O5-4

ASSESSING CALIBRATION ROBUSTNESS FOR INTACT FRUIT

John A. Guthrie* and Kerry B. Walsh

Plant Sciences Group, Primary Industries Research Centre, Central Queensland University, Rockhampton, Queensland 4702, Australia.

Near infra-red (NIR) spectroscopy has been used for the non-invasive assessment of intact fruit for eating quality attributes such as total soluble solids (TSS) content. However, little information is available in the literature with respect to the robustness of such calibration models validated against independent populations (however, see Peiris *et al.* 1998 and Guthrie *et al.* 1998). Many studies report 'prediction' statistics in which the calibration and prediction sets are subsets of the same population (e.g. a three year calibration validated against a set from the same population, Peiris *et al.* 1998; calibration and validation subsets of the same initial population, Guthrie and Walsh 1997 and McGlone and Kawano 1998). In this study, a calibration was developed across 84 melon fruit (R^2 = 0.86°Brix, SECV = 0.38°Brix), which predicted well on fruit excluded from the calibration set but taken from the same population (n = 24, SEP = 0.38°Brix with 0.1°Brix bias), relative to an independent group (same variety and farm but different harvest date) (n = 24, SEP= 0.66°Brix with 0.1°Brix bias). Prediction on a different variety, different growing district and time was worse (n = 24, SEP = 1.2°Brix with 0.9°Brix bias).

Using an 'in-line' unit based on a silicon diode array spectrometer, as described in Walsh *et al.* (2000), we collected spectra from fruit populations covering different varieties, growing districts and time. The calibration procedure was optimized in terms of spectral window, derivative function and scatter correction. Performance of a calibration across new populations of fruit (different varieties, growing districts and harvest date) is reported. Various calibration sample selection techniques (primarily based on Mahalanobis distances), were trialled to structure the calibration population to improve robustness of prediction on independent sets. Optimization of calibration population structure (using the ISI protocols of neighbourhood and global distances) resulted in the elimination of over 50% of the initial data set. The use of the ISI Local Calibration routine was also investigated.

Guthrie JA, Walsh KB. (1997). Non-invasive assessment of pineapple and mango fruit quality using near infra-red spectroscopy. Australian Journal of Experimental Agriculture 37, 253-263.

Guthrie J, Wedding B, Walsh K. (1998). Robustness of NIR calibrations for soluble solids in intact melon and pineapple. Journal of Near Infrared Spectroscopy 6, 259-265.

McGlone VA, Kawano S. (1998). Firmness, dry-matter and soluble-solids assessment of postharvest kiwifruit by NIR spectroscopy. Postharvest Biology and Technology 131-141.

Peiris KHS, Dull GG, Leffler RG, Kays SJ. (1998). Near-infrared spectroscopic method for non-destructive determination of soluble solids content of peaches. J. of Amer. Soc. Hort. Sci. 123, 898-905.

Walsh KB, Guthrie JA, Burney J. (2000). Application of commercially available, low-cost, miniaturised NIR spectrometers to the assessment of the sugar content of intact fruit. Aust. J. Plant Physiol 27, 1175-1186.