Possible effects of iodized salt on the taste, colour and consistency of traditional pickles

Osama Badran,[1] Wisam Qaraqash[1] and Sana Gamah[1]

الآثار المحتملة للملح المعالج باليود في طعم المخللات التقليدية ولونها وقوامها

أسامة بدران ووسام قرقاش وثناء قموه

خلاصة : أجرى مسح وطني النطاق في الأردن سنة 1991 لتعيين معدل انتشار اضطرابات عوز اليود . وشملت عينة البحث 2679 طفلا تتراوح أعمارهم بين 8 و10 سنوات ، وظهر من نتائج فحصهم أن 37.7% منهم كانوا يعانون من اضطرابات عوز اليود . إن الأسلوب المفضل لتعويض ما يحتاجه المصابون بهذا العوز هو معالجة ملح الطعام باليود ، (يودنة الملح) . ومن ثم أجريت هذه الدراسة من أجل استعراف تأثير الملح المعالج باليود في طعم المخللات التقليدية وفي لونها وقوامها . واتضح أنه ليس للملح المُيَوْدَن أي أثر على الخصائص الحسية للمخللات التقليدية .

ABSTRACT A national survey was conducted in Jordan in 1991 to determine the prevalence of iodine deficiency disorders. A sample of 2679 children aged 8–10 years was screened and the results revealed that 37.7% of the study sample were suffering from iodine deficiency disorders. Iodization of salt is the preferred approach for supplementation. The present study was conducted to identify the effect of iodized salt on the colour, taste and consistency of traditionally prepared pickles. It was concluded that iodized salt has no effect on any of the sensory characteristics of traditionally prepared pickles.

Effets possibles du sel iodé sur le goût, la couleur et la consistance des condiments de légumes traditionnels

RESUME Une enquête nationale a été réalisée en Jordanie en 1991 pour déterminer la prévalence des troubles dus à une carence en iode. Un échantillon de 2679 enfants âgés de 8 à 10 ans a été examiné et les résultats ont montré que 37,7% de la population étudiée dans cet échantillon souffrait de troubles dus à une carence en iode. L'iodation du sel est l'approche préférée pour l'apport d'un complément d'iode. La présente étude a été menée pour rechercher l'effet du sel iodé sur le goût, la couleur et la consistance des condiments de légumes préparés de manière traditionnelle. La conclusion tirée est que le sel iodé n'a pas d'effet sur toute caractéristique sensible—goût, couleur, consistance—des condiments de légumes préparés de manière traditionnelle.

[1]*Maternal and Child Health/Family Planning Directorate, Ministry of Health, Amman, Jordan.*

Introduction

Iodine is an essential micronutrient for human survival. It is needed for growth and development, even before birth. The importance of iodine in human nutrition is due to the fact that it is an essential component of the thyroid hormones, thyroxin and triiodothyronine, which are needed for normal development and functioning of the brain and nervous system, and for maintenance of body heat and energy. Very small amounts of iodine (100–300 µg/day) are sufficient to satisfy daily needs and enable the body to work properly [*1*].

When the diet contains insufficient iodine, the thyroid gland cannot make sufficient thyroid hormones to satisfy the body's needs, leading to different iodine deficiency disorders (IDD). During fetal life and infancy, IDD manifest as abortion, stillbirth, increased infant mortality, psychomotor defects and cretinism in various degrees. In childhood and adolescence, IDD include goitre, retarded physical development, impaired mental development and impaired intellectual performance. The main forms of IDD in adults are goitre, hypothyroidism and impaired mental function.

IDD are currently a significant public health problem in 118 countries. In 1960, WHO estimated that 200 million people in the world were suffering from goitre; this had increased to at least 655 million by 1992. Moreover, it is estimated that more than one thousand million people in the world are at risk of IDD. In the Eastern Mediterranean Region, 16 out of 22 countries have a problem with IDD. Over 42% of the total population of the Region are considered at risk of IDD.

In Jordan, a national survey was conducted in 1991 by the Ministry of Health in collaboration with WHO and UNICEF to determine the prevalence of IDD [*2*]. A sample of 2679 children aged 8–10 years was screened through clinical examination and urine analysis. The results revealed that 37.7% of the study sample were suffering from IDD.

Strategies for the prevention of IDD

A variety of strategies can be employed in the prevention of IDD, including the iodization of foodstuffs such as salt, oil and water and the use of Lugol's solution. Iodization of salt is the preferred approach for supplementation in iodine-deficient populations. Salt iodization was first used in Switzerland in 1922. Many developing countries have started programmes of salt iodization in order to combat IDD [*3,4*]. In Jordan, salt iodization started at the beginning of 1994. Potassium iodate is now added to all table salt, and Jordanian legislation has been modified so that all types of salt, both that used in the home and that used in the food-processing industry, are iodized.

Objective

It is estimated that 5–15 g of salt are consumed per person daily. The recommended daily allowance (RDA) of iodine (150 µg/day) would be met through such consumption; however, the iodine RDA could not be met from table salt alone. Iodized salt therefore needs to be used in all food industries, including baking, pickling and cheese-making operations. There have been some suggestions that iodized salt, when used in pickling, may affect the consistency of the pickles. This has never been confirmed. Since Jordan has adopted the strategy of iodization of salt and has established a system for monitoring and follow-

up, this study was undertaken to assess whether iodized salt affected traditionally prepared pickles.

Methodology

Pickling preparation

Two groups of 10 women each were asked to prepare mixed vegetable pickles and pickled cucumbers using their own traditional recipe. Each woman was provided with a container of salt, labelled A or B. One of these contained iodized salt, the other noniodized, both from Jordan. The key to which salt (A or B) was iodized was known only to the chief investigator, who was not involved in the allocation of women to either salt A or salt B.

After preparing and handing over the first batch of pickles, the women were asked to prepare a second, identical batch now using another container of salt, with a cross-over from salt A to salt B and salt B to salt A. A total of 80 jars of vegetables were prepared, 40 jars for cucumber and 40 jars for mixed vegetables. The pickles were stored for two months at room temperature.

Sensory testing

Sensory testing was conducted in the University of Jordan, Faculty of Agriculture, Division of Nutrition and Food Technology during the period of 9–18 March 1996. To evaluate the effects of iodized and noniodized salt on the physical characteristics of pickles, a form was designed. The properties to be evaluated were: colour, consistency, taste and overall acceptability.

A total of 30 judges were chosen (15 for each type of pickle: 5 food technologists and 10 untrained persons). Every tester tested 20 paired samples (iodized and not iodized) of each type of pickled vegetables. Ten days were needed so that every panelist could taste the 40 samples. The panelists rinsed their mouths with water and ate a piece of bread between samples.

A hedonic scale was used by the testers to give a score for each sample. The average score of each sensory characteristic for every tester was calculated. The Student *t*-test for paired observations was used to test the statistical significance.

Results

Pickled cucumbers

1. Food technologists. The mean difference for each sensory characteristic was calculated (Table 1). The mean difference between the pickled cucumber

Table 1 **Mean difference by sensory characteristic of cucumber for food technologists**

Characteristic	Mean difference	*t*-value	*t*-table (0.05)
Taste	0.48	2.28	2.77
Texture	0.38	2.32	2.77
Colour	0.37	2.06	2.77
General acceptability	0.46	2.38	2.77

Table 2 **Mean difference by sensory characteristic of cucumber for untrained persons**

Characteristic	Mean difference	*t*-value	*t*-table (0.05)
Taste	0.09	0.44	2.26
Texture	0.14	0.68	2.26
Colour	–0.10	–0.56	2.26
General acceptability	0.16	1.15	2.26

with iodized salt and the pickled cucumber with non-iodized salt for each sensory characteristics was not statistically significant at the 0.05 level of significance.

2. Untrained persons. The mean difference was not statistically significant for all sensory characteristics of pickled cucumber at the 0.05 level of significance (Table 2).

Pickled mixed vegetables

1. Food technologists. The mean difference between the iodized pickled mixed vegetables and the non-iodized pickled mixed vegetables was not statistically significant at the 0.05 level of significance (Table 3).

Table 3 **Mean difference by sensory characteristics of mixed vegetables for food technologists**

Characteristic	Mean difference	*t*-value	*t*-table (0.05)
Taste	0.08	0.44	2.77
Texture	0.05	0.28	2.77
Colour	0.19	1.14	2.77
General acceptability	−0.18	−0.86	2.77

Table 4 **Mean difference by sensory characteristics of mixed vegetables for untrained persons**

Characteristic	Mean difference	*t*-value	*t*-table (0.05)
Taste	−0.08	−0.57	2.26
Texture	−0.08	−0.88	2.26
Colour	−0.12	−0.90	2.26
General acceptability	−0.11	−0.65	2.26

2. Untrained persons. The mean difference was not statistically significant for all sensory characteristics of pickled vegetables at the 0.05 level of significance (Table 4).

Conclusion

The study was based on a proposal prepared by WHO Regional Office for the Eastern Mediterranean. The aim was to study the possibility that iodized salt used in pickling of vegetables produces changes in the colour and texture, as suggested in some unpublished reports [*1*]. No statistically significant difference was found in the taste, colour or texture between pickles prepared using non-iodized salt and pickles prepared using iodized salt. It is important to note that the traditional methods of pickle preparation were not consistent. The women who prepared the vegetables used different additives such as onions, pepper, garlic and cloves. These ingredients are known to affect the sensory characteristics of food, especially taste and texture. It can be concluded nevertheless that iodized salt has no effect on any of the sensory characteristics of traditionally prepared pickled vegetables. This finding adds important information to the existing body of knowledge which has so far not identified any negative effect of iodized salt on processed foods [*1*].

The study results support the call for universal salt iodization to reach the goal of virtual elimination of iodine deficiency disorders by the year 2000.

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