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Use of the Pilodyn for Estimating Basic Density and Its Applicability to Density-based Classifying of *Cryptomeria japonica* Green Logs

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Abstract: We used a Pilodyn for estimating basic density in the green condition for the purpose of classifying logs of *Cryptomeria japonica* D. Don based on their density. The relationships between Pilodyn penetration depth in the radial direction (Pr) and basic density of blocks with pin penetration were examined in a wide basic density range of hardwoods and softwoods (199-779 kg/m^3), and *C. japonica* (221-474 kg/m^3). There were significant negative correlations in hardwoods ($r = - 0.92$, $P<0.001$), softwoods ($r = - 0.86$, $P<0.001$) and *C. japonica* ($r = - 0.82$, $P<0.001$). Thus, the basic density of the block could be estimated based on the penetration depth. Curvilinear regressions gave the best fits in hardwoods, softwoods and *C. japonica* and the estimated basic densities from the curvilinear regressions for the same Pr were close to each other. In *C. japonica*, Pr varied between sample groups with similar basic densities, and Pr was smaller in the group with greater earlywood width in spite of similar densities. We examined the applicability of the Pilodyn to estimating average density of *C. japonica* green logs. There was a significant correlation between Pr and the disk-averaged basic density ($r = - 0.84$, $P<0.001$). The 95% confidence limits of the disk-averaged basic density estimated from Pr were ±47 kg/m^3 when Pr was measured once, in each of two directions. The variations of the disk-averaged basic density within logs were smaller than the confidence limits except for those at the ground level. It was concluded that the Pilodyn could be used for classifying logs of *C. japonica* based on their density, although it is necessary to consider that the density variation from pith to bark could be

varied by tree age, inherited characters and growth conditions.

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