

Patch testing to plants: sensitisation associated with exposure to plants, essential oils and botanicals in cosmetics

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ABSTRACT

BACKGROUND: Contact allergy to plants, particularly Compositae, presents with dermatitis and is diagnosed with skin patch testing. Sesquiterpene lactone mix is a common screening allergen for plant allergy. The rate of plant allergen sensitisation in New Zealand, which is affected by local horticultural factors, has not previously been documented.

AIMS: To investigate the rate of plant allergen sensitisation in New Zealand's regional population, characterise common allergens and reassess appropriate allergens for patch testing.

METHODS: Retrospective analysis of patient demographics and patch-test results over an eight-year period (2012 to 2020) was performed at a tertiary patch-test clinic in Auckland, New Zealand.

RESULTS: 820 patients completed patch testing. There was a 12.9% sensitivity rate (a positive reaction on patch testing) to at least one plant allergen and a 6.2% plant allergy rate (positive reaction of current relevance). The most frequent positive reactions were *Myroxylon pereirae* (n=38), colophonium (n=35) and sesquiterpene lactone mix (n=14). Of patients with a plant allergy (n=51), the allergy source was a botanical in a cosmetic product in 27 cases (52.9%), a plant in ten (19.6%) and an essential oil in two (3.9%).

CONCLUSIONS: Reactions to plant allergens were related to botanicals in cosmetics and creams, plants and essential oils. Rates of plant sensitisation in our cohort are comparable with international data.

Contact with plants may cause plant dermatitis (phytodermatitis) due to allergic, irritant and photosensitive (phytophotodermatitis) mechanisms.^{1,2} Urticarial and airborne reactions to plant allergens can also occur. Allergic eczema (delayed-type hypersensitivity) due to plants is diagnosed with formal skin patch testing in dermatology clinics. Exposure to plants and subsequent development of allergy depends on local environmental and horticultural factors.

There are around 250 recognised contact sensitising families and over 10,000 species of contact sensitising plants worldwide, not counting poisonous plants. Compositae (daisy family) plants are significant culprits worldwide and include various weeds and edible and flowering plants. Patch testing with sesquiterpene lactone (SL) chemicals

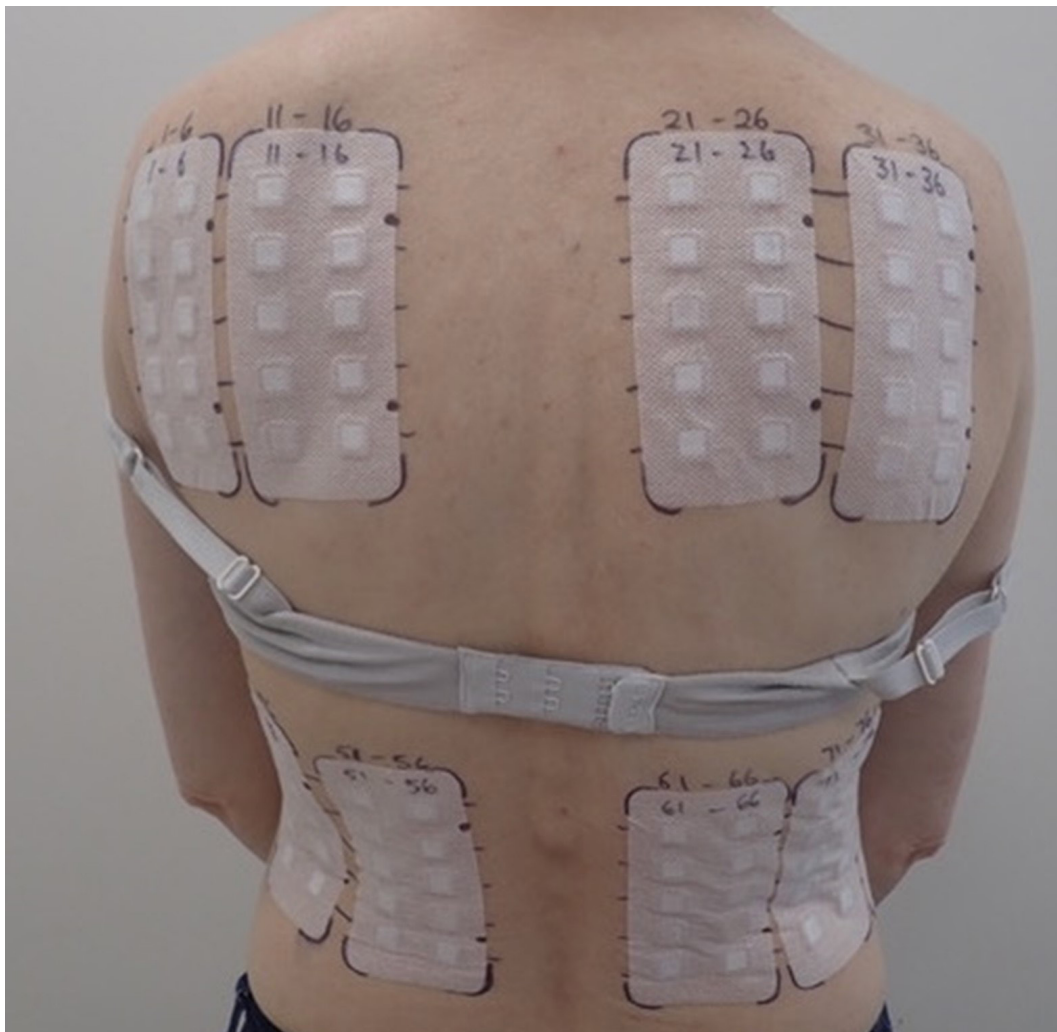
detects approximately 65% of Compositae allergy.³ Some institutions utilise an additional Compositae mix (a 6% petroleum mix of chamomile, tansy, yarrow, Arnica and feverfew extracts), as well as related plant allergens including parthenolide and/or specific extracts prepared from individual plants in the Compositae family, depending on clinical suspicion.⁴⁻⁶ Other plant sources for allergic eczema include diallyl disulfate (garlic), urushiol (poison ivy, Rhus tree and mango), primin (primula), colophonium (pine) and tuliposide A (tulips and alstroemeria).⁷ Cross-sensitisation may arise between plant families; in particular, a third of Compositae-sensitised patients have allergy to fragrances, *Myroxylon pereirae* (Balsam of Peru), and colophonium (pine rosin), which are also of plant origin.⁸

Allergic reactions to plants arise not only from contact with plants themselves, but also from cosmetic and personal-care products containing plant substances (often plant derived fragrances), essential oils and other products such as propolis drops.

Patch testing is a technique used to identify the cause of allergic contact dermatitis (delayed-type hypersensitivity) and verify the diagnosis (Figure 1) by controlled exposure to the suspected allergens in patients with a history and clinical picture of contact dermatitis. The most relevant and common allergens that cause contact dermatitis in the general population are recommended for use in most cases undergoing patch testing, as a 'baseline' or 'standard' series, with additional allergens added according to the clinical scenario.^{9,10}

SL mix is included in the baseline series, which identifies many species of Compositae plants. The common cross-sensitising allergens colophonium and *Myroxylon pereirae* are also included in the baseline series. The plant series (17 allergens) is added if there is clinical suspicion of plant allergy. This series has not been updated recently: it is based on international plant allergens and may not contain optimised allergens for diagnosing plant allergies in New Zealand. Importantly, little is known about potential plant allergy related to rongoā and the traditional use of plants as topical botanical products in Māori medicine, which are not tested in our clinic (though patients' own products are tested where indicated). These allergens, including *Piper excelsum* (kawakawa), *Leptospermum*

Figure 1: Allergens applied to a patient's back during patch testing. Allergens stay in place for two days before removal.



scoparium (mānuka) and *Phormium tenax* (harakeke), are becoming increasingly used in botanical skin care products on the New Zealand market.

Reported data suggest that 5–10% of contact allergy in Europe is caused by plants and plant products, with the majority being occupational in nature.^{1,11} International studies suggest a Compositae sensitisation rate in the patch-test population between 0.8% and 4.3%.^{2–6} Examining patch-test data for our specific population is integral to detecting trends in rates of allergenicity. The aim of this study was to identify patients with plant allergy and determine the most common sensitising botanical allergens and exposures in a New Zealand population.

Methods

This study was a retrospective review of all patients patch tested at Auckland District Health Board (DHB) over an eight-year period. This is a tertiary service for patch testing and a central referral site for central Auckland (population 515,000) as well as the greater Auckland and Northland regions (populations 1,193,000 and 179,000, respectively).¹² Referrals are accepted from specialists only, predominantly dermatologists. Locality approval for this study was granted from Auckland Health Research Ethics Committee.

Individuals were routinely patch tested to the local baseline series (49 allergens) with additional series such as the plant and fragrance series and patient's own products added, as indicated by the clinical presentation.¹³ Patch testing was performed with commercial allergens in plastic chambers on adhesive hypoallergenic tape (Chemo-technique, Vellinge, Sweden). Patches were removed on day two. Readings were recorded on day two and day five (2014 to 2017) or day seven (2018 to 2019).¹⁴

Population characteristics including gender, occupationally related dermatosis, presence of atopy, site of dermatosis, age and ethnicity were recorded in addition to the primary pre- and post-patch test diagnosis. The rates of positive and relevant positive patch-test reactions to plant allergens in the standard series, as well as the plant series and plant allergens in the fragrance series, were recorded (Appendix

Table 1). Data was entered into a Microsoft Excel spreadsheet.

A positive reaction (+, ++ or +++) on the final reading was categorised as 'positive'. Irritant (IR) and doubtful positive (+/-) reactions were excluded. Reactions were graded in accordance with European Society of Contact Dermatitis guidelines. Relevance for positive reactions was recorded as current, past or unknown. Current relevance was defined as a positive patch test reaction to an allergen in contact with the skin in the distribution of the dermatosis.

Compositae allergy was defined as clinically diagnosed 'relevant positive' reactions to sesquiterpene lactone mix, and/or Compositae markers in the plant series (*Chamomilla romana*, *Arnica montana*, *Taraxacum officinale*, *Achillea millefolium*, *Chrysanthemum cinerariaefolium*, alpha-methylene-gamma-butyrolactone, *Tanacetum vulgare*, alantolactone, parthenolide, *Chamomilla recutita*).

Results

From July 2008 to December 2020, 859 individuals attended for patch testing, and 820 of these completed testing. Ethnicity analysis showed New Zealand European as the largest group (57.0%), followed by Asian (20.2%), Māori (7.9%) and Pacific peoples (6.3%). Compared to 2018 Census data, Asian patients are overrepresented while other groups, particularly Māori (16.5%), are underrepresented despite the incidence of eczema being higher in Māori.^{15,16}

Overall, 54.9% of patients had at least one positive reaction (n=450). The most frequently positive allergens from the baseline series were nickel sulphate (metal, 23.0% sensitisation), fragrance mix I (6.8%), 4-phenylenediamine (hair dye, 6.0%), cobalt chloride (metal, 5.9%) and methylisothiazolinone/methylchlorisothiazolinone (preservative, 5.4%).

One hundred and six patients (12.9%) tested positive to at least one plant allergen (the 'plant-sensitised population'). In the sensitised population, almost half (n=51, 48.1%) of plant reactions were of current relevance (the 'allergic population') and the cause of allergic contact dermatitis. Thirty-four patients were tested to their own plant or botanical product, and positive

reactions were produced in five patients. There were no significant differences in patient age, gender, atopy or ethnicity between the overall patch-tested population and those with plant sensitisation (Table 1).

Sensitisation and relevance rates for plant allergens are summarised in Table 2. The most frequently positive plant allergens were *Myroxylon pereirae* (n=38, 4.6%), colophonium (n=35, 4.3%), SL mix (n=14, 1.7%), fragrance mix II (n=11, 1.3%), cinnamyl alcohol (n=5, 0.6%), hydroperoxides of linalool (n=5, 0.6%), parthenolide (n=5, 0.6%) and propolis (n=5, 0.6%).

In the allergic population (n=51), ten cases were sourced directly to plants, making the rate of plant allergy 1.2% (summarised in Table 3). Eight of these cases were Compositae allergy and two were colophonium allergy, arising from contact with pine trees/resin. The remainder of relevant positive reactions were related to cosmetics and botanical creams (n=27), plant allergens in essential oils (n=2) and other sources (n=12). Two cases of plant allergy were occupational.

Discussion

Our rate of plant allergen sensitisation is in line with internationally reported rates, including Australia.²⁻⁶ To our knowledge

there is not prior New Zealand data for comparison. Geographically, sensitisation rates are expected to vary due to local horticultural factors, diverse patch-testing populations, including occupational exposures and different patch-test series and patch-testing methodologies.

We found plant reactions occurred most commonly with the baseline series allergens SL mix (marker for Compositae), colophonium and *Myroxylon pereirae*. SL mix represents the alpha-methylene-gamma-butyrolactones molecular family of allergens, while colophonium is from the terpene family, and *Myroxylon pereirae*, which is primarily from the terpene family, contains a mixture of components including cinnamic acid, benzoic acid and eugenol. *Myroxylon pereirae* (Balsam of Peru) is most commonly found as a vanilla/cinnamon fragrance in perfumes, deodorants and cosmetics, as well being an ingredient in a popular pawpaw lip balm. Colophonium (pine resin) is also found most commonly in cosmetics such as mascara, as well as in sticking plaster adhesive. SL mix is a component in plants of the Compositae family, which includes species of flowers including daisy, aster and sunflower. The main source of allergy to this allergen is through exposure to the plant flower or pollen, though Compositae

Table 1: Clinical characteristics of patients patch tested at Auckland City Hospital between 2008 and 2020 (n=820).

Characteristic	Overall patch-tested population n=820 (%)	Plant-sensitised population n=106 (%)	P-value
Female	557 (67.9)	76 (71.7)	0.430
Occupational cause for dermatosis	59 (7.2)	9 (8.5)	0.631
Atopy	501 (61.1)	71 (67.0)	0.242
Site of dermatosis			
Hands	233 (28.4)	39 (36.8)	0.075
Face	194 (23.7)	25 (23.6)	0.984
Legs	14 (1.7)	0 (0.0)	0.173
Age > 40 years†	471 (57.4)	61 (57.5)	0.984
Positivity rate (≥1 positive reaction)	450 (54.9)	-	-

†Mean age = 45 (standard deviation 17.1).

Table 2: Reactions to plant allergens in patients patch tested at Auckland City Hospital between 2008 and 2020 (n=820).

Plant allergen tested	Positive	Relevant positive	Sensitisation rate in overall patch-tested population (n=820)	Relevant/positive %	Patients tested
<i>Myroxylon pereirae</i>	38	20	4.6%	52.6%	820
Colophonium	35	14	4.3%	40.0%	820
Sesquiterpene lactone mix	14	6	1.7%	42.9%	820
Fragrance mix II	11	4	1.3%	36.4%	820
Cinnamyl alcohol	5	3	0.6%	60.0%	34
Hydroperoxide of linalool	5	4	0.6%	80.0%	35
Parthenolide	5	2	0.6%	40.0%	11
Propolis	5	3	0.6%	60.0%	92
Cinnamal	3	3	0.4%	100.0%	108
Isoeugenol	3	2	0.4%	66.7%	108
Oakmoss absolute	3	3	0.4%	100.0%	108
Ylang-ylang oil	3	1	0.4%	33.3%	108
Citral	3	0	0.4%	0.0%	108
<i>Tanacetum vulgare</i> (tansy)	3	2	0.4%	66.7%	70
Lichen acid mix	3	0	0.4%	0.0%	70
Eugenol	2	2	0.2%	100.0%	108
Hydroxycitronellal	2	1	0.2%	50.0%	108
Lavender absolute	2	2	0.2%	100.0%	108
Cananga oil	2	2	0.2%	100.0%	108
Hydroperoxide of limonene	2	1	0.2%	50.0%	11
Amyl cinnamyl	1	0	0.1%	0.0%	108
Geraniol	1	0	0.1%	0.0%	108
Vanillin	1	1	0.1%	100.0%	108
Rose oil absolute	1	1	0.1%	100.0%	108
Geranium oil bourbon	1	1	0.1%	100.0%	108
Sandalwood oil (Indian)	1	1	0.1%	100.0%	108
Farnesol	1	1	0.1%	100.0%	108
Citronellol	1	1	0.1%	100.0%	108

Table 2: Reactions to plant allergens in patients patch tested at Auckland City Hospital between 2008 and 2020 (n=820) (continued).

Plant allergen tested	Positive	Relevant positive	Sensitisation rate in overall patch-tested population (n=820)	Relevant/positive %	Patients tested
Hexyl cinnamic aldehyde	1	1	0.1%	100.0%	108
Coumarin	1	0	0.1%	0.0%	108
Diallyl disulphide (garlic)	1	0	0.1%	0.0%	70
Achillea millefolium (yarrow)	1	1	0.1%	100.0%	70
<i>Chrysanthemum cinerariaefolium</i> (Chrysanthemum)	1	1	0.1%	100.0%	70
<i>Narcissus poeticus</i>	0	0	0.0%	0.0%	108
Jasmine absolute, Egyptian	0	0	0.0%	0.0%	108
<i>Chamomilla romana</i> (Roman chamomile)	0	0	0.0%	0.0%	70
<i>Arnica montana</i> (mountain tobacco)	0	0	0.0%	0.0%	70
<i>Taraxacum officinale</i> (dandelion)	0	0	0.0%	0.0%	70
Alpha-methylene-gamma-butyrolactone	0	0	0.0%	0.0%	70
Alantolactone	0	0	0.0%	0.0%	70
<i>Chamomilla recutita</i> (German chamomile)	0	0	0.0%	0.0%	70
Usnic acid	0	0	0.0%	0.0%	70
Atroronin	0	0	0.0%	0.0%	70
Evernic acid	0	0	0.0%	0.0%	70
Total	162	84	-	-	-

Table 3: Summary of patients with diagnosed contact allergy to plants.

Case	Age at testing	Gender	Ethnicity	Atopy	Occupational	Clinical diagnosis and Localisation	Source of allergy	Plant allergy type	Positive plant marker reactions	Positive own plant product reactions	Other positive reactions
1	62	Female	NZ European	Yes	No	Atopic dermatitis + allergic contact dermatitis (hands)	Gardening with Compositae plants	Compositae allergy	SL mix	No	Cobalt, nickel
2	48	Female	NZ European	Yes	No	Allergic contact dermatitis + atopic dermatitis (generalised)	Gardening with Compositae plants	Compositae allergy	SL mix, tansy, lichen acid, parthenolide	No	Cobalt, nickel, own Revlon Crème Make-up
3	30	Female	Not stated	Yes	Yes (Zoo keeper)	Allergic contact dermatitis (hands and face)	Zoo worker—occupational contact with Compositae plants	Compositae allergy	SL mix, parthenolide	Not tested	Thiuram
4	31	Female	Māori	Yes	No	Allergic contact dermatitis (generalised)	Airborne contact dermatitis to Compositae plants	Compositae allergy	Colophonium, SL mix, abeitic acid, SL mix 0.1%	No	-
5	44	Male	NZ European	Yes	No	Allergic contact dermatitis (hands)	Incidental exposure to Compositae plants	Compositae allergy	Yarrow, <i>Chrysanthemum cinerariaefolium</i> , tansy	Not tested	-
6	71	Male	NZ European	No	No	Pompholyx + allergic contact dermatitis (hands)	Gardening, plant types not identified	Compositae allergy	SL mix, parthenolide	Not tested	-

Table 3: Summary of patients with diagnosed contact allergy to plants (continued).

Case	Age at testing	Gender	Ethnicity	Atopy	Occupational	Clinical diagnosis and Localisation	Source of allergy	Plant allergy type	Positive plant marker reactions	Positive own plant product reactions	Other positive reactions
7	53	Male	Not stated	No	Yes (Shop keeper)	Allergic contact dermatitis (hands)	Greengrocer—occupational contact with plants	Compositae allergy	SL mix, tansy	Not tested	-
8	73	Male	NZ European	No	No	Psoriasis + allergic contact dermatitis (palmoplantar)	Gardening with Compositae plants	Compositae allergy	SL mix, parthenolide	Not tested	Lidocaine hydrochloride
9	60	Female	Korean	No	No	Allergic contact dermatitis (face)	Contact with pine tree resin	Colophonium (pine) allergy	Colophonium, <i>Myroxylon pereirae</i> , propolis, abeitic acid	No	Neomycin, nickel, tixocortol-1-pivalate
10	9	Female	NZ European	No	No	Allergic contact dermatitis (hands)	Contact with Christmas tree	Colophonium (pine) allergy	Colophonium	Not tested	-

extracts may also be used in cosmetics (eg, calendula oil).

Botanical cosmetics and topical botanical products were the most common exposures responsible for allergy overall, rather than the plants themselves. The most common medical or cosmetic motivation for using topical botanical products was as moisturiser (face and body creams), such as to manage eczema. A Belgian study had a lower sensitisation rate of 0.8% to topical herbal medicines, though definitions of topical botanical products may vary between studies.⁶ The Belgian study also showed that many patients did not react to the commercial allergens in the patch series, but only to the products used. This suggests testing of patients' own cosmetic and other topical products is vital, particularly considering that botanical allergens not available in our botanical series, including those related to rongoā Māori medicine, are increasingly being used in topical skin care products on the New Zealand market.^{17,18}

The plant series used in our centre are based on international data on sensitisation. Plants common in the northern hemisphere may be less relevant for New Zealand, and testing patients' own plant products is paramount to discover unsuspected allergens.⁶ Although there is little data on the epidemiology of plant allergy in New Zealand, in a 2001 publication Grieg and Rademaker observed that in their clinical experience most New Zealand allergic reactions are due to exotic species, such as tulips, daffodils and grevillea.¹⁹ *Primula obconica*, introduced to New Zealand in 1993, has caused a number of allergic reactions, and *Toxicodendron succedaneum* (Rhus tree) is a significant problem in the North Island, having caused 20 cases of phytodermatitis at Grieg and Rademaker's centre in 1993. New Zealand case reports on phytodermatitis include *Lavandula angustifolia* (lavender), *Ficus carica* (fig tree), *Grevillea robusta* (grevillea), *Toxicodendron succedaneum* (Rhus tree), *Heracleum mantegazzianum* (hogsbane), *Hydrangea macrophylla* (hydrangea), *Actinidia chinensis* (kiwifruit vine), *Toxicodendron radicans* (poison ivy and poison oak) and *Asparagus officinalis* (asparagus).^{20–27} Data suggest that cross-sensitisation from SL mix may pick up sensitivity to relevant plants in New

Zealand. However, our patch-test data are still limited in the testing of New Zealand native plants.

Little clinical data are available about potential plant allergy related to rongoā (traditional Māori medicinal practices), and Māori patients who may be more likely to have these exposures are underrepresented in our patch testing population. Plants such as *Piper excelsum* (kawakawa), *Phormium tenax* (harakeke), *Pseudowintera colorata* (horopito), *Pomaderris kumeraho* (kūmarahou) and *Leptospermum scoparium* (mānuka) are culturally significant and traditionally used in rongoā, and now they are more commonly incorporated into proprietary products such as eczema creams and moisturisers.²⁸ Although these plants are not included in our plant-testing series, there may be some cross-reactivity with existing plant markers: for example, mānuka oil, horopito and kawakawa contain terpene derivatives that may cross react with colophonium and *Myroxylon pereirae*.^{28,29} We found just one case of allergic contact dermatitis to a native New Zealand plant in the literature, with a woman reacting to *Pseudowintera colorata* (horopito).³⁰ The leaves of horopito are used in rongoā to treat fungal skin infections, venereal diseases, stomach pain and diarrhoea.³¹

In addition to New Zealand native plants, *Melaleuca alternifolia* (tea tree oil) may be of particular relevance in Australasia. Allergy to *Melaleuca alternifolia* has been identified at much higher rates in Australia (3%) compared to North American and European groups, where prevalence is reported at 0.1–0.15%. Older Australian studies have found rates of up to 3–5% and this has led to inclusion of melaleuca oil in the Australian Baseline Series.¹⁰ This Australian plant-derived essential oil from the family Myrtaceae is frequently used in herbal and traditional medicines of Australia and New Zealand and may also be relevant to our population. We found five cases of *Melaleuca alternifolia* sensitisation in our population with exposures including cosmetics and essential oils.

In a 2018 Danish study, SL was among the top seven allergens associated with polysensitisation (sensitisation to multiple allergens on patch testing).⁸ Meta-analysis of contact allergy in 28 studies from 2007 to 2017 in

Europe and North America also reported that there is significant cross-reactivity between Compositae mix and fragrance mix, *Myroxylon pereirae* and colophonium.³² Our centre shows similar polysensitisation rates: 72.7% of the plant allergy cases reacted to more than one plant allergen, and 54.5% reacted to more than two plant allergens.

A Singaporean study conducted on ten patients with contact dermatitis to topical traditional Chinese herbal medicine found three cases of allergic contact dermatitis with reactions to *Myroxylon perierae* and fragrance mix I.³³ Chinese herbal plant extracts notably contain terpenes (eg, camphor and menthol) known to cross-react with colophonium (terpene family) and *Myroxylon pereirae* (terpene family), as well as essential oils (eg, eucalyptus and cinnamon), suggesting cross-reaction to plant allergens in our baseline series may pick up allergy to plant allergens in traditional medicine. Asian patients were also over-represented in our cohort. This may be related to high eczema rates in Asians, a yet uncharacterised susceptibility to contact allergy or cultural factors, including use of plants in Chinese traditional medicines.³⁴

Our study has a number of limitations. Firstly, in some cases the retrospective design with data collected from clinical

notes led to difficulty interpreting the relevance of plant reactions. Often the specific plant species of exposure was unknown or not documented. Additionally, patients are only patch tested to additional allergen series where there is clinical suspicion of allergy, and for practical reasons the full plant series is not tested sequentially. Untested allergens are assumed to be negative, but this may result in a falsely low sensitisation rate. Due to limitations in clinic staffing, the final reading changed from day five to day seven in 2018. The ideal timing for final patch test readings is day three or four and day seven.¹⁴ The late reading at our centre may lower sensitisation rates.

In summary, we report a sensitisation rate of 12.9% to plant allergens in a New Zealand tertiary referral population. The most frequent reactions were to terpenes (*Myroxylon pereirae* and colophonium), with the most frequent exposures to these being botanical ingredients in cosmetics and personal care products. Of those with true plant allergy, Compositae plants were the most frequent culprits, followed by pine. Further research is needed into the potential for irritant reactions and sensitisation to New Zealand native plants, particularly those of cultural importance in traditional Māori medicine.

Appendix

Appendix Table 1: Plant allergens used in sequential and additional testing at Auckland City Hospital.

Series	Allergen name	Concentration and vehicle
Baseline	Colophonium	20.0% pet
	<i>Myroxylon pereirae</i>	25.0% pet
	Sesquiterpene lactone mix	0.1% pet
	Propolis	10.0% pet
Fragrance	Cinnamal	1.0% pet
	Cinnamyl alcohol	2.0% pet
	Amyl cinnamyl	2.0% pet
	Eugenol	2.0% pet
	Isoeugenol	2.0% pet
	Geraniol	2.0% pet
	Oakmoss absolute	2.0% pet
	Hydroxycitronellal	2.0% pet
	<i>Narcissus poeticus</i>	2.0% pet
	Vanillin	10.0% pet
	Lavender absolute	2.0% pet
	Cananga oil	2.0% pet
	Rose oil absolute	2.0% pet
	Ylang-ylang oil	2.0% pet
	Geranium oil bourbon	2.0% pet
	Jasmine absolute, Egyptian	2.0% pet
	Sandalwood oil, Indian	2.0% pet
	Citral	2.0% pet
	Farnesol	5.0% pet
	Citronellol	1.0% pet
	Hexyl cinnamic aldehyde	10.0% pet
	Coumarin	5.0% pet
	Fragrance mix II	14.0% pet
	Hydroperoxide of limonene	0.3% pet
	Hydroperoxide of linalool	1.0% pet

Appendix Table 1: Plant allergens used in sequential and additional testing at Auckland City Hospital.

Series	Allergen name	Concentration and vehicle
Plant	<i>Chamomilla romana</i>	1.0% pet
	Diallyl disulphide	1.0% pet
	<i>Arnica montana</i>	0,5% pet
	<i>Taraxacum officinale</i>	2.5% pet
	<i>Achillea millefolium</i>	1.0% pet
	Propolis	10.0% pet
	<i>Chrysanthemum cinerariaefolium</i>	1.0% pet
	Sesquiterpene lactone mix	0.1% pet
	Alpha-methylene-gamma-butyrolactone	0.01% pet
	<i>Tanacetum vulgare</i>	1.0% pet
	Alantolactone	0.033% pet
	Lichen acid mix	0.3% pet
	Parthenolide	0.1% pet
	<i>Chamomilla recutita</i>	1.0% pet
	Usnic acid	0.1% pet
	Atronorin	0.1% pet
	Evernic acid	0.1% pet

Competing interests:

Nil.

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