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ONLINE ISSN : 1349-1008

PRINT ISSN : 1343-943X

Plant Production Science

Vol. 7 (2004) , No. 3 243-251



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Analysis of Lodging-Resistant Characteristics of Different Rice Genotypes Grown under the Standard and Nitrogen-Free Basal Dressing Accompanied with Sparse Planting Density Practices

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(Received: October 30, 2003)

Abstract: Field experiments were carried out in 2001 and 2002 to examine the lodging-resistance characteristics of various rice cultivars bred for the Tohoku region of Japan including the widely-cultivated cultivars (WCC) and the newly-released cultivars (NRC). The difference in these characteristics between the plants grown under standard (CONT) and nitrogen-free basal dressing accompanied with sparse planting density (BNo) practices was also analyzed. The lengths of the lower internodes and culms were often shorter in NRC than in WCC. Bending moment by whole plant was not different between NRC and WCC, but the breaking strength at the basal internode (IV) with leaf sheaths was often larger in NRC than in WCC. As a result, the lodging index was smaller in the former than in the latter. Breaking strength at the basal internode (IV) without leaf sheaths was also often larger in NRC than in WCC due to a larger cross section modulus or bending stress in NRC. Although the lengths of the upper internodes (I+II+III) were not different between BNo and CONT, the lower internodes (IV+V) were shorter in BNo, resulting in the shortened culms in BNo, especially in the long-culm cultivars. Breaking strength at the basal internode (IV) with leaf sheaths was significantly larger in BNo than in CONT, and thus the lodging index was smaller in BNo. The breaking strength at the basal internode (IV) without leaf sheaths and its two components, cross section modulus and bending stress, were also significantly larger in BNo than in CONT, particularly in the long-culm cultivars. These results suggest that besides creating new cultivars with short and stiff lower internodes,

cultivation with sparse planting density accompanied with application of a small amount of nitrogen fertilizer in the early growth stage like BNo may also effectively increase the lodging resistance in rice plants.

Keywords: [Breaking strength](#), [Lodging](#), [Lower internodes](#), [Nitrogen-free basal dressing](#), [Rice cultivars](#), [Sparse planting density](#)

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Pham Quang Duy, Akira Abe, Mitsugu Hirano, Satoru Sagawa and Eiki Kuroda: "Analysis of Lodging-Resistant Characteristics of Different Rice Genotypes Grown under the Standard and Nitrogen-Free Basal Dressing Accompanied with Sparse Planting Density Practices". *Plant Production Science*, Vol. 7, pp.243-251 (2004) .

doi:10.1626/pps.7.243

JOI JST.JSTAGE/pps/7.243

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