## Abstract

This study consists of three projects. First project is turmeric (*Curcuma longa* L.) improvement for resistance to bacterial wilt disease (*Ralstonia solanacearum*). Second project is optimum harvest time of Plai (*Zingiber cassumunar* Roxb.). Last project is the study on genetic variation of Plai's Seedling. The first project was carried out to determine the effect of turmeric varieties and gamma irradiation on bacterial wilt disease of turmeric. Eight turmeric seed rhizomes from line 001, 002, 003, 004, 005, 006, 007 and 008 were irradiated to varying dose of gamma ray; 0 Gy., 30 Gy. and 40 Gy. Turmeric varieties were grown in the pots at National Corn and Sorghum Research Center. The factorial experiment was designed at randomized complete block design with 2 replications. Inoculations were injected by syringe during the growing season at 54 days after planting with $10^8$ cfu/ml concentration of *Ralstonia solanacearum*. Data on different parameter of vegetative growth, yield and curcuminoid content were recorded. The different varieties showed no significantly influence on the plant height but effect on the number of tillers. The highest number of tillers (8.76, 7.50, 6.33 and 6.00 tillers per plant) was found in line 007, 008, 006 and 002 respectively. Turmerics that irradiated with 40 Gy. showed dwarfed and yellow furrow leaves, reduced the number of tillers and decreased disease susceptibility. The line 008 had higher disease resistant level than other lines. The maximum dry weight (120.97 and 103.08 grams per plant) of rhizomes were found from line 008 and 006 respectively. Moreover, the highest dry weight of rhizome was obtained from line 008 with 30 Gy. irradiation. Line 008 produced the highest curcuminoid content (6.5718 %) as compared to the other. The study indicated that both turmeric varieties and doses of gamma irradiation affected the level of bacterial wilt disease resistance and rhizome yield of turmerics.

The second project was conducted at National Corn and Sorghum Research Center. The factorial experiment was designed at randomized complete block design with three replications. The treatments consisted of three varieties (line 1, line 2 and line 3) and three harvest times (7 months, 9 months and 11 months). Plant growth, rhizome of Plai were recorded and volatile oil analyzed following the standard statistical procedure. The highest yield rhizome fresh weight (1,690.60 and 1,644.10 grams per plant respectively) was observed from line 2 and line 3 and significantly different from rhizome fresh weight of line 1 (690 grams per plant). No significant differences in quantity of volatile oil per weight were detected from various varieties and harvest times. However line 2 and line 3 showed the highest weight of volatile oil per plant which were 35.02 and 33.76 grams per plant respectively. The harvest date of 11 months gave the highest volatile oil yield (37.90 grams per plant). It was concluded that line 2 and line 3 were promising lines that provided high rhizome yield and volatile oil per plant. Results indicated that harvesting at 11 months after planting affected rhizome yield, volatile oil per plant and physical properties of volatile oil. The qualities of the oil do not meet the standard requirement according to TISI (Thai Industrial Standards Institute).

The third project was to study the genetic diversity of the seedlings of Plai (*Zingiber cassumunar* Roxb). The samples of leaves taking from each seedling had been collected. DNA from an individual seedling had been extracted and identified its DNA fingerprint. The Amplified Fragment Length Polymorphism (AFLP) technique was used to assess the genetic diversity and the genetic correlation between the seedlings and each their mother plant. In this study, the total of 13 mother plants in the germplasm collection and 109 seedlings were used. It was concluded that all of the seedling's DNA fingerprints showed the segregation patterns of the marker-loci which were differed from their mother plants. The result of the study, not only, can explain why we found the large genetic diversity of Plai in Thailand which normally use the rhizome as the seed for propagation purpose, but also, lead to the further investigation and utilization of the genetic resources to improve our worldwide standard pharmaceutical industrial in Thailand.