

Nitrate and nitrite contents in Cuban beer

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Az élelmi anyagok nitrát- és nitrittartalmának vizsgálatáról az utóbbi időszakban egyre gyakrabban jelennek meg közlemények a szakirodalomban. Viszonylag kevés azonban azoknak a dolgozatoknak a száma, melyek élvezeti szerek és ezen belül az alkoholtartalmú italok témakörében születtek. Szerzők a nitrát- nitritproblémát főként a rákkeltő nitrozaminok képződésének veszélye szempontjából említik, pedig ezen vegyületek önmagában való jelenléte is figyelmet érdemel a methaemoglobin kialakulásának lehetősége és az ebből következő egészségkárosodás szempontjából is. (A lektor megj.)

Introduction

Since the discovery of the cancerogenic properties of the nitrosamins by Magee and Barnes in 1956 (1), many investigators have dedicated themselves to the study of the N-nitroso compounds. Some of these have verified the cancerogenicity of these compounds (2, 3), others their formation in the human body starting with their forerunners (4, 5) and recently, publications which show their presence in foods (6, 7, 8).

In 1968, it was informed (9) that dimetilnitrosamin was detected in alcoholic beverages of African origin. Later, other investigators have worked in this direction (10, 11).

A medium level of 2.7 $\mu\text{g}/\text{kg}$ of dimetilnitrosamine has been reported in 70% of the West German beer samples analyzed. The maximum level found was 68 $\mu\text{g}/\text{kg}$. Other nitrosamins were hardly ever detected (11).

A possible source of dimetilamine in beer is hordenine (N, N-dimetil-p-hydroxifeniletülenamine) which is formed in the barley grains during malting (12).

The contents of dimetilamine in beer fluctuates between 200 and 300 mg/kg and is even higher in dark beers (13).

However, the amine forerunners of the N-nitroso cancerogenic compounds are not the most important to control and reduce in foods; most important are the nitrosant forerunners, the nitrates and nitrites (14).

Due to this, several investigations have been conducted in our laboratories, in which levels of nitrates and nitrites have been reported in Cuban foods (15, 16, 17, 18).

In this work information is given on the levels of nitrates and nitrites in the four different types of beer under the name of "HATUEY", made in the "Guido Pérez" Havana brewery during 1980 and 1981.

Materials and methods

Twelve beer samples, using an aleatory method, were taken from each production day. From these, three "pools" were made where the contents of nitrates and nitrites was determined. In this manner, each test performed represent four samples of beer. 322 determinations were made of nitrates and nitrites in beer (207 of Regular (10° B), 64 Special (12° B), 27 Super (15° B) and 24 Super-Extra (18° B) which represent a total of 1288 samples.

The analytical method used was the one reported by the Mixed Committee, FAO/OMS (19), using a reducing column which contains metallic cadmium, described by Follet and Ratcliff (20).

Results and discussions

On table results are expressed. The medium contents of nitrates (\bar{x}) are shown (given in mg of $\text{NaNO}_3/1$, samples) with a standard deviation (S) and variation coefficient (CV) in each case. Results obtained show that the nitrate levels with all types of beer are inferior to the maximum admissible recommended for drinking water (45 mg of $\text{NaNO}_3/1$ of the sample) (21).

In order to test the equality of the medium contents of nitrates in the different types of beer, the homocedasticity of the varianzen was previously verified through the Bartlett test (22) and a varianzen analysis was carried out of simple classification, offering as a result, the existence of highly significant medium contents of nitrates (<0.01). Following this, a Duncan (22) test was performed to detect in which types of beer there existed a difference. A very significant difference was found (<0.01) between the contents of nitrate in regular beer (10° B) and every one of the other three types of beer under investigation. Among the Special beer (12° B), Super (15° B) and Super-Extra (18° B), no significant differences were found (>0.05).

These results are easily explained by the fact that regular beer 10° B contains a less considerable amount of malt and hops, and these raw materials contain nitrates.

It is of remarkable interest to find that no beer samples contained nitrite, using an analytical method which detects 1 mg/kg. Due to the fact that we found a low nitrate level in the four types of "Hatuey" beer, and what is still more important, due to the absence of nitrite in these beers, it is possible to assume that the consumption of beer ("Hatuey") produced in the City of Havana does not represent a health risk through intake of nitrates and nitrites, based on three fundamental reasons:

1. Daily admissible intake recommended OMS (23) is, for nitrate, 0–5 mg of NaNO_2/kg of body weight; for nitrite, 0–0,2 mg of NaNO_2/kg of body weight. A person who weighs 60 kg could then admit 300 mg of sodium nitrate. Contents of sodium nitrate in a bottle of beer is quite distant from this number, and can be calculated between 11.1 and 14.36 mg of NaNO_3 approximately, according to the type of beer.

2. Nitrate level found in "Hatuey" beer is lower than the maximum admissible for drinking water.

Results of nitrate analysis expressed in mg of Na NO₃ × 1 of sample, performed for the four types of „Hatuey,, beer

Type of beer	Amount of determinations	mg/l of Na NO ₃ \bar{x}	Deviation standard S	Variation coefficient % C. V.
1. Regular (10° B)	207	31.73	9.88	31.1
2. Special (12° B)	64	37.15	10.78	29.0
3. Super (15° B)	27	41.04	8.25	20.1
4. Super-Extra (18° B) ..	24	39.52	10.45	26.4

3. The possibility that the beers under investigation contain cancerogenic nitrosamine is not likely, due to the low levels of nitrates contained in same, and above all, to the absence of nitrites, the nitrosant forerunners of the formation reaction of N-nitroso compounds.

Appreciations

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KUBAI SÖRÖK NITRÁT ÉS NITRIT TARTALMA

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Szerzők a havannai „Guido Perez” sörgyárban 1980 és 1981-ben gyártott 1288 minta nitrít és nitrát tartalmát vizsgálták. Eredményeik szerint az átlagos nitrát tartalom minden vizsgált fajtában kisebb mint az ivóvízre megengedett 45 mg/l. A kommersz (10° B) és az egyéb típusú Special (12° B), Super (15° B), valamint a Super-Extra (18° B) sörök nitrát tartalma szignifikánsan különbözött egymástól, de nem volt különbség az utóbbi három fajta között. Nitritet a sörmintákban kimutatni nem tudtak. Az eredmények szerint e kubai sörök fogyasztása nem jelent egészségkárosító veszélyt.

СОДЕРЖАНИЕ НИТРАТА И НИТРИТА В КУБИНСКИХ ПИВАХ

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Авторы исследовали содержание нитрита и нитрата в 1288 образцах пива производства 1980 и 1981 гг. на пивоваренном заводе имени «Guido Perez» в городе Гаванна. На основании полученных результатов общее содержание нитрата в исследованных образцах было ниже 45 мг/л допустимой для питьевой воды. Содержание нитрита в пивах массового производства (10°B) и в прочих специальных (12°B), в пивах сорта Супер (15°B, а также в Супер-Экстра (18°B) пивах сигнификантно различались друг от друга, но между последними тремя сортами пива разницы небыло. В образцах пива не обнаружили содержание нитрита. Согласно полученным результатам потребление Кубинских сортов пива не оказывает вредное действие на здоровья человека.