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Improvement of Wood Characteristics of Tropical *Acacia* by Molecular Breeding

(分子育種による熱帯アカシアの材質改良)

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Related RISH mission

Mission 1, 2, and 4

Abstract

Acacia species are fast-growing tropical trees, are widely planted in tropical countries. *Acacia* species including *Acacia mangium* and *Acacia crassicarpa* are largely used in the pulp and paper industries as fiber source due to their characteristics of high pulp yield and high fiber quality. It is well know that we are mostly depended on fossil fuels as energy source. The increase in energy demand is declining fossil fuel reserves. The burning of fossil fuel is steadily increasing the concentration of CO_2 and other greenhouse gases in the atmosphere. However, these acacias are yielded high biomass and can conserve biomass for several years, which considered to be utilized as an alternative fuel source to fossil resources. In various viewpoints, these two acacias are advantageous trees for plantation, therefore the more improvement of wood properties are required for commercial utilization. Molecular breeding based on the genetic transformation technology has been expected in the field of the tree improvement, because molecular breeding can confer the superior traits to the trees within a short period, which is very efficient from the breeding of trees with a long lifecycle. However, the researches on biotechnology of the *Acacia* species are existing at primitive stages.

The present study was undertaken to establish the efficient genetic transformation and regeneration protocols on those *Acacia* species.

In the present investigation, we have established *in vitro* shoot regeneration protocols of *A. mangium* and *A. crassicarpa*. The multiple shoots proliferation was achieved from nodal segment of both *Acacia* species. The nodular callus was obtained from leaf (pinnate) segment of *A. mangium* on Murashige & Skoog (MS) medium supplemented with the combination of thidiazuron (TDZ) and indole-3-acetic acid (IAA). Adventitious shoots organogenesis is being conducted on solid and liquid medium supplemented with various plant growth regulators (PGRs). In case of *A. crassicarpa*, the green nodular structures were achieved at cut ends in MS medium supplemented with TDZ + α-Naphthaleneacetic acid (NAA) after 15 days of culture. The embryogenic nodular callus obtained in MS medium supplemented with TDZ + NAA + 5% coconut water within two months after subculture. Finally, plantlet established through somatic embryogenesis after subculturing on medium containing different PGRs supplementation. The transgenic callus of *A. mangium* consisting of pH35CG was induced from nodal segments on MS medium containing TDZ + IAA + 20mg/l Hygromycin + 150mg/l carbenicillin.