ELSEVIER

Food Chemistry 83 (2003) 557–561

Food Chemistry

www.elsevier.com/locate/foodchem

Soluble and insoluble dietary fibre in thirty-two Kuwaiti dishes

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Received 21 November 2002; received in revised form 18 March 2003; accepted 18 March 2003

Abstract

Thirty-two commonly consumed dishes (fish dishes, sandwiches, soup, pastries, salads, kubas, sweets and dairy dishes) in Kuwait were analysed for total dietary fibre, soluble dietary fibre and insoluble dietary fibre. The total dietary fibres were the highest in salads with an average of 5.39 mg/100 g edible portion. The other dishes contained variable amounts of dietary fibre with ranges of 3.36–4.22, 4.73–4.99, 1.85–4.3, 1.99–3.8, 1.73–2.5 and 0–3.33 mg/100 g for sandwiches, soup, pastries, fish, and sweet dishes respectively. The dairy dishes contained 0% fibre. For the insoluble dietary fibre, the range for all dishes was from 0 to 6.55%, while for the soluble fraction it was from 0 to 2.52%.

Keywords: Soluble dietary fibre; Insoluble dietary fibre; Total dietary fibre

1. Introduction

Soluble and insoluble dietary fibre which are considered to be important elements in the human diet are primarily the storage and cell wall polysacchrides of plants that cannot be hydrolysed by human digestive enzymes (Bethesda, 1986). Soluble dietary fibre is the fraction of fibre which is suspended in water during analysis (Marlett, 1997). The insoluble fraction of dietary fibre, in most mixed food diets, is more than the soluble fraction. About two thirds to three quarters of the total dietary fibre is water-insoluble (Bethesda, 1986).

As a component of medical nutrition therapy, dietary fibre has an immense effect on disease prevention and health maintenance. Information derived from animal experiments showed that certain dietary fibre could act as a hypocholestrolemic factor (Kritchevsky, Tepper, Kim, Moses, & Story, 1975; Story, Baldino, Czarnecki, & Kritchevsky, 1981; Wells & Ershoff, 1961). The influence of dietary fibre on serum lipids in both man and animal has been the subject of recent reviews (Kay & Truswell, 1980; Story & Thomas, 1982; Vadhera, Punia, & Soni, 1995). Vadhera et al. (1995) reported significant hypocholestoric and hypolepidemic effect using dietary fibre extracted from the skins of onion and garlic. Although no recommended daily allowances (RDAs) have been set, most health/nutrition professionals agree on the benefit of increasing consumption of dietary fibre to over 30 g/d (Potty, 1996). Research has indicated that increasing the amount of fibre intake in the diet has a positive influence on various diseases such as diabetes and CHD heart disease, and decreases the incidence of colon cancer (Anderson et al., 1991; Bingham, 1990). The American Diabetes Association in 1994 recommended 25–35 g of dietary fibre per day for persons suffering from diabetes. The National Cancer Institute in 1986 recommended a dietary fibre intake of 20–35 g/day in the US diet compared with the current average intake of 10–13 g/day (National Cancer Institute, 1984). Likewise, a national advisory committee in Great Britain recommended increasing fibre intake to 25 and 30 g/day over the short and long term, respectively (NACNE, 1983). In view of such recommendations, and the potential and health benefits of increasing the consumption of dietary fibre, accurate information on its content in commonly consumed diets is needed.

2. Materials and methods

2.1. Preparation and standardization of the recipes

Thirty-two dishes were selected for the present study. Among these, three dishes were ready-made while the remaining 29 were cooked dishes.

For standardization and preparation of the cooked dishes, a survey was conducted, among 300 Kuwaiti

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doi:10.1016/S0308-8146(03)00153-5

Table 1
Ingredients of 32 Kuwaiti dishes

Dishes	Major ingredients (%)
Fish-based dishes	
F1. Fish Saneya (Baked Fish with Vegetables)	Fish 54.61, Onion 10.75, Tomato 14.2, Green Pepper 12.62, Lemon Juice 2.5, Oil 2.0, Garlic 1.32, Spice 0.23, Cumin 0.36, Black Pepper 0.27, Salt 1.28
F2. Fish Kofta (Fried Fish Ball)	Fish 52.47, Onion 20.41, Egg 11.16, Fresh Coriander 5.99, Rusk 5.75, Salt 1.5, Garlic 1.95, Spice 0.34, Dried Lemon 0.47
F3. Matfee (Thick Fish Stew)	Fish 43.69, Tomato 21.59, Onion 12. 23, Water 9.07, Fresh Coriander 4.47, Tomato Sauce 5.26, Garlic 1.73, Dried Lemon 0.69, Turmeric 0.31, Salt 1.21, Spice 0.32
F4. Khathra (Mixed Fish and Rice)	Fish 24.00, Rice 21.66, Water 25.61, Tomato 12. 85, Onion 6.01, Coriander 1.73, Garlic 0.98, Turmeric 0.17, Black Pepper 0.05, Tomato Sauce 4.26, Spice 0.15, Salt 0.72, Dried Lemon 0.62, Oil 1.34
F5. Fried Fish	Fish 93.22, Garlic 2.24, Lemon Juice 1.48, Salt 1.51, Turmeric 0.96, Spice 0.59
F6. Shrimp Banee (Fried Shrimp)	Shrimp 63.99, Flour 12.15, Egg 10.7, Sumak 7.35, Lemon Juice 3.27, Garlic 2.19, Spice 0. 59, Black Pepper 0.35, Salt 1.4
F7. Grilled Shrimp	Shrimp 93.08, Salt 3.17, Garlic 1.97, Lemon Juice 1.76, Spice 0.75
Salad	
V1. Tabola	Burgol 6.88, Onion 13.89, Tomato 22.69, Olive Oil 3.37, Parsley 41.45, Salt 0.70, Mint 7.11, Lemon Juice 4.18
V2. Motabal	Eggplant 83.38, Tahina 7.27, Garlic 1.43, Salt 1.03, Lemon Juice 4.80, Cumin 0.58, Olive Oil 1.69
V3. Hommas	Hommas 82.63, Tahina 8.49, Olive Oil 2.54, Lemon Juice 2.84, Garlic 2.06, Salt 1.32
V4. Foul Modammas	Broad Beans 66.49, Tomato 23.39, Garlic 1.33, Cumin 2.12, Salt 1.39, Olive Oil 3.17, Lemon juice 2.11
V5. Fattoosh	Tomato 23.19, Cucumber 20.08, Parsley 6.42, Mint 6.54, Onion 8.70, Garlic 0.25, Olive Oil 2.46, Lettuce 6.74, Bread (Arabic) 5.55, Lemon 2.11, Salt 0.78, Semak 0.51, Leek 6.69, Pepper (green) 9.96
V6. Falafel	Broad Beans 51.02, Parsley 10.16, Salt 0.94, Coriander 5.36, Cumin 0.98, Green Onion 13.22, Garlic 2.37, Onion 13.78, Black Pepper 0.72, Sodium Bicarbonate 0.64, Red Pepper 0.27, Spice 0.54
Pastries	
P1. Spinach Pastry (baked)	Flour 39.73, Water 14.74, Fresh Spinach 21.2, Onions 9.65, Oil 5.49, Powdered Milk 1.72, Sumak 1.22, Lemon Juice 1.92, Salt 0.6, Yeast 0.55, Eggs 3.7
P2. Cheese Pastry (baked)	Flour 47.3, Water 18.69, Cheese 11.76, Powdered Milk 1.58, Mint 6.81, Oil 6.74, Egg, 5.25, Sugar 0.82, Yeast 0.58, Salt 0.52.
P3. Cheese Sambosak (deep fried cheese pastry)	Sambosak 59.98, Cheese 24.19, Mint 7.57, Water 6.59, Flour 2.60
P4. Meat Samboask (deep fried meat pastry)	Sambosak 46.12, Minced Meat 30.79, Onion 20.72, Spices 0.58, Black Pepper 0.52, Salt 1.25
P5. Thyme Pastry (baked)	Flour 47.2, Powdered Milk 2.79, Oil 6.03, Egg 6.23, Thyme 7.3, Water 17.39, Olive Oil 7.71, Salt 0.56, Yeast 0.67, Sugar 1.25
P6. Vegetable Sambosak (deep fried vegetable pastry)	Sambosak 47.14, Frozen Vegetables 33.59, Onion 17.75, Salt 0.95, Spices 0.58
Sweet	
S1. Mahalabia (milky sweet)	Milk 80.51, Sugar 11.01, Starch 7.17, Rose Water 0.91, Cardamom 0.40

(*continued on next page*)

Table 1 (*continued*)

Dishes	Major ingredients (%)
S2. Legemat	White Flour 20.071, Brown Flour 25.55, Yoghurt 24.59, Water 28.59, Yeast 1.2
S3. Sab-Al-Gafsha (fried dumpling dipped in sugar syrup)	Brown Flour, 15.67, Gramflour 9.73, Water 40.58, Egg 16.31, White Flour 16.43, Cardamom 0.36, Saffron 0.13, Yeast 0.78
S4. Rahash	Readymade traditional sweet made of 50% sesame pulp and 50% sugar
Sandwiches	
SN1. Chicken Shawerma (chicken sandwich)	Chicken 50.64, Bread 25.13, Tomato 9.6, Oil 1.56, Garlic 0.46, Salt 0.93, Spice 025, Onion 10.64, Black pepper 0.3, Sumak 0.46
SN2. Meat Shawarma (meat sandwich)	Meat 48.96, Onion 11.95, Bread 22.38, Oil 1.57, Salt 1.25, Tomato 12.98, Black Pepper 0.29, Spice 0.25
Kuba dishes	
C1. Rice Kuba (fried meat-rice balls)	Rice 37.84, Meat 24.64, Onion 27.57, Egg 5.5, Currant 1.45, Salt 1.49, Spice 0.5, Turmeric 0.48
C2. Burgol Kuba (fried burgol-meat balls)	Burgol 32.72, Meat 48.87, Onion 14.5, Pine 1.53, Salt 0.83, Black Pepper 0.29, Spice 0.36, Garlic 0.79
C3. Potato Kuba (fried potato-meat balls)	Potato 40.8, Meat 18.9, Egg 6.17, Onion 13.07, Rusk 4.98, Salt 1.29, Rice 11.52, Pine 3.02, Spice 0.24
Soup	
L1. Vegetable Soup	Squash 10.93, Potato 12.8, Onion 11.93, Tomato 13.84, Water 29.51, Green Beans 7.84, Black Pepper 0.26, Salt 0.62, Parsley 2.78, Oil 0.94
L2. Lentil Soup	Lentil 24.6, Water 58.74, Onion 10.62, Oil 2.03, Garlic 1.43, Black Pepper, 0.27, Cumin 0.3, Black Lemon 0.6
Dairy products	
D1. Labnah	Strained Yoghurt
D2. Hallomi Cheese	

households, to collect information on recipes ingredients and cooking methods, following a procedure reported earlier by Sawaya et al. (1998); however, for the three ready-made dishes, *labnah* (strained yogurt), *hallomi* cheese and *rahash* (a traditional sweet made of sesame pulp and sugar), 3 kg each of five popular selected brand names of *labenah, hallomi cheese* and *rahash* were collected, pooled and prepared for analysis. The total weight of the pooled samples of each ready made dish was 15 kg. Major ingredients (% w/w) of the 32 recipes and their codes are presented in Table 1. Dishes were coded according to the type and nature of the raw ingredients used in the preparation. Classification of those dishes was as follows: seven fish dishes (F1–F7), six salad dishes (V1–V6), six pastries (P1–P6), four sweet dishes (S1–S4), two soup dishes (L1–L2), two sandwich dishes (SN1-SN2), three *kuba* dishes (C1–C3), and two dairy products (D1–D2).

2.2. Sample preparation

The dishes were prepared and cooked under the supervision of a highly experienced cook at the Ministry of Public Health kitchen. Three identical preparations for each dish were cooked. The cooked dishes, along with the ready-made, were thoroughly homogenized and then sampled for moisture analysis. The remaining samples were freeze-dried for total, soluble and insoluble dietary fibre analysis.

2.3. Dietary fibre analysis

Soluble dietary fibre (SDF), insoluble dietary fibre (IDF) and total dietary fibre (TDF) were determined by an enzymatic–gravimetric method according to Prosky, Asp, Furda, Devries, Schweizer, and Harland, (1988, 1992). TDF was the sum of SDF and IDF.

3. Results and discussion

The results of dietary fibre analyses (i.e. IDF, SDF, and TDF) in grams (g/100 g edible portion) are presented in Table 2. TDF ranged from 7.64% in *tabola* (V1) to 0% in the dairy dishes (D1), *hallomi cheese* (D2),

Table 2
IDF,SDF and TDF and standard deviations of Kuwaiti composite dishes

Code	IDF[a]	SDF[b]	TDF[c]
F1	3.21±0.01	0.60±0.01	3.81
F2	2.37±0.01	0.61±0.01	2.98
F3	1.50±0.06	0.40±0.01	1.90
F4	2.50±0.03	0.62±0.03	3.12
F5	2.19±0.04	0.33±0.01	2.52
F6	1.51±0.02	0.49±0.02	2.00
F7	1.38±0.03	0.61±0.01	2.00
V1	6.55±0.22	1.09±0.05	7.64
V2	3.43±0.07	0.94±0.02	4.37
V3	1.12±0.07	0.52±0.02	1.64
V4	3.54±0.13	3.27±0.16	6.81
V5	5.68±0.37	1.15±0.09	6.83
V6	4.22±0.07	0.85±0.03	5.07
S1	0.00±0.00	0.00±0.00	0.00
S2	2.19±0.06	1.14±0.05	3.33
S3	1.84±0.03	0.90±0.03	2.74
S4	1.03±0.06	0.41±0.01	1.44
SN1	2.55±0.17	1.67±0.13	4.22
SN2	2.22±0.10	1.14±0.03	3.36
C1	1.78±0.04	0.72±0.01	2.50
C2	1.35±0.02	0.39±0.01	1.74
C3	1.35±0.02	0.61±0.01	1.95
P1	2.97±0.02	1.33±0.03	4.30
P2	1.41±0.04	0.44±0.02	1.85
P3	1.50±0.05	0.48±0.02	1.97
P4	2.40±0.12	0.84±0.02	3.24
P5	2.13±0.16	0.59±0.02	2.72
P6	2.95±0.09	1.28±0.09	4.23
L1	3.11±0.08	1.62±0.07	4.73
L2	2.47±0.06	2.53±0.08	5.00
D1	0.00±0.00	0.00±0.00	0.00
D2	0.00±0.00	0.00±0.00	0.00

Data are given in g per 100 g fresh weight.
[a] IDF, insoluble dietary fibre.
[b] SDF, soluble dietary fibre.
[c] TDF, total dietary fibre.

and *mahalabia* (S1). *Tabola* consists mainly of leafy vegetables, tomatoes, onions and bulgur, which contains 9.1% TDF (Dreher, 1987). As expected, dishes based on vegetables, cereal grains and legumes have the highest level of TDF. This is shown in the salads (V1–V6), with fibre contents ranging from 7.64 to 1.63%, and with an average of 5.39%. This is followed by the soups (L1 with 4.73% and L2 with 5.00%), with an average of 4.87%. Lentil soup (L2) is made mainly of lentils and onions while vegetable soup (L1) is made of varying amounts of vegetables. According to the Canadian Advisory Committee on Dietary Fibre (CACDF, 1985), the average dietary fibre contents of the salads and the soups studied are relatively high.

The chicken (SN1) and meat (SN2) sandwiches contained moderate amounts of TDF, i.e. 4.22 and 3.36%, respectively, with an average of 3.79%. They were followed by the pastry dishes (P1–P6), with TDF levels ranging between 1.85 and 4.3% and an average of 3.05%. This variation may be due to the various amounts of vegetables and whole wheat flour used in each dish. The TDF of the fish dishes (F1–F7) ranged between 1.9% in *matfee* (F3) and 3.8% in baked fish with vegetables (F1), with an average of 2.62%. Fried *kuba* TDF values were from 1.73 to 2.5%.

For the sweet dishes, the TDF ranged from 0% in *mahalabia* (S1) to as high as 3.33% in *legemat* (S2), a dessert eaten occasionally, mainly in the fasting month of *Ramadhan*. The TDF in *legemat* is derived mostly from the whole-wheat flour used in the recipe. As expected, the dairy dishes did not contain any dietary fibre.

The IDS fraction ranged from 0% in *labneh, haloomi cheese*, and *mahalabia* (D1, D2 and S1) to 6.55% in *tabola* (V1). The SDF ranged from 0% in the dairy dishes (D1, D2 and S1) to 2.52% in lentil soup (L2). The IDF constituted the major fraction of TDF among the dishes. Most nutritionists agree that it is beneficial to plan for a daily intake of 30 g of fibre or 12 g/1000 kcal by a normal healthy adult (Potty, 1996). The proportion of soluble to insoluble fibre should be 1:2. and the intake is preferred to be through diet made up of varied sources of cereals, vegetables and legumes (Prosky et al., 1992). Several Kuwaiti dishes, such as grilled shrimp, *hommas, legemat, sub-al-gafsha, meat shawerma, potato koba, vegetable sambosak*, and vegetable soup (F7, V3, S2, S3, SN2, C3, P6 and L1) adhere to the 1:2 SDF:IDF ratio.

The IDF in most of the dishes was mostly from the vegetables and cereals used in the preparation of these dishes. The IDF contents of some of the cooked dishes were higher than the theoretical values calculated from the raw materials constituting those dishes. Such was very clear in the deep-fried *potato kuba* (C3). The dietary fibre in C3 came mainly from potato, rice, rusk and onion. The IDF and TDF of C3 were 1.3 and 1.9%, respectively, while the theoretical values calculated from the raw ingredients were 0.9 and 1.1%. An explanation of this phenomenon could be that some of the starch in the potato became indigestible by amylolytic enzymes after cooking and this could cause the observed increase in the IDF fraction (Thed & Philips, 1995). The same authors also suggested that the deep-fat-frying of certain selected processed potato products may increase both the resistant starch (RS) and IDF.

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