Abstract No: 249 (Poster) *Plant Sciences and Forestry*

Comparative surface morphology of two rice blast resistant and susceptible rice varieties

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The rice blast fungus *Magnaporthe grisea* causes one of the most destructive fungal diseases in cultivated rice throughout the world. The contribution of surface morphology on disease resistant development is a well-known fact. Although surface morphological analyses are performed, no recent studies were done to develop morphological markers to distinguish blast resistant and susceptible varieties. Therefore, the present study was conducted to identify and compare the surface morphology of resistant (Tetep) and susceptible (Pachchaperumal) rice varieties to rice blast disease and to understand the effect of surface morphology on development of resistance against blast pathogen. Micrographs of upper and lower surface of leaf and stem of both varieties were taken under 250X and 500X magnifications using a scanning electron microscope (SEM) with energy dispersive X-ray spectroscopy. Surface morphology of Pachchaperumal and Tetep was compared and fine structures on the surface were identified using SEM images with 250X and 500X magnifications, respectively. Surface hair densities were calculated through direct observations using a grid. On adaxial surface of Pachchaperumal, macro-hairs arranged with a mean density of 53.00 cm^{-2}. Instead Tetep had silicified prickle hairs (277.50 cm^{-2}). In Pachchaperumal unicellular macro-hairs were scarcely observed (1.00 per 3 cm^{-2}) but unicellular macro-hairs were absent on Tetep leaf abaxial surface. Only Tetep had prickle hairs (53.66 cm^{-2}). Macro-hairs were present on the stem surface of Pachchaperumal, (361.00 cm^{-2}), while Tetep had stiff macro-hairs (112.83 cm^{-2}) and large, silicified prickle hairs (59.00 cm^{-2}). Simple prickle hairs with comparatively lower density (39.83 cm^{-2}) were present on Pachchaperumal stem. The higher density and the distribution of surface protrusions increase the spore adhesion, retention and germination on leaves, making Pachchaperumal more susceptible to blast disease, while higher densities of silicified prickle hairs on Tetep develop resistance by acting as barriers. The rough surface morphology of Tetep plays an important role in resistance to rice blast disease, whereas comparatively smoother surface morphology of Pachchaperumal increases the susceptibility of the plants to the disease. This overall study will be important in identifying defense mechanisms of rice blast resistant in relation to morphological features which will be helpful to develop morphological markers.