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NIR

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(// : // :)

NIR

PLS

NIR

PDA

NIR

(PLS)

(MSC)

NIR

PLS

NIR

(RMSECV)

/

(R^2_{cv})

/

(RPD)

% /

/
(FAOSTAT, 2006)

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(Ashraf

.Jahani, 2002)

(FAOSTAT, 2006)

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samireei@cc.iut.ac.ir :

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1. Palmaceae
2. Phoenix
3. Dactylifera

(Nicolai *et al.*, 2007)
(2000) Schaare & Fraser

(Schmilovitch *et al.* 1999)

SSC

(2011) Kavdir *et al.* .

(Ashrafjehani, 2002)

NIR

FT- (Mireei *et al.*, 2010a) NIR

(Mireei *et al.*, 2010b) NIR

NIR

NIR

NIR

(Noh & Choui, 2006) ^Δ

^YPDA

EPP2000NIR

(InGaAs)

-
1. Reflectance
 2. Transmission
 3. Interactance
 4. Full Transmittance Measuring Method
 5. Half Transmittance Measuring Method
 6. Bifurcated optical cable

7. Photo-Diode Array
8. StellarNet, Inc. Oldsmar, Florida, USA

... :

$$(R_{reference}) \quad (R_{dark})$$

/
()

() SL1-CAL

$$R_{relative} = \left(\frac{R_{sample} - R_{dark}}{R_{reference} - R_{dark}} \right) \times 100 \quad (1)$$

$$\frac{R_{sample}}{R_{reference}} \quad R_{relative} : \quad R_{dark}$$

R400-7-VISNIR
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NIR
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$$(T_{reference}) \quad (T_{dark}) \quad (T_{relative})$$

()

()

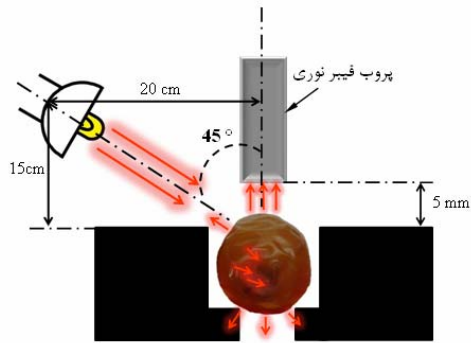
()

(I_{dark})

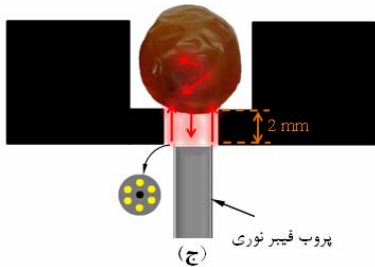
$$(I_{relative}) \quad (I_{reference})$$

()

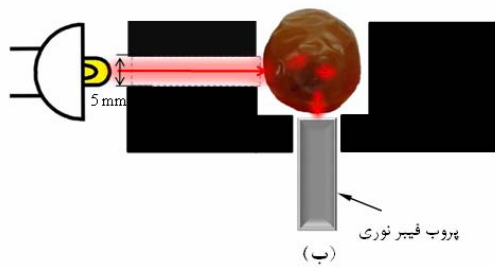
(R_{relative})



(الف)



(ج)



(ب)

NIR

(((()

(MSC) r

MSC

(Lu, 2001)

AOAC

(Elleuch et al., 2008; Keramat Jahromi et al., 2008)

(PLS) r

PLS .

) X

(Williams & Norris, 2001)

) Y

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X

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1. Savitzky- Golay Algorithm
2. Multiplicative Scatter Correction
3. Partial Least Squares

(RPD) ⁴

(RMSECV) ³

(LV) ¹

RPD

Williams & Norris, 2001

PLS

Mireei *et al.*, 2010b

(RMSECV)

PLS

(Li *et al.*, 2007; Williams & Norris, 2001)

PLS

²

RMSECV

PLS

/ Unscrambler

()

NIR

(Williams & Norris, 2001)

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(

(/)

(R²)

% /

3. Root Mean Square Error of Cross Validation
4. Residual Predictive Deviation

1. Latent Variables
2. Leave one-out Cross Validation

NIR

(%)

/ / / / /

/

(%)

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-CH₂ -CH

-OH

()

()

()

Williams

(2001) & Norris

NIR

-CH₂ CH

()

-OH

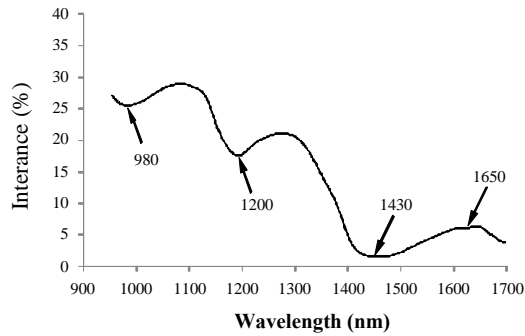
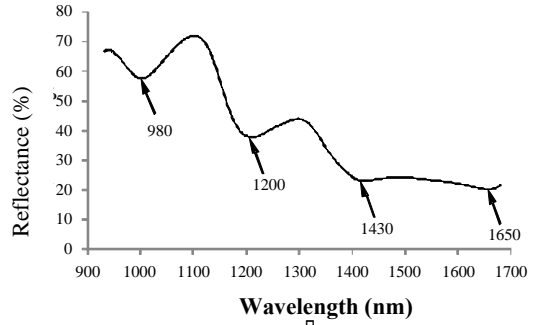
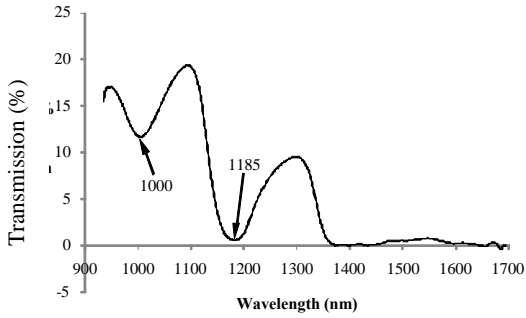
()

()

()

Schaare & Fraser, 2000

()



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(2003)

-CH₂

(Williams & Norris, 2001)

NIR

PLS

MSC

PLS

NIR

(PLS-PCs) PLS

NIR

()

NIR

/ / /

/

-OH

(2001) Williams & Norris .

-OH+-CH

/ /

RMSECV

(LV)

-CH₂ -CH

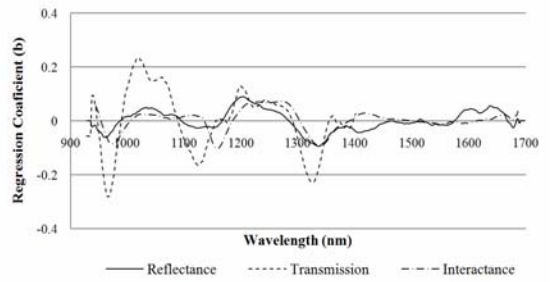
Park *et al.* .

PLS ()
()

PLS

PLS

RPD	RMSECV	R^2_{cv}	RMSEC	R^2
/	/	/	/	/
/	/	/	/	/
/	/	/	/	/



(b)

()

()

-OH

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()

PLS

() ()

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() ()

PLS

$R^2_{cv} = /$ ()

()

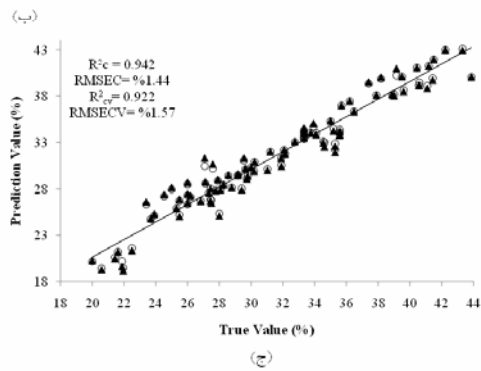
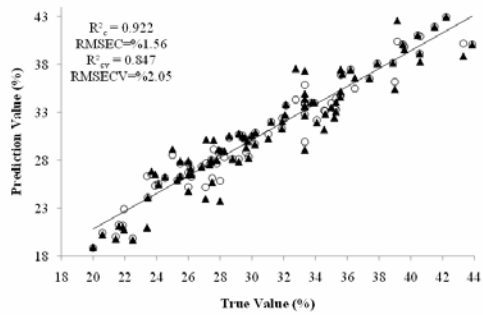
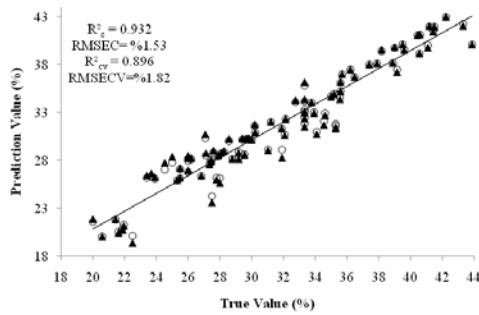
$$R^2_{cv} = /)$$

$$(RMSEC = \% /$$

$$(RPD = / RMSECV = \% /$$

MSC

()



(c)

PLS

(((((▲)

$$(RMSEC = \% / R^2_c = /)$$

$$RMSECV = \% / R^2_{cv} = /)$$

$$(RPD = /$$

(2000) Schaare & Fraser

	$R^2_{cv} = /$)	
	$R^2_{cv} = /$)	(RMSEC=% /
NIR			(RPD= / RMSECV=% /
PLS			
RPD	($R^2_{cv} = /$)	/	RMSECV
		/	

REFERENCES

- Ashrafjehani A. (2002). *Date fruit, The fruit of life*. Iran, Agricultural Sciences Publication. (in Farsi)
- Association of Official Agricultural Chemists. (1998). *Official Methods of Analysis*. A.O.A.C. 16th ed. Published by A.O.A.C. Washington, D.C. (U.S.A).
- Elleuch M., Besbes S., Roiseux O., Blecker C., Deroanne C., Drira N. & Attia H. (2008). Date flesh: Chemical composition and characteristics of the dietary fibre. *Journal of Food Chemistry*, 111, 676-682.
- FAOSTAT (2007). *Statistical Year Book of FAO*. Available in: <http://faostat.fao.org>.
- Kavdir I., Buyukcan M. B., Lu R., Kocabiyyik H., Seker M. 2011. Prediction of olive quality using FT-NIR spectroscopy in reflectance and transmittance modes. *Biosystems Engineering*, 103, 304-312.
- Keramat Jahromi M., Jafari A., Rafiee Sh., Mirasheh R. & Mohtasebi S. S. (2008). Changes in physical properties of date fruit (cv. Shahani) during three edible stages of ripening. *American-Eurasian Journal of Agricultural and Environmental Science*, 3 (1), 132-136.
- Li X., He Y., Wu C. & Sun D. (2007). Nondestructive measurement and fingerprint analysis of soluble solid content of tea soft drink based on Vis/NIR spectroscopy. *Journal of Food Engineering*, 82, 316-323.
- Lu R. (2001). Predicting Firmness and sugar content of sweet cherries using near-infrared diffuse reflectance spectroscopy. *Transactions of the ASAE*, 44(5), 1265-1271.
- Mireei S. A., Mohtasebi S. S., Massudi R., Rafiee S., Arabanian A. S. & Berardinelli A. (2010a). Non-destructive Measurement of Moisture and Soluble Solids Content of Mazafati Date Fruit by NIR Spectroscopy. *Australian Journal of Crop Science*, 4 (3), 175-179.
- Mireei S. A., Mohtasebi S. S., Massudi R., Rafiee S., Arabanian A. S. (2010b). Using FT- NIR Spectroscopy in Nondestructive Maturity Determination of Shahani Date Fruits. *Iranian Journal of Biosystems Engineering*, 41(2), 113-120. (in Farsi)
- Nicolai B. M., Beullens K., Bobelyn E., Peirs A., Saeys W., Theron K. I. & Lammertyn J. (2007). Nondestructive measurement of fruit and vegetable quality by means of NIR spectroscopy: A review. *Postharvest Biology and Technology*, 46, 99-118.
- Noh S. H. & Choui K. H. (2006). Nondestructive Quality Evaluation Technology for Fruits and Vegetables. *International Seminar on Enhancing Export Competitiveness of Asian Fruits*.
- Park B., Abbott J. A., Lee K. J., Choi C. H. & Choi K. H. (2003). Near- infrared diffused reflectance for quantitative and qualitative measurement of soluble solids and firmness of Delicious and Gala apples. *Transactions of the ASAE*, 46 (6), 1721-1731.
- Schaare P. N. & Fraser D. G. (2000). Comparison of Reflectance, Interactance and Transmission Modes of Visible-Near Infrared Spectroscopy for Measuring Internal Properties of Kiwifruit. *Postharvest Biology and Technology*, 20, 175-184.
- Schmilovitch Z., Hoffman A., Egozi H., Ben-Zvi R., Bernstein Z. & Alchanatis V. (1999). Maturity determination of fresh dates by near infrared spectrometry. *Journal of the Science of Food and Agriculture*. 79, 86-90.
- Williams P. C. & Norris K. (2001). *Near-Infrared technology in the Agricultural and Food industry*. St. Paul, MN: American Association of Cereal Chemists, Inc.

