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Molecular and Biochemical Characterization of Germin-like Protein in Rice

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Germin-like proteins (GLPs) belong to a superfamily of cupin-domain containing proteins with a variety of functions in plant defense and in response to abiotic and biotic stresses. They are associated with three major enzymatic activities namely superoxide dismutase (SOD), oxalate oxidase (OxO) and ADPglucose pyrophosphatase/phosphodiesterase (AGPPase).

In this study, a germin-like protein located on rice chromosome 8 (*Os08g08960*), was identified and characterized by molecular and biochemical approaches. *Os08g08960* gene was expressed predominantly in spikelets and was designated as spikelets-specific germin-like protein (ssGLP). The ssGLP transcript was expressed strongly in 10, 15 and 20 days after fertilization (DAF) in panicles/spikelets, but was observed at lower levels prior to fertilization, 1, 3 and 25 days after fertilization (DAF). Molecular data from PCR provided evidence that *ssGLP* is present as single copy in seven cultivated rice varieties and ten wild rice species.

ssGLP is a bifunctional protein having both superoxide dismutase (SOD) and oxalate oxidase (OxO) enzymatic activities which are conserved in different rice varieties and during the development of rice panicles/spikelets. The observed bifunctional role of ssGLP is a first in rice. In addition, the SOD function of ssGLP was not affected under reduced photosynthesis and inhibition of carbohydrates production. Interestingly, the ssGLP is detected in anthers/stamen, ovules/carpel, palea/lemma and milky endosperm tissues of spikelets having tissue-dependent glycoforms. This result is the first time where the same protein is identified to be expressed in different tissues but with putatively different glycosylation pattern.

Award

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Contributors to the best paper at IRRI alumni

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