



ISOLATION AND CHARACTERISATION OF SIDEROPHORE PRODUCING MICROORGANISM TO PROMOTE ANTIOXIDANT ACTIVITY OF TRIGONELLA FOENUM AND ITS APPLICATION AS IRON SUPPLEMENT

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ABSTRACT

Iron is one of essential mineral required by human body that plays a vital role in several metabolic process such as oxygen transport to blood cells that contains hemoglobin. Lack of essential quantity of iron intake leads to many complications, most commonly iron deficient anaemia. Hence iron supplementation is warned to build up iron stores in individuals with iron-deficiency anaemia. Since there are many side effects of chemically derived iron supplementation tablets that contains ferrous sulphate which leads to constipation, diarrhea, nausea and vomiting; plant derived supplements may be preferred. Fenugreek plant has lot of medicinal values such as prevention of diabetes and control of blood sugar level. The Bacillus sp is found to produce siderophores in soil on providing FeCl₃. This bacterial siderophores help in improving the antioxidant activity and iron content of fenugreek leaves that can be used for formulating plant derived iron supplements in a cost effective way and eliminates the side effects as that of chemical iron supplements. It is also found to have antimicrobial activity against several human pathogens.

KEYWORDS : Iron, Fenugreek, Siderophores, Antimicrobial Activity

INTRODUCTION

Iron is a mineral, vital for the proper functioning of hemoglobin, a protein needed to transport oxygen in the blood. Iron also has a role in a variety of other important processes in the body including general energy and focus, gastrointestinal processes, the immune system and the regulation of body temperature. Over the period 2008 - 2011, the Government Accountability Office (GAO) of United States received 6,307 reports of health problems that supplement products containing lead and other contaminants. A 2013 study on herbal supplements found that many products were of low quality and one third did not contain active ingredients. For thousands of years, fenugreek has been used for various medical purposes. It helps in reducing bad cholesterol, prevent and control diabetes by regulating the absorption of sugar by the body and aid weight loss by facilitating digestion and bowel movement.

Siderophores are secondary metabolites that comprise a high-affinity system for the uptake of iron from the environment, present in many microorganisms. They are produced under iron limiting conditions. Siderophores are secondary metabolites that comprise a high-affinity system for the uptake of iron from the environment, present in many microorganisms. They are produced under iron limiting conditions

MATERIALS AND METHODS

The rhizosphere soil was collected from the agricultural land in Coimbatore. Staining and biochemical test was done to confirm the organism

Screening For Production Of Siderophores:

The isolates were plated on Chrome Azurol -S (CAS) agar medium which is the selective media for identifying microbial siderophores. The siderophore producers form yellowish orange halo around the colony on the agar surface.

Pot Experiment:

The steam sterilized soil is used for the pot experiment. Three plastic pots of 500 ml volume were used. They were filled up to 4/5 th total height with the sterile soil.

Frap Assay:

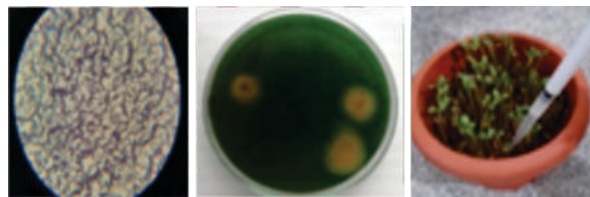
The ferric reducing antioxidant power of aqueous leaf extract of Trigonella foenum was done.

Antibacterial Activity:

The antibacterial activity of varying concentrations of the aqueous extract of Trigonella foenum leaves against pathogenic organisms like Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Bacillus sp and Proteus sp., were tested.

RESULTS :

Microscopic observation Siderophore production on of Bacillus sp CAS medium



Biochemical reaction:

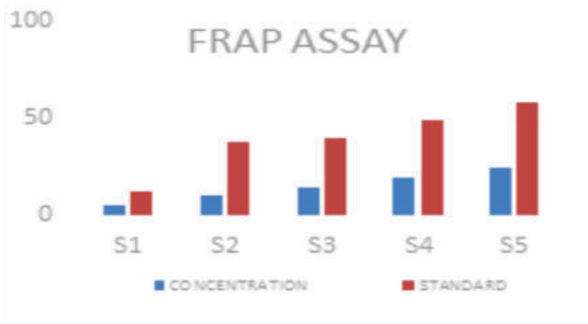
S.NO	TEST NAME	RESULT
1	Catalase	+ ve
2	Oxidase	- ve
3	Motility	+ ve
4	Nitrate reduction	+ ve
5	Indole	- ve
6	Methyl red	- ve
7	Voges proskauer	+ ve
8	Citrate utilization	+ ve
9	Carbohydrate utilization: Glucose	-ve
	Mannitol	+ve
	Sucrose	-ve
	Mannose	+ ve
	Galactose	+ ve
10	Starch hydrolysis	+ ve

Pot Experiment

- The seeds were surface sterilized with Mercuric Chloride and the seeding process is done in three different pots.
- In first pot hoagsland solution supplemented with 10MmFeCl₃ to access the role of microbial siderophores.
- In second pot the hoagsland solution supplemented with 10Mm FeCl₃ and microbial culture is not employed.
- The third pot is the control that consists of only hoagsland solution.

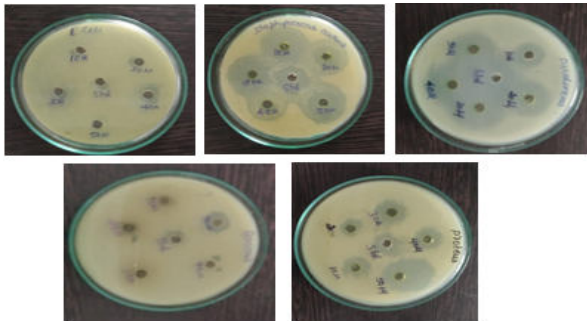
Frap Assay:

The ferric reducing antioxidant power of aqueous leaf extract of Trigonella foenum was done



Antibacterial Activity:

Bacteria	10 μ l	20 μ l	30 μ l	40 μ l	50 μ l	Std
E. coli	-	-	-	3mm	-	-
Staphylococcus aureus	6mm	3mm	8mm	6mm	14mm	6mm
Pseudomonas aeruginosa	8mm	10mm	12mm	12mm	10mm	12mm
Bacillus sp.	-	-	-	-	3mm	-
Proteus sp.	12mm	14mm	10mm	10mm	12mm	12mm



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