European Journal of Molecular & Clinical Medicine
ISSN 2515-8260 Volume 07, Issue 03, 2020

Amino Acids In Three Iraqi Truffles Type

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Abstract: Three types of Iraqi truffles, which were collected from different regions of the Western Desert in Anbar Governorate in western Iraq, were studied. The three types of truffles were diagnosed as alhurqa truffles that are black-dark brown Terfezia boudieri ,and the second type is truffle aljabah that is brown-light-brown in color Terfezia claveryi. The third type was white to creamy color, and brittle solid with zigzags and cracks in its outer shell Tirmania nivea . Models of soil grouped with the three types were studied to determine the chemical and physical properties of the soil, as well as the total numbers of bacteria and fungi present in the truffle rhizosphere were calculated. as well as the total numbers of bacteria and fungi present in the truffle rhizosphere. Amino acids, which differed between the three types, were diagnosed in terms of the quality and quantity of the amino acid, The truffle T. boudieri containing 14 amino acids whose values ranged from 0.011 ppm for Aspartic to 75.654 ppm for Arginine, the total concentration of amino acids was 239.609 ppm While T. claveryi contained 0.192 ppm Aspartic acid to 194.433 ppm Glutamic and the total concentration of amino acids was 346.633 ppm. At last T. nivea content 0.294 ppm Isoleucine to 233.555 ppm Alanine, and the total concentration of amino acids was 556.365 ppm. Soil characteristics varied between the three types of truffles. As well as the amount of nutrients in addition to the difference in the numbers of bacteria and fungi between the truffles types. The truffles oxidant results according to estimate Thiobarbituric acid showed higher value in T. boudieri (0.835) than T. claveryi (0.649) and T. nivea (0.486) mg m Malondialdehyde (MDA). kg truffles.

KeyWords: Amino acids, Iraqi truffles, brittle solid, Aspartic acid.

1. INTRODUCTION

Truffles belong to hypogeous ascomycete fungi that make a mycorrhizal association with some kind of vascular plants. The desert truffles are economically important and widely distributed in arid and semi-arid regions (Slama et al, 2010) Many Tuber species are suitable for human consumption, including the highly prized black truffle (Tuber melanosporum Vittad.). Due to its unique aroma and flavor, the black truffle is one of the world's top culinary delicacies (Mello et al, 2006) therefore; the interest in cultivating it and studying its water needs to increase its production (Garcia-Barreda & Camarero 2020).
Terfezia claveryi is a most member fungus found in marl-gypsum soils and in marl calcareous and sandy soils under the desert condition (Honrubia et al. 1992). In Iraq and some countries in middle east there are many types of desert truffles like *T. claveryi* known locally Aljabah (dark brown color and smooth thick crust) and the second type *T. boudieri* known Alhurqa (black color and smooth thick crust) and the other genus *Tirmania nivea* known Zubaidee (White color with cracked skin) (Alrawi & Taha,2010). truffles are eaten for their flavor and used as a spice, known with their culinary use and aromatic toast The sell prices of one pound of some types reach 1000 -3000$ (Lefevre, 2008). The reason for paying attention to this

fruity body is because truffles are an excellent nutrient sources with specific good taste (Morte et al.,2009), It has a unique nutritional profile of unsaturated fatty acid, vitamins, minerals, and protein (Patel, 2012).
Truffles are the fructification of some Ascomycetes fungi. Their mycelia form mycorrhiza with the roots of some host plant species. These last depend on site characteristics (soil type and climatic conditions) and
truffle species (Slama et al,2010), Many environmental factors, such as amount of rain and time, soil types and climatic changes, make the change in chemical composition in the same species of truffles from different regions (Hussain and Al-Ruqaie, 1999). even the host plant has an effect on the growth of truffles (Dib & Fortasz, 2019). Alrawi & Taha (2010) shows that the famous two fungal genera (*Terfezia* and *Tirmania*) had many amino acids. This work aims to make a comparison between the three types of desert truffles spread in Iraq in terms of the amino acids present in each type and their quantities.

2. MATERIAL AND METHODS

The fruiting bodies of desert truffles were collected from different regions of western Iraq, and were classified according to the Alrawi & Taha (2010). The soil adjacent to the fruiting body of each type of classified speciation was taken and collected separately and analyzes.
The methods presented in USDA Hand Book No. 60 (1954) were used in soil analyzes.(pH,ECe,$CaCO_3$,$CaSO_4$,Na,K,Ca,Mg,Cl,HCO_3 ,SO_4). Soil organic matter was estimated by Walkly & Black method according to Jackson (1958). Available nitrogen estimated according to Black (1965a), and available phosphorus according to Olsen & Sommers in Page et al (1982).

Estimate the amino acid
The amino acids estimated in Chromatography (Dilution 1, Mobile Phase : Buffer: Mix, Detecation : Ex = 340 nm Em = 450 nm, Flow Rate : 2ml/min).

Table 1 some soil characteristic.

	T. nivea	T. boudieri	T. claveryi
pH	7.62	7.45	7.50
ECe (dSm^{-1})	2.65	3.00	2.98
O.M ($g.kg^{-1}$)	12.22	13.01	12.90
$CaCO_3$($g.kg^{-1}$)	370.20	350.00	359.83
$CaSO_4$($g.kg^{-1}$)	12.50	13.05	13.80
N ($mg.kg^{-1}$)	50	55	53
P ($mg.kg^{-1}$)	7	9	8
K ($mg.kg^{-1}$)	350	365	362
Ca^{++} ($Cmol.kg^{-1}$)	0.63	0.70	0.68
Mg^{++} ($Cmol.kg^{-1}$)	0.53	0.49	0.40
Na^{+} ($Cmol.kg^{-1}$)	0.25	0.30	0.28
Cl^{-} ($Cmol.kg^{-1}$)	0.71	0.74	0.76
HCO_3^{-} ($Cmol.kg^{-1}$)	0.35	0.23	0.25
SO_4^{--} ($Cmol.kg^{-1}$)	0.55	0.57	0.59
Total count(cfu.g $soil^{-1}$)	7.4*1010	2.4*1010	3.5*1010

3. RESULTS AND DISCUSSION

The results showed the presence of amino acids in the three types of desert truffles and in different quantities, as the highest value in *T. nivea* was 556.365 ppm, while it reached 346.633 and 239.609 ppm in *T. claveryi* and *T. boudieri* respectively (Table 2,3,4). *T. nivea* contains the lowest number of amino acids which are Aspartic acid, Serine, Threonine, Alanine, Cysteine, Methionine, Isoleucine, and Lysine, While truffles *T. boudieri* contain the highest number of amino acids, it reached 14 amino acids among the three types (Aspartic acid, Glutamic acid, Serine, Histidine, Glycine, Threonine, Arginine, Alanine, Cysteine, Valine, Methionine, Phenylalanine, Isoleucine, Leucine) followed by truffles *T. claveryi* which contained 11 amino acids (Aspartic acid, Glutamic acid, Serine, Histidine, Glycine, Cysteine, Valine, Phenylalanine, Isoleucine, Leucine, Lysine), The results showed that the three types of desert truffles contain a large amount of amino acids that are important in human nutrition (Al-Rawi and Taha, 2010). The reason for the difference in the quantity and quality of amino acids between the species may be due to the different environments accompanying the truffles, truffles are affected by the surrounding environmental conditions (Garicia-Barreda et al,2020). We can also see the presence of aspartic acid, serine, Cystine and isoleucine in the three types, this similarity between these three amino acids may be due to the similarities in the genetic origins of the three types of truffles, as recent studies have indicated similarities between gene pairs that reach very large numbers (Dimitromanolakis et al,2019). Truffles *T. boudieri* are distinguished from the rest types in contain Arginine while the types *T. nivea* and *T. claveryi* contain Lysine.

Table 2 The amount and peak type and compound of amino acids in *T. nivea* .

	Reten.Tim(min)	Response	Amount(ppm)	Amount(%)	Peak Type	Compound
1	9.084	982.124	40.525	7.3	Order	Aspartic acid
2	11.832	3468.308	35.480	6.4	Order	Serine
3	12.568	1184.302	12.866	2.3	Order	Threonine
4	12.880	481.861	0.000	0.0		
5	13.016	7022.729	0.000	0.0		
6	13.328	30646.076	233.555	42.0	Order	Alanine
7	15.936	6284.047	104.309	18.7	Order	Cystine
8	16.864	767.440	0.000	0.0		
9	17.604	2231.464	119.008	21.4	Order	Methionine
10	17.824	40.709	0.000	0.0		
11	18.336	6.350	0.294	0.1	Order	
12	18.596	884.662	0.000	0.0		Isoleucine
13	19.108	266.959	10.327	1.9	Order	Lysine
	Total		556.365	100.0		

Table 3 The amount and peak type and compound of amino acids in *T. claveryi*

	Reten. Tim(min)	Response	Amount(ppm)	Amount(%)	Peak Type	Compound
1	9.036	4.648	0.192	0.1	Order	Aspartic acid

2	10.768	6525.148	194.433	56.1	Order	Glutamic acid
3	11.840	1920.948	19.651	5.7	Order	Serine
4	12.020	3008.520	13.789	4.0	Order	Histidine
5	12.424	2393.080	16.023	4.6	Order	Glycine
6	12.524	433.822	0.000	0.0		
7	16.144	646.865	10.737	3.1	Order	Cystine
8	16.460	11729.611	0.000	0.0		
9	16.788	1546.907	0.000	0.0		
10	17.212	1030.078	21.878	6.3	Order	Valine
11	17.332	314.236	0.000	0.0		
12	17.956	375.007	12.180	3.5	Order	Phenylalanine
13	18.548	1111.660	51.549	14.9	Order	Isoleucine
14	18.780	139.757	3.098	0.9	Order	Leucine
15	18.992	80.223	3.103	0.9	Order	Lysine
	Total		346.633	100.0		

Table 4 The amount and peak type and compound of amino acids in *T. boudieri*

	Reten. Tim(min)	Response	Amount(ppm)	Amount(%)	Peak Type	Compound
1	8.952	0.276	0.011	0.0	Order	Aspartic acid
2	10.820	2663.477	79.365	33.1	Order	Glutamic acid
3	11.904	1210.757	12.386	5.2	Order	Serine
4	12.068	1327.437	6.084	2.5	Order	Histidine
5	12.480	1873.428	12.543	5.2	Order	Glycine
6	12.724	1704.079	18.513	7.7	Order	Threonine
7	13.052	5827.920	0.000	0.0		
8	13.084	2240.735	0.000	0.0		
9	13.152	4356.773	75.654	31.6	Order	Arginine
10	13.412	1283.819	9.784	4.1	Order	Alanine
11	15.928	24.403	0.405	0.2	Order	Cystine
12	17.288	581.560	12.352	5.2	Order	Valine
13	17.496	66.521	3.548	1.5	Order	Methionine
14	18.084	38.137	1.239	0.5	Order	Phenylalanine
15	18.600	101.893	4.725	2.0	Order	Isoleucine
16	18.704	556.584	0.000	0.0		
17	18.872	135.355	3.000	1.3	Order	Leucine
	Total		239.609	100.0		

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