Enhancement in Early Growth of Oil Palm Nursery Seedlings Inoculated with *Azospirillum* spp

Zulkifli Hj. Shamsuddin

Faculty of Agriculture,
Universiti Putra Malaysia
43400 UPM, Serdang, Selangor
Malaysia

Telephone Number of Corresponding Author: 03-89466990
E-mail of Corresponding Authorzulsham@agri.upm.edu.my

Key words: oil palm, *Azospirillum,* biofertilizer, bioenhancer, nitrogen fixation

Introduction

Azospirillum, an associative nitrogen (N_2) fixing bacteria, is commonly associated with roots of grasses (Malik, 1980), maize and sugar cane (Dobereiner, 1982), and has been shown to stimulate growth of root hairs in peas (Okon, 1986). Recently it has also been demonstrated to increase root volume of young banana seedlings (Shamsuddin and Baset, 1998). Preliminary studies have indicated that *Azospirillum* can increase the photosynthetic rates of 3-months old oil palm seedlings (Shamsuddin and Amir Hamzah, 1998). However specific beneficial effects of *Azospirillum* inoculation on oil palm seedlings have not been identified.

Materials and Methods

1. *Azospirillum* inoculation on growth of oil palm plantlets and seedlings in acid conditions. A)Glasshouse and field (nursery) studies using oil palm seedlings inoculated with *Azospirillum* were conducted with enriched -^{15}N dilution technique. The rate of N_2 fixed and other beneficial effects of *Azospirillum* inoculation were assessed.

Results and Discussion

Results showed that *Azospirillum* inoculation treatments contributed up to 48% of the total nitrogen requirement of the oil palm clonal seedlings, stimulated top and root growth (+30%) and increased the host photosynthetic rates (+50%) compared to control.

Conclusions

Azospirillum could fix nitrogen with oil palm seedlings and increased the photosynthetic rates as well as top and root growth.

Benefits from the study

Oil palm growers will benefit directly from the N_2 fixing *Azospirillum* inoculation due to savings in nitrogen fertilizer cost. The bigger oil palm nursery seedlings will reduce the nursery period and increase savings.

Patent(s), if applicable:

None

Stage of Commercialization, if applicable:

Not applicable

Project Publications in Refereed Journals

1. Amir, H.G., **Shamsuddin, Z.H.**, Halimi, M.S., Ramlan, M.F. and Marziah, M. 2003. N_2 Fixation, nutrient accumulation and plant growth promotion by rhizobacteria in association with oil palm seedlings. *Pakistan Journal of Biological Sciences* 6 (14): 1269-1272.

2. Amir, H.G., **Shamsuddin, Z.H.**, Halimi, M.S., Ramlan, M.F. and Marziah, M. 2001. Effects of *Azospirillum* inoculation on N_2 fixation and growth of oil palm plantlets at nursery stage. *J. Oil Palm Res.* (Former title: *Elaeis*). 13(1): 42-49.

Project Publications in Conference Proceedings

1. Amir, H.G., **Shamsuddin, Z.H.,** Halimi. M.S., Ramlan, M.F. and Marziah, M. (2000). Potential use of rhizobacteria for sustainable oil palm seedling production. *Int. Sympo. on Sustainable Land Management: Paradigms for the New Millenium.* (8-10 Aug., 2000), Kuala Lumpur, Malaysia. p. 26-28.

2. Amir H. G., **Shamsuddin Z. H.,** M.S. Halimi, M.F. Ramlan and Marziah, M. (1999). Effects of *Azospirillum* inoculation on N_2 fixation and growth of oil palm seedlings. Proc. Soil Sci. Conf. of Malaysia 1999(20-21 April, 1999) Seremban,Malaysia . p.231-239.

3. **Shamsuddin, Z.H.,** Amir, H.G. and Mia, M.A.B. (1999). *Azospirillum* as bioenhancer and biofertilizer for banana and oil palm seedlings. . In: Yoshida, T., Seki, T., Pornchai, M., Ebora, R.V., Sukara, E. and Ismail, M.A.K. (eds). *Biotechnology for Sustainable Utilization of Biological Resources in the Tropics.* Osaka, Japan. 13: 326-338.

4. **Shamsuddin, Z.H.,** Amir, H.G., Halimi, M.S., Nazalan, N., Ramlan, M.F. and Marziah, M. (1999). Growth of oil palm seedlings inoculated with N_2 fixing *Azospirillum* and rhizobacteria. 7th. Malaysia PlanColloquium on Advances in Oil Palm Research under IRPA- Funded Programmes. (1 – 3 November 1999). PORIM. Bangi, Malaysia.

5. Amir, H.G., **Shamsuddin, Z.H.,**. Halimi, M.S., Ramlan, M.F. and Marziah, M. (1999). Estimation of N_2 fixation by *Azospirillium* and *Azobacteria* in association with oil palm seedlings. Proc. 22nd. Malaysian Soc. Microbiol. Sympo.(21-24 November 1999). Penang. Malaysia.

Graduate Research

	Name of Graduate	Research Topic	Field of Expertise	Degree Awarded	Graduation Year
2.	**Amir Hamzah Ahmad Ghazali**	**Nitrogen Fixation and Plant Growth Enhancement by Beneficial Rhizobacteria in Association with Oil Palm**	**Soil Microbiology**	**Ph.D.**	**2002**

IRPA Project number:01-02-04-0372
UPM Research Cluster: AFF