

Grower Summary

FV/PE 455

**Determining the basis of
variation in herb flavour**

Annual report, March 2019

Project title: Determining the basis of variation in herb flavour

Project number: FV/PE 455

Project leader: Prof Carol Wagstaff, University of Reading

Report: Annual report March 2019

Previous report: N/A

Key staff: Ana Contente
Dr Maria-Jose Oruna-Concha

Location of project: University of Reading

Industry Representative: Philip Dodd, Herbs Unlimited, York

Date project commenced: 12th March 2018

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The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

Professor Carol Wagstaff

Principal Investigator, Head of School Chemistry, Food and Pharmacy

University of Reading

Signature *C. Wagstaff* Date30th April 2019.....

Report authorised by:

Professor Carol Wagstaff

Principal Investigator, Head of School Chemistry, Food and Pharmacy

University of Reading

Signature *C. Wagstaff* Date30th April 2019.....

GROWER SUMMARY

Headline

Baseline flavour profiles have been determined for three UK herb crops, basil, coriander and rosemary. Work is ongoing to determine how flavour profiles vary with season and production method.

Background

Herb flavour can vary in its composition as well as intensity. This variation can happen as a result of different cultivars, agronomic practices, season and climate. Consumption of culinary herbs has increased due to pressure to reduce salt content in foods whilst retaining a flavourful eating experience, so the flavour is the most important attribute of the herbs. Therefore, understanding how flavour varies in composition and abundance within a herb species as a result of different production systems and climate conditions, and how these differences are perceived by consumers, will help growers to adjust their practice, to enable the industry to deliver a more consistent and acceptable product.

The overall project aim is to elucidate the chemical profile of commercially important culinary herb crops and understand how varietal choice, season, agronomic practice, cultivation system and environment interact with this. Project objectives are to:

- Profile chemistry of three core herbs: coriander, basil, and rosemary
- Examine the impact of different seasons on flavour profile over three sequential years
- Examine the impact of production system on flavour profile
- Associate flavour profiles with consumer liking

Summary

Three different herbs were selected for study as being of the greatest commercial relevance and covering both annual, perennial, soft and woody herbs: basil, coriander and rosemary. The steering group provided several sites (across West Sussex, Lincolnshire, Berkshire, Worcestershire, Norfolk and Yorkshire) covering a range of production methods. These sites provided samples of herbs produced in protected conditions in pots under glass (Pots), in soil under protection (Soil) or in hydroponics under glass (Hydroponics). Samples from field production (Field) were also provided for analysis. The herbs included at each sampling time depended on what was available for each site / production system. The table below shows which production types were analysed for each of the herbs in summer and autumn 2018, and the corresponding geographical location. Further samples were collected from protected

cropping only, in January 2019. Coriander samples were all of var. Cruiser, and basil was of type Sweet Genovese. Rosemary varieties varied with site.

Table 1. Production systems sampled for three herb species and corresponding geographical location.

| | Rosemary | Coriander | Basil |
|--------------|-----------------|------------------|-------------------|
| West Sussex | Pots | Pots, Field | Pots, Hydroponics |
| Lincolnshire | | Pots | Pots |
| Berkshire | Field | | |
| Worcs | Field | Field | Soil |
| Norfolk | Field | | |
| Yorks | Soil, Field | Field | |

To determine flavour profiles, fresh samples were used for head-space volatiles analysis and this was done using solid-phase microextraction (SPME) coupled with gas chromatography-mass spectrometry (GC-MS). The relative abundance of different compounds was calculated using an internal standard. Statistical analyses are ongoing to determine the significance of variation in volatile compounds attributed to production method, location of production and season. This annual report focuses on results from samples collected in summer 2018.

Initial sampling of the three herbs provided baseline data of the key flavour volatiles found in each crop type. For all the three herbs the main compounds mentioned in the literature as being important components of the flavour, were detected in all the samples. In the case of rosemary, these compounds were alpha-pinene, camphene, beta-pinene, 1,8-cineole, linalool, camphor, alpha-terpineol and verbenone, described as giving a fresh, wood, pine, camphor, menthol aroma. For coriander, the compounds provided a soapy, waxy, citrus, fruity aroma, and this was due to the presence of E-2-undecenal, dodecanal, E-2-dodecenal and E-2-decenal. Basil's main compounds were 1,8-cineole, linalool, methyl chavicol and eugenol, providing an aroma described as sweet, herbal, fresh, floral and spicy. Rosemary was the species with the most aroma volatiles detected, followed by basil then coriander. Of the three herbs, basil had the most common compounds detected across samples from different production systems / geographic locations.

From the results so far, it has been possible to observe some broad differences between samples from different herbs, production systems and geographic locations:

- Variation in the flavour profiles of rosemary samples were largely attributed to differences in variety, rather than production systems.
- Pot-produced herbs show significant differences in flavour profile when compared with other types of production such as field cultivation, soil-grown under protection or hydroponics (basil only). This was particularly apparent for coriander samples (Figure A) where principal components analysis was used to correlate flavour components to different production systems.
- Of the three herbs studied, basil is the one with a flavour profile that is most sensitive to environmental conditions, in other words to the geographical location.

More analysis needs to be done in order to reach more definitive conclusions, using samples collected from the same sites during different seasons. Understanding how these differences are perceived by the consumer (project year 2 onwards) will help determine how definite these differences are for those who buy these products.

Financial Benefits

This project will provide UK herb growers with information to help them understand better the variations in their product, and in doing it, help to deliver a more consistent product along the year. This means that the need of importing product from other countries will decrease, leading to an increase in the consumption of UK grown herbs resulting in more profit and less waste.

Action Points

None to date

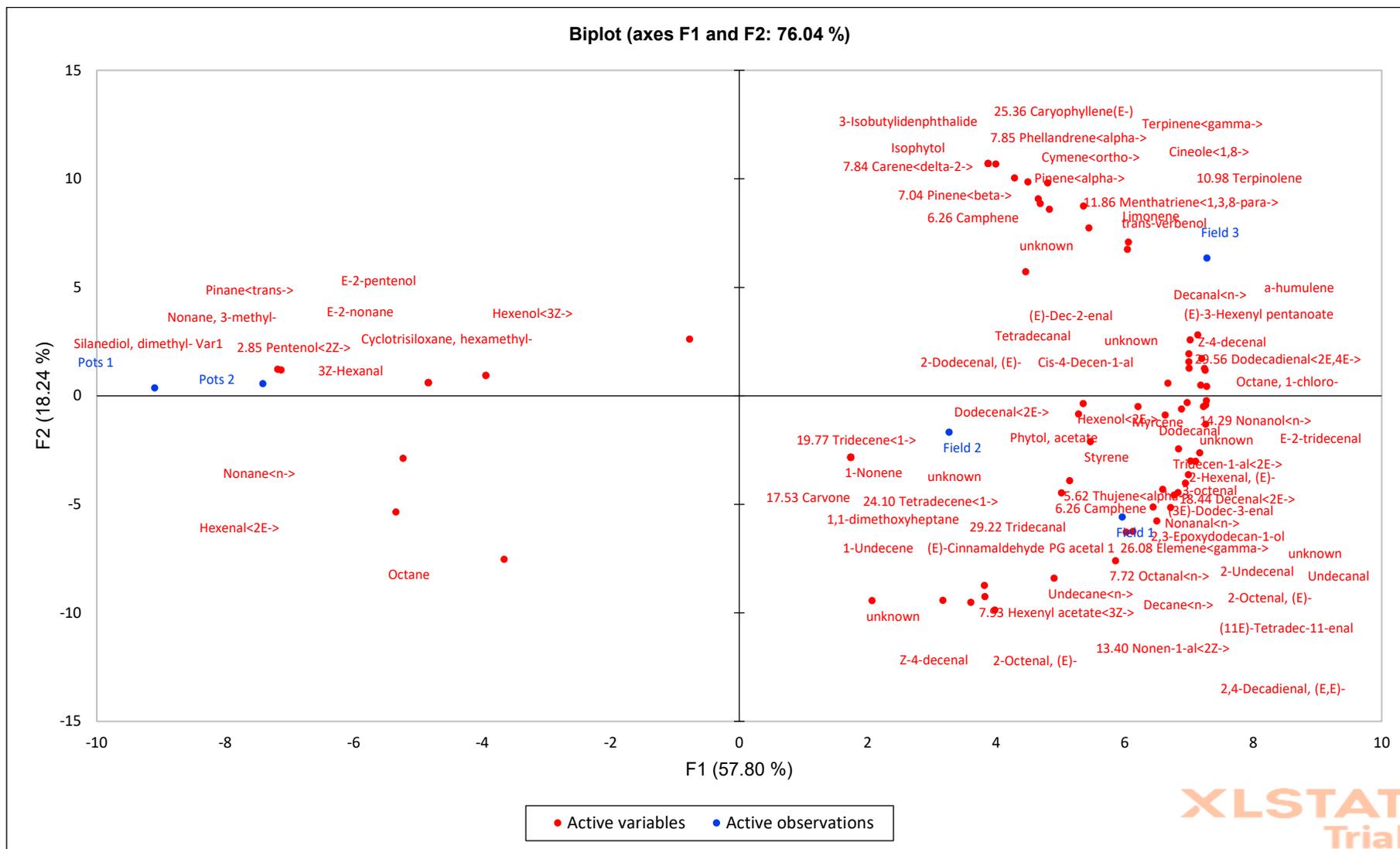


Figure A. Graph correlating the volatile compounds found in coriander (red text) and their relation to the different production methods (blue text)