



ANALYSIS OF WATER-SOLUBLE VITAMINS IN THE DRY EXTRACT OF *SILYBUM MARIANUM L.*

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<https://doi.org/10.5281/zenodo.17046502>

ARTICLE INFO

Received: 25th August 2025

Accepted: 30th August 2025

Online: 31st August 2025

KEYWORDS

Silybum marianum L., dry extract, medicinal plants, vitamins, high-performance liquid chromatography (HPLC).

ABSTRACT

*Medicinal products derived from plant raw materials play a vital role in the prevention and treatment of various diseases. Vitamins, despite their low quantitative content compared to proteins, fats, and carbohydrates, are essential organic compounds that ensure normal metabolic processes and maintain physiological balance. Their deficiency can lead to metabolic disorders, hypovitaminosis, and even severe pathological conditions. Milk thistle (*Silybum marianum L.*) is a medicinal plant widely used in hepatoprotective therapy due to its biologically active compounds. However, limited attention has been paid to the vitamin composition of its extracts. This study focuses on the determination of water-soluble vitamins in the dry extract of *Silybum marianum L.* seeds (after defatting) using high-performance liquid chromatography (HPLC).*

Materials and Methods: The dry extract of *Silybum marianum L.* seeds was obtained after defatting. For vitamin quantification, high-performance liquid chromatography (HPLC, Agilent 1200 system with Eclipse XDB-C18 column, 250×4.6 mm, 5 μm) equipped with a diode-array detector was used. An acetate buffer–acetonitrile gradient was applied as the mobile phase with a flow rate of 0.8 mL/min at 25 °C. Detection wavelength was set at 250 nm. Standard stock solutions of water-soluble vitamins (B1, B2, B6, B9, PP, and C) were prepared at a concentration of 1 mg/mL in 40% ethanol. Calibration curves were constructed for each vitamin to ensure accurate quantification.

Experimental Part: 5–10 g of the dry extract was precisely weighed and extracted with 40% ethanol under reflux for 1 hour, followed by cooling and further stirring. The obtained mixture was filtered, and the filtrates were combined and adjusted to volume. The solution was centrifuged at 7000 rpm for 10 min, and the supernatant was subjected to HPLC analysis. Metrological evaluation was performed to validate the accuracy, precision, and reproducibility of the developed methods for each vitamin. The parameters such as standard deviation, variance, relative error, and confidence interval were calculated for reliability assessment.

Results and Discussion: Quantitative analysis demonstrated the presence of the following water-soluble vitamins in *Silybum marianum L.* dry extract: Thiamine hydrochloride (B1), Pyridoxine (B6), Nicotinamide (PP), Folic acid (B9), Ascorbic acid (C). The results revealed that vitamin B9 and vitamin C were the most abundant among the identified water-soluble



vitamins, significantly exceeding the quantities of B1, B2, B6, and PP. This finding highlights that *Silybum marianum* L. extract can serve not only as a source of biologically active flavonolignans but also as a valuable source of essential vitamins. Thus, the developed analytical approach provides a reliable basis for the standardization of phytopreparations derived from *Silybum marianum* L., enriching their therapeutic potential and ensuring quality control.

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