

**The Internal Optimization of trees by Environmental Stress
such as Water Deficiency and Liana Entwinement**

Dong Ok Lim

Department of Biology, Honam University

Because of the perennial nature, long life, and potentially large size of trees, these plants were required special consideration in their growth and development under environmental stress. From a comparison of cambial cells and their derivatives between naturally occurring dwarf trees and normal ones, it was concluded that tracheary elements and fibers in the annual rings of dwarf trees are shorter, narrower and fewer than those of normal trees. Dwarf trees appeared to have higher ratio of latewood to earlywood than that in normal trees. The frequency of anticlinal divisions and loss of cambial initials were low during the differentiation of xylem cell from cambial initials in dwarf trees. And the length and intrusive growth of fusiform initials were slightly less than those of normal trees. Thus, it is concluded that the shortening of tracheary elements and fibers in dwarf trees was due to the fact that cambial initials were themselves shortened and that intrusive growth during differentiation of xylem mother cells has occurred as a result of slow growth by environmental stress such as water deficiency.

And the anatomy of stemwood that grew spirally due to liana entwinement has been examined. In the first three years after entwinement by liana, annual radial growth of the stemwood increased by 1.2 to 5.0 times. Thereafter the radial increment declined markedly as the liana continued to develop, producing abnormal growth in the tree stem. The wood of the liana affected stem showed distinct differences in both cell orientation and anatomical characteristics compared with normal wood. In the first three years after entwinement, the vessels became inclined to the stem axis. In later growth all the axial cells contributed to spiral grain angles up to 30° to the stem axis. Dimensions of vessels and fibers were also found to be affected.

Dwarf growth and spiral growth of trees was due to the fact that these internal optimization of trees by environmental stress such as water deficit and liana entwinement were occurred.