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THE AMINO ACIDS OF LEAVES AND SEEDS OF ECBALLIUM ELATERIUM (L.) A. RICH. FLORA OF PALESTINE

Khaled Taha Muhammad Abu Thaher*

Assistant Professor College of Law and Forensic Sciences - Department of Forensic Sciences
Al-Istiqlal University (Palestinian Academy for Security Sciences) Jericho – Palestine.

***Corresponding Author: Dr. Khaled Taha Muhammad Abu Thaher**

Assistant Professor College of Law and Forensic Sciences - Department of Forensic Sciences Al-Istiqlal University (Palestinian Academy for Security Sciences) Jericho – Palestine.

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ABSTRACT

This research aims to study the amino acids in the leaves and seeds of the *Ecballium elaterium (L.) A. Rich* plant, belonging to the *Cucurbitaceae* family, located in Palestine, through a qualitative study. In order to search for alternative plant medicines as a source of amino acids to treat various diseases replacement of currently used synthetic drugs whose effectiveness and safety are questionable in the future. The chemical study of various aqueous and alcoholic extracts of leaves and seeds was carried out using multiple types of specific chemical reactions and multiple types of chromatography. As a result of the Phytochemical analysis, sixteen free amino acids were identified in the seeds and leaves of the plant (*Ecballium elaterium (L.) A. Rich*), including seven essential, which are (Isoleucine, leucine, lysine, phenylalanine, threonine, valine, methionine), three semi-essentials, which are (Arginine, histidine, tyrosine), and sex non-essentials, which are (aspartic, alanine, glutamic, glycine, proline, serine). For the first time, the presence of these amino acids was established.

KEYWORDS: Phytochemical analysis, Amino acids, *Ecballium elaterium (L.) A. Rich*, flora of Palestine.

I. INTRODUCTION

Amino acids are essential for several physiological functions in plants, including the formation of phenolic compounds. Nutraceuticals and pharmaceuticals derived from medicinal plants can include high concentrations of both necessary and nonessential amino acids.[1]

Recent research has proven that amino acids are essential to the human body. They are vital building blocks for many proteins and play a number of roles in important body functions. Furthermore, the body needs amino acids to support metabolic processes by generating necessary hormones and neurotransmitters.[2]

The body's capacity to construct the amino acid carbon skeleton further divides amino acids into[3]

1- Essential amino acids: which the body is unable to produce on its own and must thus obtain from diet.
2- Non-essential amino acids: which can be produced by the body.
3- Semi essential amino acids: when the matching amino acids are available, the body can produce them.

Nowadays, the search for plants that have a history of continuous use and minimal side effects has become a topic of interest to our society. One of these plants is the *Ecballium elaterium (L.) A. Rich* plant, belonging to the *Cucurbitaceae* family, which possesses a large and diverse amount of effective chemicals such as phenolic, flavonoids, tannins and alkaloids.[4]

In addition, traditionally, this plant has been used for the treatment of fever, cancer, sinusitis, jaundice, constipation, and hypertension and rhino sinusitis.[5,6]

Studies of compounds formed by plants because of defense mechanisms allow us to understand the molecular mechanism involved in their medicinal properties.

Thus, the aim of our study was to determine the amino acid content of the leaves and seeds of the *Ecballium elaterium (L.) A. Rich*. Figure.1

Leaves

Seeds

Fig. 1: *Ecballium elaterium.*

II. MATERIALS AND METHODS

To make the extract, the *Ecballium elaterium* leaves and seeds were washed with cold distilled water, allowed to air dry at a temperature of 30^0 C in the shade. Then processed into a powder using an electric grinder. After that, the powder was stored in clear plastic containers until it was required.

Plant material

In August and September respectively, leaves and seeds of *Ecballium elaterium* were harvested from wild plants thriving in the West Bank-Palestine hamlet of Izbet Shoofa within the Tulkarm Governorate.

Methods

Extraction

Aqueous extracts were prepared at a ratio of 1: 5 (herbal material: extract ant) from the leaves and seeds of *Ecballium elaterium*. The extracts were prepared and heating in a water bath with a reflux condenser for 30 minutes, after extraction, the extract was filtered.[7]

Phytochemical examination- Qualitative analysis

Multiple types of specialized chemical reactions were used to identify the main amino acids from (leaves and seeds) of *Ecballium elaterium* by qualitative analysis.[8–10]

Phytochemical examination- Chromatographic techniques

The primary amino acids from the leaves and seeds of *Ecballium elaterium* were determined by phytochemical examination of plant organs. We will employ the TLC method on silica gel and the paper chromatography method in various systems to confirm the presence of the key amino acids from (leaves and seeds) of *Ecballium elaterium* in order to validate the findings of chemical testing.[11-14]

III. RESULTS AND DISCUSSION

In order to detect the amino acids in extracts of leaves and seeds from *Ecballium elaterium*, this study used a variety of particular chemical processes. By comparing the Rf values and spot colors to those of reference samples, as well as the dye's color shift before and after treatment with certain reagents, the primary amino acids in the extracts under study were determined table.1.

Phytochemical examination- Qualitative analysis

The qualitative analysis of amino acids in the leaves and seeds of *Ecballium elaterium* was determined using a variety of specific chemical reactions.

Amino acids screening

- Biuret test: A little amount of Biuret reagent was combined with a 2 ml of extracts of leaves and seeds from *Ecballium elaterium*. The color transitioned from light blue to violet, suggesting the presence of proteins or peptide connections.
- Ninhydrin test: Add 1-3 drops of a 0.1-1% alcohol solution of ninhydrin, with a 2 ml extracts of leaves and seeds from *Ecballium elaterium* various colors appear, from yellow to purple suggesting the presence of amino acids.
- Xanthoprotein test: Add 1 ml of concentrated nitric acid, with a 2 ml extracts of leaves and seeds from *Ecballium elaterium*, a cloud or white precipitate appears, the color of which changes to bright yellow when heated, suggesting the presence of amino acids.

The results of the qualitative analysis of amino acids in the leaves and seeds of *Ecballium elaterium* using a variety of specific chemical reactions, showed in Table.1.

Phytochemical examination- Chromatographic techniques

The primary amino acids were determined by phytochemical analyzing various extracts from leaves and seeds from *Ecballium elaterium*. We will employ the TLC method and the paper chromatography method in various systems to confirm the presence of amino acids in order to validate the findings of chemical testing.

Amino acids- (Chromatographic techniques)

To detect the presence of amino acids in *Ecballium elaterium's* leaves and seeds, it is possible to perform qualitative chromatographic analysis of amino acids using one-dimensional chromatography on paper or in a thin layer chromatography TLC in different systems :

A- n-*butanol – acetic acid – water*,(4:1:5) (40:12.5:29) (4:1:2)

B- *n-butanol- acetone- glacial acetic acid- water* (35: 35: 10: 20)

The chromatograms were dried, treated with a 0.2% alcohol solution of ninhydrin and placed in a drying cabinet for 5 minutes at a temperature of 100-105^{0}C; red, red-violet and brown spots appeared, indicating the presence of amino acids, the results of chromatographic studies showed in Table.1.

Table 1: The qualitative composition of amino acids in the leaves and seeds of Ecballium *elaterium* (L.) A. Rich.

No.	Amino acid	General formula	Rf in system B - A -W 4:1:2	Seeds	Leaves
1	Aspartic	$C_4H_7O_4N$	0.15	+	+
2	Alanine	$C_4H_8O_3N_2$	0.22	+	+
3	Arginine	$C_6H_{14}O_2N_4$	0.05	+	-
4	Glutamic	$C_5H_9O_2N$	0.18	+	-
5	Glycine	$C_2H_5O_2N$	0.23	+	+
6	Histidine	$C_6H_9O_2N_3$	0.12	+	-
7	Isoleucine	$C_6H_{13}O_2N$	0.71	+	+
8	Leucine	$C_6H_{13}O_2N$	0.65	+	+
9	Lysine	$C_6H_{14}O_2N_2$	0.04	+	+
10	Methionine	$C_5H_{11}O_2NS$	0.40	+	-
11	Phenylalanine	$C_9H_{11}O_2N$	0.33	+	+
12	Proline	$C_5H_9O_2N$	0.25	+	-
13	Serine	$C_3H_7O_3N$	0.16	+	+
14	Threonine	$C_4H_9O_2N$	0.19	+	+
15	Tyrosine	$C_9H_{11}O_3N$	0.55	+	-
16	Valine	$C_5H_{11}O_2N$	0.44	+	-

As a result of the phytochemical examination (qualitative analysis - chromatographic techniques) and comparison with reference samples, sixteen free amino acids were found in the seeds and leaves of the plant (Ecballium elaterium (L.) A. Rich). These included three semi-essential amino acids (arginine, histidine, tyrosine), seven essential amino acids (isoleucine, leucine, lysine, phenylalanine, threonine, valine, methionine), and sex non-essential amino acids (aspartic, alanine, glutamic, glycine, proline, serine). It was determined for the first time that certain amino acids existed. Table.1. Table.2. Figura.2.

Table 2: Classification of amino acids in leaves and seeds of *Ecballium elaterium (L.)* A. Rich.

Non-essential amino acids	Semi-essential amino acids	Essential amino acids
Aspartic	Arginine	Isoleucine
Alanine	Histidine	Leucine
Glutamic	Tyrosine	Lysine
Glycine		Phenylalanine
Proline		Threonine
Serine		Valine
		Methionine

Histidine and arginine are regarded as semi-essential amino acids since the body requires them only during a particular time—that is, when sustaining the growth of infants and young children. Tyrosine is not necessary in the diet if there is an adequate supply of phenylalanine and methionine, but it is semi-essential since it lowers the needs for these nutrients.[3]

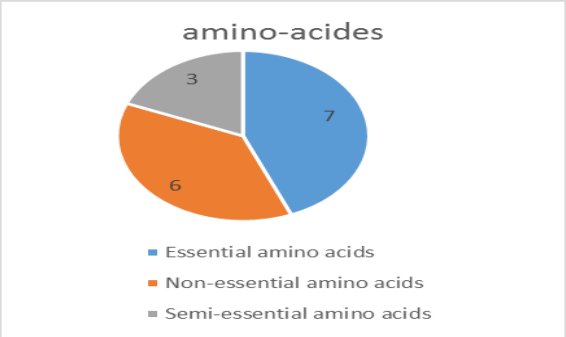

Figura 2: Classification of amino acids in *Ecballium elaterium (L.)* A. Rich.

Studies have been conducted on *Ecballium elaterium* plants in Palestine.[15,16,17] but we did not find a study that talks about the phytochemical composition of the amino acids found in the leaves and seeds of the plant.

However, our work differs from previous research in the following respects :

1. The researcher studied the phytochemical composition of the amino acid content in the leaves and seeds of the *Ecballium elaterium* flora of Palestine for the first time .
2. The presence of 16 amino acids in the leaves and seeds of the *Ecballium elaterium* plant has been proven for the first time.

IV. CONCLUSIONS

This work uses a qualitative approach to investigate the amino acids present in the leaves and seeds of the rich plant *Ecballium elaterium* (L.) A., a member of the *Cucurbitaceae* family that is native to Palestine.

Different types of particular chemical reactions and different forms of chromatography have been used in the chemical investigation of diverse aqueous and alcoholic extracts of leaves and seeds.

The plant (*Ecballium elaterium (L.)* A. Rich) yielded sixteen free amino acids after chemical analysis; these include seven essential amino acids (isoleucine, leucine, lysine, phenylalanine, threonine, valine, and methionine), three semi-essential amino acids (arginine, histidine, and tyrosine), and six non-essential amino acids (aspartic, alanine, glutamic, glycine, proline, and serine).

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