P6-20

DETERMINATION OF MOISTURE AND NITROGEN ON UNDRIED FORAGES BY NEAR INFRARED REFLECTANCE ESPECTROSCOPY (NIRS)

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Forages, both grazed and conserved, provide the basis of ruminant production systems throughout the world. More than 90 per cent of the feed energy consumed by herbivorous animals world – wide were provided by forages. With such world – wide dependence on forages, the economic and nutritional necessity of been able to characterise them in a meaningful way is vital. The characterisation of forages for productive animals is becoming important for several reasons. Relative to conventional laboratory procedures, Near Infrared Reflectance Spectroscopy (NIRS) offers advantages of simplicity, speed, reduced chemical waste, and more cost-effective prediction of product functionality. NIR spectroscopy represents a radical departure from conventional analytical methods, in that entire sample of forage is characterised in terms of its absorption properties in the near infrared region, rather than separate subsamples being treated with various chemicals to isolate specific components. This forces the analyst to abandon his/her traditional narrow focus on the sample (one analyte at a time) and to take a broader view of the relationship between components within the sample and between the sample and the population from which it comes. Forage is usually analysed by NIRS in dry and ground presentation. Initial success of NIRS analysis of coarse forages suggest a need to better understand the potential for analysis of minimally processed samples. Preparation costs and possible compositional alterations could be reduced by samples presented to the instrument in undried and unground conditions. NIRS has gained widespread acceptance for the analysis of forage quality constituents on dry material, however little attention has been given to the use of NIRS for chemical determinations on undried and unground forages. Relatively few works reported the use of NIRS to determine quality parameters on undried materials, most of them on both grass and corn silage. Only two works have been found on the determination of quality parameters on fresh forages. The objectives of this paper were (1) to evaluate the use of NIRS for determination of nitrogen and moisture on undried and unground forage samples and (2) to explore two mathematical treatments and two NIR regions to predict chemical parameters on fresh forage. Four hundred forage samples (n: 400) were analysed in a NIRS 6500 instrument (NIRSystems, PA, USA) in reflectance mode. Two mathematical treatments were applied: 1,4,4,1 and 2,5,5,2. Predictive equations were developed using modified partial least squares (MPLS) with internal cross – validation. Coefficient of determination in calibration (R^2_{CAL}) and standard error in cross-validation (SECV) for moisture were 0.92 (12.4) and 0.92 (12.4) for 1,4,4,1 and 2,5,5,2 respectively, on g kg^{-1} dry weight. For crude protein NIRS calibration statistics yield a (R^2_{CAL}) and (SECV) of 0.85 (19.8) and 0.85 (19.6) for 1,4,4,1 and 2,5,5,2 respectively, on a dry weight. It was concluded that NIRS is a suitable method to predict moisture and nitrogen on fresh forage without samples preparation.