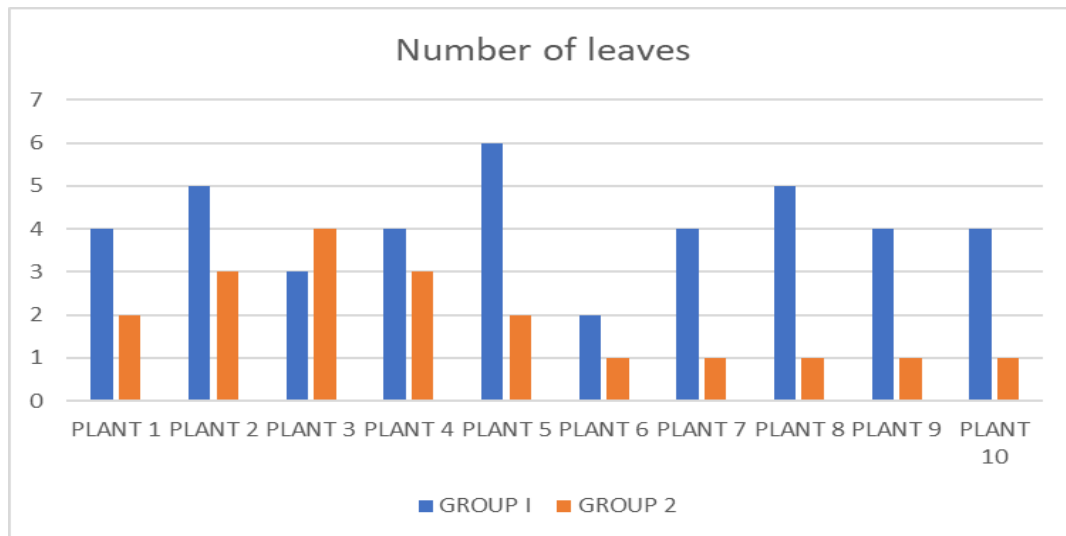


Figure No. 13

**In regard to Number of Leaves:**

Group I which is medicated with Kalium nitricum 6C produced a greater number of leaves when compared to Group II which is the control group.

t-Test: Paired Two Sample for Means		
	Variable 1	Variable 2
Mean	4.1	1.9
Variance	1.211111	1.211111
Observations	10	10
Pearson Correlation	0.009174	
Hypothesized Mean Difference	1	
df	9	
t Stat	2.44949	
P(T<=t) one-tail	0.018394	
t Critical one-tail	1.833113	
P(T<=t) two-tail	0.036787	
t Critical two-tail	2.262157	

➤ **INFERENCE:** The critical value of the study on height of the plant is 1.833 at  $P < 0.05$  with degree of freedom ( $df = n - 1$ ) 9. The calculated value is 2.45. As the table value is more than calculated value, Kalium Nitricum is significant in increasing the number of leaves in Spinach plant.

**DISCUSSION**

In regards to Time taken for germination of seeds, Kalium nitricum 6C acted well when compared to that of control group.

In case of Group I, the seeds were germinated faster on application of Kalium nitricum 6 C. The seeds of Group II, which were devoid of medicine germinated little

slower and 5-6 seeds were germinated initially later other seeds germinated but not having a drastic growth when compared to Group I.

In regards to Height of the Plant, the group with application of Kalium nitricum 6C showed marked increase in height and the control group showed moderate increase in height.

Plants under Group I had marked growth whereas, Group II showed little lesser growth.

With the use of Kalium nitricum 6C, the maximum seed quality has been attained even though no chemical solutions were used for treatment. Without any use of chemical salts, the spinach plants showed

increased leaf yield, effective photosynthesis process with the administration of homeopathic medicine. The growth and yield of spinach showed increased rates with the potentized medicine, without any use of nitrogen-based fertilisers. In this experiment without any use of NPK fertilisers, humic acid, potassium nitrate in chemical form, Kalium nitricum 6c homeopathic potentised medicine showed great results by increasing its growth, yield, increased plant height, faster germination of seeds and chlorophyll contents.

Total yield including parameters like seed germination time and height of the plant of Spinacia oleracea is having good result with 6C potency of Kalium nitricum when compared to that of control group.

Therefore, Kalium nitricum 6C enhances the seed germination and plant growth of Spinacia oleracea (Spinach).

## CONCLUSION

The aim is to avoid fertilizers which may affect the health of human beings. So, to develop the organic farming, application of homeopathic medicines for agriculture is playing a key role in healthy cultivating practices. Concluding the above discussed points, we derive the conclusion stating that Kalium nitricum 6C had significantly influenced the seed germination and plant growth of spinach thereby contributing to rise in the economic output. Further studies are required on large scale to validate and confirm the current findings. In addition to the yield, nutritive value can also be analysed to have a detailed overview of the same.

### Declaration by Authors

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**Conflict of Interest:** The authors declare no conflict of interest.

## REFERENCES

1. Dr. Navjot Singh; Homeopathy in Agriculture; Homeobook. Available from: <https://www.homeobook.com/homeopathy-in-agriculture/>
2. The Editors of Encyclopedia Britannica; Spinach; Britannica. Available from: <https://www.britannica.com/plant/endive>
3. Gaurav Gupta, Hemant Vyas, Bharat Sharma; Agrohomoepathy- Does Homeopathy have role in agriculture; Research Gate. Available from [https://www.researchgate.net/publication/346579288\\_Agrohomoepathy-Does\\_Homeopathy\\_have\\_Role\\_in\\_Agriculture](https://www.researchgate.net/publication/346579288_Agrohomoepathy-Does_Homeopathy_have_Role_in_Agriculture)
4. Agriculture; New World Encyclopedia. <https://www.newworldencyclopedia.org/entry/Agriculture>
5. Papiya Bigoniya; The anti-inflammatory potential of Spinacia oleracea leaf extract; Research gate. Available from: [https://www.researchgate.net/profile/Papiya-Bigoniya/publication/259644879\\_The\\_anti-inflammatory\\_potential\\_of\\_Spinacia\\_oleracea\\_leaf\\_extract/links/559f8b6608ae424c1e6a6d66/The-anti-inflammatory-potential-of-Spinacia-oleracea-leaf-extract.pdf](https://www.researchgate.net/profile/Papiya-Bigoniya/publication/259644879_The_anti-inflammatory_potential_of_Spinacia_oleracea_leaf_extract/links/559f8b6608ae424c1e6a6d66/The-anti-inflammatory-potential-of-Spinacia-oleracea-leaf-extract.pdf)
6. Sunita Verma; A Study on Medicinal Herbs Spinacia oleracea Linn: Amarantheacea; Journal of Drug Delivery and Therapeutics. <https://jddtonline.info/index.php/jddt/article/view/1767>
7. Dr. Karanvir Singh; What are the uses & Health benefits of spinach (Spinacia oleracea)?; Chandigarh Ayurved Centre. Available from <https://www.chandigarhayurvedcentre.com/blog/what-are-the-uses-health-benefits-of-spinach-spinacia-oleracea-2/>
8. Syed Abu Bakr Haider Bukhari, Irfana Lalarukh, Syeda Fasiha Amjad; Drought Stress Alleviation by Potassium-Nitrate-Containing Chitosan/Montmorillonite Microparticles Confers Changes in Spinacia oleracea L.; MDPI. Available from: <https://www.mdpi.com/20711050/13/17/9903#:~:text=It%20is%20hypothesized%20that%20potassium,spinach%20growth%20under%20drought%20stress>
9. Edward Borowski, Sławomir Michałek; The effect of foliar feeding of potassium salts and urea in spinach on gas exchange, leaf

- yield and quality; Acta Agrobotanica. <https://pbsociety.org.pl/journals/index.php/a/article/view/1654>
10. Potassium Nitrate is an outstanding source of Potassium for its nutritional value; SQM. Available from: <https://www.sqmc.cl/en/article/potassium-nitrate-outstanding-source-potassium-its-nutritional-value#:~:text=Potassium%20nitrate%20improves%20the%20efficiency%20of%20water%20use.&text=Given%20it%20is%20responsible%20for,water%20uptake%20from%20the%20soil>
  11. Vaikuntanath Das Kaviraj, Homeopathy for Farm and Garden The Treatment of Plants, 4<sup>th</sup> revised edition, 2015, pg. no.153.
  12. Willian Boericke; Boericke's New Manual of Homoeopathic Materia Medica with Repertory; 3<sup>rd</sup> revised and Augmented edition; B. Jain Publishers; pg. no. 332.
  13. Sushobhan Sen, Indrani Chandra; Agrohomoepathy: An Emerging Field of Agriculture for Higher Crop Productivity and Protection of plants against various stress conditions; Research Gate. Available from <https://homeopathicresearch.eu/EN/SushobhanSen.2018.Agrohomeopathy.pdf>
  14. Kulsumbi A. K., Sangeeta I. M., Shakuntala N. M., Vasudevan S. N., Kisan B; Study on the effect of seed priming on Physiological and Biochemical changes in seed quality of Spinach (*Spinacia oleracea* L.); Research Journal of Pharmacognosy and Phytochemistry. Available from <https://www.indianjournals.com/ijor.aspx?target=ijor:rjpp&volume=12&issue=2&article=001>
  15. Bongekile O Zikalala, Mpumelelo Nkomo, Hintsara Araya, Wonder Ngezimana and Fhatuwani N Mudau; Nutritional quality of baby spinach (*Spinacia oleracea* L.) as affected by nitrogen, phosphorus and potassium fertilization; South African Journal of Plant and Soil. Available from <https://journals.co.za/doi/abs/10.1080/02571862.2016.1225231>
  16. Spinach Vegetable Crops Production Guide for the Atlantic Provinces; Atlantic Provinces Agricultural Services Coordinating Committee. <https://www.gov.nl.ca/ffa/files/agrifoods-plants-pdf-spinach.pdf>
  17. N. A. Wahocho, N. Memon, M. N. Kandhro et al. Response of nitrogen on the growth and productivity of spinach (*Spinacia oleracea* L.); Sindh University Research Journal. 2016, Vol. 48, No. 2, 305-308.
  18. M. E. Abou El- Nasr; Effect of some Nitrogen Sources and Potassium Levels on Yield, Quality and Nitrate Accumulation in Lettuce Leaves; Journal of Plant Production. [https://journals.ekb.eg/article\\_254724.html](https://journals.ekb.eg/article_254724.html)
  19. Magda M. Hafez, M.R. Shafeek, Asmaa R. Mahmoud and Aisha H. Ali; Beneficial Effects of Nitrogen Fertilizer and Humic acid on Growth, Yield and Nutritive Values of Spinach (*Spinacia Olivera* L.); Middle East Journal of Applied Sciences. <https://www.curreweb.com/mejas/mejas/2015/597-603.pdf>
  20. Wafaa A. Fekry, Dalia A.S. Nawar; Improving the Growth, Productivity and Quality of Spinach Plants (*Spinacia oleracea* L.); Zagazig Journal of Agricultural Research. [https://zjar.journals.ekb.eg/article\\_51328.html](https://zjar.journals.ekb.eg/article_51328.html)
  21. Cengiz Kaya & David Higgs; Supplementary Potassium Nitrate Improves Salt Tolerance in Bell Pepper Plants; Journal of Plant Nutrition. <https://www.tandfonline.com/doi/abs/10.1081/PLN-120021048>
  22. <https://en.m.wikipedia.org/wiki/Spinach>
  23. Fatima Tahseen, Tahseen Fatima Miano. Nutritional value of *Spinacia oleracea* Spinach – An overview. Published in December 2016. Research gate. [https://www.researchgate.net/publication/316488658\\_NUTRITIONAL\\_VALUE\\_OF\\_SPINACIA\\_OLERAEECEA\\_SPINACH-AN\\_OVERVIEW](https://www.researchgate.net/publication/316488658_NUTRITIONAL_VALUE_OF_SPINACIA_OLERAEECEA_SPINACH-AN_OVERVIEW)
  24. <https://www.apnikheti.com/en/pn/agriculture/horticulture/vegetable-crops/spinach>
  25. <https://signuptrendingnature.com/spinach-farming-profit-per-acre-in-india/>
  26. Lufuno Ethel Nemedodzi, Hinsta Araya. Nitrogen, Phosphorus and Potassium effects on the physiology and Biomass yield of Baby Spinach (*Spinacia oleracea* L.) Journal of Plant Nutrition 40 (14), 2033-2044, 2017. Google Scholar. [https://scholar.google.co.in/scholar?q=potassium+and+nitrogen+effect+on+spinach+growth&hl=en&as\\_sdt=0&as\\_vis=1&oi=scholar#d=gs\\_qabs&t=1682038574613&u=%23p%3DY0W27vWZV2MJ](https://scholar.google.co.in/scholar?q=potassium+and+nitrogen+effect+on+spinach+growth&hl=en&as_sdt=0&as_vis=1&oi=scholar#d=gs_qabs&t=1682038574613&u=%23p%3DY0W27vWZV2MJ)

27. Nutritional quality of baby spinach (*Spinacia oleracea* L.) as affected by nitrogen, phosphorus and potassium fertilization. Bongekile O Zikalala, Mpumelelo Nkomo. Published in 2017. Google Scholar. [https://scholar.google.co.in/scholar?q=potassium+and+nitrogen+effect+on+spinach+growth&hl=en&as\\_sdt=0&as\\_vis=1&oi=scholar#d=gs\\_qabs&t=1682039147056&u=%23p%3DnNdoklTRnNQJ](https://scholar.google.co.in/scholar?q=potassium+and+nitrogen+effect+on+spinach+growth&hl=en&as_sdt=0&as_vis=1&oi=scholar#d=gs_qabs&t=1682039147056&u=%23p%3DnNdoklTRnNQJ)
28. Jagdish. Best fertilizer for spinach: homemade, natural, organic, npk and schedule. February-13-2022. Gardening Tips. <https://gardeningtips.in/best-fertilizer-for-spinach-homemade-natural-organic-npk-and-schedule>.
29. Kathleen M. Zelman, Health Benefits of Spinach. Published in December-1-2022. WebMD. <https://www.webmd.com/diet/ss/slideshow-health-benefits-of-spinach>
30. <https://www.allthatgrows.in/blogs/posts/grow-spinach-at-home-in-india>

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