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Instantization and Evaluation of Some Traditional Egyptian Foods

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ABSTRACT

Four of the popular traditional Egyptian foods were prepared in instantized form. These foods included Medammis *in two forms,* Kishk, Bellila *and rice with milk.*

Data obtained revealed a good acceptability for the instant products as compared to their parent fresh ones. Moreover, Medammis, Bellila *and* Kishk *can be considered as a good source of protein (19·7–32·7%), carbohydrates (62·6–74·9%) and minerals (Ca, P, Mg, Fe and Mn).*

The C-PER was computed from data of amino-acid composition, FAO/WHO pattern for essential amino-acids and in-vitro digestibility. The C-PER values can be arranged ascendingly as follows: 0·95 (whole Medammis*), 0·98 (* Kishk*), 1·33 (dehulled* Medammis*), 1·47 (* Bellila*) and 2·41 (rice with milk). The in-vitro digestibility ranged between 76·3 ± 0·7% and 89·3 ± 0·8% being the lowest for whole* Medammis *and the highest for rice with milk.*

INTRODUCTION

A great deal of attention has been paid towards the instantizing and agglomeration of foods (Wilkes, 1985). Processes applied in the manufacture of instantized foods include: (i) traditional drying techniques (i.e. roller drying, convection drying, spray drying in turboreactor); (ii) expansion process heating or extrusion and (iii) cryotechniques, drying and freezing at 0°C and atmospheric pressure, freeze-drying at subzero temperature and subatmospheric pressure and freeze-drying combined with drying by heat

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(Voskotoinikov & Zakharenko, 1986). Recently, enzyme preparations were utilized for manufacture of instant foods (Taufel *et al.*, 1984; Benavides & Cabrera, 1984).

The present work was conducted on four traditional Egyptian foods, namely: *Medammis* (stewed faba beans '*Vicia faba* L.'); *Kishk* (fermented and cooked product, mainly from wheat-flour); *Bellila* (whole wheat kernels boiled in water for a long period) and cooked rice with milk as a dessert. The work aimed to prepare the aforementioned products in instantized and nutritious form. Moreover, acceptability, chemical composition, in-vitro digestibility and C-PER of such products were also investigated.

MATERIALS AND METHODS

Materials

The raw materials were purchased from the retail market in Alexandria, Egypt. Dry skim milk was kindly provided by the Dairy Science Department, Faculty of Agriculture, University of Alexandria.

Cooking processes

The methods adopted for *Kishk*, *Bellila* and rice with milk are those prevailing in Egyptian homes with the exception of delaying the addition of the dry skim milk and/or sugar after completion of the dehydration process. *Medammis* was prepared by autoclaving a mixture of faba bean seeds and distilled water (1:4 w/v) at 115·5°C for 2 h. Despite the fact that milk is not added to traditional *Medammis*, it was utilized in the present work to improve the nutritive value of *Medammis*, especially for infants. After autoclaving, an amount of *Medammis* was decoated manually, while the rest was left intact.

The methods applied to prepare the aforementioned products under study are shown in Fig. 1.

Dehydration ratio

The dehydration ratio was calculated as follows:

$$\text{Dehydration ratio} = \frac{\text{Weight of the product before dehydration}}{\text{Weight of the product after dehydration}}$$

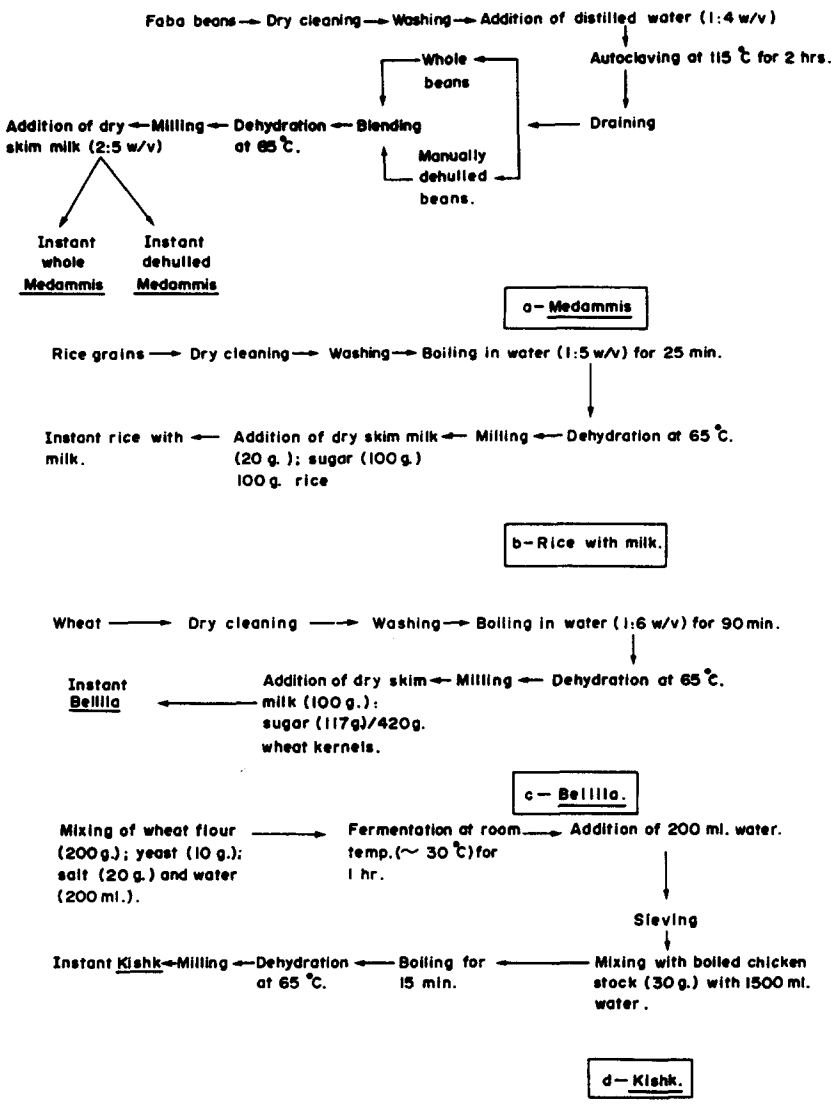

Fig. 1. Flow sheet showing the preparation steps of instant (a) *Medammis*, (b) rice with milk, (c) *Bellila* and (d) *Kishk*.

Analytical methods

Proximate composition

The moisture contents of the finished products were determined by drying at 70°C and 0·05 kg/cm^2 pressure (AOAC, 1980). Crude protein was determined by the semi-micro Kjeldahl method as outlined by Egan *et al.* (1981). The conversion factor was calculated for each product on the basis of the factor belonging to each component as well as the percentage of such

component in the final product (5·85 for faba bean, 5·7 for wheat and wheat-flour, 5·95 for rice and 6·38 for milk). Total lipids were determined by the Folch *et al.* method (1957) using a mixture of methanol and chloroform (2:1 v/v). Ash content was determined by igniting a weighed sample in a Muffle Furnace at 550°C to a constant weight (AOAC, 1980).

Mineral elements composition

Calcium, magnesium, iron, copper and manganese were determined by Atomic Absorption Spectrophotometer (Pye-Unicam SP 1900). Phosphorus was determined colorimetrically as outlined by the AOAC (1980).

Amino-acids assay

Amino-acids other than tryptophan and S-containing amino-acids were determined in the acid hydrolysate according to the method of Moore (1958), using a Beckman Amino Acid Analyzer (Model 119 CL). Acid protein hydrolysates were prepared as mentioned previously (Youssef *et al.*, 1986). For tryptophan assay, a sample was refluxed with a 0·443 M solution of barium hydroxide octahydrate for 20 h as outlined by Block *et al.* (1958). Tryptophan was estimated colorimetrically using the *p*-dimethyl amino benzaldehyde reagent of Miller (1967). Sulphur-containing amino-acids were determined as methionine as outlined by McCarthy and Sullivan (1941). In this method the acid hydrolysate of sulphur-containing amino-acids reacts with nitroprusside in strong acid medium and the resulting colour is measured at 540 nm. A standard curve was constructed using methionine.

Protein in-vitro digestibility

The method used was essentially the pepsin–pancreatin procedure of Saunders *et al.* (1973) except that at the end of the digestion, 30 ml of 1·6 M TCA were added to the digest and left for 2 h prior to centrifugation. The supernatant, rather than the residue, was analysed for TCA-soluble nitrogen by a Micro-Kjeldahl method (AOAC, 1980). The percentage of digestion was calculated with respect to the total nitrogen in the sample. Blank samples and casein, as a reference, were digested under the same conditions.

Computed-Protein Efficiency Ratio (C-PER)

The C-PER was calculated according to the computation procedure of Satterlee *et al.*, (1979), using data of the essential amino-acids, FAO/WHO Pattern (1985) and in-vitro digestibility.

Acceptability tests

The products under study were rehydrated on the basis of their dehydration

TABLE 1
Statistical Analysis of Taste Panel Testing Data for Instant *Medammis*, *Bellila*, *Kishk* and Rice with Milk

Product	t *or* f *value*		
	Colour	*Flavour*	*Consistency*
Medammis	10·99[b]	1·81	0·10
Bellila	1·21	0·63	0·24
Kishk	3·55[b]	2·71[a]	2·25
Rice with milk	0·44	0·11	1·57

[a] Significant ($P < 0·05$).
[b] Highly significant ($P < 0·01$).

ratios. The samples were presented simultaneously to a panel of 10 panellists who were asked to rank each instant product as compared to its corresponding fresh preparation (control). The hedonic scale was 1 (very poor), 2–4 (poor), 5–6 (fair), 7–8 (good) and 9–10 (excellent) for each of colour, flavour and consistency. The sensory evaluation data were statistically analysed using Analysis of Variance (Steel & Torrie, 1980).

RESULTS AND DISCUSSION

Data of taste panel testing, given in Table 1, in general did not reveal significant differences in terms of flavour, and consistency for the instant products under study as compared to their corresponding fresh samples (control). Notwithstanding, instant *Medammis* and *Kishk* were significantly darker in colour than controls and flavour of instant *Kishk* was significantly different from control. Such an effect can be attributed to the method of cabinet-drying applied in the present study rather than the product itself. Drum-drying may be much more convenient in this respect.

Proximate chemical composition

Table 2 indicates that *Medammis*, *Bellila* and *Kishk* can be considered as a good source of protein (19·7–32·3%) and carbohydrates (62·6–74·9%). Rice with milk had the lowest protein content (7·92%). However, the quality of rice protein especially for infants is well recognized since the protein efficiency ratio (PER) of rice protein was reported to be 2·18 as compared to 2·30 for beef (Hansen *et al.*, 1981).

TABLE 2
Dehydration Ratio and Proximate Chemical Composition of Instant *Medammis*, *Bellila*, *Kishk* and Rice with Milk

Product	*Dehydration ratio*	*Dry[a] matter (%)*	*% On dry wt basis[a]*			
			Crude protein	*Total lipids*	*Ash*	*Total carbohydrates[b]*
Medammis						
Whole	4·08:1	96·65 ± 0·01	31·0 ± 0·04	1·91 ± 0·02	4·03 ± 0·06	63·1
Dehulled	4·58:1	94·59 ± 0·01	32·3 ± 0·01	1·97 ± 0·01	3·13 ± 0·07	62·6
Bellila	3·33:1	94·42 ± 0·06	21·3 ± 0·45	1·36 ± 0·05	2·34 ± 0·01	74·9
Kishk	3·05:1	94·00 ± 0·05	19·7 ± 0·37	2·62 ± 0·02	8·15 ± 0·36	69·5
Rice with milk	3·47:1	93·20 ± 0·01	7·92 ± 0·01	0·80 ± 0·02	0·82 ± 0·01	90·5

[a] Mean ± standard error (SE).
[b] By difference.

The total lipid contents of the products under study ranged between 0·80% and 2·62%. The highest ash content (8·15%) for *Kishk*, can be attributed to addition of sodium chloride during preparation.

Mineral element composition

Table 3 indicates that the products under study can be considered as a good source of the following mineral elements that were determined in mg/100 g: calcium (52·2–310); phosphorus (123–412); magnesium (72·3–153); iron (0·93–4·65); copper (0·50–1·53) and manganese (0·20–0·87).

Protein quality

Table 4 shows the amino-acid composition of the instant products under study. It can be seen that the major amino-acids of these products are

TABLE 3
Mineral Element Composition of Instant *Medammis*, *Bellila*, *Kishk* and Rice with Milk

Product	*mg/100 g (on dry wt basis)[a]*					
	Calcium	*Phosphorus*	*Magnesium*	*Iron*	*Copper*	*Manganese*
Medammis						
Whole	52·9 ± 2·0	330 ± 5·6	153 ± 3·3	4·65 ± 0·03	1·08 ± 0·02	0·87 ± 0·01
Dehulled	89·6 ± 1·8	412 ± 1·5	124 ± 3·0	4·55 ± 0·09	1·53 ± 0·05	0·60 ± 0·02
Bellila	52·2 ± 1·5	156 ± 1·9	97·5 ± 2·8	3·83 ± 0·04	0·59 ± 0·01	0·70 ± 0·02
Kishk	267 ± 4·0	308 ± 5·8	72·3 ± 2·02	0·93 ± 0·07	0·52 ± 0·02	0·55 ± 0·02
Rice with milk	310 ± 5·7	123 ± 0·7	127 ± 2·2	3·43 ± 0·04	0·56 ± 0·02	0·20 ± 0·01

[a] Mean ± standard error (SE).

TABLE 4
Amino-Acid Composition of Instant *Medammis*, *Bellila*, *Kishk* and Rice with Milk

Amino-acid (*g/100 g protein*)	*Whole* Medammis	*Dehulled* Medammis	Bellila	Kishk	*Rice with milk*
Aspartic acid	13·1	13·2	9·02	14·2	8·67
Threonine	4·43	3·86	3·29	4·19	3·62
Serine	6·13	6·49	6·78	8·21	4·50
Glutamic acid	14·4	14·6	19·3	19·4	22·5
Proline	5·03	4·84	9·73	4·13	9·89
Glycine	5·06	5·65	3·61	5·85	3·35
Alanine	5·09	5·57	4·45	6·62	3·91
Valine	4·04	2·76	4·47	1·95	4·44
Isoleucine	3·96	3·38	4·29	3·13	4·09
Leucine	7·56	8·27	8·47	6·38	8·26
Tyrosine	4·47	4·80	4·65	3·91	5·38
Phenylalanine	3·73	3·67	3·07	1·83	3·51
Histidine	6·04	3·30	3·24	3·96	2·70
Lysine	5·80	6·88	6·36	6·20	6·06
Arginine	7·84	8·90	4·42	6·44	3·64
S-amino-acids	1·50	2·20	3·20	2·80	3·60
Tryptophan	1·84	1·60	0·49	0·79	1·84

aspartic acid and glutamic acid. Among the essential amino-acids, only the levels of threonine were lower than those in the FAO/WHO (1985) reference protein pattern being 7·4 g/16 g N. Levels of the rest of the essential amino-acids were higher or close to those of the FAO/WHO pattern.

Table 5 indicates that the instant products under study possessed good in-vitro digestibility and C-PER values as well. The former ranged between $76{\cdot}3 \pm 0{\cdot}7\%$ and $89{\cdot}3 \pm 0{\cdot}8\%$, while the latter ranged between 0·95 and

TABLE 5
The In-Vitro Enzymic Digestibility and Computed Protein Efficiency Ratio (C-PER) for the Instant Products

Product	*In-vitro digestibility*[a]	*C-PER*
Medammis		
Whole	$76{\cdot}3 \pm 0{\cdot}7$	0·95
Dehulled	$80{\cdot}9 \pm 0{\cdot}5$	1·33
Bellila	$84{\cdot}1 \pm 1{\cdot}0$	1·47
Kishk	$80{\cdot}0 \pm 0{\cdot}6$	0·98
Rice with milk	$89{\cdot}3 \pm 0{\cdot}8$	2·41
Casein	$98{\cdot}9 \pm 0{\cdot}1$	—

[a] Mean ± standard error (SE).

2·41. It was obvious that rice with milk exhibited the highest C-PER value, while whole *Medammis* had the lowest C-PER value. It is worth mentioning that values of both in-vitro digestibility and C-PER were correlated to each other highly significantly ($r = 0{\cdot}95$ at $P < 0{\cdot}01$). In the light of these results it is clear that addition of milk to *Kishk* is quite advisable to elevate its C-PER value.

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