

**STUDY ON THE EFFECT OF CO-INOCULATION OF  
*BRADYRHIZOBIUM JAPONICUM* AND *PIRIFORMOSPORA*  
*INDICA* Verma *et al.* ON *GLYCINE MAX* (L.) MERR.**

**A**

**Dissertation**

**Submitted to the Central Department of Microbiology  
Tribhuvan University**

**In Partial Fulfillment of the Requirements for the Award of the Degree of  
Master of Science in Microbiology (Environment and Public-Health)**

**by**

**Rajani Shrestha**

**Central Department of Microbiology**

**Tribhuvan University**

**Kirtipur, Kathmandu, Nepal**

**2006**

## RECOMMENDATION

This is to certify that Ms. Rajani Shrestha has completed this dissertation work entitled “**STUDY ON THE EFFECT OF CO-INOCULATION OF *BRADYRHIZOBIUM JAPONICUM* AND *PIRIFORMOSPORA INDICA* Verma *et al.* ON *GLYCINE MAX* (L.) MERR.” as a partial fulfillment of M.Sc. Degree in Microbiology under our supervision. To our knowledge this thesis work has not been submitted for any other degree.**

---

**Dr. Anjana Singh, Ph. D**

Head of the Department

Central Department of  
Microbiology

Tribhuvan University

Kirtipur, Kathmandu

---

**Mr. Binod Lekhak**

Assistant Professor

Central Department of  
Microbiology

Tribhuvan University

Kirtipur, Kathmandu

---

**Prof. Dr. Braj Nandan Prasad**

Biotechnology Unit

Central Department of  
Botany

Tribhuvan University

Kirtipur, Kathmandu

Date: \_\_\_\_\_

## CERTIFICATE OF APPROVAL

On the recommendation of **Dr. Anjana Singh, Mr. Binod Lekhak** and **Prof. Dr. Braj Nandan Prasad**, this dissertation work by **Ms. Rajani Shrestha**, entitled “**STUDY ON THE EFFECT OF CO-INOCULATION OF *BRADYRHIZOBIUM JAPONICUM* AND *PIRIFORMOSPORA INDICA* Verma *et al.* ON *GLYCINE MAX* (L.) MERR.” has been approved for the examination and is submitted to the Tribhuvan University in partial fulfillment of the requirement for M. Sc. Degree in Microbiology.**

---

Anjana Singh, Ph. D  
Head of the Department,  
Central Department of Microbiology,  
Tribhuvan University,  
Kirtipur, Kathmandu.

Date: \_\_\_\_\_

## BOARD OF EXAMINERS

**Recommended by:**

\_\_\_\_\_  
**Dr. Anjana Singh**  
Supervisor

\_\_\_\_\_  
**Mr. Binod Lekhak**  
Supervisor

\_\_\_\_\_  
**Prof. Dr. Braj Nandan Prasad**  
Supervisor

**Approved by:**

\_\_\_\_\_  
**Dr. Anjana Singh**  
Head of the Department

**Examined by:**

\_\_\_\_\_  
**Dr. Surya Laxmi Maskey**  
External Examiner

\_\_\_\_\_  
**Mr. Shreekant Adhikari**  
Internal Examiner

**Date:** \_\_\_\_\_

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**Rajani Shrestha**

**Date:** \_\_\_\_\_

## ABSTRACT

The effect of dual inoculation of *Bradyrhizobium japonicum* and *Piriformospora indica* Verma *et al.* on the host plant soybean [*Glycine max* (L.) Merr. cv “Sathiya”] in pot cultures were investigated using sterilized and unsterilized soil and effects were recorded after every 15 days interval i.e. on 21<sup>st</sup>, 35<sup>th</sup>, 50<sup>th</sup> and 65<sup>th</sup> from the date of plantation. From a number of physiological indices measured in this study, microsymbionts increased nodule number, nodule fresh and dry weight, shoot length, root and shoot fresh and dry weight, nitrogen, phosphorus and potassium (NPK) content of soil and inoculated plants as compared with non-inoculated controls. In both the experiments, the highest increment was observed in dual inoculated plants on all the days observed. Root colonization on soybean plants increased in presence of *B. japonicum* than when *P. indica* was treated alone and percentage colonization increased with time. The better growth responses of inoculated plants were attributed to improvement in nutrient uptake, especially NPK. Therefore, this study provides evidence for benefits of *B. japonicum* to *P. indica* in the growth promotion of the host plant and this tripartite symbiosis could be a new approach to increase the productivity of the host plant. Thus, the microsymbionts have high potential in agro-forestry to be used as biofertilizers.

Key words: inoculation, *Glycine max* (L.) Merr. cv “Sathiya”, *Piriformospora indica*, *Bradyrhizobium japonicum*, microsymbionts, biofertilizer

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## LIST OF ABBREVIATIONS

%	percentage
μ	micron
AM	Arbuscular mycorrhiza
AMF	Arbuscular mycorrhizal fungi
ANOVA	Analysis of Variance
ATP	Adenosine triphosphate
B.C	Before Christ
BNF	Biological nitrogen fixation
FAO	Food and Agriculture Organisation
G + C	Guanine + Cytosine
H	Hydrogen
Ha <sup>-1</sup>	Per hectare
IAA	Indole Acetic Acid
kg	kilogram
kg <sup>ha</sup> <sup>-1</sup>	kilogram per hectare
LCO	LipoChitoOligosaccharide
mg	milligram
MMN	Modified Merlin-Norkans
MS	Murashige and Skoog
NPK	Nitrogen, Phosphorus, Potassium
PDA	Potato Dextrose Agar
rDNA	ribosomal Deoxyribonucleic acid
SAARC	South Asian Association for Regional Corporation
SPSS	Statistical Package for Social Scientists
VAM	Vesicular Arbuscular Mycorrhiza
WPM	Woody Plant Medium
YMA	Yeast extract Mannitol Agar
YMB	Yeast extract Mannitol Broth

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