69 Plants

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Core Messages

- Occupational skin reactions to plants are common, and under-reported.
- Reactions may be irritant, phototoxic, urticarial, or allergic.
- Correct identification of the plant is essential. Do not patch test "blind" with an unknown plant as it may cause chemical burns or sensitize the patient.
- Urticaria may be chemically or immunologically induced.
- Phototoxic reactions are confined to areas exposed to plant material plus UV light. They can be prevented by adequate photoprotection.
- Most allergic reactions are caused by a small number of plant families, including Anacardiaceae (e.g., poison ivy) and Compositae or Asteraceae (e.g., chrysanthemum).
- Patch testing should be performed in departments with expertise in the technique, using commercially available plant allergens where possible and testing controls to suspected "new" plant allergens.

1 Introduction

Plants are essential to our existence; we eat them, grow them for ornament, wear clothes derived from them, and use plant products in cosmetics, toiletries, and medicines. It is therefore not surprising that adverse reactions to plants can affect many different occupations (› *Table 69.1*). The proportion of occupational dermatitis due to plants is difficult to determine; reports range from 1% in Denmark (Halkier-Sorensen 1996) to 14.3% in South Carolina (Shmunes and Keil 1983). Plants are a more frequent cause of dermatitis in some occupations, notably floristry, forestry, agriculture, and horticulture. Allergic contact dermatitis to plants was attributable to occupation in 30.4% of patients in a series from Northern Spain (Cabanillas et al. 2006). Plant products are increasingly used in cosmetics and toiletries, and the prevalent desire for "natural" remedies puts aromatherapists, masseuses, and herbalists at risk of plant dermatitis.

Skin reactions to plants include irritancy, phototoxicity, urticaria (due to toxic substances in the plant), or allergic contact dermatitis. These mechanisms are discussed below, followed by a summary of the principal plant families causing allergic contact dermatitis and the major occupations at risk of plant toxicity and allergy. The subject was reviewed elegantly by JD Guin in the first edition of this textbook (Guin 2000).

Accurate Latin identification of the suspected plant is highly desirable, but sometimes difficult. It is useful to have illustrated copies of the local wild and garden flora in the clinic. Remember that the same common name is often applied to several different plant species. If the patient is asked to bring in plant material for testing, stress that each plant sample should be packaged separately to avoid cross-contamination of potential allergens. If you wish to send plant material for botanical identification, it is best to dry it, e.g., lightly compressed between paper towels; a botanist will not be pleased to receive a soggy mass of decayed plant soup in a sealed polythene bag! Good photographs showing the plant habit, details of leaves and flowers, are invaluable.

A careful clinical history and examination should help to elucidate the type of clinical reaction. Patch testing is only helpful when allergic dermatitis is suspected. Never patch test with an unknown plant; there is a risk of inducing chemical burns or sensitizing the patient. Initially screen the patient with commercially available plant allergens as well as a baseline series which may often give clues to plant allergens. Before reporting "new" plant allergens it is important to test the suspected plant for irritancy in control individuals.

Several textbooks (sadly mostly out of print) have been written on plant dermatoses. The major ones are listed below (Mitchell and Rook 1979; Benezra et al. 1985; Hausen 1988; Ott 1991; Lovell 1993; Avalos and Maibach 2007). A useful historical database of dermatitic species, based on Mitchell and Rook, is available on the Internet (Schmidt 2001).

T. Rustemeyer, P. Elsner, S.M. John & H.I. Maibach (eds.), *Kanerva's Occupational Dermatology*,
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Table 69.1
Some occupations exposed to plants and plant products

Gardeners, horticulturalists, nursery workers, fruit pickers
Farmers, agricultural workers (e.g., Compositae, notably *Parthenium hysterophorus*)
Florists, flower arrangers, flower pickers, packers
Botanists, naturalists, laboratory workers
Herbalists, aromatherapists (*Fig. 69.1*), masseurs, homeopaths
Pharmacists, pharmacologists, organic chemists, plant biochemists
Dentists (e.g., oil of cloves), veterinary surgeons (plant contaminants in animal fur)
Perfumers (e.g., essential oils, lichen acids), beauticians, cosmetologists
Food handlers, chefs, sandwich makers, food/grain processing workers
Bar tenders (e.g., mint in cocktails)
Sports (e.g., golf, fishing, climbing)
Military (plant exposure on exercise, dhobi marking)
Delivery drivers, packers
Tobacco workers
Musicians (e.g., cane reeds used for saxophones/clarinets, tropical hardwood recorders)
Office workers (e.g., foliage plants such as *Philodendron, Schefflera*)
Textile/flax workers
Beekeepers (propolis)
Toddy tappers (Sri Lanka – frictional dermatitis)

Fig. 69.1
A selection of aromatherapy oils

2 Irritancy

2.1 Mechanical

Several plants are armed with spines or hooks as a defense against predation (Lovell 1993; Modi et al. 2009). Hairs (trichomes) on the plant surface may also discourage predators, and also facilitate trapping water, notably in desert regions. Penetration of the skin by thorns may facilitate entry of microorganisms, e.g., sporotrichosis, and *Mycobacterium ulcerans* in the tropics. Farmers and agricultural workers walking barefoot are especially at risk.

Many gardeners handling tomato seedlings will notice tingling of the fingers, but repeated handling of hair-bearing herbs such as borage *(Borago officinalis)* may induce irritant contact dermatitis. Cacti such as *Opuntia ficus indica* possess tufts of small spines (glochids) which can induce pruritus in operatives harvesting the fruit (e.g., Sabra dermatitis in prickly pear pickers). Mechanical and chemical irritation of the skin can enhance the penetration of potential allergens.

2.2 Chemical

Many plants contain chemical irritants in the sap (latex), which may drip from uninjured leaves (guttation fluid), or housed in specific organelles which release chemical irritants on trauma. Examples include chicory shoots (chicons) which release irritant milky fluid on cutting (Rycroft 1993) (*Figs. 69.2* and *69.3*). The Euphorbiaceae (spurge family) contain many species which induce severe irritancy on skin contact and conjunctival irritation or even blindness; these include the manchineel tree (*Hippomane mancinella*) and many ornamental garden plants and weeds; the unsuspecting gardener is particularly at risk. Several bulb species contain calcium oxalate crystals in the bulb and flower stem, inducing irritant contact dermatitis in pickers and bulb handlers, e.g., "daffodil itch" (Julian and Bowers 1997). Members of the arum family (Araceae) can induce severe chemical irritation, even leading to cutaneous necrosis. An example is the dumb cane, *Dieffenbachia*, commonly sold by florists and used as an ornamental house or office plant. In addition to calcium oxalate crystals, the irritants include matrix metalloproteinases (Mirastschijski et al. 2010). Some genera possess urticant hairs (see Urticaria below).

Because of the potential irritancy of many plant species, an unknown plant should never be applied to the

Fig. 69.2
Processing of chicory

Fig. 69.3
Sap exuding from broken chicon

patient's skin under patch test conditions. In addition to the risk of chemical burns, there is a risk of active sensitization to the plant.

3 Phytophotodermatitis

This term refers to a toxic eruption induced by contact with furocoumarins in plant sap and exposure to ultraviolet light. Furocoumarins are heterocyclic compounds

Table 69.2
Distinctions between phototoxicity and allergic contact dermatitis

Phototoxicity	Allergic contact dermatitis
All lesions develop simultaneously	Lesions may gradually evolve
Sharply demarcated to light-exposed areas	Not restricted to light-exposed areas
Typically streaky, vesicular, or bullous	May be streaky, erythematous, but can be vesicular or bullous
Often painful	Pruritic
Hyperpigmentation, may persist for months	Minimal, if any hyperpigmentation
Common in children	Typically resolves with scaling
	Commoner in adults
	Recurrent episodes typical

formed by fusion of a furan ring with coumarin (benz-α-pyrone). They appear to act as natural fungicides in the plant, and their concentration may be increased if the plant is injured. They are found in several members of the umbellifer family (Apiaceae), which include parsley, celery and parsnip, Rutaceae, including rue, citrus fruit, and burning bush (*Dictamnus*), and Moraceae (*Ficus carica* – fig tree). Phototoxic reactions are typically linear (caused by brushing against the plant with bare skin and subsequent exposure to UVA), dusky red and bullous, later becoming hyperpigmented. The distinguishing features from allergic contact dermatitis are outlined in *Table 69.2*. The hyperpigmentation has been used in folk medicine in many cultures to treat vitiligo and is the basis of PUVA therapy in dermatology and some tanning remedies.

Children at play are particularly at risk of phototoxicity, and may be wrongly diagnosed as victims of child abuse. Horticultural and agricultural workers frequently present with phototoxic reactions, when working scantily clad in sunny weather (*Figs. 69.4* and *69.5*). Atypical patterns include a more widespread maculopapular eruption caused by release of plant sap by string trimmers ("strimmer rash") (Oakley et al. 1986; Reynolds et al. 1991) or spray from food processing machines (*Fig. 69.6*). Phototoxic reactions to citrus fruit include "berlock" or "breloque" dermatitis from application of oil of bergamot from *Citrus bergamia* and exposure to limes in catering and bar work. Fig harvesters may develop phototoxicity and even photoallergic dermatitis

Fig. 69.4
Bullous phototoxic reaction after harvesting parsnips in summer

Fig. 69.5
Phototoxic reaction to rue. This decorator was painting a window, wearing shorts and calf-length boots, whilst leaning against a rue bush

to furocoumarins (Bonamonte et al. 2010). The condition can be prevented by adequate photoprotection with clothing and sunscreens effective in the UVA range (Vale 1993).

4 Urticaria

4.1 Chemical

The term "urticaria" (hives) is derived from the stinging nettle (*Urtica* spp) (*Fig. 69.7*) which injects toxins into the skin from sharp hairs (emergences) on the surface of the plant. This acts as a defense against predation. The hairs themselves elicit a mechanical irritant reaction (Cummings and Olsen 2011). The toxic chemicals include histamine (which induces urticarial weals), acetylcholine, and 5-hydroxytryptamine and also a neurotoxin which can cause delayed dysesthesia (Oliver et al. 1991; Anderson et al. 2003).

Other stinging plants include *Laportea* spp and members of the Loasaceae, mostly found in South America (Thurston and Lersten 1969). Agricultural and horticultural workers are chiefly at risk. The reactions are often trivial but may be severe with some tropical and subtropical species, notably *Dendrocnide* in Australasia.

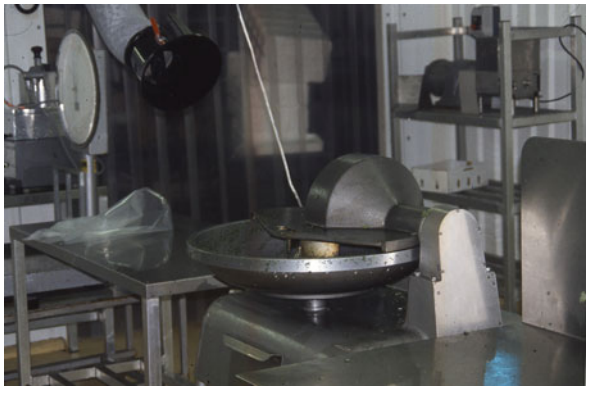

Fig. 69.6
Parsley processing mill

4.2 Immunological

Immediate type 1 reactions occur in individuals who have been previously sensitized to the plant or plant product. Irritant hairs on the plant surface enhance the penetration of the antigen. Food handlers are especially at risk, perhaps aggravated by wet working conditions leading to

Fig. 69.7
Urtica dioica

maceration of the skin, however gardeners and agriculturalists are also at risk. Even office workers may be sensitized to house plants such as *Ficus benjamina* (Pradalier et al. 2004) Health-care workers in particular are at risk of sensitization to hevein in rubber latex, derived from the sap of *Hevea brasiliensis*, although operatives tapping the trees to extract the sap are also at risk. Cross-reaction may occur with fruits, including banana and avocado.

Allergenic proteins in several fruits, vegetables, and nuts are implicated (Amaro and Goossens 2008). Type 1 reactions may present as an exacerbation of chronic dermatitis (protein contact dermatitis); patch tests are typically negative, but prick tests positive (Levin and Warshaw 2008). Some plants reported to cause immunological contact urticaria are listed in *Table 69.3*. Oral allergy syndrome may be induced by profilins. These are found in many plants, especially in the pollen. Different profilins share IgE epitopes, explaining the frequent cross-reaction between widely diverse plant species (Sirvent et al. 2011). Detecting IgE antibodies to a single representative profilin is often sufficient to diagnose or exclude profilin sensitivity (Villalta and Asero 2010).

Reactions range from urticaria to life-threatening anaphylaxis, e.g., from ingesting peanuts, and the severity of the reaction may be enhanced by exercise. Plant food additives may put food handlers at risk of urticaria, asthma, or anaphylaxis, including the increasing use of sesame seeds and flour derived from lupine (*Lupinus*) in bakeries (Hieta et al. 2009; Campbell and Yates 2010). Prick testing with the suspected plant material is

Table 69.3
Plants or plant products reported to cause immunological contact urticaria or anaphylaxis (Lovell 1993)

Vegetables/herbs	Beans (alfalfa, chick peas, runner beans, winged bean (*Psophocarpus*), Cabbage, carrot, cauliflower, celery, chives, coriander, caraway, cumin, cucumber, dill, endive, garlic, bell pepper, leek, lettuce, mustard, onion, parsley, parsnip, potato, rapeseed, shallot, spinach, thyme, tomato, watercress
Fruits	Apple, apricot, banana, grapefruit, kiwi fruit, lemon, mango, melon, orange, pineapple, strawberry
Spices	Cinnamon
Nuts	Tree nuts, almond, hazel, brazil, peanuts
Other economic plants	Coffee, *Cannabis*, cotton, rubber tree (*Hevea*), hop, henna, flax, castor oil plant, *Semecarpus anacardium* (source of Dhobi mark)
Essential oils	Sesame oil
Cosmetic ingredients	Balsam of Peru, lime extract in shampoos
Grasses/cereals	Wheat, maize, barley, rye
Herbaceous plants	Ivy, iris, *Blumea gariepina* (South Africa), *Tanacetum cinerariifolium*, *Monstera deliciosa* (edible fruit in tropics), *Salsola kali* (tumbleweed), *Trifolium pratense* (red clover), tulips, chrysanthemums, *Bougainvillea*
Shrubs	*Agave*, *Cornus sanguineus* (bloodtwig dogwood), *Cotoneaster*, *Crataegus* (hawthorn), *Grevillea juniperifolia*, *Hakea suaveolens* (Australia)
Algae	*Lyngbya majuscula*
Lichens	
Horsetails	*Equisetum*
Trees and woods	Birch, Indian rosewood (*Dalbergia latifolia*), *Eucalyptus*, larch, Philippine red mahogany *(Shorea)*, teak (*Tectonia grandis*), Limba tree (*Terminalia superba*), *Thuya plicata* (arborvitae, western red cedar), obeche/abachi *(Triplochiton scleroxylon)*

usually diagnostic. Although generally a safe procedure, it should always be performed where resuscitation facilities are available, in view of the rare risk of anaphylaxis, e.g., to henna or some nuts (van de Scheur and Bruynzeel 2004).

5 Allergic Contact Dermatitis

5.1 Introduction

Relatively few plant families are major causes of allergic contact dermatitis, although several species have been implicated in case reports (Table 69.4). Worldwide, the Anacardiaceae, including *Rhus (Toxicodendron)* (poison ivy, poison oak) and Compositae or Asteraceae, daisy family, predominate. Other significant genera include *Primula*, *Hedera helix* (ivy), bulbous genera such as *Tulipa*, and the related *Alstroemeria*. Tropical hardwoods and ingredients of plant-derived fragrance materials and colophony from pine trees are also important allergens.

Sensitization can follow repeated exposure to the plant (Fig. 69.8), and florists (see Chap. 152, "Florists") and gardeners (see Chap. 157, "Gardeners") are especially at risk. Typically a pruritic eruption develops in a streaky pattern within 24–48 h of reexposure; it may be bullous and may evolve gradually over a few days, perhaps due to persistence of the allergen. Several clinical features distinguish it from phototoxicity (Table 69.2). Tulip bulb handlers develop hyperkeratotic fissured areas on the finger tips and cooks develop a similar eruption affecting the thumb, index, and middle finger tips of the nondominant hand, caused by garlic (Fig. 69.9).

Some plant allergens are volatile, inducing an airborne pattern of dermatitis; in others, e.g., Compositae, the allergens are transferred through airborne particles on the plant surface (Paulsen et al. 2007), or by finger contact with the face or penis. Contact allergy to quinones such as primin and allergens in some tropical hardwoods may present as an erythema multiforme-like eruption. Although airborne contact dermatitis may result in photosensitivity (chronic actinic dermatitis), true photoallergy to plants is very rare; exceptions include photosensitization to psoralens in figs (*Ficus carica*) (Bonamonte et al. 2010) and possibly *Parthenium hysterophorus* in India (Lakshmi and Srinivas 2007; Kar et al. 2009).

Reactions may be severe, requiring potent topical steroids, even on the face for short periods and often systemic prednisolone (30–60 mg od).

Table 69.4
Some plant families implicated in allergic contact dermatitis

Important families: Anacardiaceae (including poison ivy/oak)
Compositae (Asteraceae)
Primulaceae (*Primula obconica)*
Araliaceae (ivy)
Lamiaceae/Labiatae (mint, thyme, lavender, sage)
Alstroemeriaceae (*Alstroemeria*)
Liliaceae (tulip, lily)
Alliaceae (garlic, onion)
Jubulaceae (liverworts, e.g., *Frullania*)
Lichens (*Evernia, Parmelia*, etc.)
Cupressaceae and Pinaceae (conifers)
Tropical hardwood families, including Dipterocarpaceae, Sterculiaceae, Burseraceae, Meliaceae, Leguminosae, Sapotaceae, Ebenaceae, Bignoniaceae, Verbenaceae, Lauraceae, Hernandiaceae, Proteaceae (*Grevillea*), Thymelaceae, Moraceae.
Other families reported to cause allergic reactions: Magnoliaceae, Illiciaceae (star anise), Annonaceae (ylang ylang), Papaveraceae (*Meconopsis cambrica)*, Brassicaceae/Cruciferae (black mustard, radish), Capparidaceae (caper), Cistaceae (*Cistus*), Cactaceae (*Schlumbergia*), Caryophyllaceae (carnation), Malvaceae (okra), Linaceae (flax), Zygophyllaceae (creosote bush), Geraniaceae (*Pelargonium*), Rutaceae (citrus fruit), Burseraceae (olibanum), Vitaceae (grape), Hippocastanaceae (horse chestnut), Aceraceae (maple), Saxifragaceae (*Tolmeia*), Hydrangeaceae (hydrangea), Hamamelidaceae (storax), Myrtaceae (tea tree, *Eucalyptus*), Lecythidaceae (brazil nut), Lythraceae (henna), Apiaceae/Umbelliferae (carrot, *Centella asiatica*), Rubiaceae (coffee, madder), Styraceae (styrax), Oleaceae (olive, jasmine), Apocyanaceae (periwinkle), Hydrophyllaceae (*Phacelia, Wigandia*), Solanaceae (*Capsicum*, tobacco), Gesneriaceae (*Streptocarpus*), Pedaliaceae (sesame), Myristicaceae (nutmeg, mace), Lauraceae (sweet bay, cinnamon), Santalaceae (sandalwood), Euphorbiaceae (poinsettia), Buxaceae (*Simmondsia*), Cannabinaceae (hop, cannabis), Juglandaceae (walnut), Fagaceae (oak), Salicaceae (poplar), Orchidaceae (vanilla), Zingiberaceae (ginger, myoga), Dioscoraceae (yam), Aloeaceae (aloe), Asparagaceae (asparagus), Agavaceae (agave, century plant), Hyacinthaceae (hyacinth), Amaryllidaceae (*Narcissus*), Iridaceae (iris), Commelinaceae (*Tradescantia*), Palmaceae (palms), Araceae (*Philodendron, Epipremnum*), Graminaceae (grasses, cereals), Ginkgoaceae (*Ginkgo*), ferns (Dryopteridaceae, Oleandraceae).

Fig. 69.8
Mass production of bedding plants

Fig. 69.9
Fingertip dermatitis in non-dominant hand due to garlic (patient is *left-handed*)

5.2 Chemistry of Plant Allergens

The chemistry of the major plant allergens can be classified according to their chemical structures (Benezra and Ducombs 1987). Lipophilic phenol derivatives include urushiol in poison ivy and related phenols in *Gingko* and *Grevillea*. They are prohaptens, being converted to allergenic electrophilic haptens after they penetrate the skin. Lactones include over several hundred Sesquiterpene lactones, found especially in Compositae (daisy family). Quinones include primin (in *Primula obconica*) and several tropical woods. Terpenes are found in conifers (e.g., allergens in colophony) and many essential oils (e.g., limonene in lemon rind). Terpenes such as linalool are important causes of fragrance allergy; oxidization renders them allergenic (Karlberg et al. 2008; Christensson et al. 2010).

5.3 Investigation of the Patient with Suspected Plant Contact Dermatitis

A careful clinical and occupational history should be taken. A site visit may be necessary. Patch testing in a specialized dermatology department is the most definitive investigation, but it is fraught with problems. The patient may bring a vast array of poorly identified plants. Patch testing "blind" with plant material carries a significant risk of chemical burns due to irritancy, or active sensitization of a previously unsensitized patient, notably to *Alstroemeria, Primula obconica*, or Anacardiaceae. Where possible, it is desirable to test using purified allergens, e.g., primin (a screen for *Primula obconica)*, α-methylene γ-butyrolactone (in tulips and *Alstroemeria*), diallyldisulphide (garlic), and the sesquiterpene lactone mix (a screen for Compositae). Testing with a standard series may also give clues to possible plant allergy, e.g., fragrance allergens, propolis, and colophony. If sesquiterpene lactone mix is negative, and Compositae are suspected, test with Compositae mix and ideally specific compositae allergens such as parthenolide.

If testing with the plant is unavoidable, lightly crush leaves or petals and cut stalks into thin slices. Always identify the plant before testing and check that it is not a known irritant. Try not to test with several different plants at one time, multiple positive reactions may create an "angry back" or "excited skin" syndrome. If a positive patch test reaction is elicited to a plant, test 10–20 controls for irritancy.

Where possible, it is desirable to confirm a positive patch test to plant material by testing to extracts and ideally identifying the allergen. This can prove time-consuming, frustrating, and expensive. Inflammable organic solvents such as ethyl ether or methanol are often used to make extracts, and further purification requires chromatographic techniques including thin layer chromatography and high

pressure liquid chromatography. The precise chemical structure is identified using mass spectrometry and nuclear magnetic resonance (Lepoittevin 2000).

5.4 Specific Plant Families

5.4.1 Anacardiaceae

This family is probably the most important cause of allergic contact dermatitis worldwide. It includes *Rhus*, formerly *Toxicodendron*, *radicans*, and *toxicarium* (poison ivy and poison oak, respectively), major allergens in the USA, *Rhus succedaneum* (Fig. 69.10) and *vernicifluum* (Fig. 69.11) (sources of Japanese lacquer), *Anacardium occidentale*, the cashew nut tree, and *Mangifera indica* (mango), both cultivated in the tropics, and *Smodingium* in Southern Africa.

Fig. 69.10
Rhus succedaneum (Courtesy of Dr Sheila Powell)

Fig. 69.11
Rhus verniciflua

Dermatitis can be severe (Fig. 69.12), often starting on the face and later extending to the arms following delayed absorption of the allergen. Usually the affected individual will have worked or taken recreation in woodland or the garden. The eruption may be elicited by contact with contaminated animal fur or fomites such as clothing worn by others. The sap hardens and turns black on the skin, where it persists; even the hardened resin is allergenic, and it is important to wash the contaminated area, ideally with soap and water or an organic solvent, as soon as possible after contact (Boelman 2010; Paniaqua and Bean 2011). The black spot test can be used in the field to distinguish toxic *Rhus* species from similar-looking innocuous plants (Guin et al. 1981). The allergens are not transmitted by pollen. Systemic contact dermatitis can be induced by ingestion, notably *Rhus* added to chicken as a health food in Korea (Yoo et al. 2010) in individuals previously sensitized to lacquer.

The allergens are alk(en)yl catechols (urushiols); allergenicity depends in part on the number of double bonds in the side chains (Johnson et al. 1972). Similar allergens are found in Grevillea species (Fig. 69.13).

Prevention ideally involves avoidance of plant contact, a counsel of perfection in rural parts of the USA. Barrier creams such as quaternium bentonite or antigen binding agents such as Stokogard may be helpful (Orchard et al. 1986). Hyposensitization was previously attempted but is no longer current practice. However, some individuals working with Anacardiaceae woods appear to become tolerant to the allergen.

5.4.2 Compositae/Asteraceae

The daisy family is one of the largest, with over 22,750 known species, and a worldwide distribution.

Fig. 69.12
Allergic dermatitis from *Rhus toxicodendron*

Many species are weeds. Accidental introduction of *Parthenium hysterophorus*, a Texan native, in grain to India has created major outbreaks of dermatitis in rural areas; the species has also spread to Queensland, and several African countries, where it can decimate sorghum crops. Similarly, the introduction of South African genera such as *Arctotheca* to Australia has led to airborne "bush" dermatitis in farmers and the Mediterranean *Dittrichia graveolens* is naturalized in California.

The major allergens are sesquiterpene lactones, of which there are more than 1,600, which sometimes, but not always, cross-react on patch testing. Sesquiterpene lactones are found in botanically unrelated plants such as the liverwort genus *Frullania*, which has caused airborne dermatitis in foresters and woodworkers (Fernandez de Corres 1984), sweet bay (*Laurus nobilis*), and *Magnolia spp.*

In a survey of Danish greenhouse workers, 19% reported skin or mucosal symptoms related to Compositae and 10% exhibited positive patch tests to Compositae mix or sesquiterpene lactone mix (Paulsen et al. 1998).

Typically, Compositae dermatitis presents in the elderly male hobby gardener growing chrysanthemums (*Dendranthema*), although occupational dermatitis affects a younger population with a greater female predominance (Paulsen et al. 1998). Chrysanthemums are "disbudded" manually in nurseries; the operative removes the central growth point manually to achieve a more bushy plant. Compositae dermatitis may initially affect the hands and arms, but typically spreads to the face and neck, imitating photosensitivity but involving skin folds and "Wilkinson's triangle" behind the ears. The facial skin often becomes thickened and furrowed (leonine facies). Rarely, the patient may become erythrodermic, notably in patients exposed to *Parthenium hysterophorus* (Agarwal et al. 2008, Agarwal and D'Souza 2009). In temperate climates the eruption is seasonal, when the plants are in maximal growth.

Later, the patient may develop true photosensitive eczema (chronic actinic dermatitis), confirmed on phototesting (Beach and Pratt 2009). It has been postulated that sesquiterpene lactones react with thymine/thymidine to form [2 + 2] photoadducts in high yields, perhaps explaining the transition from contact allergy to photosensitivity (Lepoittevin and Berl 2009). However, other allergens, including colophony and para-phenylene diamine (Chew et al. 2010), also predispose to chronic actinic dermatitis. If the individual avoids the allergen, the photosensitivity can improve with time. True

Fig. 69.13
***Grevillea* cv Robyn Gordon**

Fig. 69.14
Airborne allergic contact dermatitis from compositae in an Ethiopian farmer

photosensitivity to Compositae may occur in individuals exposed to *Parthenium hysterophorus* (Kar et al. 2009).

In addition to gardeners, farmers (Fig. 69.14), and florists, herbalists and food handlers may become sensitized to Compositae extracts in medicines and aromatherapy oils and vegetables such as lettuce, chicory, and artichokes.

A diagnosis of Compositae dermatitis can usually be made with a positive patch test to the sesquiterpene lactone (SL) mix, which contains three molecularly dissimilar lactones, alantolactone (found in many species, notably Inula helenium (Fig. 69.15)), costunolide, and dehydrocostus lactone (each 0.1%) in petrolatum. However, European studies have shown that this mix fails to detect allergy to some Compositae such as dandelion (*Taraxacum officinale*), and sensitivity was increased by adding a mixture of Compositae plant extracts (Compositae mix) (von der Werth et al. 1999). However, Compositae mix carries a small risk of active sensitization and may produce irritant reactions at 6%. Paulsen and Andersen (2011) advocate testing the SL mix together with parthenolide (0.1% or possibly 0.033%) in the baseline series to improve the detection rate.

Fig. 69.15
Inula helenium

5.4.3 Primulaceae

The typical streaky eruption on the hands and arms induced by allergy to *Primula obconica* is now becoming rare in northern Europe, since the development of new cultivar strains such as "Touch me" and "Libre" which are almost primin-free (Connolly et al. 2004; Zachariae et al. 2007). Scattered case reports still occur. The eruption may mimic erythema multiforme or herpes simplex and can present with facial involvement due to airborne allergen. Primula dermatitis mostly affects amateur growers although florists and professional gardeners are also affected. Other species of *Primula*, including *P. auricula*, are cultivated by alpine gardeners and nurserymen, and can induce a similar pattern of dermatitis; the allergen(s) are currently undetermined, although primin is not the culprit. Some growers report becoming tolerant to the plants after repeated handling (Aplin and Lovell 2001).

5.4.4 Other Plant Allergens

Alstroemeria cultivars are a significant cause of allergic dermatitis in florists (see Chap. 152, "Florists"). The allergen, tuliposide A, is also found in tulip bulbs (*Tulipa cvs*).

Fingertip dermatitis from bulbs can be irritant or allergic or both. Garlic *(Allium sativum)* bulbs characteristically cause a fissured hyperkeratotic eruption on the fingertips of the nondominant hand in chefs, although it can cause a more widespread eruption. The major allergen is diallyldisulphide (Bordel-Gomez and Mirando-Romero 2008).

Common ivy (*Hedera helix cvs*) (Fig. 69.16) is botanically unrelated to poison ivy (*Rhus)*. However, it is an important and probably under-recorded cause of allergic contact dermatitis in gardeners and greenhouse workers. Currently, ivy is grown intensively for use as a houseplant. The major allergen is falcarinol, which is also found in carrots and celery, causing allergy in food handlers. The dermatitis can be florid and edematous (Fig. 69.17), with facial involvement (Paulsen et al. 2010). Unfortunately falcarinol is not currently available as a screening allergen. Lichens are dual organisms, reflecting a symbiotic relationship between an alga and a fungus. Lichens may cause allergic dermatitis in foresters and lumberjacks. Several species are used in perfumery, e.g., oakmoss (Schalock 2009), and positive patch test reactions to fragrance mix 1 may reflect occupational sensitization to lichens in farmers (Bilcha et al. 2010). Other plant allergens are listed in Table 69.4 and outlined in Chaps. 152, "Florists" and 157, "Gardeners.".

Fig. 69.16
Ivy leaf

Fig. 69.18
Collecting rosin from pine trees

Fig. 69.17
Bullous allergic contact dermatitis from Hedera helix

6 Occupations at Risk

A bewildering array of occupations are at risk of plant dermatoses (Rycroft 1993). The major ones are listed in *Table 69.1*. Outdoor workers such as gardeners, farmers, construction workers, and foresters predominate. Food handlers and bartenders are exposed to fruits (especially citrus) and vegetables, and may present with protein contact dermatitis. Beekeepers may be sensitized to propolis, the glue derived from poplar tree buds, and used by bees to construct honeycombs. Colophony dermatitis can occur in operatives who tap the sap from pine trees (*Fig. 69.18*). Cosmetic handlers, masseuses, and aromatherapists become sensitized to essential oils derived from plants and these oils are also increasingly used in herbal medicines. Even office workers can be sensitized to "green" plants such as *Ficus benjamina* and *Schefflera.*

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