

Application of NIRS in nutrient composition evaluation of *Lathyrus sativus*

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Introduction

Near Infrared Reflectance Spectroscopy (NIRS) Analysis has applied to measure nutrient composition successfully in many forage species (Jerry *et al.* 2003). *Lathyrus sativus*, an annual legume, is the only edible legume among *Lathyrus* with crude protein up to 30% (Jackson and Yunus 1984). It has high drought tolerance, and can grow well in barren soil. Thus, this species has a great potential as a crude protein source for livestock in arid and semi-arid area. To introduce this species into a grassland system in Northwest of China, developing a rapid method to determine nutrient composition of various accessions is necessary. This study is aimed at calibrating an NIRS instrument to predict nutritional traits of *L. sativus* straw and green manure from 50 accessions.

Materials and Methods

Fifty accessions were planted using random complete block design (RCBD) with 3 replicates in China and Ethiopia in 2005 and 2006, respectively. We harvested 600 samples of above ground biomass of *L. sativus* plants during flowering stage and seed harvest stage. Samples were dried in a forced-air oven at 60°C for 48 h and ground (particle <0.3mm) and analysed for OM, DM, CP, NDF, TIVOMD, NDFD by chemistry methods (Zhang 2003; Tilley and Terry 1963; Goering and Van Soest 1970) and NIRS (NIR System 5000, Silver Spring, MD, USA).

For NIRS measurement, each sample was scanned 4 times and data collected over in the 1100~2498 nm wavelength region. WinISI II Project Manager Version1.50

(FOSS Product) was used to analyze spectrum, and MPLS method was used for calibration and SNV-D for validation.

Results and Discussion

The calibration results showed correlation coefficients for CP, NDF, and TIVOMD are 0.99, 0.97, and 0.95, respectively, and corresponding SEC and SECV of only 0.79, 1.31, 1.74, and 0.84, 1.46, 1.74, respectively. Validation results showed that SEP, BIAS and RSQ of CP, NDF, and TIVOMD are 0.85, 0.04, 0.99, and 1.68, 0.06, 0.96, and 2.00, -0.06, 0.94, respectively. These results indicate equations developed by NIRS are suitable to predict CP, NDF, TIVOMD in *L. sativus* green forage and residue. Contrast with this, the correlation coefficients of DM and OM of 0.60 and 0.52, imply application of NIRS to measure DM and OM is limited. Moreover, though the calibration results showed the coefficient for NDFD is 0.81, the validation results showed RSQ is 0.64 only, imply NIRS is not suitable for NDFD determination for *L. sativus*.

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References

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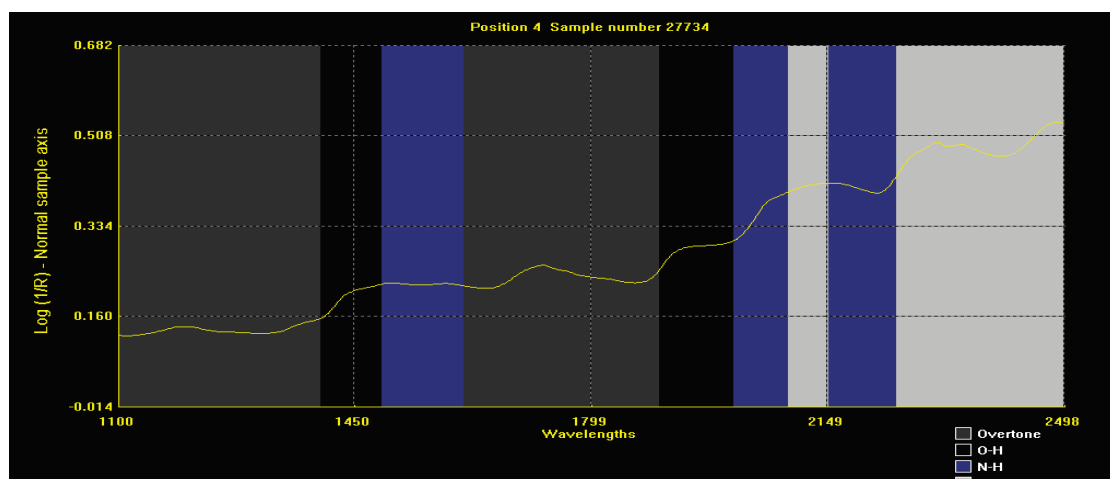


Figure1. Characteristic NIRS scan *Lathyrus sativus* plant samples

Table 1 Parameters of NIRS calibration for nutrition components contents in *Lathyrus sativus* plants.

Component	Calibration			Validation			
	SEC	R ²	SECV	SEP	Slope	Bias	RSQ
DM	0.60	0.60	0.64	0.74	1.001	0.07	0.55
OM	0.78	0.52	0.81	0.78	1.053	-0.06	0.55
CP	0.79	0.99	0.84	0.85	0.984	0.04	0.99
NDF	1.31	0.97	1.46	1.68	1.044	0.06	0.96
TIVOMD	1.74	0.95	1.74	2.00	0.999	-0.06	0.94
NDFD	3.59	0.81	3.66	5.20	0.877	0.03	0.64
<i>P</i>	0.08	0.72	0.08	0.07	1.054	-0.001	0.82