FTIR analysis of phenolic extracts from *Moringa oleifera leaves*

J. E. Cruz-Espinoza[1], A. Orduña-Díaz[1], M. Rosales-Perez[2,3], O. Zaca-Morán[1], R. Delgado-Macuil[1], V.L. Gayou[1] and M. Rojas-López[1]

[1]Instituto Politécnico Nacional-CIBA, Tepetitla, Tlaxcala, México;
[2] Facultad de Agrobiología, Universidad Autónoma de Tlaxcala. 90120, México
[3]Instituto Tecnológico de Monterrey, campus Puebla,72800, México
Email:midnattsoll@hotmail.com

Key words: Moringa oleifera, FTIR, phenolics compounds.

Introduction. *Moringa oleifera* is a tree, which contains a large amount of phenolic compounds which have nutritional, therapeutic and profilactic properties [1]. In particular, It has been used to combat malnutrition, especially among infants and nursing mothers. Leaves can be eaten fresh, cooked, or stored as dried powder for many months without refrigeration, and also without loss of nutritional value. For quantifying phenolic compounds, several traditional techniques are commonly used [1]. However there are only few reports on the analysis of this kind of plant by using Fourier transform infrared spectroscopy (FTIR). This non-destructive technique has been used in a practical form to analyze leaves, seeds, flowers and roots in plants. In this work we have analyzed the infrared absorption from leaves of *Moringa oleifera* as alternative technique to investigate the main functional groups present. For other hand, quantitative determination total phenols concentration by traditional methods was realized.

Methods. Extract of *M. oleifera* was obtained by mixing powder of the dry leaves in acetone with sonication and spinning-dry. Total phenols of the extracts were determinated by using the Folin-Ciocalteu method, which uses UV/vis spectroscopy at 760 nm. Also gallic acid was used as a standard to obtain a calibration curve that allows to quantify total phenols [2,3]. Several aliquotes of the extract were deposited on the surface of the attenuated totally reflexion (ATR) crystal. Afterwards, the dry surface of the extract was analyzed by Fourier Transform infrared spectroscopy (FTIR) (Bruker Vertex 70). The infrared radiation is propagated through the sample to obtain the corresponding spectrum, which was averaged from several data acquisitions. FTIR spectra were acquired in the wavenumber range of 400–4000 cm^{-1}. After each measurement the crystalline surface was washed with demineralised water and dried with a soft paper.

Results. Figure 1 shows the calibration curve from the UV/VIS absorption of Gallic acid at 760 nm. According to this curve the calculated value of total phenols for *Moringa oleifera* is 0.53 mg/l. Figure 2 shows the typical FTIR spectrum of phenolic extract of leaves of this plant. A broad band at 3285 cm^{-1} belongs to stretching vibration of phenolic hydroxyl group(-OH) which represent to hydrogen bonding. Appearance of broad band at wavenumber 2920 cm^{-1} indicates presence of vibration stretching of aromatic (C-H) group, whereas the appearance of two medium and weak bands at 1615 cm^{-1} and 1500 cm^{-1} stretching vibration of aromatic (C=C) group.

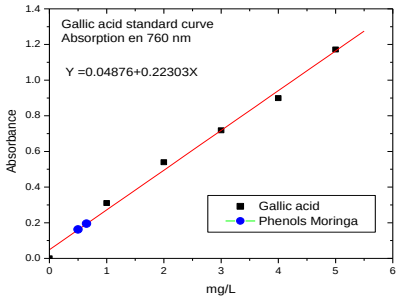

Fig.1 Calibration curve of Gallic acid for quantification of phenols.

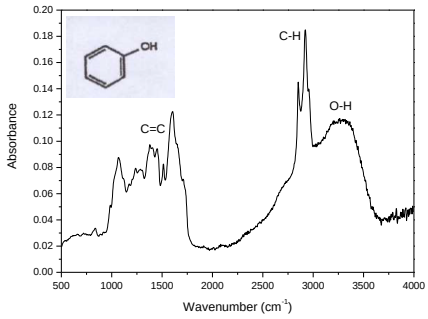

Fig.2 FTIR spectra of phenolic extract of Moringa oleifera.

Conclusions. We have quantified total phenols from extracts of *Moringa oleifera* leaves. FTIR spectrum shows intense bands which are characteristic of phenol groups. This technique could also be used to quantify total phenols using multivariate analysis.

Acknowledgements. Financial support from the Secretaría de Posgrado e Investigación del Instituto Politécnico Nacional de México (SIP-IPN) is greatly appreciated.

References.

1. Moyo (2012). *African Journal of Biotechnology* Vol. 11(11), pp. 2797-2802.
2. Perumal S and Klaus B.(2003). Leaves. *J. Agric. Food Chem*, *51,* 2144-2155.
3. Angelo L, *et al*.(2009). *Journal of Medicinal Plants Research* Vol. 3(11), 886-893.