

(別紙様式 14)

2017 年 08 月 24 日

論文の内容の要約

氏 名	Yus Andhini Bhekti Pertiwi
学位の種類	博士 (農学)
学府又は研究科・専攻	連合農学研究科 環境資源共生科学 専攻
指導を受けた大学	東京農工大学
学位論文名	Wood properties of two fast-growing tropical tree species, <i>Neolamarckia cadamba</i> and <i>Ochroma pyramidale</i> , planted in Indonesia

【論文の内容の要約】

Neolamarckia cadamba and *Ochroma pyramidale* are commercial fast-growing tree species in Indonesia. However, the plantations of these species are rarely found in Indonesia. Because the information on wood properties of these species is insufficient, forest growers have no desire to extensively plant these species in their own land. In addition, there is a negative assumption among the wood consumers that the wood obtained from faster-growing trees has inferior qualities. To encourage forest growers to establish the plantation forests by using these species, an integrated research to provide basic knowledge on wood basic properties of these species is important. Thus, the objectives of the present study are 1) to investigate the radial variations on wood properties and anatomical characteristics, 2) to obtain basic knowledge on decay resistance to the brown-rot (*Fomitopsis palustris*) and white-rot (*Trametes versicolor*) fungi related to changes in the amounts of the wood chemical components, and 3) to evaluate the effects of radial growth rate on wood properties and xylem maturation process.

Tree growth characteristics and SWV were investigated in 63 standing trees for each 4-year-old *N. cadamba* and 7-year-old *O. pyramidale* planted in East Java, Indonesia. In addition, the longitudinal variation of DMOE of logs was investigated in the harvested trees. Furthermore, radial variations of wood properties, anatomical characteristics, and cell proportions were determined for nine selected trees. The decay resistance and changes in the amounts of wood chemical components due to decay by *F. palustris* and *T. versicolor* were also investigated for 30, 60, and 90 days of incubation. Furthermore, the effects of radial growth rate on wood properties and xylem maturation process were evaluated in these two fast-growing tree species.

Significant positive correlation was found between stem diameter and tree height in *N. cadamba* as well as in *O. pyramidale*. However, no significant correlations were found between growth characteristics and SWV. In addition, DMOE of logs were differed among the trees for both

species. In *N. cadamba*, the radial variation of mean values for BD, CS parallel to grain, and several anatomical characteristics were rapidly increased up to around 4 – 6 cm from the pith. After 90 days of incubation, *N. cadamba* wood decayed by *F. palustris* showed higher mass loss compared to that decayed by *T. versicolor*. Furthermore, the ratio of lignin to holocellulose was increased with an increase in the incubation period in the wood specimens decayed by both fungi. In *O. pyramidale*, mean values of BD and mechanical properties were almost constant up to 8 cm from the pith and then sharply increased toward the bark. In contrast, mean values of fiber and vessel element lengths increased up to approximately 8 – 12 cm from the pith and then became almost stable toward the bark. *O. pyramidale* wood showed higher mass loss when decayed by *T. versicolor* compared to that decayed by *F. palustris*. In addition, the ratio of lignin to holocellulose was almost constant during the incubation period for the wood decayed by *F. palustris* and *T. versicolor*. The radial growth rate in both species did not affect any wood properties. Furthermore, the wood properties and anatomical characteristics varied from the pith to the bark, and they tended to change at the certain distance from the pith, suggesting that xylem maturation in these trees depends on the stem diameter. The trees in both species are considered to have already produced the wood with stable quality similar to mature wood in softwood. It is considered, therefore, that the stand rotation age for both species can be set below 4 and 7 years for *N. cadamba* and *O. pyramidale*, respectively in East Java, Indonesia.

Based on the results obtained in the present study, plus tree selection and conducting the appropriate tree breeding programs for these two species will result in the improvement of harvested tree volume and wood properties. Furthermore, it is considered that wood with stable quality will be obtained in shorter rotation age by developing the silvicultural treatments to stimulate tree growth in combination with tree breeding programs. In conclusion, wood resources from the *N. cadamba* and *O. pyramidale* plantations established by using seedling produced under the tree breeding programs for wood quality with accelerating tree growth rate by appropriate silvicultural treatments will be future raw materials for Indonesian wood industry.