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Diurnal Change in Water Balance of Heat-Tolerant Snap Bean (*Phaseolus vulgaris*) Cultivar and Its Association with Growth under High Temperature

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Abstract: A snap bean (*Phaseolus vulgaris* L.) cultivar Haibushi shows high productivity under high-temperature conditions. Together with intensive radiation, high temperature enhances transpiration and causes water deficit in plants even when they are irrigated enough. To characterize daily change in water balance of the heat-tolerant cultivar, we compared parameters of water balance, dry matter production and pod yield among cultivars. Four snap bean cultivars, Haibushi, Kurodane-Kinugasa, Oregon and Kentucky Wonder, were grown under optimal temperature (spring cropping) and high temperature (summer cropping) condition in the field. The daily water balance and gas exchange rate in the heat-tolerant cultivar Haibushi were compared with those in the heat-sensitive cultivar Kentucky Wonder, grown in 0.02 m² Wagner pots. In the summer cropping in the field, dry matter production, pod yield, stomatal conductance, photosynthetic rate and transpiration rate were higher in Haibushi and Kurodane-Kinugasa than in the other cultivars. In a glasshouse, the sap flow rate was lower than the transpiration rate in the morning when the transpiration rate rapidly increased in both Haibushi and Kentucky Wonder. In spite of the higher transpiration rate, Haibushi showed a higher sap flow rate and smaller cumulative water loss in the morning than Kentucky Wonder. We conclude that better growth of the heat-tolerant snap bean cultivar Haibushi under high temperature was due to higher photosynthetic rate resulting from higher stomatal conductance during the daytime, which

had a higher water uptake rate.

Keywords: [Heat tolerance](#), [Phaseolus vulgaris](#), [Sap flow](#), [Transpiration](#)

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