



REFERENCES.

1. Alexander, M." The Nitrogen Cycle " In Introduction to soil Microbiology, pp. 245-247. Tokyo: Wiley International Edition, 1961.
2. Rosswall, T. " The Internal Nitrogen Cycle between Microorganisms, Vegetation and Soil. " In Ecological Bulletins No.22 (Nitrogen Phosphorus and Sulpher Global Cycles) pp. 158. Sweden: The Swedish Natural Science Research Council, NFR, 1975.
3. Sprent, J.I. The Biology of Nitrogen-Fixing Organisms. pp. 2, 13 England: McGraw-Hill Book Co. Ltd. 1979
4. Soderlund,R., and Svensson, B.H., " The Global Nitrogen Cycle." In Ecological Bulletins No.22 Nitrogen,Phosphorus and Sulphur Global Cycles Svensson,B.H.and Söderlund, R.(eds) p. 38 Swedish Natural Science Research Council NFR, 1975.
5. Söderlund, R. and Svensson, B.H., Ibid. p. 56
6. Burns, R.C.,and Hardy, R.W.F. Nitrogen Fixation in Bacteria and Higher Plants. pp. 8-30. New York:Springer-Verlag, 1975.
7. Bohlool, B.B., and Schmidt,E.L. " Lectins; a Possible Basis for Specificity in the Rhizobium Legume root Nodule Symbiosis." Science 185 (1974): 269-271.
8. Ray, T.B., Peters, G.A., Toia, Jr., R.E., and Mayne, B.C.

- " Azolla-Anabaena Relationship " Plant Physiol.
62 (1978) : 463-467.
9. Stewart, W.D.P., Fitzgerald, G.P., and Burris, R.H.
" In Situ Studies on N₂-Fixation Using the Acetylene
Reduction Technique." Biochemistry 58 (1967):2071-2078.
10. Dobereiner, J., Marrel, I.E., and Nery, H.
" Ecological Distribution of Spirillum lipoferum
Beijerinck" Can. J. Microbiol. 22 (1976): 1464-1473.
11. Smith, R.L., Bouton, J.H., Schank, S.C., Quesenberry,
K.K., Tyler, M.E., Milan, J.R., Gaskins, M.H.,
and Littell, R.C. " Nitrogen Fixation in Grasses
Inoculated with Spirillum lipoferum." Science
193 (1976):1003-1005.
12. Hegazi, N.A., Monib, M., and Vlassak, K. " Effect of
Inoculation with N₂-Fixing Spirilla and Azotobacter
on Nitrogenase Activity on Roots of Maize Grown under
Subtropical Conditions." App. Environ. Microbiol.
38 (1979) : 621-626.
13. Von Bulow, J. F. W. and Dobereiner, J. " Potential for
Nitrogen Fixation in Maize Genotypes in Brazil."
Proc. Nat. Acad. Sci., USA. 72 (1975):2389-2393.
14. Neyra, C. A. and Dobereiner, J. " Nitrogen Fixation in
Grasses." Advances in Agronomy. 29 (1977):1-37
15. Matsuguchi, T., Tangchum, B., Patiyuth, S. " Free-living
Nitrogen Fixers and Acetylene Reduction in Tropical
Rice Field." JARQ 8 (1975):253-256.

16. Martinez, M. R., Pantastico, J. B. and Cosico, W. C., "Nitrogen Fixation by Algae in Lowland Rice Fields of the Philippines." Paper presented during the workshop on Nitrogen Cycling in South-East Asia Wet Nonsoonal Ecosystems held at Chiang Mai, Thailand on November 5-11, 1979.
17. Davis, L.C. and Wang, Y. " In Vivo and In Vitro Kinetics of Nitrogenase". J. Bacteriol., Mar, 3 (141, 1980) : 1230-1238.
18. Yoch, D. " Manganese, an Essential Trace Element for N₂ Fixation by Rhodospirillum rubrum and Rhodopseudomonas capsulata: Role in Nitrogenase Regulation." J. Bacteriol. Dec, 140 (3, 1979) : 987-995.
19. Ohisa, N. and Yamaguchi, M. " Clostridium Species and -BHC Degradation in Paddy Soil." Soil Biol, Biochem. 11 (1979):645-649.
20. Metzler, D.E. " The Metabolism of Nitrogen Containing Compounds." In Biochemistry: The Chemical Reaction of Living Cells." pp 809. USA:Academic Press, Inc, 1979.
21. Sunanta Jermhansa. " The Relation of Protein Content and Nitrogen Fixation in Forage Crops." Master's thesis, Department of Biochemistry, Faculty of Science, Chulalongkorn University, 1979.
22. Dilwarth, M.J. " The Plant as the Genetic Determination of Leghaemoglobin Production in the Legume Root Nodule." Biochem. Biophys. Acta. 184, (1969):432-441.

22. Hardy, R.W.F., Burns, R.C. and Holsten, R.D. "Application of the Acetylene-Ethylene Assay for Measurement of Nitrogen-Fixation." Soil Biol. Biochem., 5 (1973):47-81.
24. Lee, K.K.. and Watanabe, I. "Problems of the Acetylene Reduction Technique Applied to Water-Saturated Paddy Soils " Appl. Environ. Microbiol. 34, Dec (1977):654-660.
25. Watanabe,, I.,and Culrera, D.R. "Nitrogen Fixation Associated with the Rice Plant Grown in Water Culture." Appl. Environ. Microbiol., May (1979):373-378.
- 26% Dobereiner,, J., Day, J.M., and Dart, P.J. "Nitrogenase activity and Oxygen Sensitivity of the Paspalum notatum Azotobacter paspali Association. J. Gen. Microbiol. (1972):102-116.
27. Hirota. Yo, Fujii, T., Sano, Y.,and Iyama,S. "Nitrogen Fixation in the Rhizosphere of Rice." Nature,276 (1978) 416-417.
28. Day, J.M., Dobereiner, J. "Physiological Aspects of N₂-Fixation by a Spirillum from Digitaria roots." Soil Biol. Biochem.,8, (1976):45-50.
29. Okuda, A. "The effect of drainage on rice growth " Nogaku 2 (1948):306 Cited by Watanabe, I., Lee, K.K., and Almagno, B.V. in "Seasonal Change of N₂-Fixation Rate, in Rice Field Assayed by in situ Acetylene Reduction Technique" Soil Sci. Plant Nutr., 24,(1978) : 1-13

30. Watanabe, I. "Azolla and Its Use in Lowland Rice Culture." Isuchi to Biscibutsu, 20 (1978): 1-10.
31. Mac Rac, I.C., and Castro, T.F., "Root Exudates of the Rice Plant in Relation to Akagare a Physiological Disorder on Rice." Plant and Soil, 26 (1967):317-323.
32. Dommergues, Y.R., and Rinaudo G., "Factor Affecting N₂-Fixation in the Rice Rhizosphere." Symposium on Nitrogen and Rice IIRR, Sep.(1978):18-21.
33. Chakraborty, S.P., and San Gupta, S.P. "Fixation of Nitrogen by the Rice Plant." Nature 184 (1959):2033-2034.
34. Yoshida, T., and Ancajus, R.R. "Nitrogen Fixation by Bacteria in the Root Zone of Rice." Soil Sci.Soc.Amer.Proc., 35 (1971):156-157.
35. Yoshida, T., and Ancajus, R.R. "The Fixation of Atmospheric N₂ in the Rice Rhizosphere." Soil Biol. Biochem. 5,(1973):153-154.
36. Firth, P., Thitipoca, H., Suthipradit, S., Wetselaar, R. and Beech, D.F. "Nitrogen Balance Studies in the Central Plain of Thailand." Soil Biol. Biochem. 5 (1973):41-46
37. Cholitkul, W., Tangchum, B., Sangtong, P., and Watanabe, I. "Effect of Phosphorus on N₂-Fixation as Measured by the Field Acetylene Reduction Technique in Thailand Long-Term Fertility Plots." Soil Sci.Plant Nutr. 26,(1980):291-299.
38. Simasatitkul. C. and Boonjawat, J. "N₂ Fixing Bacteria In the Rice Rhizosphere." The abstract of the fifth international conference on global impacts of applied

- microbiology." 21-26 Nov. (1977):30
39. คณะกรรมการวิจัยแห่งชาติ, สำนักงาน, รายงานการศึกษาในโครงการทดลองวิจัยช้า
พ.ศ. 2515 - 2520, กรุงเทพมหานคร : สำนักงานคณะกรรมการวิจัย
แห่งชาติ
40. Dobereiner, J. "Forage Grasses and Grain Crops."
Advances in Agronomy. 29(1977):11.
41. Luria, S.E., Adams, J.W., and Ting, R.C. "Transduction of Lactose
Utilizing Ability among Strains of Escherichia Coli and
Shigella Dysenteriae and the Properties of the Transducing
Phage Particles," Virology 12(1960):348-390.
42. Prabuddham, P. Progress Report on "Ecology of Nitrogen Economy in
Tropical and Temperate Paddy Soil as Affecting the
Efficient Use of Lowland Soil." 1979.
43. Pelczar, Jr., and Chan, E.C.S., Laboratory Exercises in
Microbiology 4th. edition, USA.:McGraw-Hill, Inc., 1977.
44. Wada, H., Panichsakpatana, S., Kimura, M., and Takai, Y.
"Nitrogen Fixation in Paddy Soil. I. Factors Affecting
 N_2 -Fixation." Soil Sci. Plant Nutr., 24(1978):357-365.
45. Panichsakpatana, S., Wada, H., Kimura, H., and Takai, Y.
" Nitrogen Fixation in Paddy Soil III. N_2 Fixation and
Its Active-Sites in Soil and Rhizosphere." Soil Sci.
Plant Nutr., 25(2), (1979):165-171.
46. Balandreau.J., Pinaudo, G., Fares-Hamad, I Dommergues, Y.
"Nitrogen Fixation in the Rhizosphere of Rice Plants."
In Nitrogen Fixation by Free-living Organisms. 1st.

- Published, London: Cambridge University Press, 1975.
47. Eskew, D.L., Fecht, D.D., and Ting, I.P. "Nitrogen Fixation, Denitrification, and Pleomorphic Growth in a Highly Pigmented Spirillum lipoferum." Appl. Environ. Microbiol., Nov. (1977):582-585.
48. Watanabe, I., Barraquis, W.L., De Guzman, M.R., Cabbera, D.A., " Nitrogen-Fixing (Acetylene Reduction) Activity and Population of Aerobic Heterotrophic Nitrogen-Fixing Bacteria Associated with Wetland Rice." Appl. Environ. Microbiol. May. (1979):813-819.
49. Dommergues, Y., Balandreau, J., Rinaudo, G., and Weinhard, P. " Non-Symbiotic Nitrogen Fixation in the Rhizosphere of Rice, Maize and Different Tropical Grasses." Soil Biol. Biochem. 5 (1973):83-89
50. Watanabe, I. and Barraqute, W.L. " Low Level of Fixed Nitrogen Required for Isolation of Free Living N₂-fixing Organisms from Rice Roots." Nature 277 (1979):565-566.
51. Chatchai Simasatitkul. " Biological Nitrogen Fixation in Rice Paddy Field as Measured By Acetylene Reduction Method." Master's Thesis, Department Of Biochemistry, Faculty of Science, Chulalongkorn University, 1978.
52. David, K. A. V., and Fay, P., " Effect of Long Term Treatment with Acetylene on Nitrogen Fixing Microorganisms." Appl. Environ. Microbiol. Dec.. (1977):640-646.
53. Rajaramanohar-Rao, V., " Nitrogen Fixation as Influence by

- Moisture Content Ammonium Sulphate and Organic Sources
in a Paddy Soil." Soil Biol. Biochem. 8 (1976):445-448.
54. Pagan, J.D., Child, J.J., Scowcroft, W.R. and Gibson, A.H." Nitrogen Fixation of Rhizobium culture on a defined medium." Nature, 256, July (1975):406-407.
55. Buchanan, R.E. and Gibbons, N.E. Bergy's Manual of Determinative Bacteriology. the 8th. edition, U.S.A. Williams and Wilkins Company, 1974.
56. Tarrand, J.J., Krieg, N.R., and Dobereiner, J. "A Taxonomic Study of the Spirillum lipoferum, with Descriptions of a New Genus, Azospirillum. Nov. and two Species, Azospirillum lipoforum (Beijerinck) comb. nov. and Azospirillum brasiliense. sp. nov." Can. J Microbiol. 24, (1978):967-980.
57. Wong, P.P., Stenberg, N.E. and Edgar, L. "Characterization of a Bacterium of the Genus Azospirillum from Cellulolytic Nitrogen Fixing Mixed Culture." Can.J. Microbiol., 26, (3), (1980):291-296.
58. Barber, L.E. and Evans, H.J. "Characterization of a Nitrogen - Fixing Bacterial Strain From the Roots of Digitaria sanguinalis." Can. J. Microbiol. 22, (1976):254-260.

APPENDIX

Table 14. The original information of eight characterized bacterial cultures.

Bacterial code	Original information of the isolated bacterial cultures					
	Rice experiment site	Rice variety	Stage of rice growth	Treatment of fertilizer application	Rhizo-spheric	Incubating medium
17R1a2	Tapra	RD.6	Tiller-ing	N,P,K	Root (non-sterile)	NF + YE
18Sa22	Tapra	RD.15	Tiller-ing	N,P,K	Soil	NF + YE
5RC12	Chumpae	RD.7	Maximum Tiller-ing	T ₂	Root (non-sterile)	NF
6SC1	Chumpae	RD.7	Maximum Tiller-ing	T ₅	Soil	NF
15RR12	Rangsit	RD.7	Ripening	T ₅	Root (non-sterile)	NF
16SR1	Rangsit	RD.7	Ripening	T ₁₀	Soil	NF
10Sa21	Tapra	RD.15	Tiller-ing	N,P,K	Soil	NF + YE
25Sa12	Tapra	RD.6	Maximum Tiller-ing	N,P,K	Soil	NF + YE

BIOGRAPHY.

Miss Poontariga Harinasut was born on the
21st. August, 1955 and graduated with a
B.Sc. in Chemistry from Kasetsart University
in 1977.

