NEAR-INFRARED REFLECTANCE SPECTROSCOPY (NIRS) CALIBRATIONS FOR NON-DESTRUCTIVE ASSESSMENT OF QUALITY TRAITS IN INTACT SEEDS OF *Brassica juncea* L.

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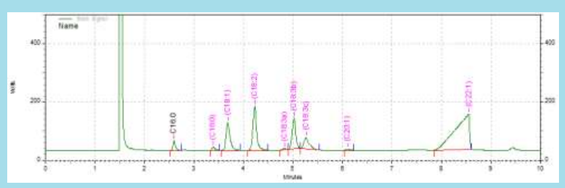
INTRODUCTION



Health promoting compounds
Phytosterols
Carotenoids
Tocopherols

Analytical methods

WET CHEMISTRY
- Destructive
- Expensive
- Time consuming
- Hazardous
- Error prone

NIRS
- Non-destructive
- Initial investment
- Fast (<1 sec)
- Non-Hazardous
- High accuracy

OBJECTIVE

Development of NIRS based calibration model for non-destructive, accurate and rapid assessment of various quality traits in seeds of *Brassica juncea*

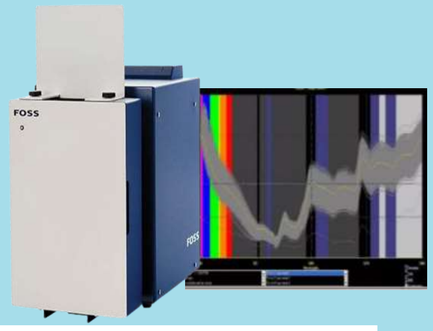
EXPERIMENTAL

Seeds of *B. juncea* diversity panel (~170 accessions)

Oil content
Oxford instruments, NMR MQC23, UK (ISO 10565:1998)

Fatty acid profile
Gas liquid chromatography, Agilent Technologies (Appelqvist 1968)

Tocopherols
UPLC
(Fritsche *et al* 2012)



Sample scanning on NIRS for collecting spectra

Merging of lab data with NIRS spectral data
↓
Data pre treatment
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Calibration equation development
↓
Cross validation of developed equation

RESULTS

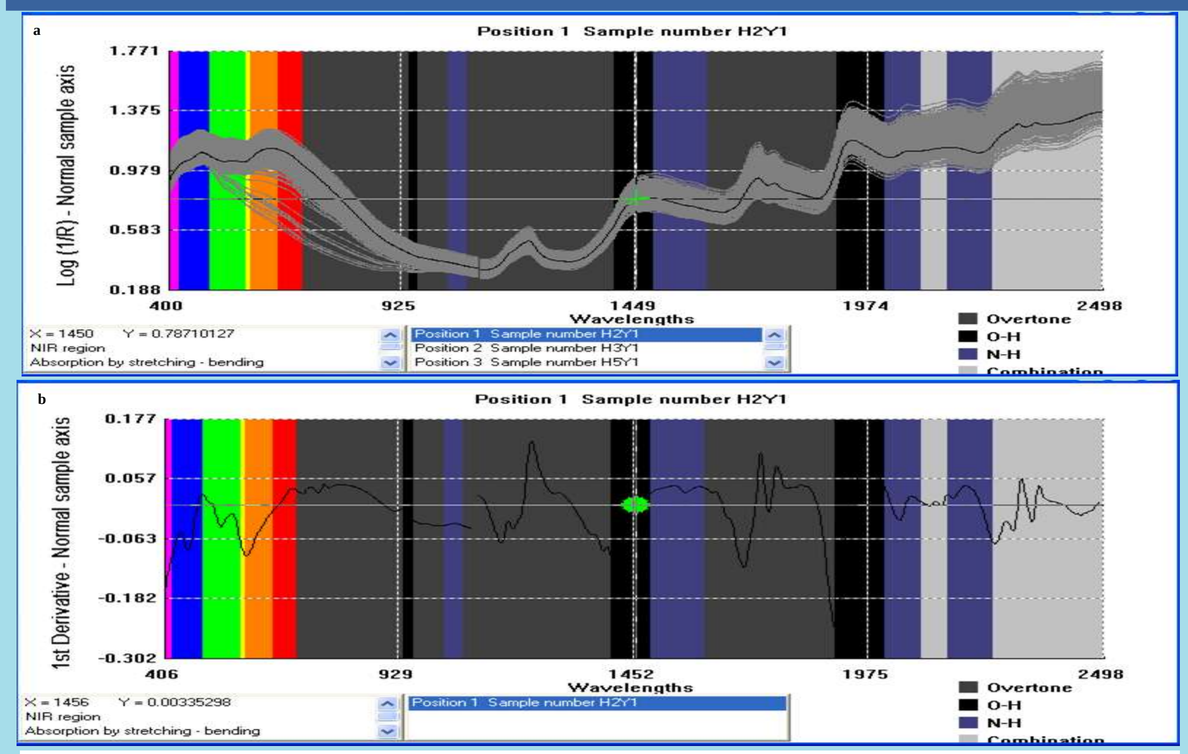

Fig. 1: (a) Reflectance spectra covering whole NIRS range for quality traits in *B. juncea* seeds (b) Smoothen plot of *B. juncea* seeds

Table1. Summary statistics of quality traits measured in seeds of 170 accessions of *B. juncea*

	Trait	Mean ± SD	Range	Regression calibration statistics				
				SEC	RSQ	F value	SECV	1-VR
	Oil (%)	37.78±2.00	30.06-40.78	1.15	0.85	68.87	1.16	0.69
Fatty acid profile (%)	Palmitic ($C_{16:0}$)	2.35±0.45	1.24-4.77	0.26	0.65	50.68	0.85	0.59
	Stearic ($C_{18:0}$)	0.93±0.25	0.30-2.24	0.19	0.38	76.60	0.22	0.28
	Oleic ($C_{18:1}$)	14.28±6.17	3.855-44.11	1.58	0.88	56.92	1.97	0.81
	Linoleic ($C_{18:2}$)	19.80±3.96	13.45-45.43	1.22	0.89	77.79	1.49	0.82
	Linolenic ($C_{18:3}$)	18.96±2.53	12.15-29.68	1.81	0.42	107.62	1.96	0.30
	Eicosenoic ($C_{20:1}$)	2.08±0.73	0.29-3.59	2.62	0.99	52.36	3.45	0.96
	Erucic ($C_{22:1}$)	41.50±10.33	1.9-56.51	3.63	0.97	44.91	4.47	0.94
Tocopherol (mg/kg)	α-	28.97 ± 15.62	2.72- 97.77	2.72	0.80	51.55	5.45	0.84
	γ-	129.89 ± 43.67	27.77- 316.46	9.21	0.90	50.63	7.52	0.82
	Total-	158.86 ± 53.62	48.19- 392.65	9.44	0.87	54.25	6.55	0.84

SD = Standard deviation, SEC = Standard error of calibration, RSQ = Determination coefficient, SECV = Standard error of cross validation, 1-VR = One minus the ratio of unexplained variance to total variance

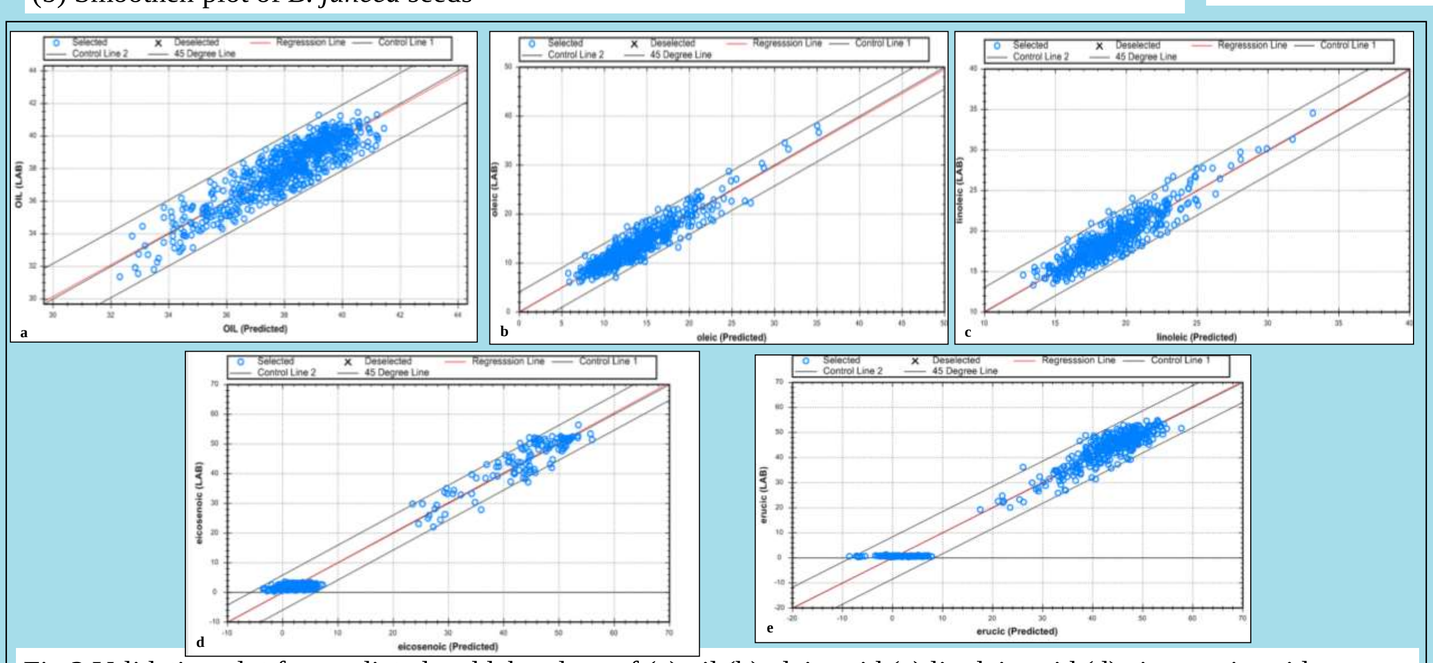

Fig.2 Validation plot for predicted and lab values of (a) oil (b) oleic acid (c) linoleic acid (d) eicosenoic acid (e) erucic acid in *B. juncea* seeds

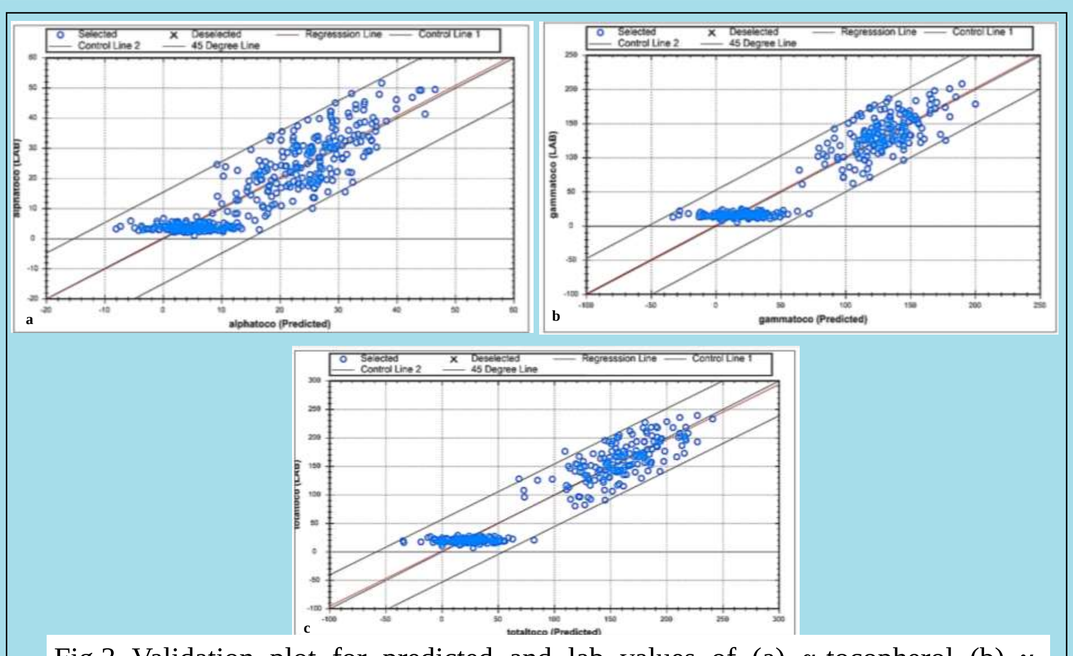

Fig.3 Validation plot for predicted and lab values of (a) α-tocopherol (b) γ-tocopherol (c) Total tocopherols in *B. juncea* seeds

CONCLUSION

Results demonstrated the efficacy of newly developed NIRS calibration model for rapid screening of quality traits (oil content, fatty acids, and tocopherols) in intact seeds of *B. juncea*. The NIRS calibrations will aid plant breeders in effective screening and selection of Brassica lines in quality improvement breeding programmes.

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- ISO 10565:1998 Oilseeds- Simultaneous determination of oil and water contents - Method using pulsed nuclear magnetic resonance spectrometry.