Glycemic index of 3 varieties of dates

Campbell J. Miller, *FRACGP, MSc Comm Med,* ***Earl V. Dunn,*** *CM, FCFP(C),* ***Isameldin B. Hashim,*** *MS, PhD.*

ABSTRACT

Objective: Dates are consumed worldwide and are a dietary staple for many Arabic people. The prevalence of type-2 diabetes mellitus is high in many developing communities, including many Arabic communities. The consumption of low glycemic index diets has been shown to have benefits for glycemic and lipid control. The purpose of this study was to determine and compare the glycemic indexes of 3 varieties of commercially available dates.

Methods: The available carbohydrate content of the dates was determined by standard laboratory methods. Normal volunteer subjects were fed the commercially processed khalas, barhi, and bo ma'an dates. Glycemic indexes were calculated by standard methods. Results were calculated using means and standard deviations. Glycemic responses were compared by using paired t-tests. The study was performed at the Faculty of Medicine and Health Sciences, United Arab Emirates University, Al Ain, United Arab Emirates, between March 2000 and August 2001.

Results: The mean glycemic indexes of the dates were 35.5 for khalas, 49.7 for barhi and 30.5 for bo ma'an. There was a significant difference between the results for bo ma'an and for the other 2 varieties.

Conclusion: Dates can be classified as low glycemic index food items. There appears to be significant and unexplained differences in glycemic index between some date varieties. Nonetheless, the consumption of the 3 varieties of dates tested in this study may be of benefit in glycemic and lipid control of diabetic patients.

Keywords: Glycemic index, dates, available carbohydrate.

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Date palms were cultivated in the Middle East and Egypt over 6000 years ago. By the 18th century, such cultivation had spread to Europe and the New World.[1] Dates are a dietary staple particularly in Arabic nations and among people of Arabic descent throughout the world. Their consumption is also widespread throughout the non-Arabic world. There are hundreds of date varieties and, in countries where they are cultivated, the fruits are consumed in various stages of ripening and used to produce a range of commercial products. Whilst the newly ripened brown/yellow dates are popular in such countries, it is the dark brown dehydrated dates that are commercially available and enjoyed worldwide. The rise in prevalence of diabetes mellitus type-2 among populations recently undergoing rapid social and lifestyle change is a matter of great medical concern. The prevalence among some urban Arabic populations is among the highest in the world. In urban Saudi Arabia and the United Arab Emigrates (UAE), the age-adjusted prevalence of diabetes in the 30-65 year age group is over 20% and in the 6th decade is nearly 50%.[2,3] Manipulation of patients' diets remains one of the cornerstones of diabetes management. The suitability of dates as a source of carbohydrate for patients with type-2 diabetes mellitus is unclear as there have been negligible reports of the glycemic response to date consumption. Clearly in those populations for whom

From the Department of Family Medicine, Faculty of Medicine and Health Sciences (Miller, Dunn), Department of Food Sciences, Faculty of Food Systems (Hashim), United Arab Emirates University, Al Ain, United Arab Emirates.

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Address correspondence and reprint request to: Dr. Campbell Miller, Department of Family Medicine, Faculty of Medicine and Health Sciences, United Arab Emirates University, PO Box 17-666, Al Ain, United Arab Emirates. Tel. +971 (3) 7039585. Fax. +971 (3) 7671890. E-mail: cjmiller@uaeu.ac.ae

dates are a dietary staple, this is an issue of significance, particularly since they also tend to be the populations with high prevalence of type-2 diabetes.

Glycemic index. The classification of foods by glycemic index (GI) was first reported in 1981.[4] Its clinical utility has been a subject of some controversy, particularly in its applicability to mixed meals.[5-8] There is recent evidence supporting beneficial outcomes for lipid and glycemic control.[9-11] Lock et al reported a study of GIs of various foods, including dates, in pregnant women, however it is unclear whether their methodology conformed to the standard methods developed and described by Wolever et al.[12,13] This was the only study of date GI found in our literature search. We have reported elsewhere a study comparing the GIs of one popular UAE date variety (khalas) when consumed in 5 different preparations: the early ripened (rutab) stage, the traditionally stored and commercially processed dehydrated (tamer) stage, both rutab and commercial tamer stages in mixed meals with plain full milk yoghurt. The purpose of this study was to determine and compare the GIs of 3 popular varieties of dates, commercially processed and available in the UAE.

Methods. Three commercially available date varieties, popular in the UAE, were chosen for study: khalas, barhi, and bo ma'an. The commercial packaging of the dates involves the following: within one week of harvesting, the dates are vacuum fumigated for 3 hours in a standard concentration of methyl bromide gas (7.709 gms/1000 litres), the dates are then cool-stored (0ºC-2ºC) for up to one year before packaging. For packaging, the dates are washed for 5 minutes by spray conveyor and then immediately dried in ovens for 20-25 minutes to a maximum of 60ºC. The dates are air cooled and then packaged in heat-sealed vacuum plastic packs ready for the commercial market. The shelf life of the packs is 2 years. The composition of the dates was analyzed using standard methods, with particular emphasis on "available carbohydrate".[14] Available carbohydrate is a term coined in 1929 to describe the digestible and glucogenic portion of dietary carbohydrate.[15] The dates were tested on normal volunteer subjects, using the commercially packaged fruit. The GI was calculated according to Wolever et al.[13] Capillary blood samples were taken using a One Touch II® Lifescan glucometer. After overnight fasting, each subject underwent 3 tests using 50 grams of glucose as the standard food and one test for each of the date varieties in amounts equivalent to 50 grams of available carbohydrate namely 66.7 grams for khalas, 68.6 grams for barhi, and 65.4 grams for bo ma'an. The incremental areas under the glycemic-response curves for each date meal were expressed as a percentage of the mean area under the 3 glucose curves for the same subject. The resulting values for all subjects were averaged to calculate the GI for each date variety. Areas under the glycemic-response curves were computed using an Excel spreadsheet. The data is presented as means and standard deviations (SD). The mean GIs of the different date varieties were compared using paired t-tests. The study conformed to the requirements of the Declaration of Helsinki and the study was approved by the Research Ethics Committee of the Faculty of Medicine and Health Sciences, UAE University. Subjects signed written informed consent to the study protocol.

Results. Eleven normal subjects (mean age 48 years, mean body mass index (BMI) 23.6 kg/m^2) were tested to calculate the GI of khalas dates, 8 subjects (mean age 48 years, mean BMI 23.9 kg/m^2) were tested to calculate the GIs of the barhi and bo ma'an dates. **Table 1** outlines the composition analyses for the 3 date varieties. **Table 2** outlines the GI results for the 3 date varieties. Using paired t-tests, there were significant differences in the GIs between bo ma'an and the other 2 date varieties.

Discussion. According to our GI results for the 3 date varieties, dates can be classified as low GI

Table 1 - Composition of dates, percentages are by weight.

Sample	% moisture	% ash	% crude fat	% protein	% dietary fibre	% available carbohydrates
Khalas	18.7	2.2	0.1	2.3	1.6	75
Barhi	20.4	2.7	0.1	2.2	1.7	72.8
Bo ma'an	17.2	2.6	0.2	1.9	1.6	76.4

Table 2 - Subjects used and glycemic index results.

Date variety	Number of subjects	Weight consumed (in gms)	Mean GI	Standard deviation
Khalas	11	66.7	35.5*	9.7
Barhi	8	68.6	49.7*	16.5
Bo ma'an	8	65.4	30.5*	12.8

GI=glycemic index, * - paired t-tests were significant between bo ma'an and each of the other 2 varieties, $p<0.05$.

food items and comparable with or lower than many other fruits. Our results suggest a lower GI for this food item than the one other reported result of 61.6 by Lock et al, however it is unclear whether the methodologies were comparable.[12] A mean of the 4 studies of GI of fructose has been reported as 23.[16] Thus, the low level of the dates' GI is likely to be associated with their high fructose content. Ahmed et al[17] has reported a glucose: fructose ratio of 1.1 in both khalas and barhi date varieties. There appears to be significant differences in the GIs of different date varieties. In our study, the bo ma'an variety had a significantly lower value than each of the other 2 varieties. There is no apparent explanation for these differences. It would appear that dates are a very suitable source of carbohydrates for diabetic patients. Our previous work has indicated that eating dates in a mixed meal with a cultured dairy product, such as yoghurt, may result in modest additional benefits in glycemic control. The implications of these results are that diabetic patients can be reassured that consumption of dates will not result in rapid and large fluctuations in blood sugar even when eaten alone. There is growing evidence for the beneficial effects of low GI meals on serum lipids.[9-11,18,19] With the close linkage between type-2 diabetes mellitus and ischemic heart disease, any reduction in risk factors for the latter disease is likely to be of benefit. The consumption of dates may, at least, contribute to a dietary reduction in risk.

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