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IRRITANT AND SENSITIZING POTENTIAL OF SOME COMMON INDIAN CACTI, SUCCULENTS, LICHENS AND AQUATIC PLANTS

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Irritant potential of 3 cacti, *Opuntia dilenii*, *Rhispalis baccifera* and *Cereus peruvians*, and 4 succulents, *Euphorbia royleana*, *Euphorbia antiquorum*, *Sansevieria zeylanica* and *Agave sisalana* was tested by rubbing their freshly exposed pulp 10 times on the forearm skin of 10 human volunteers. *Opuntia dilenii*, *Euphorbia antiquorum*, *Rhispalis baccifera* and *Agave sisalana* produced transitory itching and burning or dermatitis in only one patient each, indicating that these plants are not highly irritant. Patch tests undertaken with the juice, pulp or other components of these plants as well as those of 5 lichens, *Parmelia trichotera*, *Parmelia sulcata*, *Parmelia quercina*, *Parmelia furfuracea* and *Parmelia verrucifera*, and 6 aquatic plants, *Nelumbo nucifera*, *Eichhornia crassipes*, *Trapa natans*, *Anabaena*, *Salvinia auriculata* and *Ceratophyllum demeusum* in 10 cases each revealed positive reactions with *Opuntia dilenii*, *Rhispalis baccifera*, *Cereus peruvians*, *Parmelia verrucifera*, *Nelumbo nucifera*, *Trapa natans*, *Salvinia auriculata* and *Ceratophyllum demeusum* in one case each, *Agave sisalana* and *Sansevieria zeylanica* in 2 cases each, *Euphorbia antiquorum*, *Parmelia trichotera*, *Parmelia quercina*, *Parmelia furfuracea* and *Eichhornia crassipes* in 3 cases each, and *Euphorbia royleana* and *Parmelia sulcata* in 4 cases each.

Key words : Contact hypersensitivity, Irritant potential, Cacti, Succulents, Lichens, Aquatic plants.

The Indian plants which commonly cause contact dermatitis include *Parthenium hysterophorus*, *Lantana camara*, *Calotropis procera*, *Argemone mexicana*, *Nerium variabilis* and *Acacia nilotica*.[1] Besides these, *Allium cepa* (onion), *Allium sativum* (garlic), *Daucus carota* (carrot) and *Lycopersicon esculentum* (tomato) are some of the vegetables which have been observed to cause contact dermatitis.[2] Information about the aquatic plants, lichens and cacti however, as a cause of contact dermatitis in India is by and large lacking; except for the monograph by Behl et al.[3]

Cacti and succulents are mostly grown as hedge plants in the farms or for decoration in the gardens and houses. Thus, the individuals likely to develop contact dermatitis with these plants include farmers, gardeners or those growing these plants as their hobby. Lichens mostly grow as greyish green, brown, red or black coloured incrustations on the tree trunks, rocks, or walls, especially in the humid areas and at high altitudes. Hence, persons like geologists, forest rangers, surveyors or those living in the hills get exposed, and are likely to develop contact dermatitis due to the lichens. The aquatic flora are likely to cause contact dermatitis in persons who enter the ponds and lakes where such plants grow. Such individuals include workers engaged to remove the fruits/weeds from the lakes and ponds, or those who come in contact with the submerged aquatic weeds in the rice fields.

Materials and Methods

This study was done with 3 cacti, 4 succulents, 5 lichens and 6 aquatic plants. The cacti and succulents were obtained from the gardens and road-side traffic islands, the lichens from

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the hilly Garhwal district of Uttar Pradesh, while the aquatic plants were obtained from the botanical garden.

The three cacti were, (1) *Opuntia dilenii*, (2) *Rhispalis baccifera*, and (3) *Cereus peruvians*. The four succulents were, (1)*Euphorbia royleana*, (2) *Euphorbia antiquorum*, (3) *Sansevieria zeylanica*, and (4) *Agave sisalana*. The five lichens were, (1) *Parmelia trichotera*, (2) *Parmelia sulcata*, (3) *Parmelia quercina*, (4) *Parmelia furfuracea*, and (5) *Parmelia verrucifera*. The six aquatic plants were, (1) *Nelumbo nucifera* (lotus), (2) *Eichhornia crassipes* (water hyacinth), (3) *Trapa natans* (Singhara), (4) *Anabaena* (blue-green algae), (5) *Salvinia auriculata*, and (6) *Ceratophyllum demeusum*.

The test for irritant potential was undertaken only for cacti and succulents. The freshly exposed surface of its pulp was rubbed 10 times in the same direction, on the forearm of the patient and the skin area was observed for any evidence of dermatitis during the next 48 hours.

The antigens for patch tests, in the case of cacti and succulents, were prepared by crushing the freshly obtained thick stems and straining the crushed material through a piece of cloth to get the juice. In addition, a 0.2 cm square thin slice of the pulp was also applied as such for patch test. In the case of aquatic plants, the antigens were prepared by crushing the freshly obtained leaves and other parts like rhizome and bladder wherever available, to form a homogenous paste. The antigens from lichens were also prepared by crushing the material to a homogenous paste. Each antigen was tested on 10 individuals, majority of whom had contact dermatitis due to air-borne plant antigens. A few patients had contact dermatitis due to other antigens such as garments, antibacterial agents, hair dyes etc.

Patch tests were undertaken according to standard techniques using the juice and the pulp as antigens in the case of cacti and succulents, and the paste in the case of lichens and aquatic plants.

Results

Of the 3 cacti and 4 succulents tested on 10 patients each for their irritant potential, *Opuntia dilenii* produced burning sensation in one patient which started 2 minutes after the application and lasted 30 seconds, *Euphorbia antiquorum* produced itching and burning in another patient which started 30 seconds after the application and lasted 10 minutes and *Rhispalis baccifera* produced itching, burning and erythema in one patient which started 5 minutes after the application and persisted for 20 minutes. *Agave sisalana* also produced itching in one patient which started 1 minute after the application and lasted 20 minutes. In the remaining patients, there was no reaction.

Results of patch tests with the various cacti, succulents, lichens and the aquatic plants are shown in table I.

Comments

Of the 3 cacti tested in this study, the pulp of *Opuntia dilenii* produced a buring sensation in one patient, while *Rhispalis baccifera* resulted in actual dermatitis in one patient. The third cactus *Cereus peruvians* did not produce dermatitis in any patient. The patch tests were positive in one case each with the juices of each of the three above-mentioned cacti used as such. There was only one patient who developed a significantly positive patch test with the pulp of *Rhispalis baccifera*, used as such for the test. The literature has no information on the irritant/sensitizing properties of the cacti tested by us, although related species such as *Opuntia ficus indica*, *Opuntia macrodasys* and *Cereus grandiflorus* have been reported to cause mechanical injury to the skin, or even an irritant dermatitis.[3-5]

Of the two *Euphorbia* succulents included in this study, *Euphorbia antiquorum* produced itching and burning sensation in one patient only,

Table I. Results of patch tests with the cacti, succulents, lichens and aquatic plants.

Cactus		Degree of patch test positivity				
		—	1+	2+	3+	4+
1. *Opuntia dilenii*	Juice	9	1	—	—	—
	Pulp	10	—	—	—	—
2. *Rhispalis baccifera*	Juice	9	—	1	—	—
	Pulp	9	—	1	—	—
3. *Cereus peruvians*	Juice	9	1	—	—	—
	Pulp	10	—	—	—	—
Succulents						
1. *Euphorbia royleana*	Juice	9	—	1	—	—
	Pulp	6	2	—	1	1
2. *Euphorbia antiquorum*	Juice	9	—	—	1	—
	Pulp	7	—	2	1	—
3. *Sansevieria zeylanica*	Juice	8	—	1	1	—
	Pulp	8	—	2	—	—
4. *Agave sisalana*	Juice	9	—	1	—	—
	Pulp	8	—	1	1	—
Lichens						
1. *Parmelia trichotera*		7	3	—	—	—
2. *Parmelia sulcata*		6	1	3	—	—
3. *Parmelia quercina*		7	—	2	1	—
4. *Parmelia furfuracea*		7	1	2	—	—
5. *Parmelia verrucifera*		9	—	1	—	—
Aquatic plants						
1. *Nelumbo nucifera* (lotus)		9	—	1	—	—
2. *Eichhornia crassipes* (water hyacinth)		7	2	—	1	—
3. *Trapa natans* (singhara)		9	—	1	—	—
4. *Anabaena* (blue-green algae)		10	—	—	—	—
5. *Salvinia auriculata*		9	—	1	—	—
6. *Ceratophyllum demeusum*		9	—	1	—	—

while *Euphorbia royleana* did not produce any irritant effect. The patch tests however, were positive in one case each with their juices, and in three and four cases respectively when the pulp was used for patch tests. In contrast to our findings, the latex of *Euphorbia antiquorum* and *Euphorbia royleana* have been reported to be irritant by Behl et al,[3] Sofat et al[6] and Sood et al[7]. There are nearly 2000 species of *Euphorbia*, most of which such as *E. acaulis*, *E. balsamifera*, *E. cattimando*, *E. hirta*, *E. lactea*, *E. neriifolia*, *E. peplus*, *E. thomsoniana* and *E. tirucalli* growing in India, and *E. abyssinica*, *E. antisyphilitica*, *E. cooperi*, *E. corollata* and *E. nivulia* growing elsewhere have been recorded to be irritant. Their milky sap has been reported to produce itching, burning, swelling, ulceration or dermatitis in the skin and eyes.[5,8] All species however, are not irritant, *E. esculenta* is used as animal fodder, while patch tests with *E. milli*

and *E. pulcherrina* in 3 volunteers each have been reported to be negative.[5] D'Arcy[9] however reported a severe case of contact dermatitis due to *E. pulcherrina.*

Among the two succulents of the *Agavaceae* family tested by us, *Agave sisalana* produced itching sensation in one person only, while *Sensevieria zeylanica* did not produce any irritant effect. Two patients nevertheless, showed positive patch tests with the pulp and one patient with the juice as well, of *Agave sisalana.* In the case of *Sansevieria zeylanica,* two patients showed positive patch tests with both the pulp and the juice. The sensitizing agent in *Agave sisalana* has been reported to produce an irritant dermatitis and conjunctivitis,[10] though the chemical nature of this agent is not known. Similarly, *Sansevieria* was also reported to be irritant, but in some cases the dermatitis produced was suspected to be allergic in nature.[11] Some other members of the *Agavaceae* family such as *Furcraea,* and *Nolina* have also been recorded to be irritant to the skin and eyes.[3,5]

With lichens, the patch tests were positive in 4 of the ten patients tested with *Parmelia sulcata,* three patients each with *Parmelia trichotera, Parmelia quercina* and *Parmelia furfuracea* and one patient with *Parmelia verrucifera.* Only two of these patients gave a history of visiting hill stations like Shimla, Kulu and Mussorie. These two patients could have acquired their contact hypersensitivity to lichens during their visit, but strangely, the remaining 12 patients had never been to any hill station in their life-time. Dermatitis due to the lichens has been reported to occur in wood workers because of the lichens growing on the tree trunks and attributed to the usnic acid content.[12] Positive patch tests have been recorded with *Parmelia caperata.*[5] The other lichens reported to be allergenic include *Alectoria, Cetraria, Cladonia, Lecanora, Physica, Usnea* and *Xanthoria.* There are no reports of contact hypersensitivity to lichens from India.

Of the 6 aquatic plants tested by us, *Eichhornia crassipes* (water hyacinth) gave positive patch tests in 3 patients, while *Nelumbo nucifera* (lotus) leaf, *Trapa natans* (singhara) leaf, *Salvinia auriculata* and *Ceratophyllum demeusum* produced positive patch tests in one patient each. There is no information available in the literature regarding the contact allergenic properties of these species except *Ceratophyllum submersum* blamed for dermatitis in the bathers.[5]

Patch tests with *Anabaena* (blue-green algae) were negative in all the patients. Cohen and Reif[13] however, had recorded positive patch tests with phycocyanin present in this species. Similarly, a boy who swam in a lake full of the blue-green algae was reported to develop an erythematous papulo-vesicular eruption on the skin areas not covered by the bathing costume and had positive patch tests with *Anabaena.* Another blue-green algae, *Lyngbya majuscula* was also reported to cause sea-bathers dermatitis, and some other types of algae have also been recorded to cause dermatitis.[5]

Our experience suggests that the actual incidence of contact dermatitis due to the cacti, succulents, lichens and aquatic plants is rather low. The cacti and succulents are not so irritant to the skin as the literature tends to suggest, and patch tests with these agents can be positive to a variable degree in some of the individuals irrespective of whether they are exposed to the agent or not.

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