PB-86

Impaired Root Hairs Development in a Glabrous Rice (*Oryza sativa* L.) Mutant Line

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[Introduction]

For several decades, rice breeding programs mainly targeted yield-related traits in part due to the increasing demand of rice for food following the growing population growth rate pattern. Of these traits, number of panicle per plant, number of spikelets per panicle, grain filling ratio, and thousand grain weight, as well as grain shape attributes such as grain thickness, grain width, grain length, and grain length–width ratio are the most studied. Recently, there has been a growing interest in exploring the interplay between genetic factors controlling major yield traits of rice under various environmental conditions. A number of reports suggest the existence of a correlation between the shoot and the root development. Roots are indispensable plant organs that allow the plant to acquire nutrients. Root hairs play an important role in delivering oxygen to the rhizosphere for soil microorganisms. During gas exchange, plants release oxygen to the root rhizosphere via aerenchyma, and by the same means they take up gases such as carbon dioxide (CO_2) and methane (CH_4), which are conveyed through the vessels and emitted to the atmosphere.

[Materials and Methods]

A set of rice mutant lines were grown at the experimental field of the National Institute of Crop Science, Department of Southern Area Crop Science, Rural Development Administration, Miryang, Korea. Plants were grown under normal rice cultivation season (in Korea) a regular fertilization regime was applied. Through visual observation and by physical hand touch, plants were evaluated for their potential differential phenotypes compared with the wild type (WT) Milyang365.

[Results and Discussion]

We identified a glabrous rice mutant line (529189) characterized by a smooth (hairless) adaxial and abaxial leaf surfaces. The preliminary phenotypic characterization revealed that the glabrous mutant had hairless spikelets (hull). In addition, the number of seeds per panicle of the 529189 mutant line was fewer than that of the WT Milyang365. Furthermore, the mutant showed reduced branching phenotype of panicles. Further observations of the root system revealed that the glabrous mutant line 529189 presented a root hairless-like phenotype compared with the WT. Moreover, both the mutant and the WT had differential grain shapes, length, width, and thickness. Roots hairs play a preponderant role in plant nutrient acquisition. They also contribute to the gas exchange between the shoot and the root rhizosphere. By the same means, GHGs such as CH_4 is conveyed by the plant through aerenchyma and vessels, and released to the atmosphere. In this regard, it is of paramount importance to explorer the interplay between genetic factors controlling root hairs development in order to comprehend the molecular mechanism underlying the possible relationship between root hairs development and gas exchange-mediated GHG emissions in agriculture.

[Acknowledgement]

PJ01707301.

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