

Chakrit Na Takuthung 2012: Genetic Diversity and Provenance Variations on Growth and Some Morphological Traits of Siamese Senna (*Senna siamea* (Lam.) Irwin et Barneby) in Thailand. Doctor of Philosophy (Forestry), Major Field: Forestry, Faculty of Forestry. Thesis Advisor: Assistant Professor Damrong Pipatwattanakul, D.Sc. 143 pages.

Genetic diversity and provenance variations of Siamese Senna in the provenance trials were studied at Lad Krating Plantation, Chachoengsao province. The objectives were to (1) evaluate the provenance variation in desired traits including growth performances, biomass production, coppicing ability, and wood specific gravity; (2) determine the effect of management practices by fertilizer application and cutting levels for coppicing; (3) assess the genetic diversity and genetic distance. (4) clarify and understand the effect of genetic influence on phenotype. Inter simple sequence repeat (ISSR) markers were used to analyze the genetic diversity of 9 provenances of Siamese Senna in provenance trials.

Results showed the variation among provenances in all studied characteristics. The average seed width, length, thickness, and 1000-seed weight were .75 mm, 7.56 mm, 0.78 mm, and 25 g, respectively. The average survival percentage, diameter at ground level, total height, relative growth rate of diameter at ground level, relative growth rate of total height, total aboveground biomass, and wood specific gravity at 36 months old were 81.22%, 4.46 cm, 458.86 cm, 0.06 cm/cm/month, 0.07 cm/cm/month, 5.59 ton/hectare, and 0.56, respectively. The average coppice number, diameter at base level and total height at 6 months old were 5.88 coppices, 2 cm and 190.94 cm, respectively. The variation of fertilizer types on growth were statistically insignificant but chemical fertilizer showed the higher growth performances than the others. The coppicing ability at ground level show better coppicing ability than at 1.30 m.

ISSR analysis using 9 primers was carried out on 180 different samples. At the species level, 53 polymorphic loci were detected. The percentage of polymorphic bands (PPB) was 90.57%, Genetic diversity (H_e) was 0.262, and Shannon's information index (I) was 0.4033. Genetic differentiation (G_{st}) detected by Nei's genetic diversity analysis suggested 28% occurred among provenances. The average number of individuals exchanged between populations per generation (N_m) was 1.2503. By using ISSR markers results to assist the selection in provenance trials, the provenance from Potaram, Ratchaburi (seedlot 2002); Muang, Kanchanaburi; Muaklek, Saraburi; Takbai, Narathiwat and Chaibadal, Lopburi were recommended for planting in Chachoengsao and Eastern provinces without the problems of narrow genetic base in the future.

Student's signature

Thesis Advisor's signature