



ORIGINAL RESEARCH ARTICLE

Screening of amino acid constituents from date palm fruits

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Received: August 22, 2016; Accepted: September 17, 2016

Available online: 1st October 2016

Abstract: The date palm (*Phoenix dactylifera* L.) is one of mankind's oldest cultivated plants. The fruit of the date palm is an important crop of the hot arid and semi-arid regions of the world. It has always played a genuine economic and social part in the lives of the people of these areas. The present objective in examining the amino acid content of different varieties of date palm fruits from Middle-East region; is to determine whether its protein could effectively supplement the nutritional value and it is also aimed in finding which variety is rich in number of amino acids. The phytochemical screening revealed the presence of eight essential amino acids and five non-essential amino acids in the date fruits. Among all the date fruit varieties taken as samples for the study, Dabbas cultivar of United Arab Emirates found to exhibit eight types of amino acids which includes five as non-essential ones. Total of thirteen amino acids were detected in the seven date cultivars. Determination of amino acid can serve as a guide to the possible nutritional value.

Key words: Amino acids; Date palm; Nutrition; Phytochemical; Thin Layer Chromatography

Introduction

The date palm (*Phoenix dactylifera* L.) is one of mankind's oldest cultivated plants. It has been used as food for 6000 years (Amer, 1994). It could be used for generations to come due to its remarkable nutritional, health and economic value, in addition to its aesthetic and environmental benefits. Every part of the date palm is useful. Dates offer useful prospects for fighting hunger and diseases. A date palm fruit is an important component of the diet in most of the hot arid and semi-arid regions of the world. It is found to contain carbohydrates (total sugars 44% - 88%), fats (0.2% - 0.4%), proteins (2.3% - 5.6 %), fibers (6.4% - 11.5%), minerals and vitamins (Al-Shahib and Marshall, 2003). Apart from the nutritional value date palm, has been also known for a lot of beneficial properties such as antioxidant, antihyperlipidemic and hepatoprotective activity (Wan Ismail and Radzi, 2013).

The production of date fruits in the world is estimated at 6.7 million tones and the highest amount of date fruit production belongs to Egypt with 20% of the total world production. The actual date tree population in UAE is about 40 millions of which 8.5 in AL-Ain region. The gene pool is large and composes about 120 date varieties. New introductions from Saudi Arabia, Iraq, Iran and Oman included Khallas, AbouMaan, Hallawi, Khissab, Khenezi, Nabut Saif, Jabiri, Hillali, Chichi, Khadraoui, Sakii, Sultana and Barhi varieties (UAEU).

Twenty-three different amino acids were found in date's proteins, many of which are not found in the most popular fruits (Farsi *et al.*, 2005). Fourteen amino acids were reported in the five date cultivars namely Gondeila, Barakawi, white Gau, Red Gau, and Black Gau from Sudan (Abdel Moneim *et al.*, 2012). There are more than 2000 different varieties of fresh dates (Amer, 1994). Many fresh varieties are available throughout 8 months of the year. Packed, dry dates keep well without the addition of preservatives for at least 8 months, the high sugar content acting as an effective preservative.

The purpose of this study was to supplement existing knowledge on date fruits (*Phoenix dactylifera* L.) by undergoing phytochemical screening of amino acids on active bio-substances to examine its suitability as a feed source. The present objective in examining the amino acid content is to determine whether its protein could effectively supplement the nutritional deficiencies of grains, because determination of amino acid can only serve as a guide to the nutritional value of date fruit protein. The objectives of the study were to determine the physical properties of seven date fruits cultivars and evaluation of the nutritional value and their chemical composition.

Therefore, the present investigation was to conduct a comprehensive study on the nutritive importance of dates by analyzing amino acid from seven varieties of date fruits.

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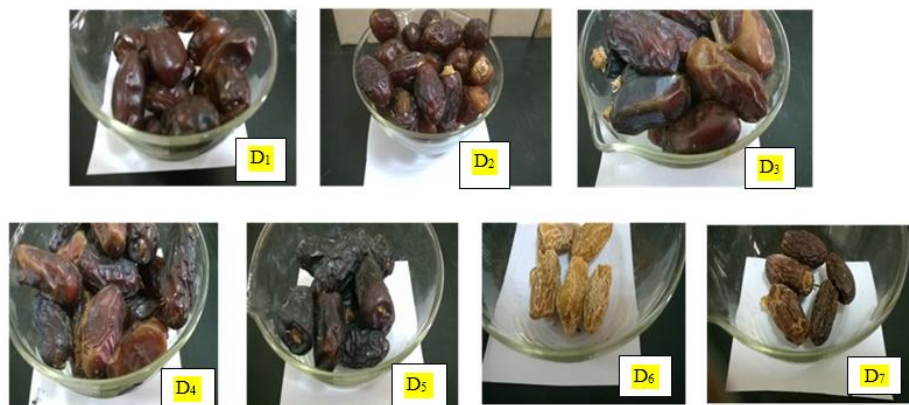
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Materials and Methods

Date fruits (*Phoenix dactylifera* L.) of cultivars: viz. Dabbas (D₁) and Lulu (D₂) from United Arab Emirates, Mabroom (D₃) from Saudi Arabia, Piarom (D₄) from Iran, Kodari (D₅) from Saudi Arabia, Dried date (D₆) from Afghanistan and Dried date named Aseel (D₇) from Pakistan were

purchased from the local markets of Dubai. Each sample was collected randomly to assure good representation, and each sample was cleaned by removing foreign matter and taken in polyethylene bags with labels, and stored in a refrigerator till analysis. The seven date fruit varieties are shown in figure 1.

Figure 1: Showing different varieties of date fruits



D₁-Dabbas, D₂ -Lulu, D₃-Mabroom, D₄-Piarom, D₅-Kodari, D₆-Dried date from Afghanistan, D₇- Dried date Aseel

Extraction

Gently washed and cleaned flesh of date fruits collected was used for the analysis. The flesh and seed was separated. Fresh sample of each date fruit material were ground in sterile pestle and mortar with ethanol. One cultivar Dabbas was also extracted with boiled ethanol (D_{8E}). The contents were centrifuged and then supernatants collected were used for spotting.

Qualitative screening of amino acids by TLC study

Amino acids were qualitatively analysed by using Thin Layer Chromatography (TLC) technique and detected colorimetrically using ninhydrin reagent following the standard method of Harborne (1973). The final extracts of Dabbas (D₁), Lulu (D₂), Mabroom (D₃), Piarom (D₄), Kodari (D₅), Dried date (D₆) from Afghanistan, Dried date Aseel (D₇), and (D_{8E}) obtained, were spotted on the TLC plate (plate of silica gel G) and the chromatograms developed using developing system-BAW₁ (n-Butanol: Acetic acid: Water, taken in 4:1:1 proportion) Later, the spots for amino acids were detected by using standard reagent ninhydrin (triketohydrindene hydrate) and

identified by their obtained colour and R_f (x100) values.

Results

The results shown in table (1, 2, and 3) revealed the presence of different amino acids in different date fruit cultivars. The comparative TLC profiles of the date fruit extract are presented in Figure 2 & 3. A total of 13 amino acids were detected naming phenylalanine, leucine, isoleucine, valine, methionine, tryptophan, threonine, arginine and glutamic acid, proline, asparagines, aspartic acid, cysteine. The perusal of table (2) shows the distribution of amino acids in the date fruit varieties. Glutamic acid was detected from all the varieties except in D₂. Dabbas Cultivar (D₁) from UAE was found to consist of 8 types of amino acids followed by 7 types in Mabroom (D₃) from Saudi Arabia. Valine was detected in 5 varieties. Essential and non-essential amino acids detected from fruits are categorized in table 3. Among the 13 amino acids detected in TLC analysis, 8 are essential amino acids and 5 are non-essential amino acids (table 3).

Table 1: Detection of Amino acids from different varieties of date palm fruits by thin layer chromatography (TLC) using different solvent systems

Extract type	Solvent system: n-Butanol: Acetic acid: Water (BAW, 4:1:1)			
	R _f (X100) Observed values	R _f (X100) Standard values	Colour of the Spot (with or without Ninhydrin)	Amino acid detected
D ₁	28.5	24	Orange	Glutamic acid
	14.2	14	Violet	Proline
	19.4	20	Violet	Threonine
	16.6	17	Blue-violet	Aspartic acid
	34.6	35	Violet	Methionine

	42.3	43	Violet	Isoleucine
	46.1	47	Grey-violet	Tryptophan
D ₂	31	32	Violet	Valine
	7.6	6	Violet	Arginine
	13.6	14	Violet	Proline
	51	43	Yellow	Phenylalanine
D ₃	25	24	Orange	Glutamic acid
	35	35	Violet	Methionine
	45	44	Violet	Leucine
	10	10	Violet	Cysteine
	13.8	14	Violet	Proline
D ₄	20	20	Violet	Threonine
	46.2	47	Violet	Tryptophan
	25.3	24	Orange	Glutamic acid
	13.8	14	Blue-violet	Asparagine
	30.7	32	Violet	Valine
D ₅	19.2	20	Violet	Threonine
	48.2	43	Yellow	Phenylalanine
	24.1	24	Brown	Glutamic acid
	17.2	17	Blue-Violet	Aspartic acid
	31	32	Violet	Valine
D ₆	44.8	44	Violet	Leucine
	23.3	24	Brown	Glutamic acid
	30	32	Violet	Valine
	46.6	47	Grey-violet	Tryptophan
	36.6	41	Violet	Methionine
D ₇	43.9	43	Yellow	Phenylalanine
	23.3	24	Orange	Glutamic acid
	46.6	44	Violet	Leucine
	43.3	43	Violet	Isoleucine
	32.6	32	Violet	Valine
D _{8E}	17.3	14	Yellow	Proline
	24.3	24	Brown	Glutamic acid
	6.9	6	Violet	Arginine
	34.7	35	Violet	Methionine
	43.7	44	Violet	Leucine

Key: D₁-Dabbas, D₂ -Lulu, D₃-Mabroom, D₄- Piarom, D₅-Kodari, D₆-Dried date from Afghanistan, D₇- Dried date Aseel, D_{8E}-Dabbas extracted with boiled ethanol.

Table 2: Distribution of Amino acids in different varieties of date palm fruits

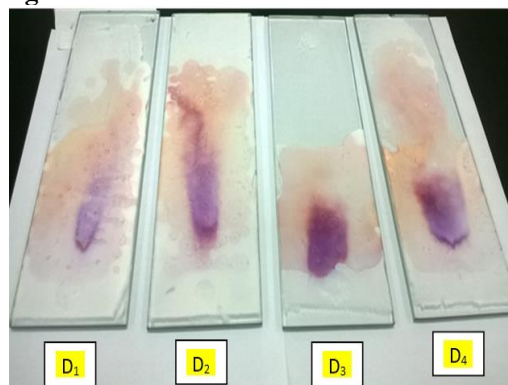
S.No.	Amino acids	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	D _{8E}
1.	Phenylalanine	-	+	-	-	+	-	+	-
2.	Leucine	-	-	+	-	+	-	+	+
3.	Isoleucine	+	-	-	-	-	-	+	-
4.	Valine	+	-	-	+	+	+	+	-
5.	Methionine	+	-	+	-	-	+	-	+
6.	Tryptophan	+	-	+	-	-	+	-	-
7.	Threonine	+	-	+	+	-	-	-	-
8.	Arginine	-	+	-	-	-	-	-	+
9.	Glutamic acid	+	+	+	+	+	+	+	+
10.	Proline	+	+	+	-	-	-	-	+
11.	Asparagine	-	-	-	+	-	-	-	-
12.	Aspartic acid	+	-	-	-	+	-	-	-
13.	Cysteine	-	-	+	-	-	-	-	-

Legend: (+) Presence of Amino acid, (-) Absence of Amino acid.

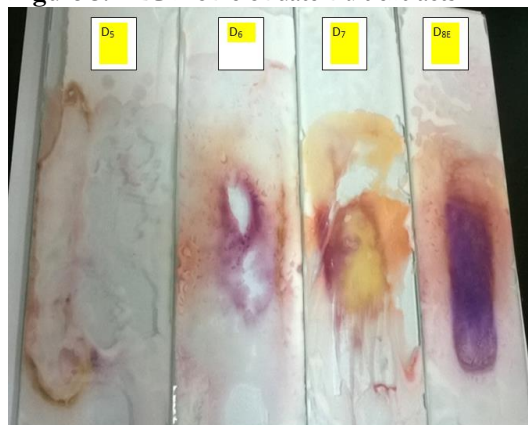
Table 3: List of essential and non-essential amino acids detected from different varieties of date palm fruits

Essential amino acids	Non-essential amino acids
Phenylalanine	Glutamic acid
Leucine	Proline
Isoleucine	Asparagine
Valine	Aspartic acid
Methionine	Cysteine
Tryptophan	
Threonine	
Arginine	

Figure 2: TLC Profile of date fruit extracts



D₁-Dabbas, D₂ -Lulu, D₃-Mabroom, D₄- Piarom

Figure 3: TLC Profile of date fruit extracts

D₅-Kodari, D₆-Dried date from Afghanistan,
D₇-Dried date Aseel, D_{8E}-Dabbas extracted with boiled ethanol

Discussion

The study revealed the presence of maximum number of amino acids essential in the diet of humans. Except lysine and histidine other essential amino acids were detected in the date fruit varieties. Presence of phenylalanine, leucine, isoleucine, valine, aspartic acid, threonine, glycine, alanine, histidine, lysine, arginine, tyrosine in date fruits of five varieties (Gondeila, Barakawi, white Gau, Red Gau, and Black Gau) from Sudan has been reported in literature (Abdel Moneim *et al.*, 2012). In addition, our study reveals the presence of methionine, tryptophan, glutamic acid, asparagine and cysteine also.

A point of interest is whether the amino acid of date fruit could serve as a supplemental source to improve the nutritional quality of grain proteins. Tryptophan is one of the two limiting amino acids in grains, therefore interest centers on this amino acid since it was detected from the test material in this study. Lysine is the second important one which has been reported by Abdel Moneim *et al.*, (2012) but not detected in our screening. The protein of *Phoenix dactylifera* L. may be developed into useful dietary supplements for grain diets. If a number of uses are found for the other constituents of date fruits (Ogungbenle, 2011; Wan Ismail and Radzi, 2013; Md Haider *et al.*, 2014) so as to make processing economically feasible, the protein could be extracted. Such a protein concentrate could be used as an effective supplement to grains for animal and human consumption. The data revealed that, the date palm extract contains suitable amounts of essential amino acids, which means high nutritional value.

Conclusion

The assessment of biochemical profiling of seven date fruit cultivars showed that Dabbas from UAE and Mabroom from Saudi Arabia cultivars are rich in amino acids as compared to other varieties studied. These findings showed that our date

cultivars have the potential to compete with the world's most capable promoted varieties. Therefore, it is suggested that further studies aimed on other aspects of feed quality. Because of the rich diversity of this plant it is expected that biochemical analysis and scientific evaluation of the plant may prove beneficial for mankind.

Acknowledgement

Author sincerely thanks and appreciation to the Principal Mr. Tajammul for his continuous support and motivation. Author extends thanks to the school management; Ms. Najera Maknojjia section supervisor and Ms. Baljinder Kaur, HOD Science department, Al Sadiq Islamic English School, Dubai (UAE) for providing lab facilities, required resources and for their encouragement. Author is also thankful to Zaroka Liwal, Reem Mohammed, Aseal Mohamed and Anika Boshra for their technical support.

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Cite this article as:

Lata Birlangi. Screening of amino acid constituents from date palm fruits. *International Journal of Bioassays* 5.10 (2016): 4972-4976.

DOI: <http://dx.doi.org/10.21746/ijbio.2016.10.0011>

Source of support: Nil.

Conflict of interest: None Declared