

Zeitschrift: Mitteilungen aus Lebensmitteluntersuchungen und Hygiene = Travaux de chimie alimentaire et d'hygiène
Herausgeber: Bundesamt für Gesundheit
Band: 94 (2003)
Heft: 5

Rubrik: Information = Informations

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Project announcement: Authenticity of Swiss honey

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Introduction

The annual honey consumption per capita in Switzerland is one of the highest in the world. With an average intake of 1.1–1.4 kg honey/year (1), it is much higher than that of most European countries, which lies between 0.5 kg and 1 kg (2). Maybe for this reason, honey was not considered a priority in the European research project TRACE on food authenticity and traceability, which was recently proposed for the sixth EU research program. Honey production in Switzerland is highly decentralized and performed at 99 % by hobby-beekeepers. Swiss honey has the image of a safe, traditional, locally made product. Indeed, honey is one of the very last food items, which remains almost totally natural and untreated.

Nevertheless, honey produced in Switzerland is far from covering the market demand and only about one third of the honey consumed in Switzerland originates from domestic production (1). Moreover, honey, as any other commodity, is prone to adulterations and frauds. These frauds can encompass the use of unlawful production methods and misleading labeling or claims like wrong or incomplete declaration of geographical or botanical origin.

The different authenticity issues were recently reviewed (3) and revealed two major aspects:

- Authenticity in respect of honey production and
- Authenticity in respect of declarations: geographical and botanical origin, “natural”, “organic”, “raw” and “unheated” honey.

The main problem regarding the authenticity of production is the proof of frauds due to the addition of beet sugar. In spite of extensive research, no methods based on markers of beet sugar are available (3). Further analytical methods can only base on differences between natural and adulterated honeys. However, before

tests on adulteration are developed, reliable authentication techniques regarding the botanical and the geographical origin of honey should be worked out.

Frauds on geographic origin

In accordance with the Swiss regulations (SR 817.02) the country of production of honey must be labeled. Moreover, the name of a region, a geographical or topographical place may also be mentioned (SR 817.02, art. 204) if the honey is from the designated origin (e.g. "miel du Jura", "miel des Alpes", "miel de Provence"). Moreover, labels or special marketing terms have been developed such as PDO honeys (Protected Denomination of Origin), e.g. "miel de Corse AOC". For some reasons, linked with proven or supposed production practices, different food safety and environmental regulations, emotion and culture, honeys from some specific geographical origins are more appreciated by the consumer and consequently reach a higher price than blended honeys. Moreover, due to large differences in human resources, prices and legislation, honeys from different countries have very different production costs. For example, Swiss honey sells at a higher price than imported one. Consequently, it may be economically interesting to blend honey from different geographic origins without properly labeling the final product or to mislabel honey as originating from appreciated geographic areas.

Traditionally, melissopalynology has been used to assess honey authenticity. Unfortunately, the Codex committee on sugars revised the standard on honey in such a way that it is now possible to remove pollen from honey by filtration. The chapter 3 (Essential composition and quality factors) of the revised Codex standard for honey states, "No pollen or constituent particular to honey may be removed except where this is unavoidable in the removal of foreign inorganic or organic matter." (4). It is thinkable that the definitions of "unavoidable" and of "foreign matter" may differ from one country to the other. The European legislation has been adapted to this Codex standard in a council directive from 2001 (5). However, it states in art. 7 that "Honey the name of which includes indications concerning floral, vegetable, regional, territorial or topographical origin or specific quality criteria may not have filtered honey added to it."

Swiss legislation did not introduce yet the designation "filtered honey". It is obvious that the availability of filtered honeys will considerably facilitate the task of adulterators, as the absence of honey pollen will render melissopalynology useless. Thus, it is necessary to develop objective characteristics (such as physical and chemical parameters) which are directly linked to a geographic origin.

Frauds on botanical origin

The specific designation of honey may be completed by some indication about its botanical origin, if it comes predominantly from this botanical origin and possesses the specific organoleptic, physico-chemical and microscopical characteristics of this botanical origin (SR 817.02, art. 204). Some unifloral honeys reach a better

price (twice or more) than more common ones or honey blends. Acacia honey achieves worldwide the highest price. In Central Europe, as well as in Switzerland, the honey from conifers has an especially high price. In countries like Italy and France, up to 50 % of the honey is sold as unifloral honey, which is more expensive than blended honey. Thus, there is a financial interest to mislabel the botanical origin of honey in order to achieve a higher price. It was recently shown (3) that the presently available test methods are not efficient enough for a fast and unequivocal proof of honey botanical origin. Although there are some indications of the organoleptic and physico-chemical characteristics of unifloral honeys in the Swiss Food Manual (6), there are no internationally accepted norms. Presently, the International Honey Commission compiles a monograph with a description of the sensory, melissopalynological and physico-chemical characteristics of 15 most important European unifloral honeys. However, the judgment based on this classical method will always depend largely on expert knowledge. As reliable routine methods for the authentication of botanical origin are lacking, frauds, consisting in selling cheaper honeys or honey blends for high-priced unifloral honey are likely to occur.

From all non-routine techniques, analysis of honey volatiles seems to be the most promising technique for the routine determination of botanical origin (3). Since the last review on the subject, it was demonstrated that an electronic Smart Nose, based on the analysis of honey volatiles, is a promising tool for the determination of botanical origin of honey (7). However, as this is a highly sophisticated instrument, it is unlikely to be used for routine testing of the botanical origin of honey.

Objectives and work plan

This project is part of a long-term endeavor in the Swiss Bee Research Centre, aiming at the characterization of Swiss unifloral honeys. In this project, all Swiss unifloral honeys will be characterized: acacia, alpine rose, chestnut, dandelion, fir, linden and rape. These honeys will be characterized by the traditional method that includes sensory, melissopalynological and physico-chemical analysis (3). The selected typical samples will be further characterized by the new techniques developed in the present project.

The project was launched beginning of 2003 with the objective of developing fit-for purpose analytical methods allowing an adequate control of the botanical origin. If this objective is fulfilled in due time, methods for the determination of the geographical origin of honeys, even in the absence of pollen are going to be tested.

Table 1

The proposed time schedule

2003	Review on honey volatiles Testing of different analytical methods for the determination of botanical origin
2004	Selection of technique(s), method validation and application on the analysis of unifloral honeys Chemical elucidation, quantization of possible unifloral markers and chemometric evaluation of the results
2005ff	Analysis of further samples by the selected methods for the determination of the botanical origin Finally, depending on time and resources available: Application of different physico-chemical techniques for the analysis of one unifloral honey from different geographical origins Selection of method(s) for the determination of geographical origin

Project organization

The Swiss Federal Office of Public Health (SFOPH) is the main sponsor of this project and member of the steering committee. The Swiss largest honey importer and packer Narimpex (Biel) as well as the Association of the Swiss Beekeepers give financial support. The Swiss Federal Research Centre for Animal Products (SFRCAP) is the contractor and charged to develop and realize the project with the mentioned goals. Kaspar Ruoff carries it out, as his doctoral thesis at the Swiss Bee Research Centre, supervised by Dr Stefan Bogdanov. The scientific director of the doctoral thesis is Prof. Renato Amadò from the Institute of Food Science and Nutrition of the Swiss Federal Institute of Technology (ETH). Dr Jacques Olivier Bosset is a private scientific consultant and coordinates this project with other research projects sponsored by the SFOPH in the same field. His role will also consist in finding collaborations and synergies with other institutions active in the field.

Conclusions

It is very important that the results of this project will be communicated in a proper form to all interested parties (private and official laboratories, producers, consumers). Developing new analytical tools on a basis recognized by the international community should make it possible to counteract honey frauds, discourage potential cheaters and increase the confidence of the consumer in honey and honey products. Finally, depending on the results and the method's performance, the development of an international standardized method could be envisaged.

Summary

The fight against fraud belongs to the strategic objectives of the Food Safety Unit of the Swiss Federal Office of Public Health (SFOPH). Moreover, SFOPH has the legal duty to establish recommendations about the evaluation and analysis of food commodities. Thus, it is the objective of the SFOPH to support research, aim-

ing at the development of authentication methods. In this context, the SFOPH launched since 2001 two projects, aiming at developing methods for analytical traceability of wine and cheese. According to the Swiss as well as the international honey directives, honey should be authentic in respect to botanical and geographical origin. However, there are no modern methods to ensure this aspect of honey authenticity. In cooperation with the SFOPH, the Swiss Federal Research Centre for Animal Products (SFRCAP) is undertaking a new study on the authenticity of the botanical and geographical origin of honey.

Key words

Honey, authenticity, botanical origin, geographical origin

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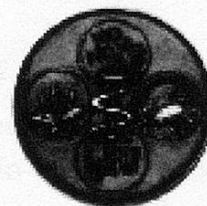
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Die Schweizerische Gesellschaft für Lebensmittelhygiene (SGLH) hat sich im Interesse der öffentlichen Gesundheit die Förderung einer hygienisch sicheren Ernährung, die Bearbeitung fachspezifischer Anliegen der Lebensmittelhygiene sowie den Erfahrungsaustausch unter den Mitgliedern zur Aufgabe gemacht.

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Société suisse d'hygiène des denrées alimentaires (SSHDA)

La société suisse d'hygiène des denrées alimentaires (SSHDA) œuvre dans l'intérêt de la santé publique par la promotion de la sûreté hygiénique des aliments, en informant sur les questions actuelles liées à l'hygiène des denrées alimentaires et en favorisant les échanges d'expérience entre ses membres.

La SSHDA assure la poursuite de ces buts par des journées de travail, des cours techniques orientés vers la pratique, des conférences spécialisées et des workshops. Elle crée et encourage la mise sur pied de groupes de travail consacrés à l'analyse des problèmes actuels et soutient activement l'élaboration de propositions de normes et de critères d'appréciation pour les analyses microbiologiques alimentaires. La SSHDA veut réaliser ces buts en étroite collaboration avec d'autres associations, les instances officielles, les universités, les écoles supérieures et d'autres personnes ou institutions œuvrant dans le domaine de la sûreté alimentaire.

Les activités de la société sont consacrées à des thèmes d'actualité liées à l'hygiène des denrées alimentaires, avant tout dans les domaines du traitement hygiénique des denrées alimentaires, des méthodes modernes de diagnostic microbiologique et de la lutte contre les intoxications et infections d'origine alimentaire. La compréhension des résultats de recherche actuels et leur application dans la pratique doivent être encouragées d'une manière générale.

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