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Sustainable uses for Australian aromatic plants

By Andrew Pengelly PhD

Introduction

While the use of plant-derived fragrances may be as old as humankind itself, some of the earliest recorded uses were by the ancient Egyptians, for religious rituals as well as to enhance lovemaking. Myrrh and frankincense were two of the most popular fragrances, their antiseptic qualities also made them useful for embalming purposes (Guentert, 2007). Throughout the ancient civilizations, people applied different extraction methods in order to produce perfumes, spices and medicine.

For most of history the production of fragrances and perfumes from plants has been centred in the Old World, however during the 20th century Australia became a significant source of plant-derived essential oils. In particular, Eucalyptus and tea tree oils became household items globally, and subsequently they have turned out to be two of the most successful natural products ever! (Sadgrove 2022). Australia was slow in developing a eucalyptus oil industry, however during the 19th century we exported trees (mainly *E. globulus*) to countries such as Portugal, Spain, Chinz and Brazil. Today these countries supply the majority of the world's Eucalyptus oil, 75% coming from China alone.

Tea tree oil (TTO), obtained from *Melaleuca alternifolia*, is a different story. Australia began production in the Casino region of NSW in the 1920s, and by the 1970s there was a network of plantations producing and exporting the oil worldwide. While China has become a significant exporter of TTO in recent years, Australia still holds around 80% of global exports, almost half of that going to the USA (Businesswire, 2022).

Melaleuca alternifolia

More recently, several other species from the Australian bush have become sought-after for essential oil production, particularly for Aromatherapists at home, in Europe and the USA, who value them for their distinctive aromas and therapeutic properties. The majority of these come from the Myrtaceae family, however various plants from other families are noted for their fragrance and essential oil quality (see Table 1). Of these, the main plants used for commercial oil production are sandalwood and the blue and white cypress pines.

Indigenous Plants for Health Association, Inc.

Indigenous Plants for Health (IPHA) is a not-for-profit incorporated association, formed with the objectives of raising awareness, sourcing grants and sponsorship for sustainable production of indigenous plant-based products.

We acknowledge that Aboriginal and Torres Straight Island Peoples are the Traditional Owners of this country, and they retain their relationship and connection to the land, sea, and community .

Sustainability – the three Ps.

Defining sustainability is a difficult task, one that has been attempted by many. Most sources agree that three measures of performance must be demonstrated for any product to be categorized as sustainable (Guentert 2007, p.6). These are:

- Environmental/ecological
- Social impact
- Economic impact

These three measures have also been described as the three pillars of sustainability, or the 3 Ps – people, planet, profit (Galentin, 2018).

While this article focuses mainly on the environmental pillar, the other two measures of sustainability will not be overlooked. Essential oils are resource intensive products, large quantities of raw materials (i.e. plants) are required to produce even relatively small quantities of oil. For example, it requires 1kg of rose petals to produce 1 mL of rose absolute (the standard for rose oil), not to mention the inputs of solvents, energy and water (Chemat, Viand & Cravotto, 2012). According to the *Mirriam-Webster online dictionary*, sustainable practices use methods that do not use up or destroy natural resources. If raw materials are wildcrafted directly from the bush, there will be a significant impact on the species population, along with the birds, insects and other life forms that may be dependent on them. In other words, the practice of wild harvesting for essential oil production is environmentally unsustainable.

Some clear examples of unsustainable practices can be found in the historic exploitation of sandalwood (*Santalum* spp.) and agarwood (*Aquilaria malaccensis, A. rostrata* [both critically endangered] and other *Aquilaria* species) globally. For some examples regarding the sustainability of agarwood, see the references listed at the end of the article.

Table 1: Major aromatic plant families

Family	Aromatic species of interest	Common names
Myrtaceae	*Eucalyptus globulus* *E. polybractea* *Corymbia citriodora* *Melaleuca alternifolia* *M. ericifolia* *Backhousia citriodora* *Anethola anisata* *Leptospermum petersonii* *Kunzea ambigua* *Taxandria fragrans*	Eucalyptus Blue mallee Lemon-scented gum Tea tree Swamp tea tree Lemon myrtle Aniseed myrtle Lemon-scented tea tree Tick bush Fragonia
Rutaceae	*Boronia metastigma* *B. safrolifera* *Philotheca myoporides* *Geijera parviflora*	Brown boronia Safrole boronia Wax flower Wilga
Lamiaceae	*Prostanthera* spp. *Mentha australis*	Mint bushes Native mint
Cupressaceae	*Callitris intratropica* *C. glaucophylla*	Blue cypress White cypress
Santalaceae	*Santalum spicatum* *S. lanceolata*	Australian sandalwood Northern sandalwood
Scrophulariaceae	*Eremophila longifolia* and spp. *E. mitchelli*	Native fuschia Budda, false sandalwood

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President's message

Hi everyone and welcome to my first newsletter as President. First off, I'd like to thank Andrew Pengelly for his stewardship over the last three years. I am so relieved that he has agreed to remain on the IPHA committee as Vice President. I also thank everyone who has agreed to be on the committee for the coming year.

By way of introduction to myself, I am a qualified practitioner of Western Herbal Medicine. My clinical work is based around the Kilcoy-Esk part of Southeast Queensland where I have been operating community clinics for about 5 years. The focus of my practice has been to ensure that herbal medicine is affordable for everyone. My partner and I live on a 45-acre rural property where we have been working to be as self-sufficient as possible while living off-the-grid (in a dome home no less). I am also part of the global volunteer network of Herbalists Without Borders (HWB). Our work includes upholding Indigenous traditions of healing, making an ideal "fit" with IPHA. I look forward to working with everyone.

The recent field days at Foxbar Falls was a wonderful example of how important the work of the IPHA is. We had some very engaging presentations that covered such a wide range of topics. Learning about the travels of the explorer Leichhardt, making a lip balm and bath salts using dried Indigenous plants, and hearing about the work of Carbon8 with their aim of regenerating and introducing farmers to a different way of production were great examples of the varying interests of our Association. Thank you to everyone involved in planning the event – it is a massive effort which I know that everyone who attended appreciated.

I am honoured to be a small part of the work of the Association. I send my best wishes to you all as we head into the Christmas / New Year season. May you find peace and joy in the coming weeks. Kerrie Oakes

Kerrie holds graduate and post-graduate qualifications in Health, Education and Community Welfare. She is undertaking a PhD at the National Centre for Naturopathic Medicine, examining cooperative models of healthcare. Her interests are in equitable and affordable access to natural medicine and the role of community in healthcare decision-making. Her volunteer work includes operating the Somerset Community Herb Clinics, establishing a Health Co-operative for her local area, running workshops, and supporting other Herbalists Without Borders members to bring herbal medicine to the community. She is coordinator for the SE Qld chapter of Herbalists Without Borders.

Field Day Report—Foxbar Falls, Amiens
Southeast Queensland—19-20 November

With over 20 people in attendance, a series of talks, demonstrations and field walks kept the participants engaged throughout the weekend, while a dip into the nearby lake was always a temptation given the warm weather.

Following a welcome to country by Kambuwal Elder Selena Griffin and a welcome to Foxbar by owner and IPHA member Alec Harslett, outgoing President Dr. Andrew Pengelly opened proceedings with a review of aromatic plant species and sustainable practices for making use of their medicinal and fragrant properties, with numerous plant specimens on hand for the audience to experience.

Andrew's presentation under the gazebo

Rod Fensham, a botanist from the Queensland Herbarium and lecturer at Qld. University, then reported on his project to publish content of the previously unpublished diaries of the explorer and botanist Ludwig Leichhardt, including information on the uses of many species of Eucalyptus which he wrote in the native languages, and which have been interpreted into English.

Bushtucker gardeners at the Amiens Legacy Centre

The group was then guided on a walk over the granite pavements known as the Sow and Pigs Formation to appreciate the bounty of wildflowers, led by Ian Milinovich and other members of the Stanthorpe Rare Wildflower Consortium. After lunch Liz Bourne, Secretary of the Wildflower Consortium, spoke about the status and plans for restoring many rare and endangered plant species in the Granite Belt.

Following this, a car rally was organized to visit the Amiens Legacy Centre, where IPHA contributed about 13 plants for their bushtucker garden, under the supervision of the centre's President Morwenna Harslett.

Field Day Report—Foxbar Falls, Amiens, cont.

Above: Jen Stroh & group on Granite top

Right: Alec Haslett hanging the shade cloth! Katya & Andrew helping.
Photos Jen Stroh & John Grimes.

During the lunch and tea breaks there was an outdoor bookshop, with a range of books on display from the Wildflower Consortium, the Carbon8—carbon8.org.au—group as well as by authors Rod Fensham and Andrew Pengelly. Seeds of the yam daisy (*Microseris lanceolata*), a highly regarded bushfood species that was grown and propagated in the granite belt, were given out to all participants.

Despite the wet and blustery conditions on Sunday morning, the seminar continued with presentations from Sophie Ader, IPHA Research Director and employee of the Uniquely Australian Foods unit of Queensland University. Melissa Thomas, founder and Director of Washpool Supply Co in Stanthorpe, then gave a most professional demonstration of manufacturing body care products using aromatic native plants, with all participants taking home samples of lip balms and bath salts.

IPHA Research Director Sophie Ader and her family Xavier, Theo & Lila

For the final session, incoming IPHA President Kerrie Oakes gave an overview of the organization Herbalists Without Borders, of which she is the SE Qld. Coordinator. Last, but by no means least, Kym Wilson, Certification Coordinator for Carbon8, spoke about regenerative farming and ways in which their organization can help and advise farmers to increase farm productivity while protecting biodiversity and increasing carbon soil levels.

Melissa Thomas of Washpool Supply Co., 2nd from left, making the lip balm with Warren, far left—one for everyone. Looking on—Haley Burgess, Tamisha, David, Selena Griffin & Julie Williams, in the foreground.

Field Day Report—Foxbar Falls, Amiens, cont.

Rod Fensham & Andrew with the Wallangarra White Gum, *Eucalyptus scoparia*

Feedback comments from participants:

IPHA yet again provided a wonderful field day, connecting all of us participants directly with nature at the beautiful Foxbar falls. It was a wonderful weekend, just what the doctor ordered.

Sophie Ader, University of Queensland

It really was a fabulous weekend with lots of information and new friends made.

Shona Churchill, Herbalist

Thanks for such an awesome weekend.

Haley Burgess, Beautiful Abundance

Fantastic weekend of learning, exploring, expanding my being in the beautiful company of the variety of people and natural ecosystems, and a brilliant spot to camp. Fun, inclusive, great information and sharing.

Jen Stroh, Naturopath

I found the weekend to be exciting and inspiring. It was so wonderful to learn from people who are so committed to creating a better world in so many different plant-related ways. From preserving our biodiversity, to growing knowledge through research, growing better food in more sustainable ways, and sharing support and offering access to natural health and self-care products. Congratulations to IPHA for building fabulous partnerships and to Andrew for his constant efforts to spread the word! Thank you for making this weekend accessible and affordable for all.

Katya Skorik, Wellness counsellor and author

Incoming IPHA President Kerrie and outgoing President Andrew in the bushtucker garden

Above: Wallengarra White Gum

Below: Two favourite recipes from a weekend of good, wholesome, healthy food!

Creamy Spiced Lentil Soup brought by Shona

Left: Bulbine Bulbosa. Photo Jen Stroh

Andrew's Salsa Verde with Warrigal Greens

1 cup warrigal greens

1 cup parsley

100mL e/v olive oil

75mL apple cider vinegar

1/2 lemon, juiced

1 tablespoon native mint (Mentha australis) leaves

1 tsp capers

2 garlic cloves - crushed

Place ingredients in food processor. Blend until smooth, season to taste

store in fridge up to 4 days

Note that the original, from Mt. Barney Lodge, included anchovies

CREAMY SPICED LENTIL SOUP

A delicious and hearty recipe to warm body and soul

There is something so comforting about a hot, homemade meal during the cooler months, and this beautiful creamy spiced lentil soup promises to warm you up from head to toe!

INGREDIENTS

3.75 cups cooked

1 1/2 cup dry red lentils
5 cups vegetable broth
1 Tbsp. coconut oil
3/4 tsp. ground turmeric
3/4 tsp. curry powder
1/2 tsp. ground cardamom
1/2 tsp. ground cinnamon
sprinkle of crushed red chilli
pinch of fresh ground nutmeg
1 large yellow onion, diced
1 Tbsp. fresh lemongrass paste (or 2 stalks)
1 tsp. minced ginger
2 tsp. dried thyme
1 garlic clove, minced
1 can of full-fat coconut milk (440ml)
1/2 small bunch of kale, de-stemmed and chopped
juice from 1 small lemon
1 Tbsp. sugar
1/2 tsp. salt
1/2 cup coriander, chopped

METHOD

In a large soup pot, combine the lentils and vegetable broth and bring to a boil over high heat, stirring occasionally. Once boiling, reduce to a simmer and allow to cook for about 20 minutes, or until the lentils are tender.

Meanwhile, heat the coconut oil over medium-low in a large saute pan. Add in the turmeric, curry, cardamom, cinnamon, crushed red chilli, and nutmeg.

Saute for about one minute, then add in the diced onion. Cook for about 5 minutes, or until the onions are nice and soft.

Add in the lemongrass, ginger, thyme, and garlic. Continue to saute for another few minutes, then remove from heat.
Serve hot and topped with half a handful of chopped coriander.

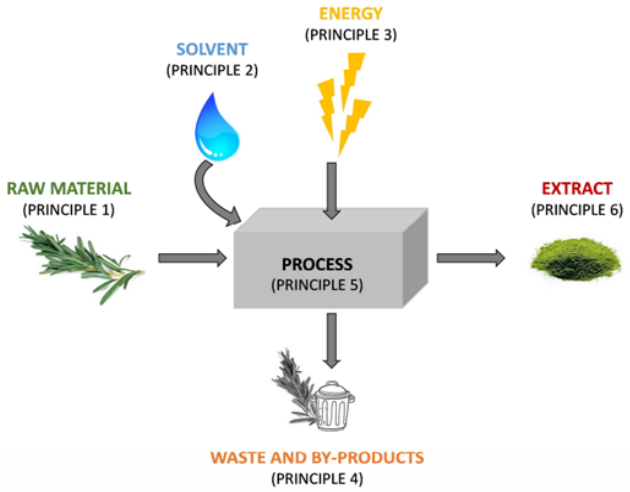
then add coconut milk, kale, sugar, salt, coriander, lemon juice.

Recipe from:
www.produceonparade.com

Essential oil distillation and analysis – innovations for sustainability

Green extraction techniques

As noted previously, in additional to the demand on natural resources, essential oil production also requires significant inputs of energy and water, while alternatives to distillation usually require organic solvents, many of which are toxic. The current century has witnessed the emergence of so-called "green extraction" which has been defined as "the discovery and design of extraction processes which will reduce energy consumption, allows use of alternative solvents and renewable natural products, and ensure a safe and high-quality extract/ product" (Chemat, Vian & Cravotto, 2012). The United Nations has declared such a strategy for 2030, aiming for "sustainable developments, waste reduction, (re)use of discarded by-products, and reduction of the carbon footprint in processing" (Giacometti et al., 2018).



Six Principles of Green Extraction (Chemat et al, 2019)

1: Innovation by selection of varieties and use of renewable plant resources.

2: Use of alternative solvents and principally water or agro-solvents.

3: Reduction of energy consumption by energy recovery and using innovative technologies.

4: Production of co-products instead of waste towards bio-refinery concepts

5: Reduction of unit operations number and development of safe, robust and controlled processes.

6: Aim for green extract with green values and non-denatured and biodegradable extract without contaminants.

Giamcometti and co-workers (2018) experimented with a range of innovative non-thermal extraction techniques to obtain essential oils and their active constituents from a range of aromatic Mediterranean herbs, such as thyme, lavender and rosemary. These include ultrasound-assisted extraction (UAE), pulsed electric fields assisted extraction, microwave-assisted extraction (MAE), sub- and supercritical fluid extraction (SFE), pressurized liquid extraction (PLE), pulsed electric fields (PEF), and high voltage electrical discharges (HVED).

Another example of improved efficiency and reduced demand on resources for the production of essential oils comes from Kerala State in India. This farm produces lemongrass essential oil, however it has been dependent of firewood as heat source, a practice that is leading to local deforestation. A prototype lemongrass distillation system using a solar steam generator, along with innovative extraction methods, was found to produce 8 times the amount of essential oil using far fewer resources (Ragula & Devananthan, 2016).

Obviously, some of the techniques mentioned are complex and expensive to introduce, and well beyond the scope of your average manufacturing herbalist or aromatherapist. However, for those practitioners who purchase herbal extracts and/or essential oils from a contract manufacturer, it would be prudent to check that there is some conformity or aspiration towards the use of green extraction techniques.

Green analytic methods?

Producers of essential oils also rely on access to analytical laboratories to provide them with chemical profiles. These laboratories also consume significant amounts of energy and water, along with the necessary plant material. The use of portable miniaturized systems, based on microwave and ultrasound technologies, has been

shown to significantly reduce inputs—including a reduction in the amount of plant material required (Chemat, Garrigues & Guardia, 2019).

Another method promoted by Nicholas Sadgrove and others replaces traditional hydrodistillation with solvent extraction of single leaves, using only 2mL of organic solvent (Sadgrove, 2022). The method has the advantage of extracting non-volatile compounds in addition to providing chemical profiles of essential oils. One of the first examples of this method was demonstrated by Collins and co-workers for analysis of the essential oil of *Eucalyptus magnificata* (Collins et al., 2018). The leaf samples used were obtained from herbarium specimens. The authors note that analysis of samples from a 44-year-old herbarium specimen produced similar results to the use of a fresh leaf from the same species. In another example, Sadgrove and co-workers from the University of New England distinguished different species of the *Phebalium* genus on the basis of the chemistry of their volatile oil profiles, using leaves removed from herbarium specimens (Sadgrove et al., 2020).

Some scientists in the analytical chemistry field are concerned that the preoccupation with green chemistry may come at the expense of performance and adaptability to the needs of industry. In light of this a new field of "white analytical chemistry" has recently been proposed, with the main objective of balancing out "greenness" with functionality (Nowak, Wietecha-Posłuszny & Pawliszyn, 2021).

Substitution of synthetically derived chemicals

One method that is being touted by some as a form of green chemistry, particularly in the perfumery industry, is the synthetic production of essential oil molecules. This isn't exactly a new technology, in-demand molecules such as menthol have long been produced semi-synthetically from natural precursor molecules, with the assistance of terpene synthases—enzymes that catalyse conversion of one terpene molecule to another. However, with advances in fields such as biocatalysis, metabolic engineering, synthetic biology, gene edition and cloning, synthetic chemicals are being touted as more sustainable alternatives compared with natural sources of aromatic molecules (Lecourt & Antoniotti, 2020). The term "naturality" is being used to describe products and processes that aren't really natural at all. One producer of fragrances has trademarked the term "naturality platform" as embracing nature-conscious fragrance creation (https://www.givaudan.com/fragrance-beauty/ingredients/naturality-platform).

Traditional uses for aromatic plants in Australia

As noted in the introduction, aromatic plants have a long history of use, whether for medicinal, perfumery or a host of other applications. In Australia, we made not have written documentation of aromatic plant use prior to the British invasion, and there has been much concern about the loss of cultural knowledge, including plant use, since that time. However, in recent decades, Aboriginal communities, often in collaboration with university researchers, have set out to record many of their traditional plant uses, including plant names in local languages. The most significant contribution in the field is *Traditional Bush Medicines, An Aboriginal Pharmacopoeia* (Aboriginal Communities of the Northern Territory, 1988), while more recent volumes include *Bush Tucker, Boomerangs and Bandages* (McKerney & White, 2011).

Due to millions of years of isolation from the rest of the world, Australia has developed a unique flora and fauna. The botanist Len Webb (1969) observed an apparent correlation between the generally infertile soils and dry conditions characteristic of much of the continent, with the distribution of plants that are high in essential oils.

Webb found that while plant species from rain forest found near the east coast tended to be rich in alkaloids (nitrogenous compounds), those from drier regions—representing the more "typical" Australian landscape, were generally low in alkaloids but rich in essential oils. Hence it isn't surprising that much of the documented medicinal plant use involves aromatic species.

With a growing awareness that our country needs to value indigenous thinking and land management practices (Yunkaporta, 2019), it is timely to review known indigenous practices when it comes to the use of aromatic plants. These practices include:

- Direct inhalation of crushed leaves e.g. Eucalyptus
- Exposure of body parts to hot smoke from burning leaves
- Smoke purification rituals
- Direct application of crushed plant parts to the skin e.g. to repel insects
- Topical applications and unguents derived from extracting aromatic plants into animal fats
- Chewing on leaves to relieve nasal congestion and stomach upsets
- Ingestion of infusions and decoctions. This practice would be more common in recent times, given the access to implements such as the billy and the kettle.
- Decoctions may also be used to sanitise and treat skin infections such as boils and as eye washes
- Ingestion with food as flavour enhancers

The methods referred to above are still used in many Aboriginal communities, and some have also been subjected to scientific investigation. For example, several species of *Eremophila* were prepared following traditional practices (including methods listed above), and tested for antimicrobial activity (Lyddarid, 2016). In a collaboration between Yaegl Aboriginal Community Elders and Macquarie University, the antimicrobial potential of plants from northeast NSW used in the topical treatment of wounds, sores and skin infections were investigated, using water-based extracts that the Aboriginal Elders recommended as being closest to traditional methods (Packer et al, 2015).

Traditional smoke fumigation methods from Australian aromatic plants such as *Eremophila* spp. *Callitris* spp. and *Geijera parvifolia* have been described and subjected to laboratory simulation, in order to access their efficacy and to identify the active chemicals involved (Sadgrove & Jones, 2016). In the case of wilga leaves (*Geijera parviflora*), non-aromatic constituents such as alkaloids were identified. This species is known for having psychoactive effects, likely due to the presence of the alkaloids.

Back to basics – simple herbal and aromatherapy applications

Rather than viewing the above techniques as primitive, we should appreciate the fact that Aboriginal traditional forms of medicine have passed the test of time, and there is still a place for them in today's world, dominated as it is by the biotech model.

I have used most of the following preparations personally over the years, many of which are in line with traditional Aboriginal practices listed above. While this approach may seem more suited to self-treatment, some can also be adapted for clinical use by herbalists, aromatherapists and naturopaths.

If you have accompanied me in the bush or on a plant medicine walk, you will have noticed that I often pick a few leaves, crush and inhale. This practice has at least three practical uses.

If an unknown plant emits an aroma, then it is likely to come from the handful of families listed in Table 1 (see page 2).

While these families might contain hundreds of species, that is a very small proportion of all Australian plants, and from a botanical point of view it represents valuable information. Secondly, for the herbalist or aromatherapist with some knowledge of phytochemistry, the quality of the aroma can depict the presence or absence of some of the more well-known aromatic compounds. For example, a piney aroma indicates the presence of pinene, a stimulating antimicrobial oil found in conifers such as *Callitris* species, but also in some non -conifers. A eucalypt aroma indicates the presence of the medicinal compound 1,8-cineole, which is found in

many other Myrtaceae plant species apart from the obvious *Eucalyptus*. Inhaling these plants will help to break up respiratory congestion—the third practical use. On the other hand, the sweet, lavender-like aroma of linalool can be detected in many species of *Melaleuca*, notably *M. ericifolia*, guaranteeing a calming effect following inhalation. This practice isn't limited to bushwalkers, leaves that have been harvested and dried should still emit their characteristic odours.

In addition to inhaling my way through the bush, I also tend to indulge in some leaf-chewing, a practice that achieves largely the same objectives as inhaling them. The non-botanist should be a little more cautious with this method. While there are few Australian plants sufficiently poisonous to inflict serious injury following a leaf chew or two, there are some that can irritate the throat or leave an unpleasant taste. Indeed, bitter tastes do indicate the possible presence of toxic chemicals, hence they act as a warning.

Teas

Herbal teas are gaining in popularity, and our bush teas are just as tasty and therapeutic as their exotic equivalents. The beauty of this method is that therapeutic plants that don't taste great can be combined with other pleasant tasting species (correctives), some of which are listed in Table 2. It turns out that the good-tasting ones are also therapeutic, so they can also be taken alone for pleasure and therapy. Herbal teas are both a form of aromatherapy (steam inhalation occurs during both preparation and ingestion) and hydrotherapy (hydrating the body with therapeutic ingredients).

Syzygium australe

Table 2. Example of Australian plant leaves suitable for herbal infusions

Common name	**Botanical name**	**Health benefits**
Lemon myrtle	*Backhousia citriodora*	Antimicrobial, digestive aid, corrective
Aniseed myrtle	*Anethola anisata*	Digestive aid, corrective
Peppermint eucalypt	*Eucalyptus dives* *E. radiata*	Expectorant, antiviral, immune-stimulant
Lemon ironbark	*Eucalyptus staigeriana*	Antiseptic, antiviral, corrective
Native mint, river mint	*Mentha australis*	Digestive aid, decongestant, corrective
Paperbark	*Melaleuca quinquenervia*	Antibacterial, antiviral, calming
Tea tree	*Melaleuca alternifolia*	Antimicrobial, antiviral
Swamp tea tree	*Melaleuca ericifolia*	Antimicrobial, calming, nervine
White cypress pine	*Callitris glauciphylla*	Stimulant, anti-inflammatory
Mint bushes	*Prostanthera* spp.	Stimulant, antidepressant
Lilly pilly	*Syzygium* spp.	Digestive aid, astringent
Tick bush	*Kunzea ambigua*	Anti-inflammatory, antirheumatic
Lemon-scented tea tree	*Leptospermum petersonii*	Antiseptic, calming
Wilga	*Geijera parviflora*	Pain relieving, sleeping aid
Hop bush	*Dodonaea viscosa*	Anti-inflammatory, antidiabetic
Gotu kola	*Centella asiatica*	Wound healing, anti-inflammatory
Java tea	*Orthosiphon stamineus*	Diuretic, antidiabetic
Gumbi gumbi	*Pittosporum angustifolium*	Anti-inflammatory
Native lemongrass	*Cymbopogon ambigua*	Antiseptic, digestive aid

Teas can be prepared from fresh or dry ingredients.

If the plant material is fresh, then more (by weight) is required, to account for the existing water content.

The usual method is to infuse 1 teaspoon of dried plant/cup, or 2 teaspoons for fresh plants.

For the busy practitioner, there is a good selection of bush teas now available online, many of these are produced by Indigenous Australians.

Topicals

Bush plants naturally lend themselves use as topical remedies, whether in the form of poultices, or prepared as ointments or salves. Many of the teas listed in Table 2 can also be applied topically. Most Australian plant species that have been investigated have been found to have some degree of antimicrobial, anti-inflammatory or wound-healing properties. My research on the slightly aromatic hop bush (*Dodonaea viscosa*) for example, found that extracts of leaves stimulated the growth of human dermal fibroblasts, an indicator of wound-healing ability (Pengelly, 2008). Subsequently Australian herbalists have made ointments and other topical applications to capitalize on this use. The use of preparations containing tea tree oil for topical use are so well known they don't need repeating here. However, these preparations can also be made directly from the leaves, either dried and ground up, applied topically as poultices, or as an antiseptic wash in the form of the tea infusion.

Native spices

I've always believed the maxim "Food is your best Medicine", and there are various ways in which aromatic plants can be incorporated into the diet. The spicy aromatic pepper berries (*Tasmannia* spp.) can replace the likes of black pepper, cardamom and cloves in baking cakes and desserts. The cinnamon myrtle (*Backhousia myrtifolia*) is a good substitute for bay leaf or cinnamon sticks. Leaves of native citrus species make excellent flavourings, while the multiple lemon-scented species can be used wherever lemon flavour is desirable. Eastern Australia also has its' own ginger (*Alpinia cerulea*) and turmeric (*Curcuma australis*), however these are not quite as flavourful as the widely used Asian species. The key to obtaining a therapeutic dose is to use generous quantities.

Table 3: Spicy ingredients for Australian cuisine

Flavour	**Common name**	**Botanical name**
Pepper, cardamom, clove	Mountain pepper berries (leaves also)	*Tasmannia* lanceolata *T. insipida*
Ginger	Native ginger	*Alpinia caerulea*
Turmeric	Native turmeric	*Curcuma australis*
Lemon	Backhousia citriodora Lemon-scented ironbark Lemon aspen Native lemongrass	*Backhousia citriodora* *Eucalyptus stageriana* *Acronychia acidula* *Cymbopogon ambigua*
Bay leaf, cinnamon	Cinnamon myrtle	*Backhousia myrtifolia*
Citrus	Native citrus Finger-lime	*Citrus* spp. *Citrus australasica*

Infused oils

This method has long been used by herbalists, it is a simple as soaking plant material in a carrier oil such as sweet almond or jojoba, then straining and filtering the oil after a given period, usually 2-4 weeks. The resultant oil is quite stable, however there are natural preservatives that are sometimes used, such as amiox and even grapefruit seed extract. Some of our aromatic plants have hard cuticles on the leaf surface, which can reduce the extraction efficiency. Crushing the leaves using a Vitamix or food processor can work; for larger quantities a compost shredder is ideal. This method would work for *Eucalyptus* leaves, *Melaleuca quinquenervia* and some other Melaleucas as well as *Backhousia* species. Finer leaved Melaleucas such as *M. alternifolia* and *M. ericifolia* do not require this level of processing.

Infused oils are quite versatile, whether used as topical treatments or in the kitchen, in which case some of the spicy ingredients listed in Table 3 would be suitable.

Tinctures

Tinctures are versatile and effective preparations for aromatic plant applications. Tinctures are traditionally based on alcohol/water solvents, usually between 45% and 60% ethanol. Ethanol is a good solvent for essential oils, and tinctures generally reproduce the plants natural aroma, only slightly sullied by the odour of ethanol. The therapeutic effect of the essential oils will also be retained, with the benefit of other non-volatile constituents such as tannins and flavonoids.

Virtually any of the aromatic species mentioned so far can be extracted via the tincture method. The most reliable method is to dry and crush the leaves first, then add 5 parts of the water/ethanol mixture. For non-practitioners without access to the purchase of ethanol, the next best solvent is vodka, or the spirits with highest alcohol % available at your local bottle shop. Wine is also a good solvent for aromatic plants, however it only has a short shelf life, whereas a traditional tincture can be stored for a few years.

Example: Eucalyptus tincture

- Harvest and dry Eucalyptus leaves to obtain 100g
- Grind leaves using a Vitamix, food processor or by mortar and pestle
- Prepare 500mL solvent using equal parts ethanol and water OR use 500mL vodka or equivalent.
- Soak the leaves in the solvent, using a sealed glass jar.
- Give the tincture a shake every couple of days, leave infusing for 1-2 weeks.
- Strain off the leaves, then filter using a Whatman's or coffee filter.
- Label your bottle, with plant species name and date.
- Typical dose is 1-2mL taken in a little water

Eucalyptus tincture is a beneficial remedy for head colds, bronchitis, sinusitis and bronchial asthma.

Eucalyptus tereticornis—
Forest red gum

Tinctures can also be made from fresh plants, however the method is a bit more complicated in terms of working out the solvent proportions. If vodka is being used, then the leaves would be soaked in the undiluted vodka, then follow the method described above. Due to the high moisture content, this tincture should be kept refrigerated.

Insect repellents

There is no doubt that Australia has the most potent insect repellent plants mainly due to the presence of the aldehyde citronellal in the leaves of so many species. In addition, closely related compounds such as citral and citronellol, with somewhat milder repellent properties, are also common constituents in the Australian flora. In fact, most essential oils will to some extent repel mosquitos and other insects, including most of the *Melaleuca* genus. The main species that I have used for the purpose, along with their active constituents, are listed in table 4.

Table 4. Major insect repellent species

Common name	**Botanical name**	**Active constituent**
Lemon-scented gum	*Corymbia citriodora*	Citronellal (>90%), citronellol
Zest-myrtle	*Backhousia citriodora* var. A	Citronellal, citral
Lemon-scented tea tree	*Leptospermum petersonii*	Citral, citronellal
"Mozzie blocker"	*Leptospermum liversidgei*	Citronellal, citral
Swamp paperbark	*Melaleuca ericifolia*	Linalool
Coastal paperbark	*Melaleuca quinquenervia*	Nerolidol, viridifloral

I admit that it is hard to go past essential oils when it comes to making up repellent blends, however there are some options. These are based on using infusions in place of water. So for example, I make a spray on repellent based on a small amount of essential oil blended in a base of water. Using the leaves of any plants listed in Table 4, a strong infusion should be made, using twice (or more) the quantity of leaves for a standard infusion. These preparations provide only short-term protection from bug bites. The following spray-on method will provide for longer term protection:

- Carrier oil (e.g. sweet almond oil) 1 teaspoon
- Aromatic leaf infused tea 1.5 tablespoons
- Vodka 1 teaspoon

Blend and add to a spray bottle

Above: *Corymbia citriodora*—photo pinterest

Below right*: Corymbia citriodora.*
Below: *Melaleuca quinquenervia*—photos Gardening With Angus

Using essential oils responsibly

If we do wish to use essential oils for therapeutic or aesthetic purposes, then there are ways of doing it without destroying the natural resources. One obvious method is to harvest cultivated plants only, and even better to cultivate the plants in the first place. Most of the IPHA distillation demonstrations have used plants that were originally planted in mass, exactly for this purpose, whether it be *Leptospermum petersonii* in the Hunter Valley, *Eucalyptus staigeriana* in West Woombye or *Backhousia citriodora* at the recent Wootton event. Many of Australian commercially distilled essential oils are derived from plantations. While this procedure does spare and even increase the plant resources, it is still a high consumer of those other precious resources, energy and water. Hence, in order to be truly sustainable, many of the elements of green chemistry and extraction also need to be employed.

From the practitioner or end-users' point of view, essential oils should be significantly diluted, whatever the intended use. Recommended dilutions range from 1%-10% in a suitable carrier, depending on the safety profile of the essential oil and the intended use. Water is not an efficient carrier, as most volatile compounds in essential oils are poorly soluble in water. Hence, they are not effective for using in the bath water. Some people advocate using a fat-based carrier, e.g. milk or vegetable oil, but in my experience these still don't mix well with the bath water. For skin applications, vegetable oils are very effective.

Conclusion

These are but a few examples of alternative methods of employing our native aromatic plants, other possible applications not covered here include personal care products such as bath salts and lip balms, honey-base preparations and hydrosols.

In summary there are two main take-home messages. Essential oil production and consumption is inherently unsustainable using traditional methods, in terms not only of the plant material used, but also the amount of energy and water required for their production. Secondly there are many other ways of utilising the properties of aromatic plants apart from the essential oil form, and a few of these methods are described.

Backhousia myrtifolia

For aromatherapists and perfumers, the major consumers of essential oils, tracing the source and history of the essential oils is vital. Avoid purchasing oils derived from wild-harvested plants, try to find out whether some of the more sustainable distillation or green extraction methods are in use. In this way we can all continue to enjoy the benefits of our wonderful aromatic flora without adding to biodiversity loss, significant water and energy consumption, and of course the big one – climate change.

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Indigenous ecological knowledge kept alive through new language exchange

A partnership between researchers and Traditional Owners in SE Arnhem Land aims to bridge the gap between traditional and western biodiversity science.

News release by CSIRO. 1st September 2022

A project celebrating Indigenous scientific knowledge that has added 2,500 native plant and animal names to the Atlas of Living Australia (ALA) was launched today at Ngukurr Primary School in South-East Arnhem Land.

The ALA, hosted by Australia's national science agency, CSIRO, worked with Yugul Mangi Rangers in South-East Arnhem Land and Macquarie University on the project, adding language words in eight local languages and descriptions for 295 species to the ALA.

ALA Indigenous Ecological Knowledge (IEK) Program Lead Nat Raisbeck-Brown said the new Indigenous names and transcriptions would increase data accessibility and strengthen researchers' and Australians' connection to Traditional Owner knowledge and language. "This project is a wonderful celebration of Indigenous scientific knowledge, highlighting the importance of Australia's first scientists in understanding biodiversity, and supporting biodiversity management and conservation efforts," Ms Raisbeck-Brown said.

"The newly updated species names are now searchable in the ALA, both by their Indigenous language name and western names (Latin and common). By having species names discoverable in Indigenous languages, we benefit from and encourage more Indigenous content to be contributed to the project," she said.

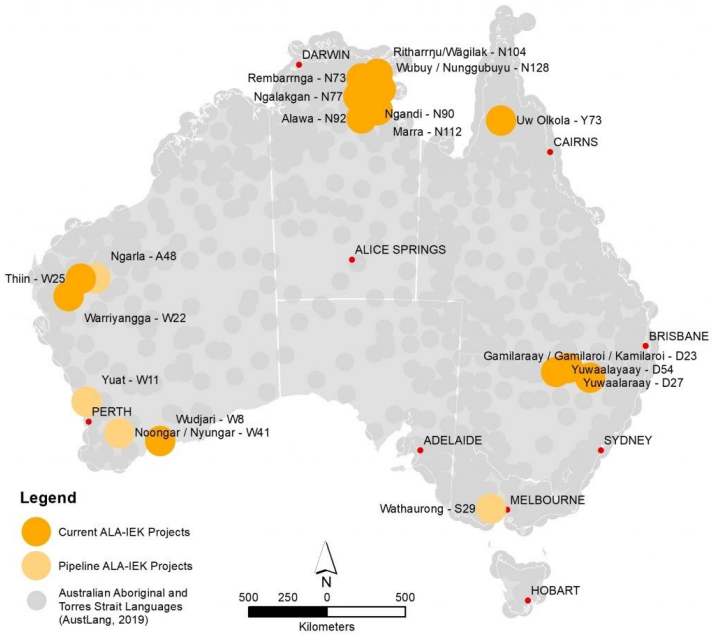
The project celebrates the Kriol, Marra, Ritharrŋu/Wägliak, Ngandi, Wubuy, Ngalakgan, Alawa and Rembarrnga languages which are now included in the ALA. Yugul Mangi Assistant Ranger Coordinator Julie Roy, who speaks Ngalakgan and Ngandi languages, said the work not only offered shared scientific benefits but also helped support keeping local languages alive. "It was very interesting for me to learn both the scientific names and local language names for the species and it's also good for the kids to be able to search these species online to learn more about local languages," Ms Roy said.

In 2020, the Ngukurr Language Centre published this knowledge in a book titled *The Cross-cultural guide to some animals and plants of South East Arnhem Land.* Macquarie University project lead Emilie Ens said working with local communities reinforced the long-standing traditions and knowledge of First Nations Peoples in effective environmental management.

"This knowledge, often encoded in language, is an important part of Australia's natural and cultural heritage," Ms Ens said.

"By showcasing these names and knowledge in the ALA, we are recognising the deep traditions of Australia's First Nations Peoples which is long overdue yet is increasingly seen as essential for effective management of Australia's environments," she said.

The ALA's IEK project is a collaborative effort with Traditional Owners across Australia to preserve and provide access to Indigenous cultural and environmental knowledge and language. The ALA, Australia's national biodiversity data infrastructure, is funded by the National Collaborative Research Infrastructure Strategy (NCRIS) and is hosted by Australia's national science agency, CSIRO.



Find out more about Indigenous ecological knowledge by visiting https://www.ala.org.au/indigenous-ecological-knowledge.

Field Day Report—Wootton Valley, NSW—Sept 10th

Regeneration, restoration, education, health and abundance was on demonstration in the Wootton Valley.

Sue & Fred Fetherston are working with their neighbours to plant paddocks out with biodiverse forest, using local pioneer species, plus many bushfood plants including macadamias, finger-limes, bunya nuts, warrigal greens, lemon myrtle and many other native Australian plants.

Fred Fetherstone on plant awareness walk

Sue & Fred Fetherston each led a walk and talk around their property, sharing their now over a decade-long project of returning formerly degraded ex-dairy country to natural abundance.

Native plantings link the river to the remnant native forests, supporting all the bandicoots, wallabies, frogs, birds and other 'ecosystem-engineers' turn over soil, control pests and distribute native grasses, herbs and fungi—that support other forest and pasture species. A beautiful virtuous circle!

Sue Fetherstone with participants on plant awareness walk

IPHA committee member Rob Santich spent most of the day distilling leaves harvested from locally grown lemon myrtle, *Backhousia citriodora*, the fragrant aroma permeating through to the Wootton Community Hall, where a series of talks and demonstrations were in progress.

Samples of lemon myrtle essential oil and hydrosol were distributed to all participants.

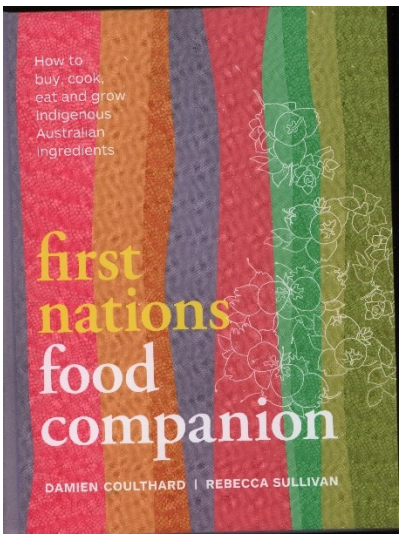
Above: Pat and Rob discussing distillation techniques.

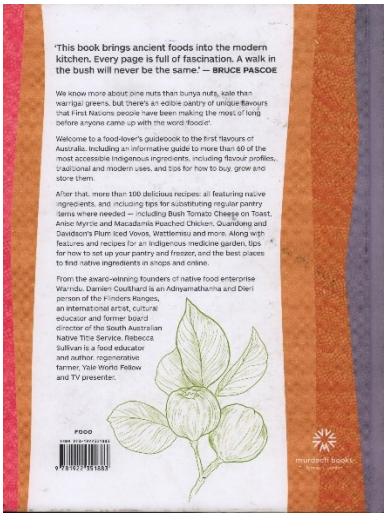
Most of the group assembled below.

Book Review

First Nations Food Companion. By Damien Coulthard & Rebecca Sullivan

Murdoch Books, Sydney





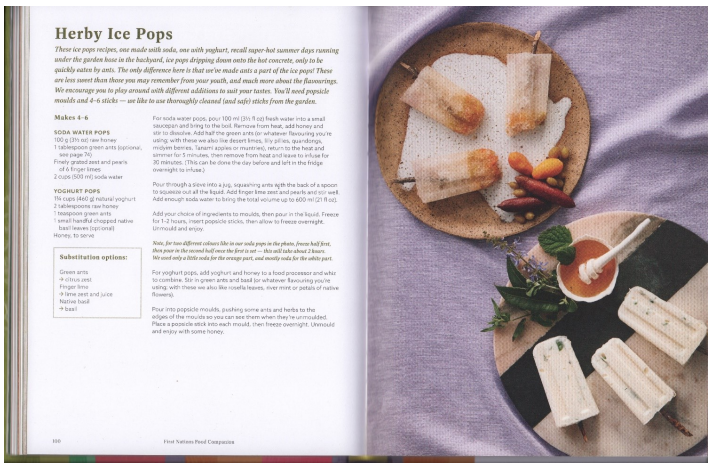
We have been fortunate to have several informative books on the source and uses of bushtucker plants in recent years, bur I believe that with the release of "First Nations Food Companion", described on the cover notes as the food lover's guidebook to the first flavours of Australia, we have the ultimate book in the category.

It seems that the book was born out of a marriage (literally and figuratively) between two people. Damien Coulthard, an Adnyamathanha and Dieri man of the Flinders Ranges, South Australian, is artist and cultural educator. Rebecca Sullivan is a food educator and author, regenerative farmer and TV presenter. Together they founded a company named Warndu, which means *good* in the Adnyamathanha language. https://warndu.com/

The first section, an ingredients guide, provides descriptions of close to 100 native plant species, with their traditional, botanical and common names. Information included for each plant includes a general overview, their uses, how to source them either in the wild or by purchase, notes on growing and storage methods, each set off with attractive illustrations by Aboriginal artists. Most of our familiar bushtucker plants can be found here, plus a few surprises, although geebung (*Persoonia* spp.) is not listed.

Apart from the main recipes section, some handy information can be found, including lists of staples dried herbs and spices for storage and fresh plants for freezing, a First-Nations flavour wheel, tips for preserving and a stocklist of suppliers. The recipes section is divided into spice, herbal, nutty, fruity, medicine garden, floral, citrusy, marine and earthy, based on the descriptors in the flavour wheel.

The recipes themselves are most comprehensive, and each one includes substitution options. For example, if you are tempted by Strawberry gum, cherry and riberry tapioca trifle (who wouldn't!), but you didn't have access to native cherries, riberries or wattleseed them you could substitute cherries, blueberries or ground coffee. For something more savoury you might fancy a barra burger with bush tartare sauce. In this case finger limes could be substituted by lime zest, seablight by capers, sea parsley by curled parsley and so on. Most recipes are accompanied by colour photos, and the whole book is sensitively designed, with imaginative use of colour and shading.



This review only touches the surface of the delights to be found. The 250-page hardback can be purchased for under $50 from several online sources, though I obtained my slightly discounted copy from a bookshop in suburban Brisbane.

Indigenous Plants for Health Association (Inc)

MEMBERSHIP APPLICATION FORM

Set out below are my membership application details for Indigenous Plants for Health Association Inc.

Enclosed/transferred is the sum of $20 annual membership fee. The amount has been paid by:

Cash Cheque

Paid by Bank Transfer (Important — flag your name with payment)

Post Membership Form and cheque to:

IPHA Treasurer, 196 Bridge St. Muswellbrook, NSW 2333 **or** if paying by transfer you may scan and email the completed and signed form to Patricia Collins (patcollins196@hotmail.com)

Bank Details for Payments: BSB 637000 Account 722660722

Name: _____

Address: _____

_____Postcode_____

Tel: Home_____

Mobile_____

Email: _____

I agree to abide by the Constitution and any policies, rules or regulations established within the association.

These are listed on the website www.indigenousplantsforhealth.com

Signed_____

Date _____

IPHA Committee Members

President Kerrie Oakes

Vice President & Newsletter editor in chief Andrew Pengelly

Treasurer Patricia Collins

Secretary & Newsletter editor Reesa Ryan

Web mistress & projects coordinator Kathleen Bennett

Research Director Sophie Ader

General member Rob Santich

General member Phil Sheppard

General member Shona Churchill