

Amino Acid Contents of Leaves and Stems for Three Types of Herbal Plants at Al-Gabal Al-Akhder Region

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Abstract: The amino acids contents were determined in leaves and stems of three types of herbal plants collected from AL-Gabal AL-Akhder region (Libya) during spring(2013). The plants includes (*Thyme*, *Rosemary* and *Salvia*). The amino acids showed difference level from plants to another, but generally the high level was (methionine) (11263834.14 μ M) found in *salvia* stems. while the lower value was in *thyme*.

Key word: Herbal Plants Amino acids contents- Libya

INTRODUCTION

Amino acids are building blocks of the proteins. Proteins are an essential part of all the living animals and participate in virtually every process within the cell. Enzymes that catalyze many biological reactions are proteins and these are vital to metabolism. Amino acids are linked with each other through peptide linkage to form a long chain which results in proteins responsible for the growth and well functioning of cells. Identification of amino acid sequence in a protein is of utmost importance in synthesizing new drugs for treatment of diseases such as cancer, diabetes and many more related to genetic disorders. The study of amino acids is important as it reveals the nature of enzymes responsible for the biogenesis of various compounds in the plants. The study of amino acids present in the plant is important from the point of view that it will open up new research avenues [1].

Cysteine has been used in chemotherapeutic treatment for leukemia, L-Proline is an osmoprotectant and therefore is used in many pharmaceutical and biotechnological applications [2].

MATERIALS AND METHODS

Sampling: Three different herbal plants samples were collected from AL-Gabal AL-Akhder region during

winter-spring Seasons. The Samples including (*Thyme*, *Rosemary* and *Salvia*).

Samples Preparation: Leaves and Stems of every plants were separated and washed with distilled water several times, then dried overnight at the room temperature, then crashed and powdered of Leaves and Stems separately using 40 mesh wiley mill to insure their complete homogeneity.

Amino Acids Analysis: Dry defatted samples of Tree types of studied herbal plants(leaves and Stems) 0.1g was hydrolyzed with 10 ml of 6 N HCL in sealed tubes for 24 hrs at 110°C. after hydrolysis,the excess HCL was removed by evaporation under vacuum with occasional addition of water. The residue was dissolved in Sodium citrate buffer PH 2.2 and any insoluble matter is filtered off. The optically clear solution (30 μ l) is chromatographic in an Amino Acid Analyzer, at unit of Analysis and Scientific Services, Faculty of Agriculture, Alexandria University [3].

RESULTS AND DISCUSSION

Thyme: The amino acids concentration in two studied parts of *Thyme* included (arginine, alanine, threonine, glycine, serine, aspartic acid, cystine, valine, proline, methionine and glutamic acid).

The high total amino acids found in Leaves (61241 μM) and the high value was recorded for Methionine (29491) and Low concentration was recorded for Proline (50.7097), with absence of arginine, alanine, threonine, glycine, aspartic acid and cystine.

While in stems the total amino acid was (30541.28 μM), with high concentration for Threonine (11413.23 μM) and Low concentration for Glycine (87.4511), with absence of valine, proline, methionine and glutamic acid (Table 1, Fig 1).

Rosemary: The amino acids concentration in two studied parts of *Rosemary* included (arginine, alanine, threonine, aspartic acid, cystine, histidine, phenyl alanine and tyrosine).

The high total amino acids found in Stems (73687.01 μM), with high concentration for amino acid was found for threonine (69570.8584) and low concentration was recorded for aspartic acid (648.3736), with absence of alanine, histidine, phenyl alanine and tyrosine.

While in Leaves the total amino acids were (36014.16 μM), with high concentration for threonine (25656.6) and low concentration for alanine (317.5396), with absence of cystine (Table 4, Fig 4).

Salvia: The amino acids concentration in two studied parts of *salvia* included (arginine, alanine, threonine, glycine, serine, cystine, valine, poline, methionine and lysine).

The high total amino acids found in Stems (11263834.14 μM) and the high value was recorded for Methionine (11234037.1333) and low concentration was recorded for Serine (2914.8732), with absence of glycine, cystine and lysine.

While in leaves the total amino acid was (92072.195 μM), with high concentration for Valine (47062) and low concentration for serine (129.3667), with absence of arginine, threonine, proline and methionine, (Table 7, Fig 7).

Essential Amino Acid (EAA) of the Leaves and the Stems of Three Herbal Plants in Libya:

Thyme: The percentage of essential amino acid are as following: threonine (ND, 100), valine (45.7, ND) and methionine (54.3, ND) in leaves and stems, respectively.

The high percentage of essential amino acid was recorded for threonine (100) in stems, while the low percentage was recorded for valine (45.7) in leaves. On other side, the high values of total essential amino

Table 1: The amount of Amino acid in *Thyme* (Leaves and Stems).

Amino acid	Sample	
	Leaves(μM)	Stems(μM)
Arginine	-	4497.211
Alanine	-	3268.8903
Threonine	-	11413.23
Glycine	-	87.4511
Serine	4279.7	3200.83
Aspartic acid	-	4288.67
Cystine	-	3785.006
Valine	24850.7	-
Proline	50.7097	-
Methionine	29491.9	-
Glutamic acid	2568.01	-
Total amino acid (TAA)	61241	30541.28

Table 2: Percentage of Essential Amino acid (EAA%) of *Thyme* (Leaves and Stems).

Amino acid	Sample			
	Leaves		Stems	
	EAA%	TAA%	EAA%	TAA%
Threonine	-	-	100	37.36
Valine	45.7	40.5	-	-
Methionine	54.3	48.15	-	-
Total Essential Amino acid (TEAA)	54342.6		11413.23	

EAA%: percentage of Essential Amino Acid.

TAA%: percentage of Total Amino Acid.

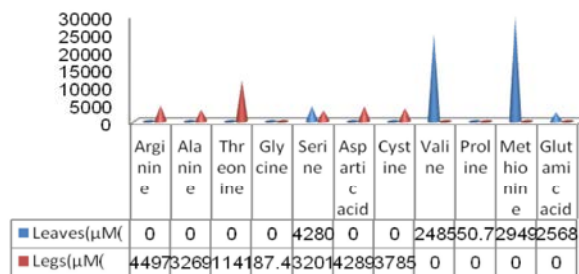


Fig 1: The amount of Amino acid in *Thyme* (Leaves and Stems (Legs)).

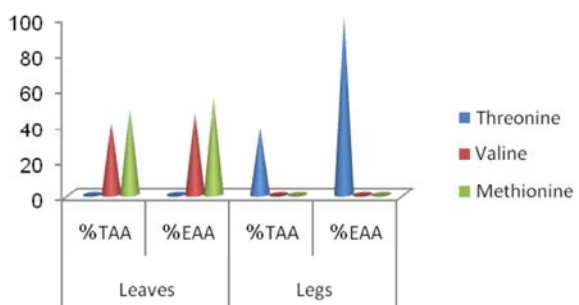


Fig. 2: Percentage of Essential Amino acid (EAA%) of *Thyme* (Leaves and Stems (Legs)).

acid of *thyme* in this study was found in leaves (54342.6), while the percentage in stems was (11413.23) (Table 2, Fig 2).

Rosemary: The percentage of essential amino acid are as following: threonine (97.8, 100) and phenyl alanine (2.16, ND) in leaves and stems, respectively.

The high percentage of essential amino acid was recorded for threonine (100) in Stems, while the low percentage was recorded for phenyl alanine (2.16) in leaves.

In general the high values of the total amino acid of *Rosemary* in the present study were found in Stems (69570.8589), while the percentage in leaves was (26225.1). (Table 5, Fig 5).

Salvia: The percentage of essential amino acid are as following: threonine (ND, 0.066), valine (61.4, 0.0492), methionine (ND, 99.8) and Lysine (38.5, ND) in leaves and stems, respectively.

The high percentage of essential amino acid was recorded for methionine (99.8) in stems, while the Low percentage was recorded for valine (0.0492) in stems. On other side, the high values of total essential amino acid of *Salvia* in this study was found in Stems (11247081.6), while the percentage in leaves was (76639.8). (Table 8, Fig 8).

Non Essential Amino Acid of the Leaves and the Stems of Three herbal Plants:

Thyme: The percentage of non essential amino acid are as following: arginine (ND, 23.5), alanine (ND, 17.08) Gglycine (ND, 0.45), serine (62.03, 16.73), aspartic acid (ND, 22.42), cystine (ND, 19.78), proline (0.73, ND) and gutamic acid (37.2, ND) in leaves and stems, respectively.

The high percentage of non essential amino acid was recorded for Serine (62.03) in Leaves, while the low percentage was recorded for proline (0.73) in Leaves.

In general the high values of the total non essential amino acids in the present study were found in stems (19128.05), while the values in leaves were (6898.4) (Table 3, Fig 3).

Rosemary: The percentage of non essential amino acids are as following: arginine (ND, 41.20), alanine (3.24, ND), aspartic acid (4.77, 15.75), cystine (ND, 43.04), histidine (52.6, ND) and tyrosine (39.34, ND) in leaves and stems, respectively.

Table 3: Percentage of Non-Essential Amino acid (NEAA%) of *Thyme* (Leaves and Stems).

Amino acid	Sample			
	Leaves		Stems	
	NEAA%	TAA%	NEAA%	TAA%
Arginine	-	-	23.5	14.72
Alanine	-	-	17.08	10.7
Glycine	-	-	0.45	0.28
Serine	62.03	6.98	16.73	10.48
Aspartic acid	-	-	22.42	14.04
Cystine	-	-	19.78	12.39
Proline	0.73	0.082	-	-
Glutamic acid	37.2	4.19	-	-
Total Non-Essential amino acid(TNEAA)	6898.4		19128.05	

NEAA%: percentage of Non Essential Amino Acid

Table 4: The Amount of Amino acid in *Rosemary* (Leaves and Stems).

Amino acid	Sample	
	Leaves(μM)	Stems(μM)
Arginine	-	1696.1021
Alanine	317.5396	-
Threonine	25656.6	69570.8584
Aspartic acid	467.2479	648.3736
Cystine	-	1771.6839
Histidine	5153.0292	-
Phenyl alanine	568.5119	-
Tyrosine	3851.2393	-
Total Amino acid (TAA)	36014.16	73687.01

Table 5: Percentage of Essential Amino acid (EAA%) of *Rosemary* (Leaves and Stems).

Amino acid	Sample			
	Leaves		Stems	
	EAA%	TAA%	EAA%	TAA%
Threonine	97.8	71.2	100	94.4
Phenyl alanine	2.16	1.57	-	-
Total Essential Amino acid (TEAA)	26225.1		69570.8589	

Table 6: Percentage of Non-Essential Amino acid (NEAA%) of *Rosemary* (Leaves and Stems).

Amino acid	Sample			
	Leaves		Stems	
	NEAA%	TAA%	NEAA%	TAA%
Arginine	-	-	41.20	2.3
Alanine	3.24	0.88	-	-
Aspartic acid	4.77	1.29	15.75	0.87
Cystine	-	-	43.04	2.4
Histidine	52.6	14.3	-	-
Tyrosine	39.34	10.69	-	-
Total Non-Essential Amino acid (TNEAA)	9789.05		4116.15	

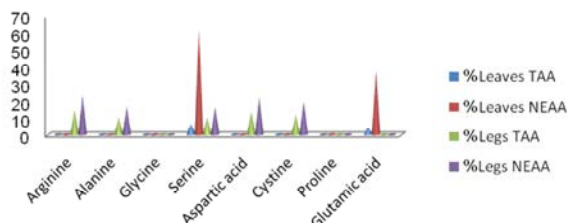


Fig. 3: Percentage of Non-Essential Amino acid (NEAA%) of Thyme (Leaves and Stems (Legs)).

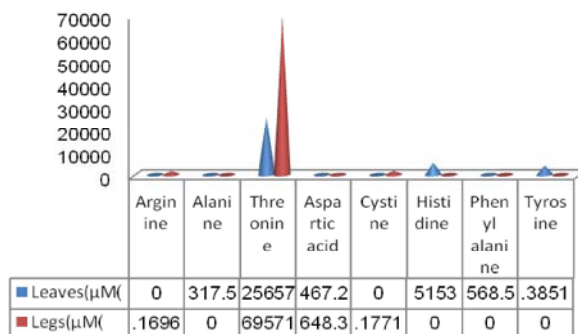


Fig. 4: The Amount of Amino acid in Rosemary (Leaves and Stems (Legs)).

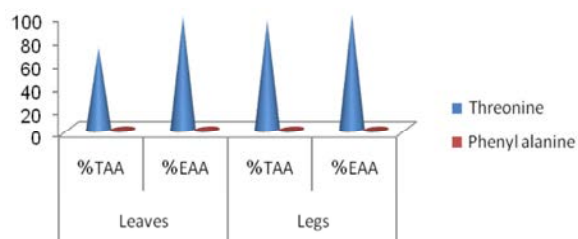


Fig. 5: Percentage of Essential Amino acid (EAA%) of Rosemary (Leaves and Stems (Legs)).

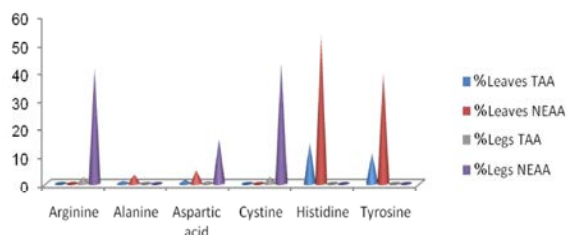


Fig. 6: Percentage of Non-Essential Amino acid (NEAA%) of Rosemary (Leaves and Stems (Legs)).

The high percentage of non essential amino acids was recorded for Histidine (52.6) in Leaves, while the low percentage was Alanine (3.24) in leaves. On other side, the high values of total non essential amino acids of *Rosemary* in this study were found in leaves (9789.05), while the Low values in stems (4116.15) (Table 6, Fig 6).

Table 7: The Amount of Amino acid in *Salvia* (Leaves and Stems).

Amino acid	Sample	
	Leaves (μM)	Stems (μM)
Arginine	-	5656.8800
Alanine	6632.5990	5158.1882
Threonine	-	7506.1919
Glycine	643.9324	-
Serine	129.3667	2914.8732
Cystine	8026.4922	-
Valine	47062.2022	5538.2818
Proline	-	3022.5914
Methionine	-	-
11234037.1333		
Lysine	29577.6025	-
Total Amino acid (TAA)	92072.195	11263834.14

Table 8: Percentage of Essential Amino acid (EAA%) of *Salvia* (Leaves and Stems).

Amino acid	Sample			
	Leaves		Stems	
	EAA%	TAA%	EAA%	TAA%
Threonine	-	-	0.066	0.06
Valine	61.4	51.1	0.0492	0.049
Methionine	-	-	99.8	99.7
Lysine	38.5	32.12	-	-
Total Essential Amino acid (TEAA)	76639.8		11247081.6	

Table 9: Percentage of Non-Essential Amino acid (NEAA%) of *Salvia* (Leaves and Stems).

Amino acid	Sample			
	Leaves		Stems	
	NEAA%	TAA%	NEAA%	TAA%
Arginine	-	-	33.7	0.05
Alanine	42.9	7.20	30.79	0.045
Glycine	4.17	0.69	-	-
Serine	0.83	0.14	17.39	0.025
Cystine	52.01	8.7	-	-
Proline	-	-	18.04	0.026
Total Non-Essential Amino acid (TEAA)	15432.39		16752.53	

Salvia: The percentage of non essential amino acid are as following: Arginine (ND, 33.7), alanine (42.9, 30.79) glycine (4.17, ND), serine (0.83, 17.39), cystine (52.01, ND) and proline (ND, 18.04) in leaves and stems, respectively.

The high percentage of non essential amino acid was recorded for Cystine (52.01) in leaves, while the low percentage was recorded for serine (0.83) in Leaves.

In general the high values of the total non essential amino acids in the present study were found in stems (16752.53), while the values in leaves were (15432.39) (Table 9, Fig 9).

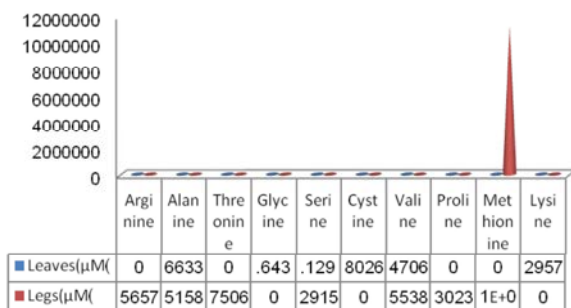


Fig. 7: The Amount of Amino acid in Salvia (Leaves and Stems (Legs)).

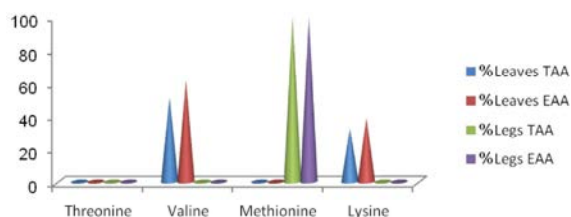


Fig. 8: Percentage of Essential Amino acid (EAA%) of Salvia (Leaves and Stems (Legs)).

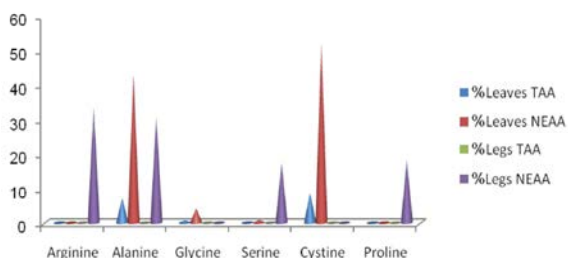


Fig. 9: Percentage of Non-Essential Amino acid (NEAA%) of Salvia (Leaves and Stems (Legs)).

The amino acids have many function for human compounds, as examples they are the major constituents for protein, hemoglobin, ciriatinine and some hormones, Also they are combine with Genatic structure and give ATP molecules.

SUMMARY AND CONCLUSION

The present study shows variations in presence of the amino acids in Leaves and Stems of every plants. Also some plants as *Marjoram*, *Hybrid tea rose* and *Rosemary* found the first data of amino acids in (Libya).

Very little previous studied gave the speciation of amino acids in herbal plants, but the our results are agreement with those recorded in [4] () in *Salvia* and *Thyme* plants. Also (recorded some amino acids in sisavus plants in Libya. (*El-Taype*, 2008) stated that, the presence of some amino acids in *Salvia* without give the speciation of every type [5, 6].

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