

Shading stress decreases rice seed setting rate by impeding pollination and fertilisation processes at the heading stage

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Abstract

Shading stress has become a worldwide phenomenon and can lead to rice (*Oryza sativa* L.) yield loss by decreasing the seed setting rate, which, in rice, depends primarily on spikelet fertility. However, little is known about the effect of shading stress on rice pollination and fertilisation processes. Here, a field experiment, spanning two years, was conducted using two rice varieties grown under full sunlight and 53% shading stress. Shading stress at the heading stage significantly decreased the anther dehiscence rate, and a mass of pollen grains remained in the anthers. Together with a reduction in the *in vitro* pollen germination rate and stigma exertion rate, shading stress reduced both the number of pollen grains and the number of germinated pollen grains per stigma by 29.44–71.16% and 9.82–63.16%, respectively. This ultimately resulted in yield loss due to reduction in the fertilisation and seed setting rates. We assert that shading stress decreased the seed setting rate by inhibiting the pollination and fertilisation processes of rice, particularly anther dehiscence and pollen grain release. Therefore, future studies should focus on the mechanisms behind anther dehiscence reduction under shading stress.

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