

**ISOLATION AND EVALUATION OF ENTOPHYTIC  
*ACTINOMYCETES SP* AS POTENTIAL INDUCERS OF DOWNY  
MILDEW DISEASE RESISTANCE AND GROWTH PROMOTER  
IN PEARL MILLET**

**Final Report of Minor Research Project**

**Submitted**

**TO**

**UNIVERSITY GRANTS COMMISSION  
South Western Regional Office,  
P.K. Block, Palace Road, Gandhi Nagar, Bangalore-560009**

**MRP(S)-0152/12-113/KAMY004/UGC-SWRO, Dated 29 March 2013**

Effective date of starting of the project: **01/11/2013**

Total amount approved Rs. : **1, 60, 0000=00**

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# **Isolation and Evaluation of entophytic *Actinomycetes* sp as potential inducers of downy mildew disease resistance and growth promoter in pearl millet**

## **BACKGROUND**

Downy Mildew disease caused by *Sclerospora graminicola* is responsible for worldwide yield losses on pearl millet (Nutsugah *et al.*, 2002). The disease affects huge population of poor people of semi-arid tropic regions of Africa and Asia who rely on pearl millet for their basic sustenance. Successful control of this disease is dependent on expensive chemicals and host resistance (Zarafi *et al.*, 2005). Due to the distinct physiological and phylogenetic niche these organisms occupy; most of the control measures have failed to obtain a durable downy mildew disease resistance (Tyler 2002; Schena and Cooke, 2006).

Induction of resistance has emerged as an attractive new alternative for managing crop diseases in a sustainable manner within the scope of conventional agriculture system (Vallad and Goodman, 2004). The method is environmentally safe compared to the pesticides and offers numerous advantages like enhanced yield, biodegradable nature, durability and broad-spectrum action (Madhaiyan *et al.*, 2006; Mishra *et al.*, 2006; Małolepsza, 2006). Number of inducers has been tested against downy mildew disease of pearl millet but previous attempts with different classes of inducing agents have resulted in identification of only a small number of bioagents for durable downy mildew disease resistance. Thus the present situation demands a constant and concerted effort to identify an effective inducer of downy mildew disease resistance in pearl millet.

Our work proceeded on a preliminary screening of endophytic *Streptomyces* sp. originating from pearl millet root samples for an enhanced

resistance to downy mildew. *Streptomyces* spp are known to produce many degradative and proteolytic enzymes which help in degrading the cell wall components of pathogens, which could lead to prevention of the spread of the pathogen in the host tissues (Bibb, 2005). The present study was carried out to ascertain whether seed treatment of pearl millet with proteolytic streptomyces of endophytic origin confers protection against downy mildew caused by *S. graminicola*. It also investigates whether the observed protection is the result of induced resistance.

### **Out Come of the Project**

A total forty endophytic *Streptomyces* spp. isolates were successfully isolated from surface sterilized pearl millet roots. The growth characteristic of all the forty isolates were studied on three different media 'S' media, casein starch agar and actinomycetes medium. A modified microplate assay was performed to test the proteolytic activity of the endophytic *streptomyces* isolates using cell free extracts after an 18 h growth cycle with casein as the substrate. In twenty isolates among the forty tested recorded proteolytic activity. All the twenty-three isolates, which showed proteolytic activity, were tested for their effect on downy mildew pathogen of pearl millet, *Sclerospora graminicola*. Ten isolates recorded in vitro inhibition by affecting the zoospore release and motility. The remaining 13 isolates, which did not demonstrate anti-sporulant activity, were used to induce in vivo resistance in pearl millet. Cell-free extract and the mycelial mats used as seed soaking and seed dressing treatments for three and six hours respectively. Artificial inoculation with the downy mildew pathogen to two-day-old susceptible coleoptile seedlings for three consecutive days recorded differential downy mildew depressing ability. Protection rates ranging from 30 to

63 percent were obtained. *Streptomyces* spp. Pgr 06-05 and *Streptomyces* spp Pgr 04-05 offered 63 and 56 percent downy mildew disease protection respectively. The two strains also induced resistance in pearl millet with time delay of 72 h between inducer treatment and maximum resistance expression. The two strains were also found to induced resistance and have growth promotional effect on both vegetative and reproductive growth. Thus Endophytic *Streptomyces* spp. have proved as effective possible biocontrol in inducing downy mildew disease resistance.

## **Publications**

- 1. Pushpalatha, H.G.,** Geetha, N.P. and Shetty, H.S. **2019.** Isolation and Evaluation of endophytic *Actinomycetes* spp as potential inducers of downy mildew disease resistance and growth promoter in pearl millet. Communicated. European journal of Plant Pathology (Under Review)