

Author: [ADVANCED](#)Volume Page Keyword: 
[TOP](#) > [Available Issues](#) > [Table of Contents](#) > [Abstract](#)

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[\[PDF \(1869K\)\]](#) [\[References\]](#)

Changes in NMR Relaxation of Rice Grains, Kernel Quality and Physicochemical Properties in Response to a High Temperature after Flowering in Heat-Tolerant and Heat-Sensitive Rice Cultivars

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Abstract: Rice productivity is related to the ability of plants to adapt to heat stress. The heat-tolerant cultivars ‘Nikomaru’ and ‘Chikushi 64’ and heat-sensitive cultivar ‘Hinohikari’ were grown at 30°C and 25°C for 49 days after flowering. At 30°C, only a few white immature kernels were produced in ‘Nikomaru’ and ‘Chikushi 64’, but about 22% of grains had immature kernels in ‘Hinohikari’. The high temperature(30°C) caused no significant changes in grain dry weight, water content, and the NMR T_1 value during the early ripening stage in ‘Nikomaru’ and ‘Chikushi 64’. It also did not affect grain development, especially with respect to the nucellar epidermis, in ‘Nikomaru’ and ‘Chikushi 64’, but caused clear cessation of development of the nucellar epidermis at 14 days after flowering in ‘Hinohikari’. In addition, high temperature decreased the amylose content and increased hardness vs. adhesion ratio of cooked rice in both ‘Nikomaru’ and ‘Chikushi 64’ resulting a softer, less sticky texture, but not in ‘Hinohikari’. The maximum viscosity and breakdown values were increased, and final viscosity decreased at 30°C in all three cultivars. These results suggested that starch in the endosperm of grains changed from a fluid state to a doughy state more slowly in ‘Nikomaru’ and ‘Chikushi 64’ than in ‘Hinohikari’, in which the water content and NMR relaxation time decreased, and transported assimilates accumulated slowly during grain development.

Keywords: [‘Chikushi 64’](#), [High temperature](#), [Kernel quality](#), [‘Nikomaru’](#), [NMR relaxation time \(\$T_1\$ and \$T_2\$ \)](#), [Nucellar epidermis](#), [Rice](#), [Water status](#)

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