

“TO EVALUATE GROWTH FACTORS OF FEENUGREEK IN HYDROPHONIC SYSTEM AND SOIL BASED SYSTEM”

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ABSTRACT: Fenugreek is considered as spice as well as legume crop. It is annual herbaceous and autogamous crop belonging to family fabaceae and sub family papillionaceae. Fenugreek (*Trigonella foenum-graecum* L.) popularly known by its vernacular name 'methi' is an important vegetable and condiment crop grown in Northern India during rabiseason for leaves, shoots and seeds. In this study, we evaluate growth factors of feenugreek in hydrophonic system and soil based system. Hydrophonic system used by two ways: a) without soil, b) without soil with organic fertilizer. This study was aimed to examine an efficient technique (Soil based system and Hydroponic system) of growing fenugreek. We evaluate the macroscopic characters like size, shape, colour, odour, taste, root length. The experiment resulted in that the hydroponic system with organic fertilizer has a better effect because height grow faster, gives better taste and root length long. The type of seeds doesn't have a significant effect on the plant growth. However, the planting system has a significant effect on the plant growth; the hydroponic system has a higher growth rate.

Key Words: Fenugreek, Fabaceae, Hydrophonic, Soil based system, Macroscopic characters

1. INTRODUCTION:

India is known worldwide for its spices and condiments most common of which include fenugreek, garlic, mustard, cumin, turmeric and curry leaves, which add characteristic flavor and aroma to the various dishes in which they are used. The herbs are extensively used in Ayurveda, as a cure for several ailments, because of their high nutritive value (Kirtikar and Basu, 1993). As nutritional supplements as well as potential functional food, Methi seeds added to ground meat and baked goods (Mansour and El-Adawy, 1994).

Fenugreek is native to the Mediterranean region of the "Old World" (Vavilov, 1926, 1951) however, De Candolle (1964) and Fazli and Hardman (1968) proposed an asian origin for the crop. Due to shorter growing cycle, lower production costs and consistent yield and quality, meethi may serve as a viable source for production of diosgenin (Petropoulos, 1973). Fenugreek (*Trigonella foenum-graecum* L.) is an annual plant belonging to family Fabaceae and is a self pollinating and multipurpose crop and is utilized as leafy vegetable/ fodder/ condiment (Khiriya and Singh, 2003). Seeds of this plant are used in daily diet in Asia and Africa (Basch *et al.*, 2003). When cooler and wetter conditions for long time it may result into slower growth and may cause a failure of plants to mature for seed harvest. The leaf development of fenugreek is temperature-dependent and the growth rate of fenugreek is slow at the beginning of the growing season (McCormick *et al.*, 2006).

Around 200 legumes are cultivated as crop plants. The nitrogen fixed by root nodules of legumes affects the N cycle of nature adding to their economic importance (Mengel *et al.*, 1974). The species name "*foenum-graecum*" means "Greek hay possibly refers to its use as a forage crop in the past (Petropoulos, 2002). The need of nitrogen fertilizers for subsequent crops can be reduced because being a legume crop fenugreek improves the soil fertility by fixing nitrogen from the atmosphere. It can reduce the cost of irrigation, save water and limit eutrophication of surface water and contamination of ground water sources (Basu *et al.*, 2004). Low water requirement and its dry land adaptation have led for increased interest in this crop for cultivation in temperate climates like that of western Canada.

Fenugreek (*Trigonella foenum-graecum* L.) has been used in folk for a variety of ailments i.e., from indigestion to baldness and one of the oldest known medicinal plant (Lust, 1986). Seeds are carminative, diuretic, galactagogue, antirheumatic and seed infusion serves as a cool drink for small pox patients. Powdered seeds are useful in veterinary medicine whereas an aqueous extract of the seeds exhibits antibacterial property (Warrier *et al.*, 1993 and Kumar *et al.*, 1997). Fenugreek is levelled as "Generally

recognized as safe" in small quantities by U.S. food and drug administration. Billaud and Adrian (2001) have studied the nutritional value and insect and pest repellent application of fenugreek seeds and leaves. It is used as a lactation stimulant (Edison, 1995 and Tiran, 2003). Seeds of fenugreek in powder or germinated form show anti-diabetic properties (Sharma *et al.*, 1990; Zia *et al.*, 2001; Devi *et al.*, 2003; Hannan *et al.*, 2003; Tahiliani and Kar, 2003; Thakaran *et al.*, 2003; Vats *et al.*, 2003 and Broca *et al.*, 2004), anti-cancer effect (Devasena and Menon, 2003) and for ethanol toxicity (Thirunavukkarasu *et al.*, 2003).

In vegetarian diet legumes, soybean, nuts and soluble fibres are beneficial in lowering total cholesterol levels in humans (Segasothy and Phillips, 1999). Fenugreek is a well known spicy agent which prevents ageing, labour pain, imparts immunity, improves mental function and adds vitality to the body. It is gastroprotective, anti-inflammatory, antipyretic, laxative and stimulates appetite (Naidu *et al.*, 2012). Diosgenin and soluble fibre are found in fenugreek contributing towards their medicinal values (Fazli and Hardman, 1968; Taylor *et al.*, 1997 and Basu *et al.*, 2008) which are important for human being. Medicinal and edible plants are rich sources of natural antioxidants.

Fenugreek is known to have several pharmacological effects such as laxative (Riad and El-Baradie, 1959), appetite stimulation, antipyretic, gastroprotective, chemo-preventive and as antioxidant.

Fenugreek can find an important place in the nutraceutical and functional food industry because of its medicinal applications in human and animal health (Acharya *et al.*, 2007a, b and Basu *et al.*, 2007). The plant-based traditional medicine system contributes significantly in health care, with about 80% of the world's inhabitants depending mainly on traditional medicines for their primary health care (Owolabi *et al.*, 2007).

Fenugreek is a very useful legume crop which can be used for short-term rotation (Moyer *et al.*, 2001), for livestock feed and for improving soil fertility. In fenugreek the highest diosgenin (including other steroid sapogenin) content was found in seedling (Petropoulos, 2002). Diosgenin is an important steroidal saponin in fenugreek seeds and is precursor for the synthesis of steroidal hormone like testosterone and progesterone. Effectiveness of plant phenolics as antioxidant depends on their reactivity towards reactive oxygen species (Randhir *et al.*, 2004).

Fenugreek leaf possesses significant nutritional quality (Gupta *et al.*, 1998). Retention of essential chemical nutrients such as ascorbic acid and β -carotene can be improved by cooking of fenugreek leaves in pressure cooker (Yadav and Sehgal, 1997). Fenugreek has powerful antioxidant properties imparting beneficial effects on liver and pancreas and the effectivity of germinated fenugreek seeds is greater than dried seeds probably germinated seed increases the bioavailability of different constituents. An aqueous fraction of fenugreek exhibited greater antioxidant activity compared to other fractions. Fenugreek seeds contain phenolic and flavonoid compounds and their aqueous fraction exhibited greater antioxidant activity (Meghwal and Goswami, 2012).

2. MATERIAL AND METHOD:

1. Collection of samples: To evaluate growth factors of fenugreek in hydroponic system and soil based system is the major objectives of this study. Fenugreek seed used in this study were purchased from a regional pharmacy, located at Bathinda, Punjab. Organic fertilizers were purchased from supermarket of Bathinda. All the solvents and reagents were of analytical grade. It can be grown on a wide variety of soils but clayey loam is relatively better. The optimum soil pH should be 6.0 to 7.0 for its better growth and development.

➤ **Material for without soil with organic fertilizer:-**

Fenugreek seeds, Bucket with narrow holes, Cotton, Jute bag, Organic fertilizers, Organic manure: Animal waste, Garden waste, Poultry farm waste.

➤ **Material for without soil with water:-**

Fenugreek seeds, Bucket with narrow holes, Cotton, Jute bag

➤ **Material for soil**

Fenugreek seeds, Soil

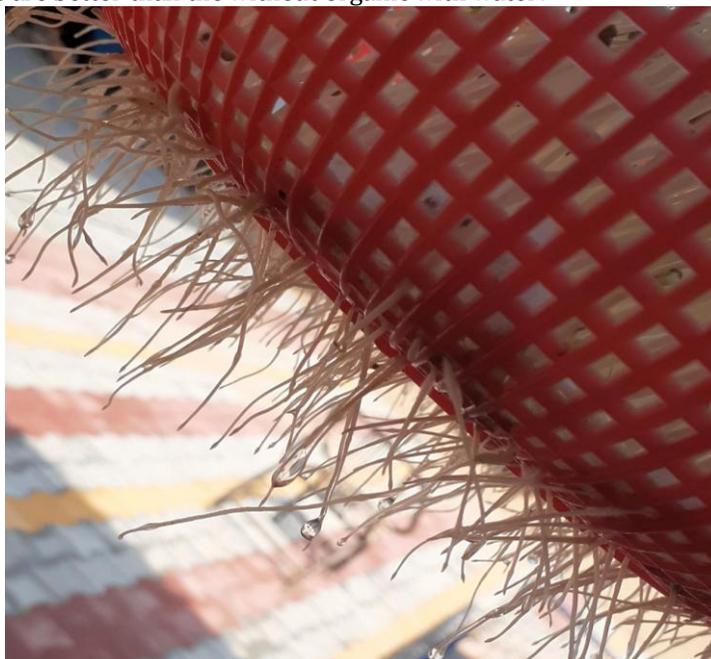
2. Production Technology:

For soil: - Take the 20 g of fenugreek seeds. Picked a space to grow fenugreek seeds. Checked the soil condition. Prepared the soil by adding organic compost material and manure to help fertilize it better. Soaked the seeds overnight before planting them. Sow the fenugreek seeds in soil (evening time). Covered the seeds with soil. For the germination of seeds (that is, begin to sprout), water them in the soil. Make sure that the soil is evenly moist. The excess water should quickly drain away, but keep it well-moistened. After 3 days sprouts were shown. Spray water on the sprouts. Wait for seedlings to mature. Harvest fenugreek leaves.



➤ **For water (Hydroponics):-** Take the 20 g of fenugreek seeds. Washed, rinsed and soaked the seeds in water for 3 hours. After 3 hours remove the seeds from water. Now placed the cotton on basket base and spread seeds on it. Lightly spray water on seeds and drained off any excess water collected at the bottom of the basket. Wet a jute bag or cloth and cover the basket. Keep in the shade, away from direct sunlight. Rinse the cloth well 2-3 times in a day, cover and then lightly spray with water (This step had to be followed daily). Again, drained off any excess water collected at the bottom of the basket. After 3 days sprouts started to grow. As the sprouts started to grow in height, secure the all sides with wet cloth to prevent from drying along the edges. Also cover the top with moist cloth. Once the leaves were fully grown, harvest and use them.

➤ **water with fertilizer (Hydroponics):-** Take the 20 g of fenugreek seeds. Washed, rinsed and soaked the seeds in water for 3 hours. After 3 hours remove the seeds from water. Now placed the cotton on basket base and spread seeds on it. Added organic manure like Animal waste, Garden waste, Poultry farm waste on it. Keep it aside undisturbed for 5 days. After 5 days, filtered and reuse of water collected at the bottom of the basket. Lightly spray seeds with water for 3 days. Keep in the shade, away from direct sunlight. After few days sprouts started to grow. After next 5-6 days, leaves were seen. Remember that the roots of leaves were always dipped in the water. After next 15-16 days leaves are fully grown, harvest and use them. These plants are better than the without organic with water.





3. RESULT AND DISCUSSION:

| Sr. No. | Result | By Soil Method | By Hydroponic Method | By Hydroponic Method With Organic Fertilizer |
|---------|-------------|-------------------------------|-------------------------------|--|
| 1. | Size | 5-7cm long and 1-2cm thick | 5-8cm long and 1-2cm thick | 6-9cm long and 1-2cm thick |
| 2. | Shape | Rhomboidal, Smooth | Rhomboidal but weak from stem | Trifoliolate, Stipules Triangular |
| 3. | Colour | Light Green | Dark Green | Dark Green |
| 4. | Odour | Characteristics | Characteristics | Characteristics |
| 5. | Taste | Mucilaginous, Slightly Bitter | Slightly Bitter | Better than soil cultivated |
| 6. | Root length | 2-3 cm long | 1-2 cm long | 3-4 cm long |

High demand for food production is increasing as the world population is growing. Meanwhile, the traditional farming using soil based system will not cover the world's growing demands for food. Thus, developing a new farming and planting system techniques is required to avoid food crisis issue in the future. This study is aimed to examine an efficient technique for alternative planting system which is the hydroponics system. The statistical experimental design approach was used to analyze and compare between soils based system and hydroponic system by planting seeds of fenugreek in both systems.

In which the analysis of fenugreek cultivation to check the variance of two techniques, whether the hydroponic system with organic fertilizer is better than the traditional system or soil based system. The final result shows that hydroponic planting system with organic fertilizer has a better effect than traditional soil system because it makes plants "height grow faster, gives better taste and root length long". On the other hand, the planting system has no significance effect on the length of leaves. Moreover, seed type and the interaction between seed type and the planting system have no signification effect on plant growth. As it did not required soil for plant growth, it may be helpful for the astronauts during their time in space to get their food. This system may help both kitchen gardeners and farmers to grow food in places where traditional farming is not possible and cost-effective. The hydroponics system offers conservation of water, soil, air, energy and employment for the quality of life. The hydroponics can enhance the economy of both developing and developed countries by using of limited natural resources.

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