PRECISION AGRICULTURAL BRANDING USING NEAR-INFRARED SPECTROSCOPY SYSTEM

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INTRODUCTION

We clarified correlation between systems of agricultural produce branding and precision agriculture (PA) (Kojima, 2009). And we especially attend the Near-infrared Spectroscopy (NIR) as the precision agricultural information technology, which is used only the quality evaluation method of agricultural many produce, now. Welsh onion (*Allium fistulosum*) is one of the characteristic specialty produce of some region in Japan. It has been clarified welsh onion's soluble solid content (SSC; Brix.) as total quality index has changed in and between individuals, and its character changed with region and seasons (Iino, 2010). So, we aimed to clarify welsh onions character and discriminate its region or seasons using NIR for branding.

MATERIAL AND METHOD

The 300 welsh onion samples were harvested 11 times in 4 months between December, 2006 to April, 2007 at different 9regions. NIR spectra were taken on each 30mm length, and divided the samples between 30mm segments for measuring the Brix. Imes950 (NIRECO CO. Ltd) was used for measuring NIR spectrum. This sensor is an on-line inner quality sensor for citrus or tomato used in the actual grading line, and its measurement wavelength is 650 to 1050 nm with 1nm interval. Spectra data was manually acquired using software for exclusive use. The spectra was measured 3 times and made the average value the transmission spectra. After taking spectra data, the absorption spectra was calculated from the measured transmission spectrum. The NIR data analysis and statistics were performed using The Unscrambler 9.8 (CAMO, Norway). Spectra for the NIR region and Vis-NIR were calibrated by the multivariate linear regression technique partial least squares (PLS) with full cross-validation. Each NIR-spectrum was transformed and smoothed by a second order (Savitzky-Golay Method). And based on the trend of Brix. change or spectrum, each samples was

divided by its character using cluster analysis method.

RESULT AND DISCUSSION

Fig.1 shows correlation between predicted Brix. with measurement Brix. using NIR spectroscopy. Its correlation coefficiency (R^2) was 0.92 and standard error of cross validation (SECV) was 0.54. Therefore, it can be said that, using NIR method welsh onion's quality could be predicted. In this research, welsh onion's spectrum was taken on each 30 mm. Using this prediction model, welsh onion's quality could be represented as Fig. 2 models. These models are also represented formula 1 with the about 0.99 correlation coefficiency.

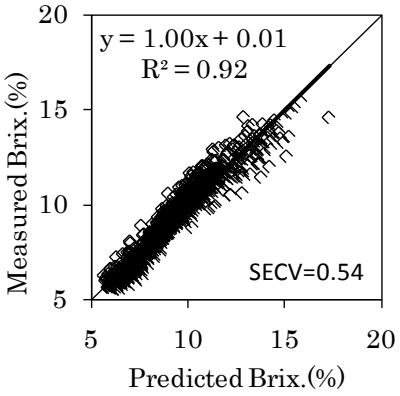

Fig.1 Correlation between predicted Brix. with measured Brix

$$y = ax^b \qquad (1)$$

where y means Brix., x means distance from root, and a, b are variables

Using these variables a, b, quality differences between seasons could be represented. Variable a means the level of quality and variable b means quality variation in one unity. Therefore, using NIRs, we could detect the welsh onion's quality and other the characteristic of its.

Moreover, welsh onion's character can be divided by cluster analysis with Brix. change model and spectrum. Fig.3 shows the dendrogram of all samples divided on each character of Brix. change using cluster analysis. With this data, welsh onions which harvested different regions and seasons could be compared based on the quality.

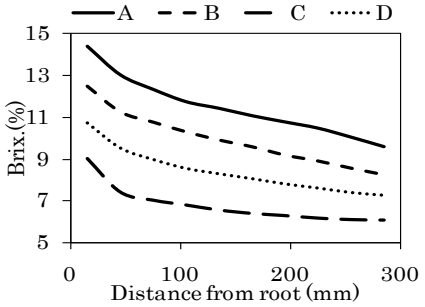

Fig. 2 Typically Brix. change in individual samples

CONCLUSION

For agricultural produce branding, we aimed to clarify welsh onions character and discriminate its character using NIR.

1) Welsh onion's Brix. as total quality index could be predicted with high accuracy of 0.92 of R^2 and 0.54 of SECV by NIR spectroscopy.

2) Welsh onion's character could be represented quality model and divided on its character with cluster analysis.

Therefore, using NIR spectroscopy, we could show and compare the quality. It brings the quality assurance and identification of

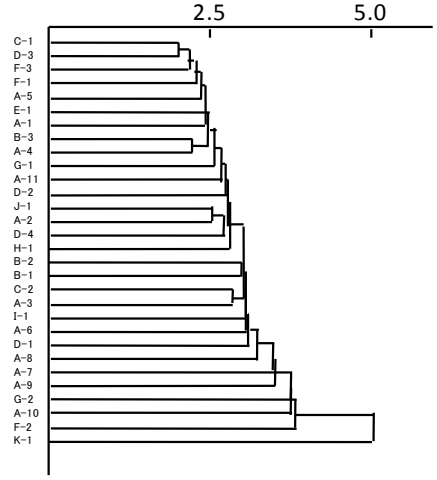

Fig.3 Dendrogram of all samples divided on each character of Brix. changing

agricultural produce which are necessary for branding.

References

1)Kojima et al. (2009) Branding Produce by Precision Agricultural Technology, Proceedings of 3rd ICPA.

2)Iino et al. (2010) Evaluation Method for Internal Quality of Leek and Their Variability, in Japanese, Journal of JSAM 72 (4), in printing.