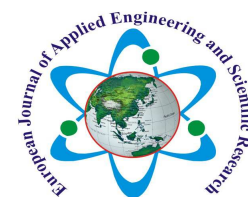




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# Effect of magnetic water on growth of Legumes

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## ABSTRACT

*Fertilizers are generally used for rapid and healthy growth of plants. To organically grow the plants use of fertilizers is avoided and only natural means are preferred. This gives pesticide free plants and fruits but less quantity is produced which ultimately results in high cost. Hence legumes like chick peas (*Cicer arietinum*) and black eyed beans (*Vigna unguiculata* subsp. *unguiculata*) were irrigated with magnetic water. The effect of magnetic water on germination and growth of chick peas and black eye beans was observed. From the results obtained it can be said that use of magnetic water in place of normal tap water can be seen as a promising technique for rapid and healthy growth of plants*

**Key words:** Magnetic water, fertilizers, organic plants, normal tap water.

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## INTRODUCTION

Water plays a very important role in the growth of any plant. So if the quality of water used is such that it enhances the growth, gives good quality and quantity and healthy yield, then it can be a boon to the farmers. Recent studies [1] have analyzed effect of poor quality water on irrigation and soil. Techniques for enhancing efficient use of water for irrigation have also been implemented [2, 3]. Studies related to genetic variations for improving the yield [4] and used fuzzy expert systems for studying growth of vegetables [5] have also been carried out. Few researchers [6, 7, 8, 9, 10, 11, and 12] have also studied the changes in plants with seeds subjected to electric, magnetic or electromagnetic field. Effect of high voltage field on fruits like pineapple has also been studied [13]. Magnetic Nanoparticles have also been used by researchers [14, 15, 16, 17, 18 and 19] for targeted drug delivery and developments in plants. Effect of Magnetic water on chemical composition and nutrients in some plants is also carried out [20, 21]. With so many techniques being implemented by various researchers towards growth of plants, in this paper the author has investigated the growth of chick peas and black eyed beans from germination to saplings by using magnetized water. The results were compared with normal tap watered plants and drastic change in the growth rate was observed. Magnetic water is beneficial for plants as observed from the experimental study. It is said to reduce the bad cholesterol in humans and animals [22, 23]. So consumption of greens irrigated with magnetic water will not have adverse effects. The study is concentrated more on germination rate, growth of plants and size of leaves and life span of the plant.

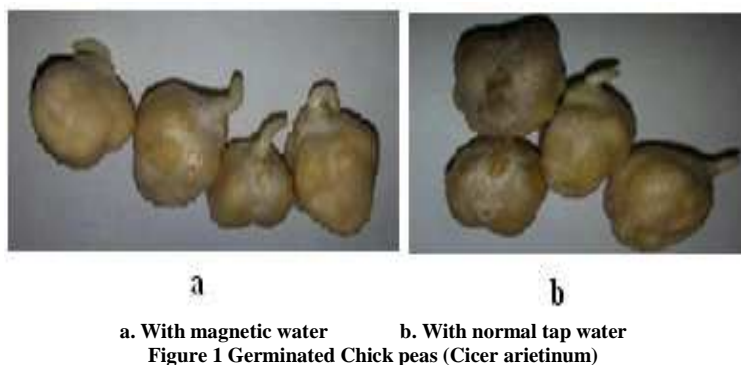
## MATERIALS AND METHODS

For studying the effect of magnetic water on the legumes, chick peas and black eyed beans were chosen as these are widely used in India. Generally black eyed beans take longer time to germinate than any other legumes where as

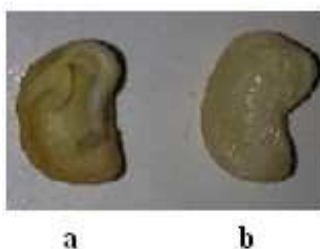
chick peas germinate at a faster rate. Hence these two legumes were chosen. To magnetise water, a pair of strong permanent magnets with opposite polarity were tied on the either side of glass container filled with water. It was kept for twenty four hours before being used for irrigation of the plants. To check if the water is magnetised or not a simple test was carried out. A cardboard was placed over a pair of strong permanent magnets. Few drops of magnetized water were poured on cardboard exactly above the magnets. The water if properly magnetised stayed in a circular form whereas normal water failed to stay. A sample with forty chick peas and forty beans of equal size and shape were soaked in magnetic water and same numbers were soaked in normal tap water for seven hours and then kept for germination after tying in a muslin cloth. The legumes were checked for sprouts after twenty four hours. The germinated legumes were then transferred to two pots and watered one with normal tap water and the other with magnetic water. Growth of the plants, size and shape of the leaves and number of branches were checked in steps. The leaves were also observed under microscope for water content and cell structure. The life span of the plants and time taken by leaves to dry off was also noted.

### RESULTS AND DISCUSSION

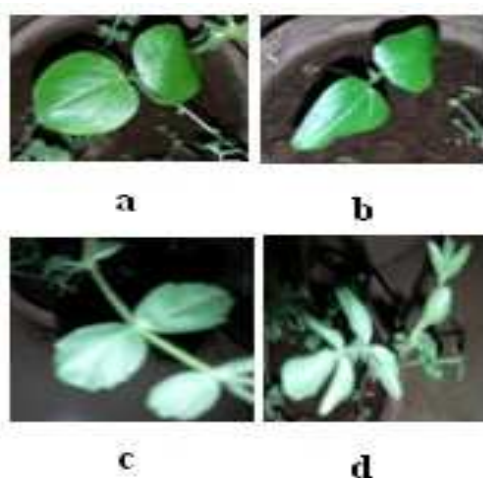
The chick peas soaked with magnetic water germinated more in number with significant shoots whereas those with normal water only a few sprouted as seen in Fig 1. For more clarity only few



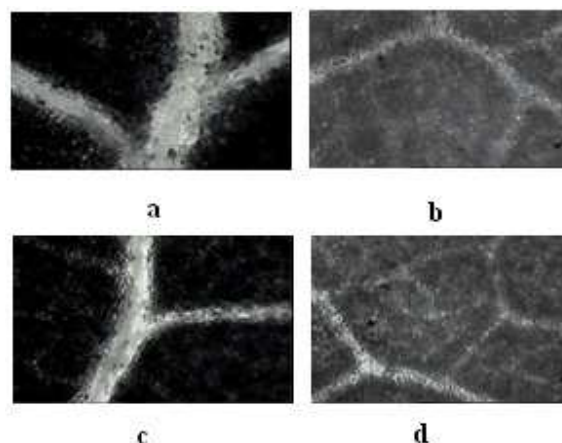
samples have been photographed. As the beans took longer time to germinate, they were opened up and checked for the growth. As seen in Fig 2, the sample shows one with magnetic water has noticeable development.



The effect of magnetic water was evident towards fast development right from the germination stage. These samples were then transferred to pots and regularly watered with same quantity of water, one with magnetic water and the other with tap water and the progress in growth was noted. After a week the beans and peas irrigated with magnetic water showed wide leaves as in Fig 3 and those with tap water had narrow leaves. The magnetic watered plants had also grown with more height. Due to a significant change in the growth of leaves, these leaves were further investigated using an optical microscope. These investigations revealed that the leaves of the plants irrigated with magnetic water had more water content as seen from figure 4a. These beans leaves also showed a larger cell structure



**Figure 3 Shape and size of the leaves**  
a. Beans Leaves with magnetic water  
b. Beans Leaves with tap water  
c. Chick peas Leaves with magnetic water  
d. Chick peas Leaves with tap water



**Figure 4 Water content and cell structure of beans leaves**  
a). Water content in leaves (magnetic water)  
(b).Cell structure (magnetic water).  
c). Water content (tap water)  
(d).Cell structure of beans (tap water)

compared to the normal water leaves as in figure 4b. Due to more water holding capacity these plants had longer life span as the leaves took longer time to dry. These experimental results with magnetic water for irrigation of plants indicate that this water gives a better yield. The plants are healthy, more productive and remain fresh for a longer period. Hence the technique can be implemented for better agriculture crops.

The comparison is specified in Table no 1. The magnetic watered chick peas plants also grew with more branches. As these legumes had sprouted well, the number of saplings also outnumbered as compared to those with normal water.

**Table I Characteristics of the Plants**

S No	Factors	Chick Peas		Black eyed beans	
		Normal water	Magnetic water	Normal water	Magnetic water
1.	Height of plant after one week	9.5cm	11.5cm	12cm	9cm
2.	Width of the leaves after one week	0.5cm	0.75cm	1cm	2cm
3.	Length of the leaves after 10days	0.85cm	1 cm	2cm	2.2cm
4.	Time taken by the leaves to dry	34 hrs	46 hrs	38 hrs	53 hrs
5.	Thickness of the main stem	0.8cm	1 cm	0.85cm	1cm

## CONCLUSION

The samples of chick peas and black eyed beans were irrigated with normal tap water and magnetic water. It was observed that more number of legumes germinated with magnetic water. These saplings hence outnumbered those irrigated with tap water. The magnetic water samples also had more number of branches, their leaves were wide and held more water. Due to more water content the greens remained fresh for a longer period. Magnetic water for irrigation can be hence considered as a useful technique for better agricultural yield.

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