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## Japanese journal of crop science

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#### Quantitative Analysis of the Architecture of Seminal Root System of Rice (*Oryza sativa* L.) Grown under Different Soil Moisture Conditions

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#### Abstract:

We analyzed and compared the development of the seminal root systems (seminal root axis and lateral roots) of seven rice cultivars grown under two different soil moisture conditions (upland and paddy treatment). The aim was to elucidate cultivar variation and environmental effects with emphasis on the configuration determined by the emergence and elongation of lateral roots (architecture). After growing in a root box for three weeks, the seminal root systems were sampled. The architectures were evaluated using topological, geometrical and fractal analyses in parallel with developmental analysis. Root system development laid emphasis on branching (emergence) of lateral roots under upland treatment and their elongation under paddy treatment. The cultivar variations in total root length were mainly due to variations in total root number and average external link length in the former and latter treatments, respectively, which are similar to those emphasized in each treatment. We found it possible to determine morphological differences in root systems among cultivars or treatments using mathematical parameters. However, we also found that to evaluate a root system architecture exactly, two features of the "complexity of branching pattern" must be understood (i.e., the degree of higher branching order and the frequency of lateral root branching using two parameters, such as topological indices and branching density). Furthermore, the significance of fractal dimension must be clarified according to the strategy of root system development.

#### Keywords:

Cultivar variation, Fractal dimension, Lateral root, Link length, Rice, Root system architecture, Soil moisture, Topological index, IN JAPANESE

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