

CHAPTER 1

INTRODUCTION

In 1989 Schneider wrote that results from most recent climatic models suggested that global average surface temperatures would increase by some 2° to 6°C during the 21st century, but future changes in greenhouse gas concentrations and feedback processes not properly accounted for in the models could produce greater or smaller increases. As a consequence soil temperatures in the tropics may rise up to about 45°C in the future. The rise in soil temperature will affect growth and physiology of soil micro-organisms including both free-living and symbiotic nitrogen-fixing bacteria. Free-living nitrogen fixers include *Aquaspirillum fasciculus*, *Azotobacter* spp., and *Beijerinckia* spp. (Holt et al, 1994). Soybean symbiotic nitrogen fixers have been divided into fast- and slow-growing rhizobia of the genera *Sinorhizobium fredii* and *Bradyrhizobium japonicum* respectively (Elkan & Bunn, 1992).

In 2001 the Department of Agricultural Extension, the Royal Thai Government, reported that soybeans were cultivated mainly in the north, northeast, and central parts of Thailand as indicated in Figure 1.1 *Rhizobium* inocula have been manufactured in Thailand by both governmental agency and private company such as the *Rhizobium* Unit, Ministry of Agriculture and Co-operatives and the Bangkok Seed Industry, Co.Ltd. based in Saraburi province. Manufactured rhizobial inocula need refrigeration for long term storage of viable inocula. This practice results in high cost for refrigeration. In countries such as India, rhizobial inocula have been kept underground under the shadow of trees to keep the inocula cool.

In 2000, Suwat Saengkerdsub isolated 5 fast-growing bacterial isolates (S171-S175) and 4 slow-growing *Bradyrhizobium japonicum* (S76, S78, S162 and S178) from root nodules of soybean (*Glycine max* cv. SJ5) grown in acidic soil (average soil pH 5.25) from Nern Mahatsajun, Kao Kaw district, Petchaboon Province.

The aims of these experiments are to obtain RAPD-PCR fingerprints to find out which of the fast-growing S171-S175 and the slow-growing S76, S78, S162, S178 are the same strains, to identify the bacterial isolates and to find out changes in nitrogen fixing potential and changes in protein profiles when isolates S172, S173, S174, S76,

S78, S162 and S178 were cultured at high temperatures. The results obtained will be used for the construction of heat-tolerant rhizobial inocula which require no refrigeration upon transportation and storage.



Figure 1.1 Map of Thailand showing areas of soybean cultivation in 1999/2000.

(Source : Department of Agricultural Extension, 2001)