

## CHAPTER 4

### DISCUSSIONS

#### I. Soybean seed field emergence performance

Soybean seed field emergence was influenced by watering pattern, soil moisture content, and soil moisture uniformity. Under daily watering and an average soil moisture content of 7-11%, the seeds of both varieties had a field emergence index of 80-97% (Tables 2 and 3). This should be the ideal field condition for soybean seed planting (Egli and TeKrony, 1996). Under the water-limited field conditions of scattered watering during 7 days of field emergence period or limited water supply, the soybean seeds had a field emergence index of 60-80% only if the average soil moisture content was at 7-11%. If the average soil moisture content was lower than 7%, the seeds had a field emergence index of lower than 60%; especially in dry conditions with a soil moisture content lower than 6% at the early period (0-4 days after planting) most seeds had field emergence index of lower than 10%. This showed that the early period of seed imbibition had a crucial effect on seed germination (Muthiah *et al.*, 1994).

Under adequate water or daily watering conditions, soybean seeds showed ability to germinate in the field mostly 80% or higher in all seed quality levels (Tables 4 and 5). This indicated that field emergence could be calculated from the standard germination percentage and its field emergence index of 80%. The high quality seeds tended to have a higher speed of emergence index and seedling growth in terms of seedling height and dry weight.

Under water-limited conditions, all quality levels of CM 60 seeds had statistically non-significantly different ability to germinate in the field, mostly in the range of 60-80% of their standard germination or field emergence index of 60-80% (Table 6). Only high quality seeds of SJ 5 variety showed the same range of field emergence index (Table 7). The medium and low quality seeds of SJ 5 had a very low field emergence index of 11.45-34.41%. High quality seeds also showed higher speed of germination index, seedling height and seedling shoot dry weight.

Again under moderately water-limited field condition, the field emergence could be calculated from its standard germination by using 60-80% of field emergence index in all quality seeds of CM 60 and high quality seeds of SJ 5 variety.

Under planting in the rainy season, only high quality seeds of CM 60 and high and low quality seeds of SJ 5 variety had the same range of field emergence index of 68.97-72.71% (Table 8) as in drought field condition. Soybean seeds could not tolerate flooding condition. They gave a very low germination after flooding for 4 hours (Table 15). The excess water in soil caused a reduction of oxygen diffusion that reduced soybean seed germinability (Sung, 1995). This is also similar to the earlier report by Wuebker *et al.* (2001) that soybean seeds were susceptible to flooding of 1 to 48 hours during the early germination process.

The soybean seed field emergence performance indicated that under adequate water, the seeds of all qualities had ability to germinate in the field 80% and higher of their standard germination percentages. Under moderate moisture stress condition, drought condition, all quality seeds of CM 60 had the ability to germinate in the field in the range of 60-80% of their standard germination percentages but only high quality seeds of SJ 5 had the same range of germination ability in the field. Also high quality seeds of both varieties and low quality seeds of SJ 5 showed the same range of germination ability in the rainy season as in drought field condition.

## **II. Water-limited germination test to evaluate soybean seed field emergence under stress planting field conditions**

Soybean seeds had different responses to drought and rainy season planting (Table 9). CM 60 seeds had statistically the same field emergence under drought and rainy season in high and medium quality seeds. SJ 5 seeds had the same field emergence when planted in rainy season as under daily watering condition. Anyhow, if the test could evaluate the field emergence under drought field planting condition, it also might be used to evaluate the field emergence in rainy planting condition. This was true in high quality seeds of both varieties and medium quality seeds of CM 60 (Table 16). The test made by planting the seeds in soil in baskets with watering at 50% of plant available water every 2 days gave the same germination percentage

as drought and rainy season planting conditions. The water-limited germination test could also be used to evaluate field emergence of corn (Sawatdikarn, 2002), sweet corn (Jittham, 2002), and cucumber (Werakul, 2003). As medium and low quality seeds had field emergence lower than 50% under drought and rainy season planting conditions (Table 9), they should not be used for planting under stress field conditions. Also this water-limited germination test could not be used to evaluate the field emergence of low quality seeds of CM 60 and medium quality seeds of SJ 5 under drought and rainy season plantings.

For the soil series or soil types, different soil series, which in this study were silt loam and clay soil, could not be used for the test because they gave a higher seed germination than sandy loam soil from the Ranong/Phato association series (Table 18). This is in agreement with a previous report by Evers and Parsons (2003), who stated that more emergence of switchgrass was found in silt loam and clay soil than in sandy loam soil. It might be that silt loam and clay soil have higher moisture content at field capacity or higher water holding capacity. Difference in soybean seed germination could only be attributed to differences in the physical property of the soils, mainly might be soil moisture content. This means that the test developed had to be used for sandy loam soil, especially for high quality seeds. Further study should be done for soybean seed planting in other different soil types.