FoodBioSystems DTP - PhD Project Advertisement

Project title:

FBS2021-06-Anastasiadi: Honey authentication using intrinsic DNA markers and metabolic fingerprint

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Project description:

Honey authentication is a complex problem facing the honey industry involving several different aspects such as botanical and geographical origin identification and adulteration detection. Honey is a completely natural product included in human diet for thousands of years. Honey's popularity is ever increasing because of not only its taste and nutritional value, but also the perceived health benefits, traditionally being used for the treatment of wounds, burns and colds. Although honey is mainly composed of sugars and water, it also contains a variety of valuable substances, such as vitamins, antioxidants, minerals, enzymes, free amino acids, and numerous volatile compounds, present as minor components. These compounds, which can vary among different honeys due to factors such as the botanical origin, geographic area and processing are responsible for conferring unique organoleptic and nutritional/health properties to honey. Premium monofloral honeys principally derived from a single floral source, such as New Zealand's manuka honey are particularly sought after by consumers and have high commercial value. The most important monofloral honey produced in Britain is heather honey, but research into its nutritional composition and health benefits is sparse. The value and popularity of honey in combination with the decline of bee populations worldwide, inevitably leaves the scene open to fraudulent practices which can occur at any step of the supply chain. Indeed, honey is among the top 10 food products most at risk of adulteration worldwide, with adulteration taking different forms such as addition of sugar syrups, dilution of premium honeys with cheaper types, and mislabelling of geographical and botanical sources. At present, there is no single method for authenticity testing for honey and the majority of the tests are time-consuming and expensive. The development of simple and reliable authentication methods is therefore particularly important in increasing consumers' confidence and safeguarding bee farmers' income by increasing their product's value.

This project will seek to establish a unique link between floral sources and heather honey from different areas of the UK by employing modern molecular and analytical techniques in combination with artificial intelligence to identify intrinsic DNA markers and metabolic biomarkers in nectar and honey. A similar approach will be taken in the case of common adulterants such as corn syrup, delivering an authentication method for simultaneous botanical origin identification and adulteration detection.

The successful applicant will have access to the world leading analytical and molecular biology facilities at Cranfield

University to investigate the genetic and metabolic fingerprint (e.g. sugars, vitamins, antioxidants, volatiles) of UK honeys and their corresponding floral sources. The student will be placed within the bioinformatics group at Cranfield University where they will learn to apply machine learning (artificial intelligence) techniques to reveal hidden patterns in multivariate and high throughput datasets and develop a decision tool for honey authentication. In addition, the student will have the opportunity to work in the Institute for Global Food Security at Queen's University Belfast to investigate the bioactivity and antimicrobial activity of UK honeys.

This is a multidisciplinary project which brings together expertise in bioinformatics, analytical chemistry, molecular biology, and nutrition and the student will receive continous support with all aspects of their research from the supervisory team at Cranfield University and the Queen's University Belfast.

Training opportunities:

The student will have access to world class training from Cranfield University and Queen's University Belfast and will receive training in diverse experimental and data analysis methodologies including:
Experimental design, advanced statistical methodology, machine learning, mass spectrometry data, molecular biology, cell cultures, bioactivity assays. The student will also have access to the CU Doctoral Researchers' Core Development (DRCD) programme and external seminars in relevant subject areas. In addition, the student will have the opportunity to work alongside bee farmers and receive expert advice on honey production.

Student profile:

This project would be suitable for students with interdisciplinary skills with a BSc and/or MSc in the following areas: biology, chemistry, nutrition, agriculture, plant science, bioinformatics, food science or a closely related subject.

Funding Note
This project is part of the FoodBioSystems BBSRC Doctoral Training Partnership (DTP), it will be funded subject to a competition to identify the strongest applicants.
The studentship is open to UK and international students (including EU countries) however due to funding rules, no more than 30% of the projects can be allocated to international students.
The funding will include a tax free stipend (minimum £15, 285 per year), support for tuition fees at the standard UK rate (currently £4,407 per year) and a contribution towards research costs. **Please note** that the host universities have not yet confirmed the level of fees charged to international students funded by the DTP. Fee levels may vary across the institutions. This information will be shared on the FoodBioSystems DTP website as soon as it becomes available.

To apply
Please go to FoodBioSystems DTP website for information on how to apply for this studentship. The closing date for applications will be 8 February 2021.

References:

1. Abuelgasim, H. et al. (2020), doi:10.1136/bmjebm-2020-111336
2. Raezke, K.-P. et al. (2018), doi:10.32741/fihb%20
3. McDonald, C.M. et al. (2018), doi:10.1038/s41538-018-0016-6
4. Soares, S. et al., (2017), doi: 10.1111/1541-4337.12278