

PROJECT SUMMARY



**RURAL
INDUSTRIES**

Research & Development
Corporation

Identification of desirable coffee secondary metabolites

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The issue

Australia's annual production of Arabica coffee beans represents only 3-4% of Australian coffee consumption with the remaining 96-97% coming from imports (Peasley, 2010a). There is an opportunity for the Australian coffee industry to capture a greater share of the Australian coffee market by closing the gap between Australian coffee production and Australian coffee consumption.

The Australian coffee industry must consistently produce greater quantities of high quality coffee to sustain the industry in the long term and this has proven to be a challenge. Coffee cupping quality is influenced by a variety of agronomic, environmental, genetic, harvesting and postharvest processing factors but the metabolites (natural chemicals) responsible for cupping quality differences are not known.

The environments of the tropical and subtropical regions of Australia are distinctly different and coffee grown in these areas have different flavour profiles but the metabolite profiles responsible for these differences are not known.



Objective

The research objective was to understand how metabolites in Australian and international coffee affects cupping quality. This could allow the Australian coffee industry to identify distinctive characteristics present in Australian coffee and form the basis for establishing quality assurance standards that assist the industry in consistently producing high quality coffee beans.

Methodology

The objective of the project was pursued by engaging in two paths of research. One path aimed to define metabolite profiles in Australian mature dry green bean (DGB) relative to international DGB while the second path aimed to define metabolite profiles in Australian DGB at different maturity levels. Both paths of research attempted to establish if there was an association between particular metabolites and cupping quality.

Two cupping protocols were utilised, one was the Specialty Coffee Association of America (SCAA) roasting and cupping protocol while the second cupping utilised espresso extraction.



Results

SCAA cupping of Australian subtropical, Australian tropical and international coffee found no difference between cupping scores when samples were grouped by origin, suggesting Australian coffee compares favourably with international coffee. The Espresso protocol found 50% of the Australian subtropical samples scored speciality grade and above with one sample scoring a Cup of Excellence grade, confirming Australian coffee is generally of high quality.

The most abundant compounds in mature DGB were caffeine, chlorogenic acid and trigonelline. Caffeine is a key compound associated with coffee and caffeine levels in the international samples were significantly higher than the Australian samples in this study. Caffeine can be either desirable or undesirable, depending on purpose. Nevertheless, low caffeine content may be a differentiating feature of Australian coffee that has market value.

DGB chlorogenic acid and trigonelline are reported to have an impact on cupping quality (Farah et al., 2006; Ky et al., 2001) but this study found neither metabolite had a significant influence on mature DGB SCAA cupping scores, instead, other less abundant DGB metabolites were more important. The DGB metabolite with single greatest impact on cupping scores explained approximately 50% of the variation in SCAA cupping scores in subtropical, tropical and international samples

and up to 55% of the variation when the subtropical samples were considered alone. Other DGB metabolites played lesser but significant roles in determining cupping scores which may be environment or cultivar dependant. Although, trigonelline had no effect on mature DGB SCAA cupping scores, it did effect cupping scores of beans at different maturity levels.

The DGB metabolite with single greatest impact on SCAA cupping scores did not play a role in Espresso cupping scores, highlighting the importance of postharvest treatment in determining cupping quality. In contrast to SCAA cupping where DGB metabolites explained 69% of the variation in cupping scores, DGB metabolites only explained 44% of the variation in Espresso cupping scores. The Espresso protocol used a darker roast compared to the SCAA protocol which meant the compounds in roasted beans were modified to a greater extent compared with the beans utilised by the SCAA protocol, reducing the power of DGB metabolites to predict Espresso cupping scores.

Hierarchical clustering and Principal Component Analysis based on all 20 metabolites grouped samples by origin. Given the mixture of genotypes in the study, it was not possible to definitively partition the relative effect of genotype (cultivar) or environment in driving these groupings.

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