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Phytochemical study of amino-fatty acids of (curly dock) *Rumex crispus* Flora of Palestine.

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ABSTRACT

This study aims to shed light on the study of amino acids in the leaves and fatty acids in the fruits of the, Rumex crispus L., in quantity and quality, which is a plant of Palestine. This study is considered the first of its kind. In addition, the study's conclusions included a number of results and recommendations, the most significant of which are perhaps as follows:
It comes discovered that a set of amino acids is present in the leaves, with the following being the most significant ones: aspartic, glutamic, serine, proline, glycine, alanine, tyrosine, histidine, lysine, arginine, isoleucine, leucine, phenylalanine, methionine, threonine and valine. Myristic acid, palmitic acid, stearic acid, arachidic acid, behenic acid, lignoceric acid, palmitoleic acid, oleic acid, erucic acid, linoleic acid, gadoleic acid, linolenic acid, nervous acid, and cerotic acid are the most significant fatty acids found in fruits.

الدراسة الكيميائية النباتية للأحماض الأمينية والدهنية في الحميض ألاصفر *Rumex crispus* L.

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الخلاصة

تهدف هذه الدراسة الى القاء الضوء على دراسة الاحماض الامينية في الأوراق والاحماض الدهنية في ثمار نبات الحميض Rumex crispus L كما ونوعا وهو من نباتات فلسطين، وتعتبر هذه الدراسة الاولى من نوعها. توصلت الدراسة الى مجموعة من النتائج والتوصيات، ولعل اهم نتائجها ما يلي:

تبين ان الأوراق تحتوي على مجموعة من الاحماض الامينية ومن أهمها: الأسبارتيك، الجلوتاميك، السيرين، البرولين، الجلايسين، ألانين، التيروزين، الهستيدين، ليسين، أرجينين، آيزوليوسين، ليوسين، فينيل ألانين، الميثيونين والثريونين والفالين. وان الثمار تحتوي على مجموعة من الاحماض الدهنية ومن أهمها حمض الميريستيك، حمض البالمتيك، حمض الأراكيديك، حمض البيهينيك، حمض اللجنوسيريك، حمض البالميتوليك، حمض الأوليك، حمض الإيروسيك، حمض اللينوليك، حمض الجادوليك، حمض اللينولينيك، وحمض السيروتيك.

الكلمات المفتاحية: الحميض Rumex crispus L.، الأوراق، الثمار، الاحماض الامينية، الاحماض الدهنية، نباتات فلسطين.

INTRODUCTION

Folk medicine has long recognized the use of plants, and Palestinian society continues to use medicinal plants in traditional medicine to treat a wide range of illnesses (Nidal, 2005). Out of the 750 plant species recognized and utilized in Palestinian folk medicine, only afew types are currently employed in official medicine. This is because a large number of plants are still unstudied, making the search for therapeutic plants and the investigation of their active ingredients and therapeutic benefits crucial. In the world of plants, the genus Rumex is a perennial flowering plant in the family Polygonaceae, extensively distributed, members of this family are very common with a native almost worldwide distribution. This family is sometimes called dock weed and some members are grown for their edible leaves. Species of this genus also act as host plants for various butterfly types. With roughly 150 species found in tropical and subtropical regions. A small number of studies have been conducted on the chemical composition and pharmacological characteristics of the approximately 14 rumex species that are found growing in Palestine (Jing-Juan et al ,2022) (M. Zohary et al , 2015). In Palestinian traditional medicine, plants belonging to the genus Rumex are commonly employed as laxatives, astringents, hemostatic, anti-inflammatory, and dermatological medicines . Rumex is a plant used in traditional and official medicine that includes a number of active compounds, including anthraquinones, flavonoids, catchin, tannins, and others, which give it a wide range of pharmacological effects (Jing-Juan et al ,2022)(Abu Zaher a ,2003)(Abu Zaher a ,2002). Research on fatty acids and amino acids in Rumex is rare, so it is important from a scientific and practical point of view to examine fatty acids in fruits and amino acids in the leaves of these plants.This is due to the inability of the bodies of animals and humans to produce the necesary fatty and amino acid.

1. Recent studies have proven that amino acids have a variety of roles in the body's essential processes and are essential building blocks of numerous proteins. Furthermore, the body uses amino acids to assist its metabolic activities by creating the hormones and neurotransmitters that are required (Rose, 2019).
2. Fatty acids, on the other hand, play crucial functions in the body's structure, function, and biology. In addition to serving as an energy source, they are essential components of cellular membranes (Nagy et al, 2017).
3. Realizing that the Ukrainian species Rumex crispus L. has been studied and classified by us and its chemical composition established in the past, the rhizomes, roots, and fruits of Rumex crispus L. flora in Ukraine were found to contain anthraquinones (emodin, chrysophanol,

fiscion, chrysophanein, glucoemodin), flavonoids (rutin, hyperoside, quercetin), catechins, leukoanthocyanidins, tannins, hydroxycinnamic acids (caffeic, chlorogenic), oxalic and ascorbic acids, and coumarins (Abu Zaher b ,2002).

4. Thus, among the flora of Palestine, we selected (*Rumex crispus* L.) as our study subject.

5. The aim of this work was to investigate the qualitative and quantitative of amino acid composition of leaves and fatty acid content of the fruits of *Rumex crispus* L.which had not been studied previously.

MATERIALS AND METHODS

Plant Material

The study included leaves and fruits from Rumex crispus L. that were collected in May and June, respectively, from the area near Tulkarm, Palestine (32.319534679699004, 35.023736473066144). The raw materials were crushed, let to air dry, and then sieved through a sieve that had a 1 mm diameter.

Fatty acids

By using procedure (Abu Zaher b,2003), the amount of fat was extracted from the dried and crushed raw materials three times at room temperature by infusion with hexane at a ratio of 1:5. After the extracts were gathered, they were distilled at a temperature lower than 40°C using a rotary evaporator. A 10 ml sharp-bottomed flask was filled with 1.0 ml of the residual solution after it had been dissolved in 2.0 ml of ether. To this was added 0.05 ml of acetyl chloride, 5 ml of methyl alcohol, and 0.5 ml of ether. The new mouth's interior volume is flipped around and filled with nitrogen. The solution was heated for 20 minutes at (65 ± 3) °C in a glycerin bath. Following the solution's evaporation in an inert gas flow to a residual volume of roughly 0.2 mL, room temperature was reached; 2.0 mL of cyclohexane, 1.0 mL of 5% sodium sulfate solution, and a minute of shaking were added. We hold onto it until the layers very separate. 0.2 g of anhydrous sodium sulfate were used to separate and filter the top cyclohexane layer. Fatty acid methyl esters obtained by direct methylation of oils were analyzed by gas liquid chromatography (GLC) in method (Abu Zaher b, 2003.(

Amino acids

0.01 mL of aqueous extracts from the leaves of the investigated species were chromatographed on F4 paper using the solvent system n-butanol-acetic acid-water (4:1:2) in order to identify free amino acids. Following drying and treatment with a 0.2% Ninhydrin alcohol solution, the chromatograms

1000 seed weight (g)

were heated to 100–105 °C for five minutes in a drying oven. The dark purple color of the dots and their RF value (Abu Zaher, 2001) are used to identify amino acids. The content of amino acids was examined using a column loaded with DCGA ion exchange resin using a Swedish LKB 4151 Alpha Plus analyzer. To evaluate the amount of free and bound amino acids, samples were hydrolyzed with 200-fold 6 M HCl in a thermostat at 110 ± 5 °C for 20 h, the test tube was cut, and the acid was pulverized. At 1000°C, evaporates. Using an automated amino acid analyzer called "Amino chrome-II" (Hungary), the residue—a combination of amino acids—was broken down into its constituent parts using ion exchange chromatography in accordance with a modified version of Szpokman, Moore, and Stein's (Abu Zaher ,2001) methodology.

RESULT AND DISCUSSION

Fatty acids

By comparing retention periods with those in known samples and using internal normalization, fatty acids were found. A percentage of their overall fat content was determined. See Figure No. 1 and Table No. 1.

Table No.1 Qualitative composition and quantitative content (%) of individual fatty acids in the fruits of *Rumex crispus* L.

No.	Index	Acid	% Content in fruits
1	C14:0	Myristic acid	0.48
2	C16:0	Palmitic acid	10.00
٣	C16:1	Palmitoleic acid	0.20
4	C18:0	Stearic acid	3.50
5	C18:1	Oleic acid	34.00
6	C18:2	Linoleic acid	20.00
7	C18:3	Linolenic acid	0.77
8	C20:0	Arachidic acid	2.00
9	C20:1	Gadoleic acid	0.92
10	C22:0	Behenic acid	0.55
11	C22:1	Erucic acid	1.55
12	C24:0	Lignoceric acid	2.00
13	C24:1	Nervous Acid	2.55
14	C26:1	Cerotic acid	1.50

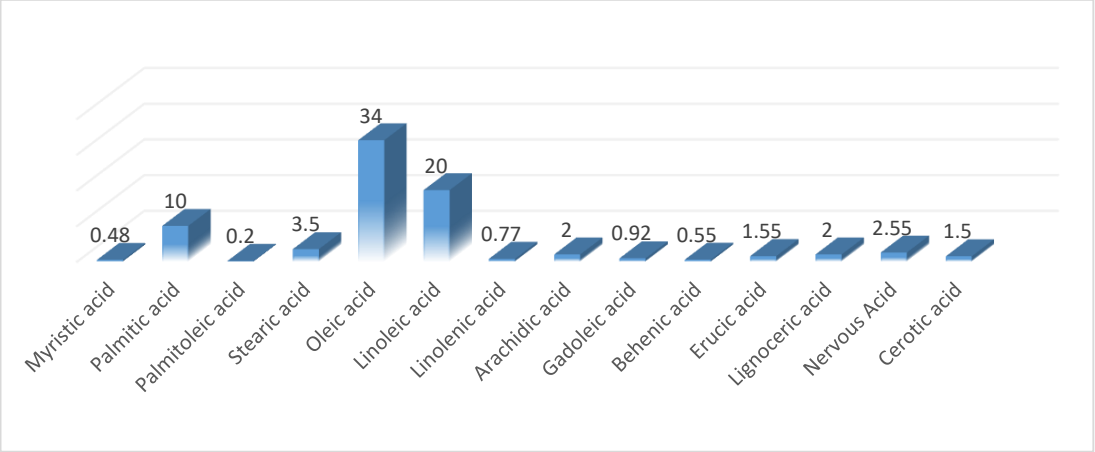

Figure No. 1 Qualitative composition and quantitative content (%) of individual fatty acids in the fruits of Rumex crispus L.

As a result, for the first time, the qualitative and quantitative content of fatty acids in fruits of Rumex crispus L. Flora of Palestine were investigated. Based on the findings of the study, the oil has 14 different types of fatty acids: myristic, palmitic, stearic, arachidic, behenic, lignoceric, palmitoleic, oleic, erucic, linoleic, nervous acid, cerotic acid, linolenic acid, and gadoleic acid.

Amino acids.

The dark purple color of the dots and their RF value are used to identify amino acids. See Figure 2.

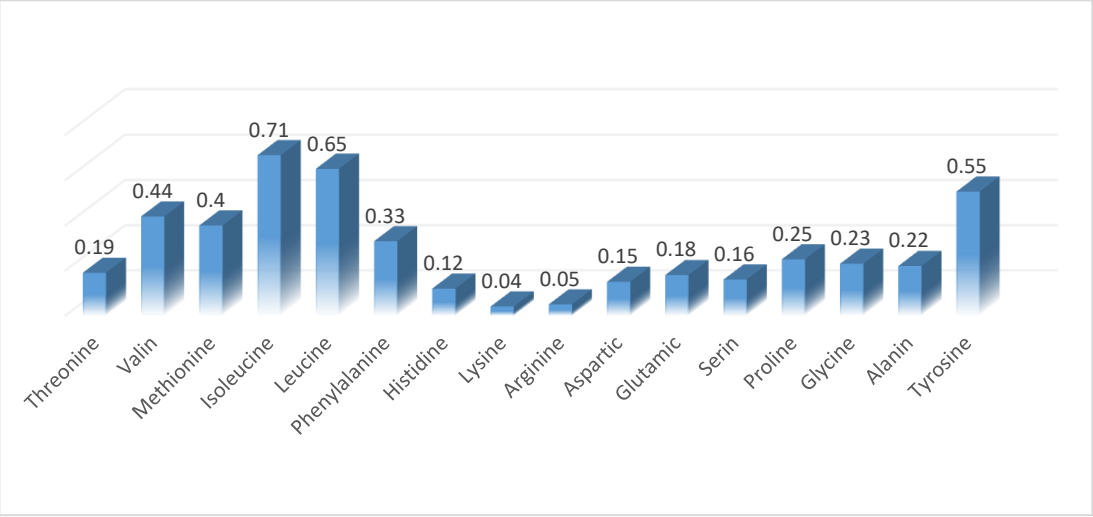

Figure No. 2. Amino acids and their RF value

As a result, for the first time, the qualitative and quantitative content of amino acids the leaves of Rumex crispus L. Flora of Palestine were investigated. As the table's data demonstrate, 16 amino acids were found in the leaves of these, 9 are essential: valine, threonine, methionine, isoleucine, leucine, phenylalanine, histidine, lysine, and arginine. See Table No. 2 and Figure No. 3.

Table No. 2. The qualitative composition and quantitative content of amino acids in the leaves of Rumex crispus L.

No.	Amino acid	General formula	Rf in BUV 4:1:2	Content in % on dry weight of raw materials
				Rumex crispus L.
1	Threonine	$C_4H_9O_2N$	0.19	1.000
2	Valine	$C_5H_{11}O_2N$	0.44	0.989
3	Methionine	$C_5H_{11}O_2NS$	0.40	0.233
4	Isoleucine	$C_6H_{13}O_2N$	0.71	0.754
5	Leucine	$C_6H_{13}O_2N$	0.65	0.989
6	Phenylalanine	$C_9H_{11}O_2N$	0.33	0.887
7	Histidine	$C_6H_9O_2N_3$	0.12	0.433
8	Lysine	$C_6H_{14}O_2N_2$	0.04	0.564
9	Arginine	$C_6H_{14}O_2N_4$	0.05	0.897
10	Aspartic	$C_4H_7O_4N$	0.15	0.878
11	Glutamic	$C_5H_9O_2N$	0.18	1.443
12	Serine	$C_3H_7O_3N$	0.16	0.667
13	Proline	$C_5H_9O_2N$	0.25	0.889
14	Glycine	$C_2H_5O_2N$	0.23	0.779
15	Alanine	$C_4H_8O_3N_2$	0.22	1.221
16	Tyrosine	$C_9H_{11}O_3N$	0.55	0.554

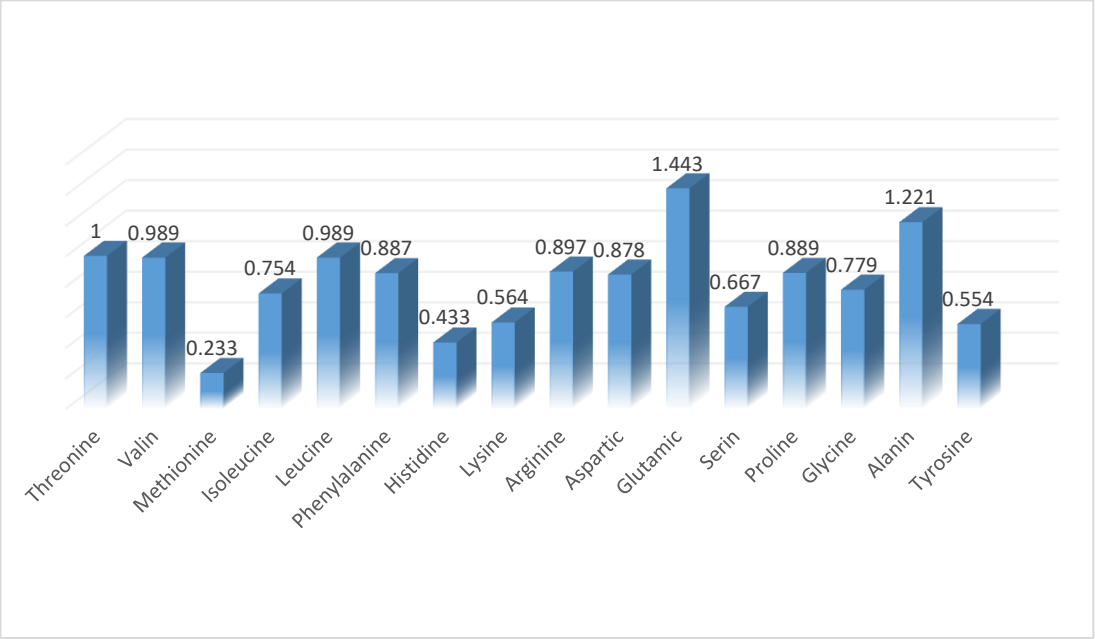

Figure No. 3 Qualitative composition and quantitative content (%) of individual amino acids in the leaves of Rumex crispus L.

The research is significant since it is the first to look at the qualitative and quantitative composition of fatty acids in the fruits and amino acids in the leaves of the Rumex crispus L. Flora plant from Palestine. In order for Palestinian plants to be utilized in both traditional and modern medicine, researchers need to focus on identifying the active ingredients in these plants and their therapeutic effects.

CONCLUSION

It comes discovered that a set of amino acids is present in the leaves of Rumex crispus Flora of Palestine, with the following being the most significant ones: aspartic, glutamic, serine, proline, glycine, alanine, tyrosine, histidine, lysine, arginine, isoleucine, leucine, phenylalanine, and valine. Myristic acid, palmitic acid, stearic acid, arachidic acid, behenic acid, lignoceric acid, palmitoleic acid, oleic acid, erucic acid, lignocelluleic acid, acid, gadoleic acid, nervous acid, and cerotic acid are the most significant fatty acids found in fruits of Rumex crispus Flora of Palestine .

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