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A test to detect cane-sugar-honey

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SUMMARY. A manual procedure for simple detection of cane sugar honey is described in terms of a visual reaction of honey, water and diethyl ether mixtures. Analyses of 30 samples of genuine honey were contrasted with 30 samples of cane-sugar-hóney from Venezuela, and discriminated correctly by the proposed method.
Key words: Cane sugar honey, genuine honey.

RESUMEN. Un test para detectar fraudes de miel de abejas a base de azúcar. Se describe un procedimiento manual para detectar miel de abejas preparadas a base de azúcar de caña. El método propuesto consiste en la producción y observación de una reacción visual de mezclas de miel, agua y éter dietílico. Se analizaron 30 muestras de miel genuina y 30 muestras de fraudes de miel de abeja en Venezuela, las cuales fueron identificadas en el grupo correcto por el método propuesto.
Palabras clave: Miel de abejas, azúcar de caña.

INTRODUCTION

Problems arising from evermore fraudulent foodstuffs in the market stimulate the expansion of food analysis methodology. Considerable ingenuity is required to develop effective tests which are economical and reliable. Honey frauds made with cane sugar are common in developing countries; they depress the market price of honey and damage the application of honey for natural folk medicine. The control of cane-sugar-honey is complex because a well coordinated action between official authorities and qualified laboratories is required.

Quality factors of commercial honeys from Venezuela were previously studied in 500 samples collected in 1985-1988 (1). Experimental observations of the hydroxymethylfurfural (HMF) extractive mixture were foreseen as a possible means to differentiate fraudulent and genuine honeys.

The objetive of this work was to develop a kit to detect cane-sugar-honey to provide an easy, rapid and reliable test for honey consumers in Venezuela.

MATERIALS AND METHODS

Samples

The detection test was done in thirty cane-sugar-honey and thirty genuine honey of commercial origin, collected in the Venezuelan market. These samples were previously analysed for water content, acidity, reducing sugars, sucrose, ash, hydroxymethylfurfural, diastase and nitrogen, to confirm their nature (2). The honey sediment was mounted following the method of the International Commission of Bee Plants (3). Additional microscopic observations of the sediment following the technique suggested by Kerkvliet et al. (4) agreed with the previous chemical characterisation, pollen was always present in genuine honeys while vessel rings were distinctive for cane-sugar-honey.

Design of a new instrument suitable for kit test

Accuracy and easy handling to measure fixed volumens of liquids or solids, to mix reagents and to observe the mixture, were the requirements of the tube to be included in the kit for honey analysis. The prototype used in the present work consisted of a three-mark glass tube with aluminium piston and cap provided with o-rings for air tight purposes.

Test

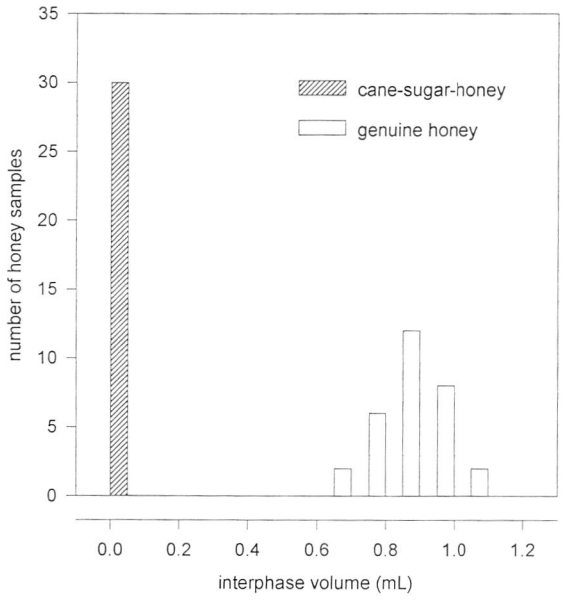
A fixed volume (1 mL) of either liquid or crystallised honey was diluted with the same volume of water. The piston enabled volumetric measurements and the required expansions for effective mixing inside the tube. A double volume (2 ml) of diethyl ether was added to the honey dilution and vigorously shaked with twenty up and down movements of the hand. The mixture was settled vertically and the number of phases was observed one minute later. The volume of the intermediate phase was measured with a calibrated scale

RESULTS

Volume variations of the intermediate phase are presented in Fig. 1. Cane-sugar-honeys presented two phases while genuine honeys presented three phases. The intermediate phase was lacking in cane-sugar-honeys, while this phase covered a range comprised between 0.7 mL and 1.1 mL in genuine honeys. This fact is better illustrated by the results of

the proposed test in Fig. 2a, where tube A contains the genuine honey and tube B contains the cane-sugar-honey. Fig. 2b is a micrograph of the intermediate phase, which was present only in genuine honey mixtures.

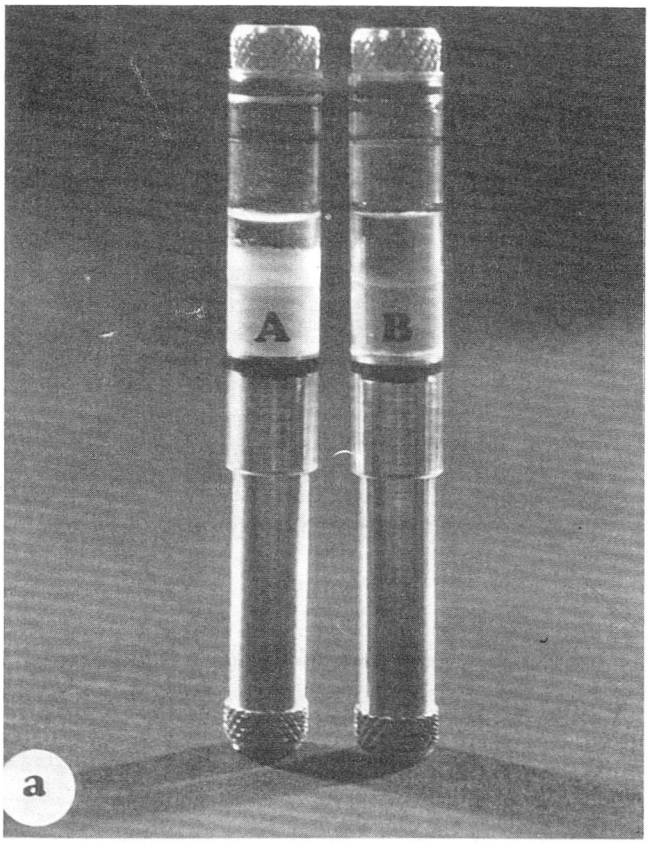
FIGURE 1
Variations of interphase volume in genuine honey and cane-sugar-honey

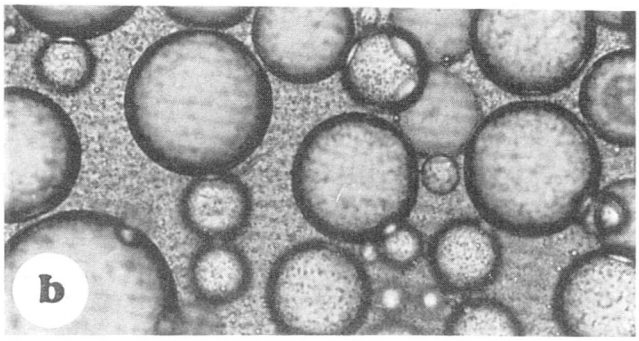


DISCUSSION

The presence or absence of the intermediate phase in honey, water and diethyl ether shaked mixtures, was distinctive according to the nature of honeys under examination (Fig. 2a). Cane-sugar-honeys never presented this phase, that was characteristic and varying in volumes for genuine honeys (Fig. 1). Since honey is a natural product, there are numerous constituents that can generate differences in rheological behaviour when compared with cane-sugar-honey, under the test conditions. A possible protein relation with this phenomenon is supported by the fact that the nitrogen content was significantly higher in genuine honey than in cane-sugar-honey (5). The proteins present in honey but not in fraudulent imitations, can therefore be involved in the films originated by liquid-air interactions, giving rise to bubbles that were stable for more than 24 hours inthe test tube. These bubbles (Fig. 2b) followed a contraction and collapse pattern when a drop of the intermediate phase was mounted on an uncovered slide and was observed with light microscope.

FIGURE 2
a) Phase patterns observed in genuine honey (A) and cane-sugar-honey (B) mixtures. A lower aqueous phase and upper diethyl ether phase were present in both genuine and fraudulent honey, but the intermediate phase was formed only in genuine honey. b) Characteristic bubbles of the intermediate phase





The main controversies for this test could be based on whether or not it will work for adulterated honey mixtures of cane-sugar-honeys with genuine honeys. Even if this is a serious problem for the honey market in several countries, this was not the problem for commercial honeys from Venezuela. This test can produce a false negative for such mixtures, but further research focusing to both the sensibility and the limits of the test should make it suitable to solve different problems concerned with fraudulent honey. It will be of great interest to extend this study in commercial honeys originated in other countries with similar problems to the Venezuelan market.

The measurement of a non conventional honey quality factor explored in this work, can be considered as a contribution to approach the detection of fraudulent honey in the market. Information on a larger number of honey components will increase the probability of detection of honey frauds (6). Both the absence of intermediate phase in honey, water and diethyl ether shaked mixtures studied here, and the presence of cane sugar tissue residues with the microscopic procedure described by Kerkvliet et al. (4), offer a broader range of cane-sugar-honey detection by consumers and qualified analysts, respectively.

The present study offers a proposal for simple detection of cane-sugar-honey, based on the differential behaviour of honey, water and diethyl ether mixtures. Work is in progress to facilitate observations of the test result by colouring the reagent.

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REFERENCES

1. Vit P, González de Martorrellu I & López-Palacios S. Clasificación de mieles comerciales venezolanas. Arch Latinoam Nutr 1994; 44:47-56.
2. Vit P. Miel de Abejas. Cuaderno de Ciencia de los Alimentos N° 1. Consejo de Publicaciones-Universidad de Los Andes, Mérida, Venezuela. 1993; p.97.
3. Louveaux J, Maurizio A & Vorwohol G. Methods of Melissopalynology. Bee World, 1978; 59:139-157.
4. Kerkvliet JD, Shresta M, Tuladar K & Manandhar H. Microscopic detection of adulterationof honey with cane sugar products. Apidologie, 1995; 26:131-139.
5. Vit Olivier P. Utilidad de la determinacióndel contenido de nitrógeno en el control de calidad de mieles venezolanas. Acta Científica Venezolana, 1987; 39:511-512.
6. White JW Jr & Rudyj ON. The protein content of honey. J Apicult Res, 1978; 17:234-238.

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