Performances of handheld NIR instruments on wet and dry forages

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The study used 120 samples of fresh chopped corn plant or corn ear collected from different farms in Italy during summer 2019. Wet samples were scanned with two handheld spectrometers:1) a diode array (DA) with 256 diodes, 950-1650 every 2nm (AuroraNir, GraiNit s.r.l.); 2) a digital light processing (DLP) also scanning between 950 and 1650 every 2 nm. DA scans were collected by swiping 4 times on the surface of samples and for DLP scans were taken in static mode from 10 different spots. Scans were all averaged by sample before calibration development. For each sample one aliquot was dried overnight at 105°C for DM determination and a second aliquot was dried at 60°C until constant weight. After drying at low temperature samples were ground through a 1mm screen. Dried and ground samples were scanned with DA (2 spots), DLP (5 spots) and a Foss NIRSystem 5000 (LAB;1100-1498, 2nm) with samples packed in ring cups. Dried and ground samples were analysed for residual moisture, crude protein, NDF and Starch. Of the 120 samples, 20 samples were identified for validation and the remaining for calibration. All calibration for wet or dried samples were developed using UCAL 4.0 (Unity Scientific, USA). DM predictions of wet validation samples had r**2** greater than 95 for both handhelds, and SEP of 1.6 % and 2.6% for DA and DLP, respectively. In general SEP on wet samples were 40 to 50% greater than the SEP of dried and ground material. LAB had a clear advantage for CP, but SEP for NDF and Starch of DA were only 10% greater than LAB. Handhelds can be used for on field DM measurements, but they are also an economical option for lab processed samples.

**Keywords:** handheld instrument, wet forage, on field analysis

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