



# Harnessing Pomegranate Microbiome for Sustainable Pomegranate Production:

## A Success Story From Lab To Land

Manjunatha N., Somnath S. Pokhare, Prakash G. Patil, N. V. Singh, Mallikarjun M. H. and R. A. Marathe

ICAR-National Research Centre on Pomegranate, Solapur (MS)-413255, INDIA



### INTRODUCTION

- Pomegranate (*Punica granatum* L.) is an ancient, highly valued fruit globally for its **nutritional superiority and medicinal properties** (rich in polyphenols).
- Its expanding production is severely threatened by **diseases** caused by bacteria, fungi and root knot nematode.
- To meet the demand for residue-free fruit, management increasingly relies on beneficial microbes which suppress pathogens through:
  1. Antibiosis
  2. Competition
  3. Plant growth promotion by enhanced nutrient solubilization/uptake from soil
  4. Increasing plants' immunity

### OBJECTIVES

1. Develop sustainable management strategies
2. Enhance soil nutrient availability
3. Reduce chemical pesticide dependency
4. Improve overall crop productivity

### KEY BENEFITS

1. Environmentally safe application
2. Enhanced plant resistance mechanisms
3. Improved soil health and fertility
4. Cost-effective farming solution

### METHODOLOGY

#### 1. A story of serendipity: exploiting endo-sphere microbiome

- Native endophytes isolated from tissue cultured pomegranate plants
- Act as potential biocontrol agent against foliar pathogens causing bacterial blight, fruit rot and as growth promotion agents
- Efficacy has been proven under polyhouse conditions and on field against bacterial blight.
- Most of the effective isolates have been found to belong to the genus *Bacillus* [NAIMCC-B-03178-80]

#### 2. Exploiting soil microbiome for soil borne disease management

- Suppressive soil from pomegranate orchards
- Culture-based isolation of soil microflora
- Fungal bioagents found effective against wilt and root knot nematodes
- Most of the effective isolates have been found to belong to the genus *Trichoderma* [NAIMCC-F-04295-97]

#### 3. Exploiting rhizosphere microbiome for nutrient management and bio-hardening

- Isolation of fungal strains from rhizosphere-soil of pomegranate orchards with good bearing
- Mineral solubilizing microbes (MSMs): P, K & Zn solubilizer and mobilizer improving nutrient availability
- Increased nutrient uptake leading to growth promotion of pomegranate plants
- Fungal strain identified as *Penicillium pinophilum* [NFCCI 2498]

### PRODUCTS



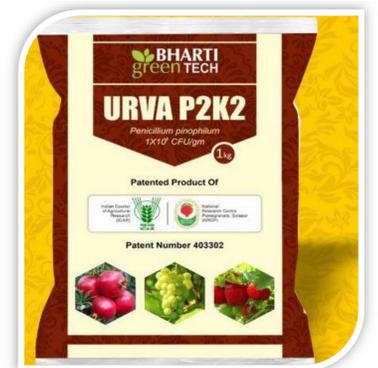
#### Eco-friendly Immune Modulator

- *Bacillus* spp. consortium
- Natural biocontrol agent against foliar, soil borne pathogens
- Enhances plant immunity
- P,K & Zn Solubilizer & Mobilizer



#### Disease Prevention

- *Trichoderma* spp. consortium
- Protection against wilt and root knot nematodes
- Improves soil quality
- Reduces crop losses significantly



#### Nutrient Enhancement

- *Penicillium pinophilum*
- Multi-functional P, K & Zn solubilizer and mobilizer
- Improves nutrient availability

### REFERENCES

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2. Maity, A., Pal, R.K., Chandra, R. and Singh, N.V., 2014. *Penicillium pinophilum*—A novel microorganism for nutrient management in pomegranate (*Punica granatum* L.). *Scientia Horticulturae*, 169, pp.111-117.

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