



Australian Government

Rural Industries Research and
Development Corporation

Defining the Unique Flavours of Australian Native Foods



RIRDC new ideas for rural Australia



Davidson plums

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Foreword

Australian native plant foods provide new and exciting eating experiences for consumers and have the potential to re-position 'Australian cuisine' as a contemporary food choice for consumers worldwide.

The development of a common set of flavour and aroma descriptors and characteristics was identified as a key priority for the Australian native food industry. This research assists in the development and supply of product information to support market access and market growth for this emerging industry.

This work was targeted so that a concise, consistent and accurate description of the flavours of these ingredients could be delivered to consumers. This report details the results of the development of the first 'Australian native flavour wheel' and sensory descriptions for sixteen of the key commercial native food species including fruits, berries, herbs, spices and seeds.

This project was funded from Rural Industries Research and Development Corporation (RIRDC) Core Funds which are provided by the Australian Government, together with funds and in-kind contribution from the Australian Native Foods Industry Ltd (ANFIL) and in-kind investment from the Queensland Government Department of Employment, Economic Development and Innovation (DEEDI).

This report is an addition to RIRDC's diverse range of over 2000 research publications and forms part of our New Plant Products Research and Development Program, which aims to facilitate the development of new industries based on plants or plant products that have commercial potential for Australia.

Most of RIRDC's publications are available for viewing, free downloading or purchasing online at www.rirdc.gov.au. Purchases can also be made by phoning 1300 634 313.

Peter O'Brien
Managing Director

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Lemon myrtle

Executive Summary

What the report is about

This report presents results and outputs from a research project aimed at developing vocabulary for describing the unique flavours of commercially important native plant foods. The product of this work is a consistent, reproducible and concise sensory 'lexicon' to be used by the native food industry, the food service sector and broader food industry. This work will allow a consistent, whole of industry approach for promoting and describing the flavours of native plant foods.

Who is the report targeted at?

This report was prepared for the Australian Native Food Industry Ltd (ANFIL) and for individuals and groups which use native foods. The knowledge generated by this research is targeted at consumers, the food service sector and the broader food industry in Australia and overseas.

Background

One of the issues identified for the native food industry is the use of inappropriate terminology across the industry and the lack of a suitable reference for the use of indigenous ingredients. There is a need to better understand the flavours of native foods to allow a consistent message regarding the value of this unique range of ingredients.

Aims/objectives

The main objective of this research is to develop, publish and distribute a native food 'flavour lexicon' which includes sensory profiles of important commercial species. This information is intended to be incorporated into product factsheets and other promotional material regularly used by industry, producers, culinary experts and consumers.



Lemon aspen

Methods used

The lexicon for the present study was developed by standard quantitative sensory descriptive techniques involving a panel of 10 sensory experts. The panel reviewed representative samples of the 16 key commercial species and developed both quantitative flavour profiles and a qualitative sensory attribute list using recognised and authenticated terminology appropriate to the genre. An industry consultation process was employed to ensure the relevance and suitability of the sensory descriptions developed.

Results/key findings

The 'Australian native flavour wheel' developed by this project is a concise summary of the sensory language appropriate for use when describing the flavours of Australian native plant foods. In addition, accurate sensory descriptions were developed for each of the key species studied.

Implications for relevant stakeholders

This work provides a clear, useful means of characterising and describing the flavours of native food products for the native foods industry,

chefs, formulators, food technologists and flavour experts. This knowledge will allow a consistent message regarding native food ingredients and assist the broader food industry to successfully develop flavour blends and produce food products from native food ingredients. The successful adoption of the products of this research has the potential to increase the use and demand for native food ingredients both in Australia and overseas.

Recommendations

The 'Australian native flavour wheel' and sensory descriptions of products will be published in a suitable hardcopy format for distribution. It is recommended that the Australian Native Food Industry Ltd (ANFIL) incorporate the sensory descriptions into fact sheets and promote the native flavour 'lexicon' in future ANFIL bulletins, via their website and through public media channels for dissemination to target audiences. The Department of Employment, Economic Development and Innovation (DEEDI) will continue to work with RIRDC and ANFIL to achieve successful uptake of this research.



Australian bushfoods

Introduction

The food industry world-wide is demanding novel flavours to satisfy ever-evolving consumer requirements for new and exciting taste sensations. There is also a rapidly growing awareness and consumer demand for regional cuisine and 'Australian flavour' both locally and overseas. Australia is rich in unique native foods which introduce a distinctly Australian signature to otherwise international dishes and food products [1].

The Australian native food industry is currently valued around \$16m [2, 3] and, although it is steadily growing both in size and diversity, there is ample scope for the industry to be worth significantly more to the Australian economy. To assist the growth and long-term sustainability of the Australian native foods industry, RIRDC funded market assessments have focused on identifying the broader food industry's awareness, attitudes and current perceptions of indigenous foods [2]. The results of these studies have demonstrated the need for product category re-positioning which better suits the

sophisticated culinary industry in Australia and overseas.

One of the issues identified for the industry in the RIRDC Report (2000) was the use of inappropriate terminology across the industry and the lack of a suitable reference for the use of indigenous ingredients [2]. Recent discussions with the Australian Native Food Industry Ltd (ANFIL) [4], industry leading producers, native food chefs and members of the Queensland indigenous community, confirm the need to better understand and describe the value of native ingredients through the development of a standardised vocabulary relevant to such uniquely flavoured products. To date, no scientific research has tackled the issues around describing the sensory attributes of native foods leaving niche producers to label with independent product descriptions. In addition, there have been limited indigenous foods research projects conducted which have collectively involved and consulted members from all levels of the native foods industry.



Sensory panel during a typical training session

This project will re-position Australian cuisine through the development of a native foods ‘flavour lexicon’ describing the unique flavour diversity of indigenous plant foods and products.

Objectives

The objectives of this project were:

- To publish and distribute a native food ‘flavour lexicon’, a concise plain English vocabulary for describing Australian native food products;
- To provide native food flavour profiles for important commercial species for incorporation into product factsheets; and
- To promote the application and uptake of the ‘flavour lexicon’ knowledge by industry, producers, culinary experts and consumers.

Methodology

A flavour lexicon is a tool used to record and describe the sensory properties of a target food or beverage. The main phases common to the development of any flavour lexicon include appropriate product frame of reference

(sample) collection, language generation, and designation of definitions and references before a final descriptor list can be determined [5]. This technical dictionary can be applied as a powerful research tool to profile sensory properties or used by industry to describe, compare and monitor product flavours. A detailed review of the development of food flavour lexicons was published by Drake and Civille, 2002 [5] and a summary of vocabulary frequently used for major food groups (i.e. dairy, seafood, meat, fruits) is available in a book by Civille and Lyon, 1996 [6].

Flavour lexicons have been developed and published for wine [7-10], cheese [11-15], honey [16] apple juice [17], yoghurt [18], tomatoes [19], green tea [20], bread [21], frozen vegetables [22] and a range of other specific product categories. No reports were found in the literature that related to lexicon development for a ‘cuisine’ category, a broad ingredient category (such as spices or herbs), or for any indigenous Australian plant foods.

The lexicon for the present study was developed by involving a panel of sensory experts who reviewed 16 priority native food species and

developed both quantitative flavour profiles and a qualitative sensory attribute list, using recognised and authenticated terminology appropriate to the genre. Draft vocabulary was presented to industry during a consultation process that was undertaken with producers, chefs, indigenous community members and food evaluation experts. The 'Australian native flavour wheel', together with details of its development, is presented in this report.

Samples

Representative commercial samples of dried herb, dried ground spice (fruit and seed) and fresh-frozen fruit were sourced in consultation with ANFIL. These included key commercial species as identified by ANFIL and listed in Table 1.

Product samples were transported as per commercial practice (typically by post or courier) and were received at Innovative Food Technologies (IFT) from 11th March through to 7th April 2009 with the exception of wattle seed (*Acacia victoriae*) and cut leaf mint (*Prostanthera incisa*), which were received during December 2009 and February 2010, respectively. For each

product, between 0.5 and 3 kg were obtained (~200 g each of wattle seed *Acacia victoriae* and cut leaf mint) and all samples were stored at -19°C immediately on arrival.

The samples of wattle seed (*Acacia victoriae*) and cut leaf mint (*Prostanthera incisa*) were received toward the end of the study for inclusion in a single vocabulary development session. These two samples were not included in the formal evaluation sessions.

Sample presentation

For presentation to panellists, samples were prepared in a format that was considered suitable for aroma and taste evaluation. Sample presentation formats were developed separately for aroma and taste for each ingredient as shown in Table 2.

For aroma evaluation, most samples were presented 'as is' with the exception of the fruits which were diced, finger limes where only the squeezed pulp was presented, and the pepper berry which was freshly ground prior to presentation.

Table 1 Sample identity, format and source

Sample identity	Sample format on arrival	Source / brand	Botanical name
Fruits			
Davidson Plum (NSW)	Fresh halves - frozen	Australian Produce Company	<i>Davidsonia jerseyana</i>
Davidson Plum (Qld)	Fresh halves - frozen	Australian Produce Company	<i>Davidsonia pruriens</i>
Desert lime	Fresh whole - frozen	Australian Desert Limes	<i>Citrus glauca</i>
Finger lime (clear - green skin)	Fresh whole	Limeburst Finger Limes	<i>Citrus australasica</i>
Finger lime (red - red skin)	Fresh whole	Limeburst Finger Limes	<i>Citrus australasica</i>
Kakadu plum	Fresh whole - frozen	Australian Produce Company	<i>Terminalia ferdinandiana</i>
Lemon aspen	Fresh whole - frozen	Australian Produce Company	<i>Acronychia acidula</i>
Muntries	Fresh whole - frozen	Australian Produce Company	<i>Kunzia pomifera</i>
Quandong	Fresh deseeded halves- frozen	Australian Produce Company	<i>Santaluum acuminatum</i>
Riberry	Fresh whole- frozen	Galeru Pty Ltd	<i>Syzygium leuhmanii</i>
Herbs			
Anise myrtle	Dried chopped	Australian Rainforest Products Pty Ltd	<i>Syzygium anisatum</i>
Lemon myrtle	Dried chopped	Australian Rainforest Products Pty Ltd	<i>Backhousia citriodora</i>
Cut leaf mint*	Dried chopped		<i>Prostanthera incisa</i>
Spices			
Bush tomato (Kutjera)	Dried ground	Outback Pride	<i>Solanum centrale</i>
Tasmanian pepper berry	Dried whole	Diemen Pepper	<i>Tasmannia lanceolata</i>
Tasmanian pepper leaf	Dried ground	Diemen Pepper	<i>Tasmannia lanceolata</i>
Wattle seed	Dried ground	Outback Pride	<i>Acacia victoriae</i>
Wattle seed**	Dried ground (roasted)	Supplied by Chris Read	<i>Acacia victoriae</i>

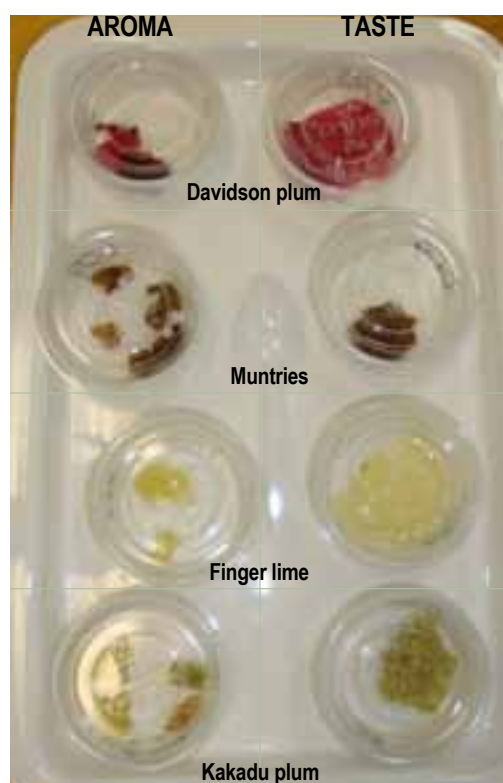
* Sample not included in formal evaluation session

** Sample not included in formal evaluation session

Considering the intense flavours of the products and the fact that the products are intended as food ingredients, it was appropriate to dilute the concentration of the samples to make them palatable for taste evaluation. Several product carriers were assessed including tapioca starch, corn flour, instant mashed potato, various types of rice, polenta, semolina and couscous. Semolina (Sostanza brand) was chosen as the preferred carrier as it provided a neutral flavoured base, consistent texture and was found to give a true representation of the flavour of the ingredient in the mouth. Boiling water was used to make up the semolina at a ratio of 4:1 (water to semolina) and the resulting paste was cooled to room temperature before mixing with the ingredients at the optimised ratios described in Table 2.

During the training and formal evaluation, samples were thawed, prepared and served at room temperature immediately prior to the tasting session. Samples were presented in 30 mL plastic cups with clear lids which were coded to mask sample identity. For aroma evaluation 1 – 2 g of sample was prepared while for taste evaluation 5 g of sample was presented.

Samples were presented on white plastic trays together with plastic teaspoons, a glass of filtered water and spittoons.



Typical sample presentation for sensory assessment. The samples on the left are for aroma and on right for taste.

During training, between 3 and 6 samples were presented for discussion. During formal evaluation, a maximum of 4 products were presented at any one time and included the samples for aroma evaluation and the samples for taste evaluation as shown in above.

Table 2 Preparation of samples for sensory evaluation

Sample identity	Presentation for aroma evaluation (1-2 g)	Presentation for taste evaluation (5 g)
Fruits		
Davidson Plum (NSW)	Diced fruit	1:2, puree fruit : semolina
Davidson Plum (Qld)	Diced fruit	1:2, puree fruit : semolina
Desert lime	Diced fruit	1:2, puree fruit : semolina
Finger lime (clear – green skin)	Fruit pulp	1:1, pulp fruit : semolina
Finger lime (red - red skin)	Fruit pulp	1:1, pulp fruit : semolina
Kakadu plum	Diced fruit	puree fruit (no dilution)
Lemon aspen	Diced fruit	1:2, puree fruit : semolina
Muntries	Diced fruit	puree fruit (no dilution)
Quandong	Diced fruit	1:1, puree fruit : semolina
Riberry	Diced fruit	1:1, puree fruit : semolina
Herbs		
Anise myrtle	'as is'	0.03:1, ground herb : semolina
Lemon myrtle	'as is'	0.005:1, ground herb : semolina
Cut leaf mint	'as is'	0.005:1, ground herb : semolina
Spices		
Bush tomato (Kutjera)	'as is'	0.03:1, ground herb : semolina
Tasmanian pepper berry	Freshly ground	0.005:1, ground herb : semolina
Tasmanian pepper leaf	'as is'	0.005:1, ground herb : semolina
Wattle seed	'as is'	0.055:1, ground herb : semolina
Wattle seed (Acacia victoriae)	'as is'	0.055:1, ground herb : semolina

Sensory descriptive analysis

Conventional quantitative sensory descriptive analysis was employed for the sensory evaluation of the native product samples. Training and formal evaluation sessions were completed separately for the fruits category and the herbs and spice category of products as defined in Table 2.

Panellists

An 11-membered panel of assessors was selected, comprising six female and five male panellists, aged 25–44 years (average age 33), all of whom were staff of Innovative Food Technologies. The majority of the panel were experienced in sensory studies and all were experienced in food research.

Panel training and development of vocabulary

For the fruit samples, training sessions were conducted over six weeks (14 sessions, 26 June–10 August 2009) and involved twelve discussion sessions and two practice sessions using the specialised software in the sensory booths. For the herb and spice samples, training sessions were conducted over four weeks (six sessions, 31 August–11 September 2009).

During training, the assessors generated a set of descriptive terms using the native food products. By consensus, 18 aroma terms and five in-mouth flavour and mouth-feel terms were selected for the fruit products and 14 aroma terms and five in-mouth flavour and mouth-feel terms were selected for rating of the herb and spice products during the formal sessions (see Table 3 and Table 4). Sensory definitions and reference standards were developed for each aroma term during the training. Sensory reference standards usually consisted of a sample of food stuffs, plant material or chemical aroma compounds (Table 3 and Table 4). An example of a set of sensory reference standards is shown below. An 'other' attribute was also included in the record sheet for both the aroma and flavour (taste) terms, for panellists to use if they could smell or taste a character that was not covered by the agreed upon list of terms. The practice booth sessions were carried out prior to formal sessions to ensure that panellists were confident in rating the samples, were familiar with the set-up that would be used during the formal sessions and to ensure that the panel was sufficiently well trained to progress to formal evaluation. Every sample was presented to the panel at least four times during the training phase to ensure vocabulary development was accurate and consistent.



A set of sensory reference standards developed during training

Table 3 Sensory attributes and definitions selected for the native fruit products

Sensory attribute	Definition	Reference standard composition
Aroma		
rosella	The aroma of rosella flowers/jam, cooked rhubarb, fruity	Rosella jam (John Keating's Jams and Relishes, Dayboro), stewed rhubarb (from fresh)
fresh citrus	The fresh zesty aroma of grapefruit, lemon or lime zest	Freshly sliced grapefruit, lemon zest chopped
cooked citrus	The aroma of marmalade, cooked citrus pith, bottled orange juice, or brown lime cordial	1 Tspn citrus marmalade (Cottees Breakfast Marmalade), 1 Tsp lime cordial (Bickfords Lime Juice Cordial), 1 Tsp OJ (Just Juice, Premium Orange Juice)
fermented	The aroma of over-ripe fruit, slightly fermenting sugarcane juice	Mango juice (Nudie Crushie) fermented with yeast
spiced tea	The aroma of spices, cloves, cardamom, cinnamon, chai tea	Tea Leaves (~200 mg) from a chai tea bag (Nerada Chai Tea)
fruit mince	The aroma of moist dried fruit mince, fig, sultana	Minced fruit from biscuits (Arnott's spicy fruit roll)
artificial fruit	The aroma of bubblegum, lollies, estery and sweet chemical	1 drop each isoamyl acetate, ethyl 2-methylbutanoate, ethyl 3-methylbutanoate, ethyl butanoate, on a piece of cotton wool
musk	The aroma of musk lollies, floral	3 pink musk lollies (Handy Candy), 1 drop geraniol on cotton wool
pickled	The aroma of pickled vegetable, a sour note	~2 cm ³ pieces of pickled carrot (Always fresh Marinated Dipping Sticks) and pickled chilli (Hoyts, Hot Peppers)
metallic	The aroma of a tin can, metallic	nil
stewed apple/pear fruit	The aroma of stewed apple and pears, tinned apple / pear	~4 cm ³ pieces of canned pear (You'll Love Coles, Pear Halves in fruit juice), apple (Ardmona Pie Fruit, Apples Sliced, SPC), dried apple (Lion of Sahara, Fruit for life, dried apple rings)
bush honey	The aroma of floral bush honey, aromatic, molasses	1 Tspn blue gum honey (Capilano Natural Australian Blue Gum Honey)
buttery	The aroma of butter, whipped or slightly burnt butter	1 Tspn butter (Western Star Original Butter)
lentils	The aroma of butter beans, nutty, split peas, lentils	1 Tspn dry lentils freshly milled (McKenzie's Green Split Peas)
chemical	The aroma of chemicals, antiseptic, shoe polish, mouthwash	~50 mg Brown shoe polish (Kiwi, Shoe Polish, Dark Tan), drop antiseptic (Betadine), drop bathroom cleaner (Desert washroom cleaner)
conifer	The aroma of resin, woody, sappy, conifer leaves	~2 g fresh conifer leaves crushed plus pine resin (dried powdered pine tree sap)
cut grass	The aroma of freshly cut grass, herbaceous	~1 g fresh snipped grass plus ~1 g snipped tomato leaf
fresh beetroot	The aroma of fresh cut beetroot, earthy, forest floor	Freshly grated beetroot, piece of canned beetroot (Coles sliced beetroot, 425 g)
Flavour and mouthfeel		
sweetness	Sweet taste	nil
sourness	Sour taste or aftertaste	nil
saltiness	Salty taste	nil
bitterness	Bitter taste or aftertaste	nil
astringency	Astringent, drying in-mouth sensation or aftertaste	nil

Table 4 Sensory attributes and definitions selected for the native herb and spice products

Sensory attribute	Definition	Reference standard composition
Aroma		
perfumed	The aroma of perfume and floral	Geraniol drop on cotton wool
lemon lolly	The aroma of lemon lollies, lemon throat lozenges, lemonade icy-pole, and lemon chemical/disinfectant	1 Tspn icy pole liquid (lemonade flavour, You'll Love Coles 24 cool tubes), 1 lemon-sherbet lolly (Coles Sherbet Lemon 200 g), ½ throat lozenge (Strepsils Honey & Lemon)
fruity lolly	The fruity lolly aroma of chewing gum, bubble gum, esters, tutti fruity	½ piece cheap chewing gum lolly (Super tattoos, Bubble gum and tattoos)
aniseed	The aroma of aniseed, liquorice and fennel seed like	¼ piece of 2 types of aniseed lolly (Barratt Black Jack Aniseed flavour chews, Bassett's Aniseed Imperials)
sweet spice	The aroma of sweet spices including cardamom, cinnamon and cloves	¼ Tspn ground cardamom (Masterfoods), ¼ Tspn ground cinnamon (McCormick)
herbal	A herbal and herbaceous aroma of Italian herbs oregano, basil, parsley, cut grass, tea leaves.	½ Tpsn each dried oregano and basil (Hoyts) plus one torn fresh basil leaf
menthol	A cooling menthol aroma and sensation reminiscent of mint, spearmint, peppermint	½ menthol lolly (Fishermans Friend, Original extra strong menthol)
bush scrub	The aroma of dry Australian bushland, eucalypt with some lantana notes	Dried eucalyptus leaves, 1 drop eucalyptus oil, one fresh torn lantana leaf
paperbark	The earthy, dry, dusty aroma of stripped paperbark	Dry paperbark plus dust/dirt
savoury	The savoury aroma of breadcrumb stuffing, dried stock, yeasty, Bonox, dried tomato, roast chicken	1/6 dried stock cube (Masset Beef Style 35 g stock cubes)
carob	A carob-like and caramelised aroma	2 Carob lollies
wheat-biscuit	The aroma of wheat-biscuit, cereal-like, stale wafers, infant rusks, wheat flour	Wheat biscuit crushed (Arnott's shredded wheatmeal)
nutty	The nutty aroma of peanut paste, roasted peanuts, crushed nuts, dried beans	1 Tspn raw peanut paste (made from Coles smartbuy crushed peanuts) plus 2 peanut skins (Santos raw peanuts 150 g pkt)
rancid	The rancid aroma of old oil, rancid nuts, play dough	½ Tspn old rancid vegetable oil
Flavour and mouthfeel		
sweetness	Sweet taste	nil
savoury flavour	Umami, cereal-like, bread crust, caramelised, baked potato, nutty flavour	nil
other flavour intensity	Any other flavour attributes detected such as aniseed, resin/sappy, lemon lolly, herbal. Panellist to describe.	nil
cooling	The cooling sensation in the mouth similar to mint or menthol	nil
hotness	The warming sensation in the mouth similar to chilli, pepper, ginger-like pungency	nil

The wattle seed (*Acacia victoriae*) and cut leaf mint (*Prostanthera incisa*) were included in a single vocabulary development sensory session (15 February 2010). These two samples were

not included in the formal sensory evaluation sessions. The sensory attributes derived from the session for these samples are listed in Table 5.

Table 5 Sensory attributes and definitions selected for the wattle seed and cut leaf mint samples assessed in February 2010

Sensory attribute	Definition
Aroma	
rosella	Used previously (Table 3)
raisin	The aroma of dried fruit, raisin
sweet spice	Used previously (Table 4)
herbal	Used previously (Table 4)
menthol	Used previously (Table 4)
bush scrub	Used previously (Table 4)
wheat-biscuit	Used previously (Table 4)
coffee	The aroma of coffee grounds, black coffee

Sensory attribute	Definition
dark chocolate	The aroma of dark chocolate
burnt	The aroma of burnt toast, burnt coffee
toasty	The aroma of toast, toasted wood
Flavour and mouthfeel	
savoury flavour	Used previously (Table 4)
bitterness	Used previously (Table 3)
other flavour intensity	Including minty, herbal, coffee.
cooling	Used previously (Table 4)

Formal assessments

Formal rating sessions were held in which judges evaluated the 10 fruit and 6 herb/spice products in triplicate (9 sessions for the fruits, 10–21 August 2009, 6 sessions for the herb/spices, 14–16 September 2009). For the fruits, up to four samples were presented per session, while only 3 samples were presented per session for the herb and spice samples. Samples were presented to each panellist each session in randomly ordered coded sample cups. The products were also randomised within each replicate. Formal sessions were conducted in the sensory laboratory at IFT, Hamilton, which contains twelve isolated booths equipped with a computer to record responses. During the formal sessions, the panel were also presented with the set of freshly prepared sensory reference standards (Table 3 and Table 4). The reference standards were presented in covered 100 mL plastic cups. Panellists were asked to smell the reference standards and then to evaluate each sample and rate the intensity of the aroma and flavour (taste) attributes using an unstructured line scale (0–0), anchored from none to high. An example of a typical line scale is shown in below.

The data acquisition software used was Compusense® five (release 5.0, Compusense Inc., Guelph, ON, Canada).

Statistical analyses

An analysis of variance (ANOVA) was performed on the raw data set (10 judges x three replicates x 10 or 6 samples) for each sensory attribute to determine if there were significant differences among the samples. The mean scores were calculated from the summarised data set and Tukey-Kramer HSD was applied to determine ranking of sample scores within attributes.

Development of the flavour lexicon

The language developed in the descriptive analysis training for the native ingredients was collated and grouped systematically into sensory term categories. This process was assisted by referring to grouping systems applied in other sensory lexicon tools (refer to [6, 9, 10, 23]). According to the definitions developed by the

panel, redundancy was removed and language was optimised from the flavour vocabulary and a draft version of the 'Australian native flavour wheel' was developed. The draft flavour wheel was used during industry consultation sessions and was systematically modified in accordance with feedback from sensory panellists, chefs, industry and other users. The final native flavour lexicon consists of a concise list of attributes that describe the breadth of the flavour types exhibited in the samples presented in this study.

Industry consultation

Industry consultation was conducted through the following events and meetings:

- Future Foods Forum – Australian Native Flavours, 5 October 2009, Nambour. The forum targeted native foods chefs, indigenous food industry members, other native food industry participants and food media.
- Queensland Grown Summer Showcase, 12 October 2009, Brisbane. The summer showcase targeted gourmet and high end chefs, food buyers, distributors, retailers and food media.
- ANFIL AGM, 9 November 2009, Hamilton. The AGM involved members of the ANFIL board and Alison Saunders from RIRDC.

At each event, industry consultation was achieved through a short presentation of the project, followed by an interactive tasting evaluation and a detailed discussion with participants.

In addition, a presentation of the native food work was prepared for a group of 12 hospitality educators from TAFE Queensland on the 13 October 2009, which was unfortunately cancelled at the last minute by TAFE.

Communication

A proactive communications plan was developed at the beginning of this project which identified target audiences, key messages and distribution channels. A summary of communication activities and publications can be found in Appendix 1.



An example of a typical line scale

Results

Sensory analysis was completed for 16 of the most commercially significant native plant species resulting in development of the 'Australian native flavour wheel' together with native food flavour profiles for incorporation into product factsheets. The completed 'Australian native flavour wheel' can be found in Appendix 2 together with suggested sensory descriptions of each of the native food ingredients for commercial purposes. With approval from ANFIL, this 'Austrian native flavour wheel' will be printed for distribution to key audiences.

The information developed by this project has been promoted through workshops and by public media to producers from the native food industry, chefs, commercial users and consumers. A list of media publications of the work conducted in this project is provided in Appendix 1. Further promotion of the results from this project will take place during the inaugural native food conference 'Wild Flavours of Australia', May 2010, in South Australia and through additional Queensland Government media releases at that time.

The sensory descriptive analysis of the 16 species was conducted separately for the fruits, and for the herbs and spices. Results of the

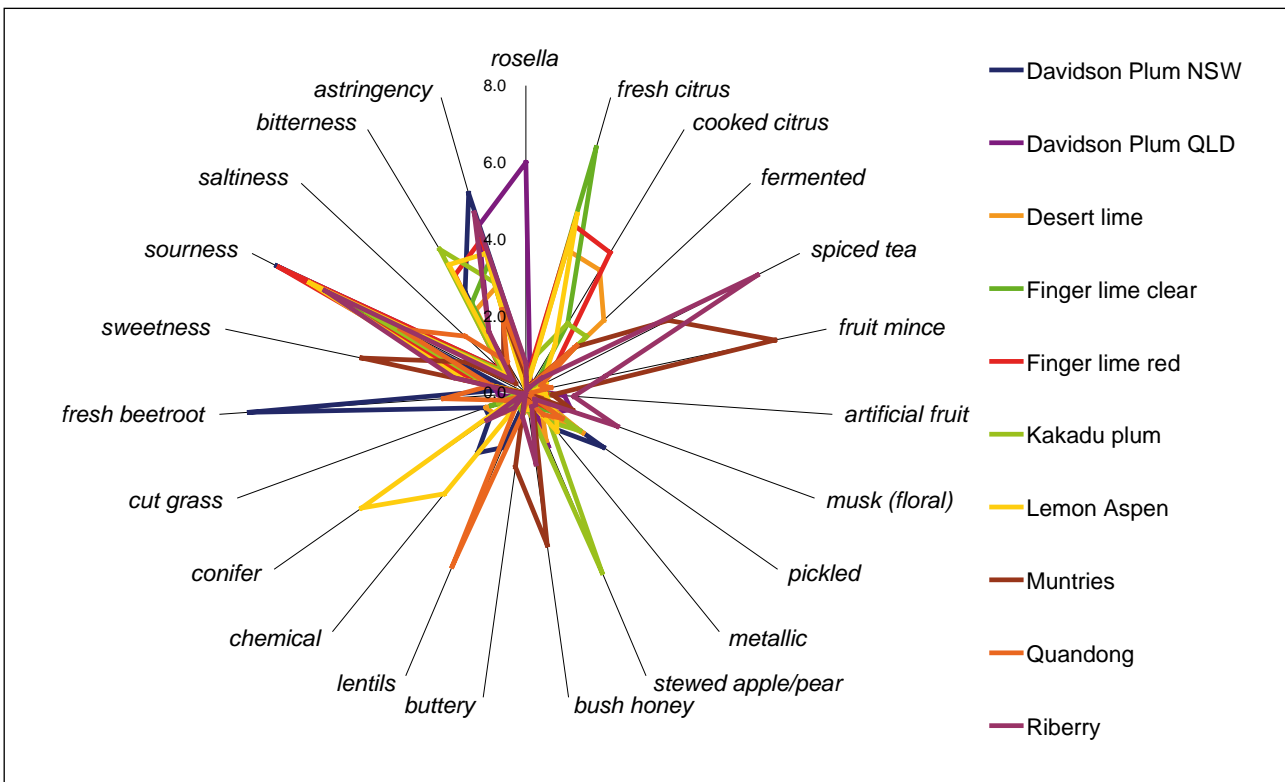
sensory analysis of each set of products are provided in the following sections of this report. An additional section provides a summary of the feedback obtained from the industry consultation process undertaken as part of this project.

Sensory descriptions of fruits

The results for the sensory descriptive analysis of the 10 native fruits assessed are summarised graphically below and the descriptions derived from this data are presented in Table 6. A full summary of the attribute scores for each sample, including the results of statistical analyses, can be found in Table 8, Appendix 3.

There were 18 aroma attributes and five taste or palate attributes rated by the panel for the fruit samples.

Most of the sensory attributes rated ranged in intensity across the sample set; for example, *fresh citrus* aroma was detected and scored for the two finger limes, lemon aspen and desert lime. There were, however, some attributes which were specific to only one sample including *rosella* for Davidson Plum (Qld), *buttery* for muntries and *conifer* aroma for lemon aspen.



Summary of sensory descriptive data for 10 fruits (average of 3 replicates x 10 panellists)

Table 6 Sensory descriptions of fruits aroma and flavours

Fruit	Sensory description of aroma and flavour	
Davidson plum (NSW)		<p>Aroma is earthy like fresh beetroot with slight pickled and chemical notes. Flavour is intensely tart and astringent.</p>
Davidson plum (Qld)		<p>Aroma of rosella and stewed rhubarb, some musk and lolly notes. Flavour is intensely tart and astringent.</p>
Desert lime		<p>Aroma of brown lime citrus, fermented notes, some pickled, stewed fruit and cut grass. Flavour is tart with some astringency and bitterness.</p>
Finger lime (clear)		<p>Aroma of fresh citrus with some cooked notes. Taste is citrus, tart with some astringency and bitterness.</p>
Finger lime (red)		<p>Aroma of fresh and cooked citrus with slight fermented notes. Taste is citrus, tart with some astringency and bitterness.</p>
Kakadu plum		<p>Aroma of stewed apples and pears, some cooked citrus, pickled and fermented notes. Taste is tart and bitter with a strong stewed fruit flavour intensity.</p>
Lemon aspen		<p>Aroma of fresh citrus, conifer leaf, some chemical notes. Flavour of citrus, tart, some astringency and bitterness.</p>
Muntries		<p>Aroma of moist fruit mince, spice, bush honey and buttery. Taste is sweet.</p>
Quandong		<p>Aroma of dry lentils or beans with some earthy and fermented notes. A strong flavour intensity, tart with a salty taste.</p>
Riberry		<p>Aroma of sweet spiced tea, with some musk notes, bush honey and resinous. Flavour is tart and astringent with some sweetness.</p>

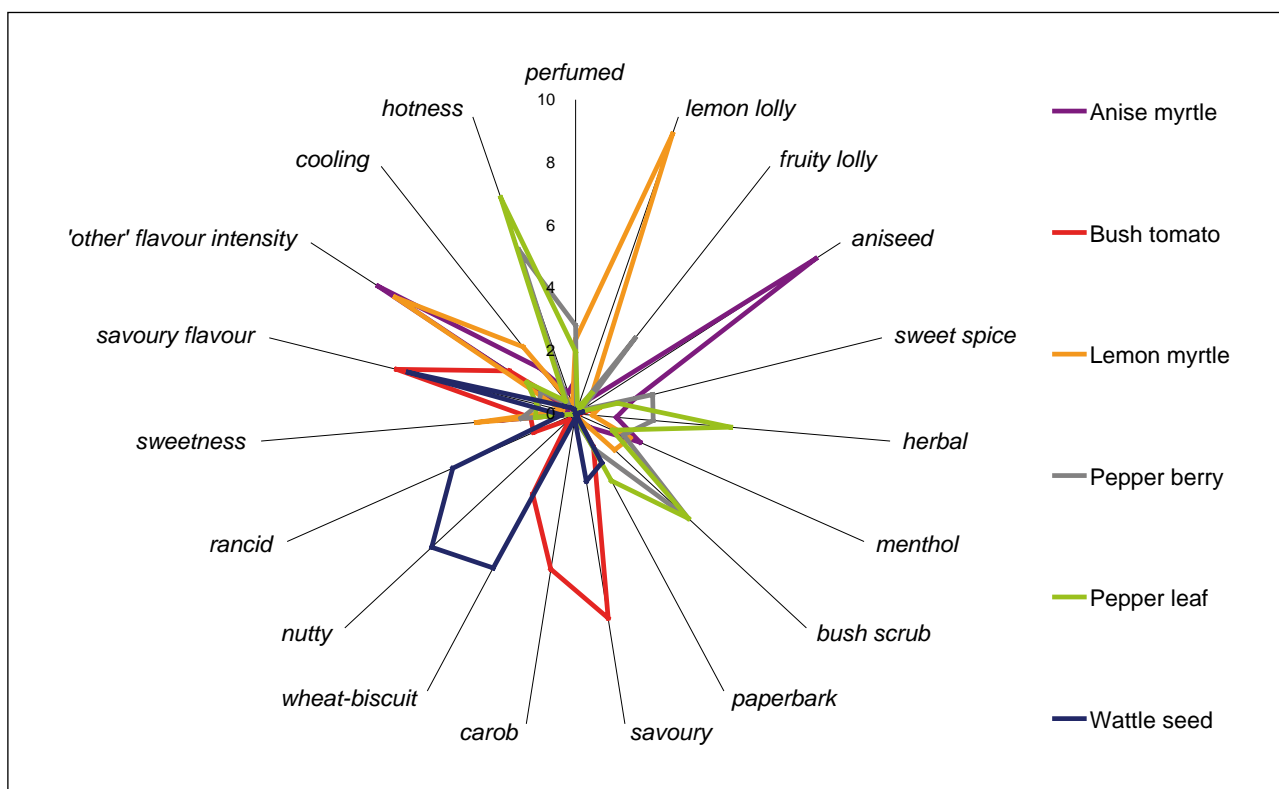
Sensory descriptions of herbs and spices

The results for the sensory descriptive analysis of the six native herbs and spices assessed are summarised graphically below and the descriptions derived from this data are presented in Table 7. There were 14 aroma attributes and five taste (or palate) attributes rated by the panel for each sample. A full summary of the attribute scores (aroma and taste) for each sample, including the results of statistical analyses, can be found in Table 9, Appendix 3.

The descriptions developed for the samples that were added later in the study, namely wattle seed and cut leaf mint, are also listed in Table 7. The sensory language used for these two samples were based on a separate vocabulary development session held with the trained panel and are not based on quantitative sensory information.









Similar to the sensory data for the fruits, there were sensory attributes for the herbs and spices that were specific to just one sample type. These included aromas *lemon lolly* for lemon myrtle, *fruity lolly* for pepper berry, *aniseed* for anise myrtle, *carob* for bush tomato and *nutty* for wattle seed. The remaining attributes were observed across a number of different samples.

The 'other' flavour intensity attribute (Table 9, Appendix 3) was consistently rated high for both anise myrtle and lemon myrtle. Anise myrtle was described by panellists as having an *aniseed* flavour and lemon myrtle a *lemon lolly* flavour on the palate. The bush tomato was also scored consistently for having a medium intensity 'other' flavour intensity on the palate which was described as being *bitter*, *burnt (burnt oil)* or *astringent*.



Summary of sensory descriptive data for 6 herbs and spices (average of 3 replicates x 10 panellists)

Table 7 Sensory descriptions of herbs and spices aroma and flavours

Herb or Spice		Sensory description of aroma and flavour
Anise myrtle		Aroma of aniseed, menthol and herbal. Flavour of aniseed, some sweetness and slightly cooling on the palate
Lemon myrtle		Aroma of lemon lolly, perfumed with some menthol notes. Flavour is strong lemon with some sweetness and cooling on the palate.
Cut leaf mint *		A herbal aroma, bush scrub and menthol. Flavour is herbal with cooling on the palate.
Bush tomato (Kutjera)		A savoury caramelised aroma of carob, some cereal notes. A savoury flavour with some sweetness.
Tasmanian pepper berry		Aroma of bush-scrub with perfumed, fruity lolly notes. Lingering heat on palate.
Tasmanian pepper leaf		Aroma of Australian bushland, dry paperbark and herbal. Intense heat which slowly develops on palate.
Wattle seed		Aroma of crushed nuts, cereal-like and slightly rancid. A savoury wheat-biscuit flavour on the palate.
Wattle seed (<i>Acacia victoriae</i>)**		Aroma of toasted coffee grounds, sweet spice, raisin and chocolate. A savoury flavour, black coffee and some bitterness.

* Assessed in a single panel vocabulary development session during February 2010

** Assessed in a single panel vocabulary development session during February 2010

Industry consultation

Three formal industry consultation sessions were held to demonstrate the sensory vocabulary developed for the 16 native ingredients and to collect feedback from chefs, producers, end users and food media. These sessions included the Future Foods Forum (below), Queensland Grown Summer Showcase (opposite), and the ANFIL AGM.

Detailed summaries of the sensory descriptions collected from each of these industry events are provided in Appendix 4. In addition, a number of individual sensory sessions were held with key producers or users who were unable to attend a formal event.

During each event a blind sensory session was conducted with all, or a selection of, ingredients. Feedback was recorded from participants on the aroma of the products prior to revealing the trained panel sensory descriptions. In most cases, the vocabulary developed through the industry sessions was identical or very similar to the vocabulary developed by the trained panel. In the rare case where discrepancies were found, the products were usually those that were extremely challenging to describe, for example, quandong.



Ingredients presented to the participants of the Future Foods Forum (Davidson plum, riberry, desert lime, quandong)

Feedback from the industry consultation sessions included:

- Agreement from participants that the sensory descriptions for the ingredients were very accurate and often were better descriptions than individuals could themselves articulate.
- Concern over the commercial use of sensory terms like *chemical* and *fermented*. These terms, although considered accurate, were not considered suitable for the general public.



Jessica Sanderson at the native flavour presentation made at the Queensland Grown Summer Showcase

Chefs reported they had no issue with the use of these terms to describe ingredients.

- Interest in seeing sensory descriptions developed that reflected the flavour contribution of the ingredient in a food product in addition to descriptions relevant only to raw ingredients.
- Positive feedback over the 'Australian native flavour wheel' tool, particularly from food media, chefs and end-users. Chefs felt they would find the wheel a valuable tool in training staff and engaging customers. Those who routinely conducted native food workshops thought the wheel would be a useful resource. The food media were keen to publish the wheel to the general public and their foodie audiences as a means of promoting native flavours.

Overall, the industry consultation exercises confirmed the relevance and accuracy of the language developed through this project and assisted in developing the final version of the flavour wheel.



Lemon myrtle orchard

Implications

This work provides a clear, useful means of characterising and describing the flavours of Australian native food products for the Australian native food industry, chefs, formulators, food technologists and flavour experts. It also forms the basis of quality control targets for emerging native food ingredients and provides knowledge that will assist the food industry to successfully develop flavour blends and produce food products from native food ingredients.

The results of this work have been communicated to the Australian food and hospitality industries to promote the uptake of native food ingredients in an effort to stimulate growth of the native food industry in Australia.

The 'Australian native flavour wheel', sensory descriptions and the range of products themselves are completely unique in the world. It is anticipated that extension of these tools to the international food market will stimulate uptake from a renewed interest in native Australian ingredients.

Recommendations

The 'Australian native flavour wheel' and sensory descriptions of products will be published in a suitable hardcopy format for distribution at the inaugural native food conference 'Wild Flavours of Australia', Adelaide SA, May 2010.

It is recommended that ANFIL incorporate the sensory descriptions into website fact sheets and future ANFIL bulletins for dissemination to target audiences. DEEDI will work with RIRDC and ANFIL to coordinate publication and communication of the information from this study.

As a result of this project, new research opportunities have been identified that RIRDC and ANFIL may wish to consider in the future. These include:

- Development of accurate sensory descriptions of the *flavour contribution* that key native food ingredients deliver to processed or formulated food products. The descriptions provided in the present work are a necessary starting point, but are relevant only to the raw ingredient.
- Detailed information gathered from expert chefs and experienced native food users regarding the practical application of native ingredients in food products. In addition, the development of flavour combinations that are ideal for native ingredients. This work would provide a valuable resource for other chefs, food formulators, and the broader food industry who are not currently experienced in applying these ingredients. This work would increase the uptake and use of native food ingredients by the food service and processing industries.



Muntries

Appendices

Appendix 1 – External communication, media releases and publicity

Media releases:

- 8 October 2009, Queensland Government, DEEDI. Native food forum awakens senses. http://www.dpi.qld.gov.au/30_15448.htm
- 16 October 2009, Queensland Government, DEEDI. *Cool food for hot times*. http://www.dpi.qld.gov.au/30_15513.htm
- An additional media release published at the end of April 2010 coinciding with the release of the 'Australian native flavour wheel' in printed brochure format.

Media publications:

- 6 October 2009, Sunshine Coast Daily, p 9. *New native names may bear fruit*.
- 13 October 2009, Cooloola Advertiser, p 10. *Good Oz tucker*.
- 21 October, 2009, Gatton Lockyer Brisbane Valley Star, p 35. *Roo becoming a foodie favourite*.
- 4 November 2009, Toowoomba Chronicle, p 20. *Chefs hot on scent of Aussie bush foods*.

Radio interviews:

- October 2009, Robyn King from Australian Rural Community Network
- October 2009, ABC radio interview

Web coverage:

- 6 October 2009, freestyle. *Australian native flavours*. <http://freestyle-freestyler.blogspot.com>
- 19 October 2009, Eat, Drink + Be Kerry. *New local foods*. www.eatdrinkandbekerry.blogspot.com
- 21 October 2009, Eatdrink. Trends: *Native ingredients to soon dominate plates?* www.eatdrink.com.au
- 22nd October 2009, Australian Bushfoods Magazine. *Native food forum awakens senses*. <http://www.ausbushfoods.com/new/index.php>

Conference presentation:

- Smyth, H.; Sanderson, J.; Sultanbawa, Y.; Davis, C., Profiling Australian Flavours. Proceedings of the 42nd Annual AIFST Convention, Brisbane, 13-16th July 2009 (oral presentation and abstract)

Australian native flavour wheel

Sensory vocabulary for describing the aroma and flavour of native plant food products



Sensory descriptions for a selection of commercial native fruits, berries, herbs, seeds and spices

Fruits and berries

Davidson plum (*Davidsonia jerseyana*)

An earthy aroma like fresh beetroot with a slight pickled note.

Davidson plum (*Davidsonia pruriens*)

Aroma of rosella jam and stewed rhubarb; some musk and lolly notes.

Desert lime (*Citrus glauca*)

A brown lime citrus aroma with some pickled notes, stewed fruit and cut grass.

Finger lime (*Citrus australasica*)

Aroma of fresh zesty citrus with a hint of cooked citrus.

Kakadu plum (*Terminalia ferdinandiana*)

Aroma of stewed apples and pears; some cooked citrus, pickled and fermented notes.

Lemon aspen (*Acronychia acidula*)

A fresh citrus aroma, conifer leaves and some chemical notes.

Muntries (*Kunzia pomifera*)

Aroma of moist fruit mince, spice, bush honey and butter.

Quandong (*Santalum acuminatum*)

Aroma of dry lentils; some earthy and fermented notes.

Riberry (*Syzygium leuhmanii*)

A sweet, spiced tea aroma with musk, bush honey and resinous notes.

Herb, spice or seed

Anise myrtle (*Syzygium anisatum*)

Aroma of aniseed, menthol and herbs.

Lemon myrtle (*Backhousia citriodora*)

A lemon lolly aroma, perfumed with some menthol notes.

Cut leaf mint (*Prostanthera incisa*)

A herbal aroma, bush scrub and menthol.

Bush tomato or 'Kutjera' (*Solanum centrale*)

The savoury caramelised aroma of carob; some cereal notes.

Tasmanian pepper berry (*Tasmannia lanceolata*)

Aroma of bush scrub with perfumed, fruity lolly notes. Lingering heat on the palate.

Tasmanian pepper leaf (*Tasmannia lanceolata*)

Aroma of Australian bushland, dry paperbark and herbs. Developing heat on the palate.

Wattle seed (*Acacia victoriae*)

Aroma of toasted coffee grounds, sweet spice, raisin and chocolate.

For recipes, fact sheets, supplier details and more information on native ingredients visit www.anfil.org.au

For more information contact the Department of Employment, Economic Development and Innovation on **13 25 23** or visit www.deedi.qld.gov.au

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Appendix 3 – Sensory scores for native fruits, herbs and spices

Table 8 Summary of quantitative sensory descriptive results for fruits (average of 3 replicates x 10 panellists, scale 0–9)

Sample identity	rosella	fresh citrus	cooked citrus	fermented	spiced tea	fruit mince	artificial fruit	musk	pickled	metallic	stewed apple/pear fruit	bush honey	buttery	lentils	chemical	conifer	cut grass	fresh beetroot	sweetness	sourness	saltiness	bitterness	astringency
Fruits																							
Davidson plum (NSW)	0.7b	0.1c	0.1d	0.2c	0.2c	0.1c	0.1b	0.1d	2.5a	1.2a	0.1c	0.1c	0.3b	1.5b	2.0b	1.1b	1.1a	7.2a	0.5c	7.3a	0.8b	3.1abc	5.4a
Davidson plum (Qld)	6.0a	0.4c	0.3d	0.3c	0.5c	0.3c	1.0ab	1.3bc	0.9abc	0.2ab	1.5b	0.3c	0.1b	0.1c	0.2c	0b	0.3ab	0.7c	0.9bc	7.1a	0.9b	1.9bc	4.5abc
Desert lime	0.1b	3.9b	3.7ab	2.8a	0.1c	0.3c	0.7ab	0.4bcd	1.8ab	0.7ab	1.4bc	0.5c	0.1b	0c	0.6c	1.0b	1.1ab	0c	1.7bc	5.6ab	0.6b	2.5abc	2.9bcd
Finger lime (clear)	0.2b	6.7a	2.1bc	0.4c	0.3c	0.2c	0.8ab	0.1cd	0.9abc	0.5ab	0.5bc	0.4c	0.4b	0c	0.1c	0.4b	1.0ab	0c	1.1bc	7.0a	0.7b	2.7abc	3.5abcd
Finger lime (red)	0.3b	4.5b	4.3a	1.1bc	0.1c	0.4c	0.5ab	0.1d	0.6bc	0.3ab	0.3bc	0.4c	0.3b	0c	0.4c	0.5b	0.5ab	0c	1.3bc	7.2a	0.9b	3.6ab	4.2abcd
Kakadu plum	0.2b	1.0c	2.1bc	2.2ab	0.2c	0.5c	0.1b	0.1cd	1.7abc	1.0ab	5.1a	0.4c	0.5b	0.4bc	0.3c	0.5b	0.8ab	0.2c	1.0bc	4.6bc	0.8b	4.4a	3.0bcd
Lemon aspen	0.1b	4.9ab	1.5cd	0.7bc	0.6c	0.2c	0.5ab	0.6bcd	1.0abc	1.3a	0.2c	0.4c	0b	0.1c	3.4a	5.2a	0.3ab	0c	1.7bc	6.3ab	0.6b	3.9ab	3.8abcd
Muntries	0.4b	0c	0.3d	1.8abc	4.2b	6.6a	0.7ab	1.3b	0c	0b	0.5bc	4.0a	2.0a	0.1c	0.1c	0.2b	0ab	0c	4.4a	1.8d	0.4b	1.1c	2.1d
Quandong	0.6b	0c	0.2d	1.8abc	0.4c	0.7c	0.1b	0.1d	1.2abc	0.7ab	0.3bc	0.2c	0.5b	4.9a	0.4c	0.1b	0.6b	2.2b	0.9bc	3.7c	2.2a	0.9c	2.3cd
Riberry	0.8b	0.1c	0.2d	0.6c	6.8a	2.1b	1.3a	2.5a	0.3bc	0.4ab	0.4bc	1.9b	0.6b	0c	0.5c	1.2b	0.1ab	0.2c	1.9b	5.9ab	0.5b	1.9bc	4.9ab
	1.1	2.0	1.8	1.6	1.4	1.1	1.1	1.2	1.7	1.2	1.3	1.2	0.9	1.2	1.3	1.3	1.1	1.0	1.4	1.9	1.2	2.3	2.4
	lsd																						

Table 9 Summary of quantitative sensory descriptive results for herbs and spices
(average of 3 replicates x 10 panellists, scale 0–9)

Sample identity	perfumed	lemon lolly	fruity lolly	aniseed	sweet spice	herbal	menthol	bush scrub	paperbark	savory	carob	wheat-biscuit	nutty	rancid	sweetness	savory flavour	other flavour intensity	cooling	hotness
Herbs																			
Anise myrtle	1.1bc	0.1b	0.5b	9.1a	1.9ab	1.3bc	2.2a	0.6bc	0.3b	0c	0b	0c	0b	0c	2.4ab	0.3b	7.5a	1.8a	0.7c
Lemon myrtle	2.4ab	9.4a	0.9b	0.1b	0.8bc	0.5c	1.9a	1.7b	0.1b	0c	0b	0c	0b	0c	3.2a	0.4b	6.8a	2.7a	0.3c
Spices																			
Bush tomato (Kutjera)	0c	0b	0b	0b	0.4c	0.1c	0b	0c	1.2ab	6.6a	5.0a	2.9b	0.3b	1.5b	1.4bc	5.9a	2.5b	0.2b	0.3c
Tasmanian pepper berry	2.8a	0.1b	3.1a	0.2b	2.5a	2.5b	1.7a	4.9a	1.3ab	0.2c	0b	0c	0b	0c	1.7abc	1.2b	1.3bc	0.4b	5.5b
Tasmanian pepper leaf	2.0ab	0.2b	0.8b	0.1b	1.4abc	4.9a	1.3a	4.9a	2.4a	0.1c	0b	0c	0b	0c	1.3bc	1.3b	1.8bc	0.5b	7.3a
Wattle seed	0c	0b	0b	0b	0.2c	0.1c	0b	0c	1.8a	2.2b	0.2b	5.6a	6.2a	4.3a	0.4c	5.5a	0.4c	0.2b	0.1c
Isd	1.5	0.4	1.3	0.5	1.3	1.4	1.2	1.7	1.5	1.2	1.2	1.0	0.9	1.2	1.4	1.7	1.9	1.0	1.5

Appendix 4 – Summary of vocabulary collected from industry consultation events

Table 10 Summary of sensory vocabulary obtained from participant assessments at the future foods forum

Davidson plum (NSW)	Riberry	Desert lime	Quandong
Astringent; Fresh beetroot; Vinegary; Earthy; Musty; Fresh grass; Pungent; Wine / winery; Sweet / sour; Burned woody; Antiseptic; Sour lollies	Perfume / cosmetic; Floral; Cinnamon; Danish pastry; Fruit mince; Mouth wash; Sweet wine; Gingery; Clove-like; French sweet jam; Caramelised	Salty ? vinegar; Stewed fruit; Bitter lemon; Bush flower; Alcohol / fermented	Peachy; Earthy; Bland; Musty; Dusty; Stone fruit; Lemon
Tasmanian pepper leaf	Bush tomato	Lemon myrtle	Wattle seed
Bush walk; Mustard; Peppery; Menthol; Eucalypt	Savoury; Woody; Earthy; Caramel; Fresh baked bread; Rancid oil; Light musty; Caramel, Sweet musty; Toasty; Hunger-enhancing; Sweet/ earthy; Sundried tomato; BBQ shapes; Breadcrumbly	Lemon grass; Limey; herbal	Hazelnut; Roast almond chocolate; Nutty; Coffee; Stale breadcrumbs; Rancid; Oily; Dusty / woody; Saw dust; Antique furniture; Stale

Table 11 Summary of sensory vocabulary obtained from participant assessments at the chef's summer showcase

Muntries	Anise myrtle	Lemon aspen
Egg yolk, mixed peel, sweet-earthy, spicy; Caramel, raisin, lemon-citrus; Tea bags, earthy; Forest floor; Mushroom; Tutti fruitti; Christmas fruit minces; Stonefruit – peach (dried); Spicy dried fruit; Palm sugar, golden syrup; Christmas pudding; Candied rosella, candied berries	Tea leaves with some aniseed; Mint, menthol, Aniseed, Parsley; Aniseed; Licorice; Ouzo mixed with tea; Bay / dry oregano; Citrus, Aniseed; Fennel; Tarragon; Thyme, Italian herbs, aniseed, bay-leaf; Fennel, ouzo; Lavender; Dutch licorice; Black jelly beans; Lemon; Ouzo, aniseed; Anise; Aniseed; Anise; Aniseed, thyme	Citrus; Citrus; Dirty citrus; Bay leaf, old lemon; Pine, preserved lemon; Soap; Lemon; Aniseed; Pineapple, rockmelon buttery; Detergent, lemon; Citrus, pineapple; Vaporub, eucalypt; Shoepolish; Citrus, antiseptic; Essential oils; Conifer, piney; Mango; Citrus; Citrus, garlic; Limey; Cumquat; Gooseberries; Citrus; Ylang ylang; Essential oil; Cooked citrus; Disinfectant; Pine, metallic; Tea tree; Preserved lemon; Bitter antiseptic; Pine'o'clean; Peppery



Tasmanian pepper berries and leaves

Table 12 Summary of sensory vocabulary obtained from participant assessments at the ANFIL AGM

Davidson plum (NSW)	Riberry	Desert lime	Quandong
Acidity, Jam; Fresh grass, woody, earthy; Peppery; Dirty; Cut grass; Astringent, beetroot; old winery, old fruit bowl, old camembert ;Sour, musty, astringent; gaseous, medicinal, antiseptic; Sour cucumber, sour pickle; Earthy, sour, plum; slightly burnt, woody pungent; musty melon; sweet & sour, spice chutney, sour lolly, mint	Caramelised, alcohol; Fruity, Sweet, Floral, Estery Sweet, Spicy, Clove like; Gingery; Sweet, sour; Sweet, fruity, spicy note, musk, clove; sherbet, French berry jam, soft citrus; caramel, cinnamon, floral, clove; perfume, lime in disguise, soap; wild berries, often used for game, sweet perfume; mineral, aromatic, clove spice; sweet fruit (mince); mouthwash; sweet, spice, clove, Danish pastry, wine, flowers/floral	Honey/ lemony; Earthy, sweet; Fruity, vinegarish; lemonish; cut grass; citrus, stewed fruit, cut grass; cooked lemon, mashed citrus, mown grass, Chinese stewed; citral, bitter, peely, sour; disinfectant, salty, lime on full breath, fermented; grapefruit, lemon sour, citrus peel; acid, wet cardboard, spice tones; melon, gooseberry; sherbet, lime, metallic, alcohol; bitter lemon, sour, bush flowers	Woody/ bitter; Earthy, bland; Vinegarish; Pineapplish; alcohol; peachy, earthy, alcohol, lentil picked; stewed plum, fresh sauerkraut; chemical, musty; fermented, citrus tang, rainbow lorikeet tucker (ripe), ready to drop off the tree; old Paper (book), fermented but sweet hard to smell; Lemony, stone fruit; mushy, dusty; faint; bland, damp earth
Tasmanian pepper leaf	Bush tomato	Lemon myrtle	Wattle seed
Woody/ fragrant; Herby, Woody, Spicy, Leafy; Herby, earthy; Fresh; dry, herbal; sweet, earthy, perfumery, bush - herbal (menthol slight); Adelaide markets, rainforest greens, onion grass; earthy, spicy, cinnamon, green, leafy, menthol; pepper, nose tickler, sinus cleansing, mown grass, dry bushland, bushwalk, middy summer vapour (menthol, eucalyptus); grassy herbal; peppery, spice, menthol; nutmeg/cinnamon; sweet/sour, cloves; mustard, wasabi, bush walk, snuff, peppery	Earthy/ Sawdust; Earthy, spicy, fresh baked bread, sweet; Warm, caramelly; Toasted; caramel, woody; fruity, woody, caramel, fresh baked bread; baked fruitcake, dark chocolate, burnt brownies; musty, sweet, woody, savoury; light curry tang, dry sweet, hunger enhancing; (fermented), woody, piny; caramel, tamarillo, mineral, wood smell; nutty, slight rancid/ oil; chicken stock; woody, dessert spice, Mediterranean, sweet dried tomato, caramel, bread/bakery	Earthy/ Tea; Lemon, lime, estery; Fresh, slight citrus; lemon; lemon lolly; lemony lolly, mould overtone after a while, lemonade iceblock; Ultimate citrus, medicinal, oily; citral, peely, fresh; fresh bath lemon soak; Lemon (Myrtle), Lemon Peel, herbal; Lemony, menthol, fresh; lemongrass tea; Citrus; grass, creek, medicine, sweet lemon	Bark/ Sawdust; Nutty, roasted; Warm, Spicy, Woody; gravy; oily, nutty; Oily (rancid), roasted almonds, mulga; weetbix, too old antique furniture, coffee grounds, burnt walnuts, walnut vinaigrette, Haigh's dark chocolate; coffee, dusty, woody, chemical; slightly burnt toast, top teeth cinnamon, bread, baking, old crumbs, dusty' Nutty, Hazelnut, almond, strong and very nice smell; nutty, coffee; stale breadcrumbs; grain/wet; nutty, roast almond chocolate, dukka



Wattle seeds on tree

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Defining the Unique Flavours of Australian Native Foods

by Heather Smyth
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Australian native plant foods provide new and exciting eating experiences for consumers and have the potential to re-position 'Australian cuisine' as a contemporary food choice for consumers worldwide.

This publication presents a common set of flavour and aroma descriptors and characteristics which was identified as a key priority for the Australian native food industry.

The research also assists in the development and supply of product information to support market access and market growth for this emerging industry.

The research was targeted so that a concise, consistent and accurate marketing message of the flavours of these Australia native foods can be delivered to customers.

The research also developed the first 'Australian native flavour wheel' and sensory descriptions for sixteen of the key commercial native food species including fruits, berries, herbs, spices and seeds.

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