The usefulness of VIS/NIR techniques for maturity and quality assessment of plums at harvest and after storage

K.P. Rutkowski1\*, A. Skorupinska2, Z.B. Jozwiak3, A. Ciecierska4, K. Fabiszewski5

The National Institute of Horticultural Research, Konstytucji 3 Maja 1/3, 96-100 Skierniewice, Poland, 1krzysztof.rutkowski@inhort.pl; 2anna.skorupinska@inhort.pl; 3zbigniew.jozwiak@inhort.pl; 4anna.ciecierska@inhort.pl; 5karol.fabiszewski@inhort.pl

\*Corresponding author

The usefulness of methods based on VIS/NIR for nondestructive assessment of maturity and quality of plums (‘Presenta’, ‘President’ and ‘Tophit’ cvs) at harvest and after storage was evaluated. Nondestructive measurements were performed using DA meter (Sintéleia, Italy) and CP Pigment Analyzer PA1101 (Control in Applied Physiology GbR., Germany). The DA index (DA meter) was calculated as DA=A670-A720 (A670 and A720 are absorbances at 670 and 720 nm). In the case of CP Pigment Analyzer signal at wavelengths in the range from 400 nm to 1100 nm was gathered. Two standard indices were computed: Normalized Difference Vegetation Index NDVI calculated as (I780-I660)/(I780+I660) and Normalized Anthocyanin Index NAI (I780-I570)/(I780+I570) where I570, I660, and I780 are reemittances at 570, 660 and 780 nm.

Besides the nondestructive measurements, the following quality parameters were measured: fruit weight, skin colour (with and without epicuticular wax), fruit firmness, soluble solids content, and titratable acidity.

During fruit storage, DA, NDVI, and NAI indices steadily changed. The rate of changes depended on storage conditions and cultivar.

On the raw spectra collected from CP Pigment Analyzer we found changes in signals reemission in the case of plums with internal browning in comparison to sound plums. However, further detailed research is required to fully utilize non-destructive methods based on VIS/NIR to assess internal damage to plums as well as estimation of soluble solids content, acidity, and firmness.

The results of the conducted research indicate the possibility of limiting the naturally occurring variability in the quality and maturity of plums intended for storage. By using VIS/NIR spectroscopy, plums can be sorted into "ripeness" classes. Because the fruits from individual classes kept their "distinctiveness" until the end of the storage period, it should be stated that VIS/NIR is a very useful tool for qualitative equalization of the plums offered on the market.

**Keywords:** plums, nondestructive, VIS/NIR, ripening, quality, storability, disorders

**Acknowledgements:** The research was carried out within the statutory programme of the National Institute of Horticulture Research (ZPiPOiW/5/2016 - P 6.1.3).