Determination of Nitrogen Content in Rice Tissue Using Near Infrared Spectroscopy

Young-Ju Song*, Seung-Hyun Cho, Nam-Ki OH and Yeong-Geun Choi

Jeonbuk Agricultural Research and Extension Services, Iksan, 570-140, Korea

The rice plant is one of the important staple crops in Korea. The high yield with low cost in rice is required the soil fertility and the development of new precise method of fertilizer application by nutritional diagnosis. Now, in Korea, the nitrogen application system for the rice plant is composed of the basal fertilization, fertilization at tillering stage and fertilization at panicle stage, which the nitrogen fertilization at panicle stage amount to about 30 percent in the total amount.

Thus, this experiment carried out to the development of the system that can measure the nitrogen content in the rice plant at panicle stage rapidly with the near infrared spectroscopy, and to predict the appropriate quantity of the nitrogen fertilization at panicle stage based on calibration model for test of nitrogen content in rice plant.

The samples were collected from 48 varieties in 4 regions which are mainly cultivated in the southern part of Korea. And then, it collected by classifying into the leaf, the whole plant and the stem since 7 days before the nitrogen fertilization at panicle stage. The ranges of the nitrogen contents were 1.6~4.0%, 1.7~3.0% and 1.4~2.7% in the leaf, the whole plant and the stem, respectively.

In the calibration models created by each part of the plant under the Multiple Linear Regression(MLR) method, the calibration model for the leaf recorded the relatively high accuracy. The mutual crossing test on unknown samples were carried out using Partial Least Square(PLS) calibration model. That is, the nitrogen content in the stem was tested by calibration model made by the leaf model and that of stem was tested by calibration model made by whole plant sample. When unknown leaf sample was tested by calibration model made by all sample that collected from each part in rice plant such as leaf, stem and whole plant, it recorded the highest accuracy.

As a result, to test the nitrogen content in the rice plant at panicle stage, the nitrogen content in the leaf shall be tested by the calibration model composed of the leaf, the stem and the whole. plant. In future, to estimated the amount of nitrogen fertilization at panicle stage for rice plant , it will be calculated based on regression model between rice yield and nitrogen content of leaf measured by calibration model made by mixed sample including leaf, stem and whole plant.