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Preliminary Studies for the Determination of Niacin

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Abstract: *Adequate intake of all vitamins is important, since they play a vital role in many biochemical functions in the human body and are essential components for maintaining optimal health [1]. Niacin is found in animal and vegetable aliments, its amounts being higher in unprepared foods compared to processed foods [2]. In addition to serving as cofactors in biochemical reactions, the representatives of the vitamin B complex are vital for normal body growth and development, healthy skin, the proper function of nerves and heart, as well as red blood cell formation. Vitamin deficiency can be compensated with food supplements [3]. Literature survey has revealed various analytical methods for the determination of vitamins from pharmaceutical formulations in combination with other drugs, such as: RP-HPLC, HPTLC, UV-Spectroscopy, or LC–MS/MS [2]. In the present study, the UV spectrophotometric method was used to determine Niacin (Vitamin B3) content in food supplements and to validate the selected method. Niacin was dissolved in ethanol used as a solvent and from its UV spectra the maximum absorption wavelength was determined. Solutions with different concentrations were prepared in order to obtain the calibration curve. After the linearity calibration curve was obtained at 262 nm, preliminary concentration determinations on different food supplements were performed.*

• Introduction

The term Vitamin B3 refers to niacin (also known as nicotinic acid or pyridine-3-carboxylic acid), niacinamide (also known as nicotinamide or pyridine-3-carboxamide) and, more recently, nicotinamide riboside [4]. In this study we aimed to determine the concentration of niacin in food supplements, using a simple and economical method, namely the UV-VIS spectrophotometric method. Niacin was dissolved in ethanol, its spectra being used in order to find the wavelength at which niacin presented maximum absorbance.

• Materials and methods

Instruments
A T90+ UV/VIS Spectrophotometer PG Instruments Ltd, an analytical balance (Partner) and micropipettes of various volumes (Easy 40+ Elite) were used.

Materials
Pure niacin (purity 99%) was purchased from Fluka (Germany) and was used without any other purification. Ethanol was purchased from Merck KGaA (Germany). Vitaking and Swanson Niacin food supplements containing 100 mg reported Niacin were purchased from a local pharmacy, in Timișoara (Romania).

Determination of the maximum absorption wavelength
A 100 mL of 100 µg/mL Niacin stock solution was prepared using ethanol as a solvent. 0.5 mL of stock solution was diluted to 25 mL with the same solvent to obtain a reference solution (2 µg/mL). The reference solution was analyzed in the spectral region 230- 300 nm.

Preparation of different concentration solutions for the linearity curve
Fourteen dilutions (0-13 µg/mL) were prepared using the previously obtained Niacin stock solution and ethanol as solvent. The maximum absorbance of these solutions was measured at 262 nm and the obtained data was used to plot the linearity calibration curve.

Analysis of niacin content in the food supplement
Niacin food supplements powder equivalent to 100 mg of Niacin were used in this study to determine their Niacin content. The tablets were weighed and grinded in order to obtain a fine powder. The powder was dissolved into 100 mL ethanol. The obtained solution was filtered through filtraTECH slow flow filter paper and the filtrate was diluted with ethanol. The final solution had a theoretical concentration of 10 µg/mL. The absorbance of this solution was measured and from the linearity calibration curve, the experimental concentration of Niacin was calculated.

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References:
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• Results and discussions

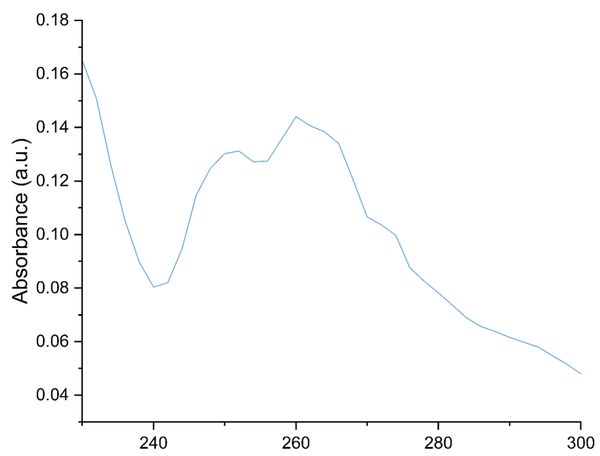

Fig 1: Spectrum of Niacin solution (2 µg/mL) in the wavelength range 230-300 nm

The obtained UV spectrum revealed a series of absorption peaks. These were compared to literature data and a λ_{max} for Niacin solution in ethanol was established at 262 nm.

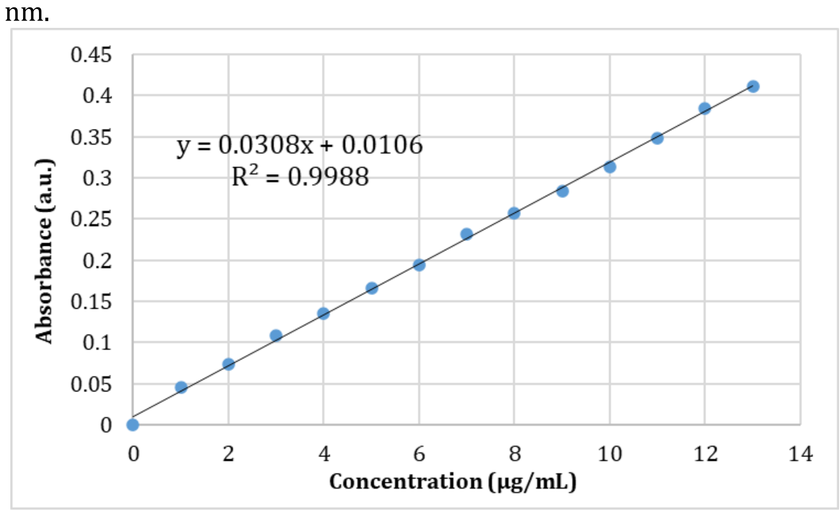

Fig 2: Linearity curve of Niacin at 262 nm

Niacin was found to have a linear A *vs.* c plot within the concentration range 0-13 µg/mL, for which a correlation coefficient of 0.9988 was obtained.

Table 1: Concentration of Niacin determined by linearity curve

Drug	Label Claim	Experimentally determined amount
Vitaking Niacin	100 mg	122 mg
Swanson Niacin	100 mg	48 mg

The concentration of Niacin present in the analyzed tablets was determined using the regression equation of the linearity curve.

• Conclusions

The method used in this study was employed since it is a simple, specific, economic, precise and rapid technique available for the determination of Niacin. A significant difference was observed for the two tested formulations, the experimentally obtained data revealing a concentration of Niacin close to the value reported by the manufacturer for the Vitaking formulation, while in the case of the Swanson formulation, the determined mass of Niacin was almost half of the mass mentioned on the label. As such, it can be said that the UV-VIS method is a valuable analysis tool, being considered an alternative method for the routine analysis of Niacin from supplements.