Original Article

Parthenium weed: a growing concern in Pakistan

Muhammad Nadeem, Zahida Rani, Shahbaz Aman, Atif Hasnain Kazmi, Asad Shabbir*

Dermatology Department, Unit I, King Edward Medical College/ Mayo Hospital, Lahore.
* Department of Mycology & Plant Pathology, Punjab University, Lahore.

Abstract ***Background*** *Parthenium hysterophorus* is a waste land weed which is hazardous to plants and human beings.
Objectives To find out the magnitude of parthenium spread and the adverse effects on agriculture and human beings.
Patients and methods This multiphase study was designed in collaboration with the Department of Mycology and Plant Pathology (MAPP), Punjab University, Lahore. In phase I, the plant itself was studied. In phase II, its effects on other plants were recorded. In phase III, patch test was performed in patients with allergic contact dermatitis visiting the medical camps at Jallo Park, and Johar town, Lahore and Changa Manga forest. Patch test was done using the leaf and flower of prthenium, as is, and 1% parthenin in petrolatum base. International Contact Dermatitis Research Group (ICDRG) guidelines and criteria were used for patch testing and interpreting the results at 48, 72 and 120 hours.

Results In the first phase of the study, the weed was found growing unchecked in the above mentioned areas. In the second phase, it was found to invade crops like rice and maize. In the third phase of the study, 511 patients suspected of allergic contact dermatitis were enrolled along with 100 controls. Out of 511, 391 reacted positively. Only 5 from the control group were positive to parthenium.

Conclusion *Parthenium hysterophorus* has replaced the main native flora in many parts of Pakistan including the big cities like Rawalpindi-Islamabad and Lahore. It has caused a major outbreak of airborne contact dermatitis. The rapid spread is probably due to its use in bouquets.

Key words
Parthenium hysterophorus, contact dermatitis.

Introduction

Parthenium hysterophorus L. is a waste land weed which is known by various local names like Congress grass, Carrot weed (Gaajar ghas), White cap (Safed topi), Chatak chandni, Star weed, etc. It has been regarded as one of the seven most dreaded weeds of the world, belonging to the family *Asteraceae*.[1] *Parthenium* is capable of growing in all types of soil and throughout the year because it has very low water requirements and a germination temperature of 8-30°C.[2]

It has been growing naturally for centuries in different parts of the world e.g. Mexico, Cuba, North and South America, West

Address for correspondence
Dr. Muhammad Nadeem
H. No. 4, Shafiq Street,
Mehmood Road, New Samanabad, Lahore.
Tel # 042-7530675, 0300-9422207.

Figure 1 *Parthenium hysterophorus* commonly used in flower bouquet.

Indies, Australia, Taiwan, Southern China, East and South Africa and Canada. This invasive weed was brought accidentally to India in the mid-fifties along with imported wheat grains from America,[3] where it produced a lot of concern causing an epidemic in Pune.[4] For the last few years, it has become a growing problem for some places in Pakistan.

The present multiphasic study was planned at the Department of Dermatology, King Edward Medical College/Mayo Hospital, Lahore in collaboration with the Department of Mycology and Plant Pathology (MAPP), Punjab University, Lahore. The study was undertaken 1) to find out the magnitude of parthenium spread, 2) to determine the extent of damage to crops and 3) to determine the frequency of allergic contact dermatitis to parthenium in human beings.

Patients and methods

The study was divided into three phases. In phase-I, the anatomy of the weed was studied in detail. In phase-II, the effects were noted in plants while in phase-III, the frequency of allergic contact dermatitis due to parthenium in human beings in the near vicinity of the selected areas was recorded. A pre-designed pro forma was duly filled, recording the hazardous effects in plants and human beings. A meticulous clinical examination was also recorded in patients at these medical camps. The data was compiled and analyzed.

Duration of study
Six months (July, 2004 to December, 2004).

Type of study
Cross-sectional

Study population
Patients visiting the medical camps at Jallo Park, Johar town and Changa Manga forest at Lahore.

Inclusion criteria
All patients of any age and either sex with allergic contact dermatitis visiting the medical camps were enrolled.

Methods
Patch test was performed with the leaf and flower as is and 1% parthenin in petrolatum base. These were placed in IQ chambers, applied to the upper back and removed after 48 hours. Results were read at 48, 72 and 120 hours. Interpretation of the results was done according to International Contact Dermatitis Research Group (ICDRG) criteria.

Results

Phase-I
The weed was seen to be an upright annual herb, growing to a height of 30-150 cm, with a deep taproot system and many finer roots. It had one main stem which was grooved lengthwise, branching in the upper half of the plant. Its leaves were deeply lobed with short hair. Rosette leaves were 8-20 cm longer but stem leaves were shorter. Flowers were white to cream in color, a single plant producing an average of 810 flower heads in its lifetime. The seeds were black, flattened and 2 mm long. Each plant produced about 5000-15000 seeds, viable even at their immature stage and were found to germinate in soil up to a depth of 5 cm.

Phase-II
Parthenium was found growing unchecked in the Jallo Park, Johar Town and the forest of Changa Manga, replacing even the native flora at some places. The weed was seen to spread to the nearby grain producing areas, contaminating grains, due to its allelopathic activity, in rice and maize fields.

Phase-III
A total of 511 patients were enrolled in the study. There were 361 males and 150 females. Their ages ranged from 12 to 67 years. Average age was 34 years. The mean duration of the disease was 24 weeks. Hundred percent of the patients were field workers. The course of the disease was continuous in 38% and episodic in 62% of the cases. A control group consisting of 100 patients (70 males and 30 females) was also enrolled from the same medical camps. These subjects had various dermatological diseases other than eczema.

Itching was the main symptom in 97.6% of the cases. Other symptoms reported were burning 62.2%, pain 54%, peeling of skin 40.7%, puffy eyes 4.8%, fatigue 0.58% and weight loss 0.39%. Different clinical patterns of the disease are depicted in **Table 1**.

All the patients and the control group were patch tested with the leaf and flower as is and 1% parthenin in petrolatum base. Out of the 511 cases, 391 showed positive reactions. One hundred and thirty three reacted positively to the leaf, 95 were

Table 1 Clinical presentations of contact dermatitis due to *Parthenium hysterophorus* (n=511)

Type of reaction	*n*
Air-borne contact dermatitis	202
Photosensitivity-like presentation	85
Atopic dermatitis-like presentation	70
Hand eczema	55
Swelling of hands	26
Peeling of skin	17
Puffy eyes	13
Erythroderma	02
Miscellaneous	41

positive to the flower and 63 showed a positive reaction to 1% parthenin. In the control group, only five patients reacted positively, 3 to the leaf and 2 to parthenin. The results were relevant in all the patients. Side effects of patch testing included pruritus in 57% and tape erythema in 11% of the subjects.

Discussion

Parthenium hysterophorus has been growing since centuries in the world. It was brought accidentally to India in the mid-fifties where it caused a major outbreak of airborne contact dermatitis.[3,4] For last few years, it has been discovered to grow in various parts of Pakistan especially the big cities like Rawalpindi-Islamabad and Lahore. Various adverse effects of the weed have been seen on the crops and humans. It has replaced the main native flora of these areas. Almost every part of the plant except the root is reactive.

In the third phase, the results of our study showed a preponderance of adult males which is in accordance with the previous literature.[5,6] Our study revealed positive patch test reactions in 76.5% (391/511) of the patients. Rao *et al.*[7] (1977) elicited positive patch test reactions in 56% of a group of adult males exposed to the plant. In another study, patch tests with *Parthenium hysterophorus* undertaken in 1662 patients, were positive in 662 (39.8%).[2] The comparison with other studies reflects the high magnitude of concern in our country.

A sizeable number revealed a clinical pattern of airborne contact dermatitis (202/511). This is a well known presentation as reported previously.[8] Generalized atopic dermatitis-like eczematous eruption was reported in 70 subjects, an almost similar ratio has been observed already.[9] Two of our patients presented with erythroderma. This has also been documented previously.[6]

Some people out of ignorance or otherwise are using parthenium flowers for preparations of bouquets. Parthenium leaves are also noted to be bundled with coriander leaves and sold in the vegetable market leading to its rapid spread in our community.

Parthenium has been regarded as a beneficial plant too, in spite of its ill effects which outweigh its uses.[10] It is used as a folk remedy[11] against various afflictions such as ulcerated sores, facial neuralgia,[12] fever and anaemia and also as insecticide.[13] Root decoction is useful in dysentery.[14] Parthenium is also reported as a promising remedy against hepatic amoebiasis.[15] A study made at the Cancer Research Institute, Mumbai has indicated that "*parthenin*", the principal ingredient of this plant, possesses anticancer properties.[16]

In spite of the fact that very little work has been done in our set up, the present study is

a step towards understanding the botanical dermatology and more research work is needed to attain further knowledge and to elucidate the problems originating from parthenium.

References

1. Rao RS. Parthenium: A new record for India. *J Bombay Nat Hist Soc* 1956; **54**: 218-20.
2. Pasricha JS. *Contact Dermatitis in India*. New Delhi: All India Institute of Medical Sciences; 1988.
3. Ranade SN. Generalized eczematoid dermatitis in epidemic form caused by *Parthenium hysterophorus L.* (Congress Grass) in Maharashtra State (India) and its treatment. *Maharashtra Med J* 1971; **17**: 495-8.
4. Towers GHN, Mitchell JC, Rodriguez E *et al*. Biology and chemistry of *Parthenium hysterophorus L.*, a problem weed in India. *J Sci Ind Res* 1977; **36**: 672-84.
5. Towers GHN, Mitchell JC. The current status of the weed *Parthenium hysterophorus L.* as a cause of allergic contact dermatitis. *Contact Dermatitis* 1983; **9**: 465-9.
6. Arlette J, Mitchell JC. Compositae dermatitis. Current aspects. *Contact Dermatitis* 1981; **7**: 129-36.
7. Subba Rao PV, Mangala A, Subba Rao BS, Prakash KM. Clinical and immunological studies on persons exposed to *Parthenium hysterophorus L. Experientia* 1977; **33**: 1387-8.
8. Sharma SC, Kaur S. Airborne contact dermatitis from *Compositae* plants in northern India. *Contact Dermatitis* 1989; **21**: 1-5.
9. Behl PN, Captain RM. *Skin Irritant and Sensitizing Plants Found in India*. New Delhi: S. Chand; 1979.
10. Sastry T, Tenjarla CS, Kavathekar KY. *Plants for reclamation of waste lands*. New Delhi: Publications and Information Directorate, CSIR; 1990.
11. Nabie SC, Mcfadyen RE, Panetta FD, Adkins SW. The Biology of Australian Weeds 27. *Parthenium hysterophorus L. Plant Protection* 1996; **11**: 76-88.
12. Uphof JC. *Dictionary of Economic Plants.* London: Englemann Weinheim; 1959.
13. Morton JF. The puzzling white top. *Parthenium hysterophorus*: *noxious weed, health hazard, folk remedy, flea repellent*. Unpublished report. Florida: Univ. of Miami; 1981.
14. Singh U, Wadhwani AM, Johri BM. *Dictionary of Economic Plants in India.* New Delhi: Indian Council of Agricultural Research; 1996.
15. Sharma GL, Bhutani KK. Plant based antiamoebic drugs. Part-II. Amoebicidal activity of parthenin, isolated from Parthenium hysterophorus. *Planta Medica* 1988; **54**: 20-2.
16. Mew D, Balza F, Towers GHN, Levy IG. Antitumor effects of the sesquiterpene lactone parthenin. *Planta Medica* 1982; **45**: 23-7.