

Rhinoconjunctivitis and occupational asthma caused by *Diplotaxis eruroides* (wall rocket)

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Wall rocket (*Diplotaxis eruroides*) is a common Crucifera plant that grows in European and American vineyards and olive groves. We present the cases of 2 farmers with rhinoconjunctivitis and asthma related to wine-growing tasks during *D eruroides* pollination (March-April). The aim of this work was to demonstrate that occupational symptoms were caused by *D eruroides* pollen sensitization. Cutaneous tests, specific IgE measurements, conjunctival and bronchial provocation tests, and peak-flow measurements during working days were performed. (J Allergy Clin Immunol 2001;108:125-7.)

Key words: *Diplotaxis eruroides*, occupational allergy, pollen allergy, Cruciferae allergy

Plants are probably the most common source of occupational allergens, which are mainly different types of wood, cereal flour, coffee beans, latex, plant food, and enzymes.^{1,2}

The Cruciferae family is very extensive, including about 350 genera and almost 3000 species that are well represented in areas with mild climates. Several cases of respiratory allergy caused by rape pollen (*Brassica napus*) have been described.^{3,4}

Other Cruciferae genera includes species that are commonly found in agricultural areas, such as *Diplotaxis eruroides* in European and American vineyards and olive groves. Because this plant grows in vineyards at the time (March-April) when agricultural tasks, such as pruning, planting, or weeding, take place, it may be considered a great source of allergens among those farmers involved in wine-growing activities.

METHODS

Patient 1 was a 29-year-old male farmer who presented every March and April over a 3-year period with ocular and nasal pruritus,

Abbreviations used

BPT: Bronchial provocation test
PEFR: Peak expiratory flow rate
SPT: Skin prick test

conjunctival hyperemia, repeated sneezing, hydrorrhea, nasal obstruction, coughing, tightness of the chest, and sibilant dyspnea. He related symptoms exclusively to his outside work at the vineyard.

Patient 2 was a 37-year-old male farmer who reported periods of ocular and nasal pruritus, conjunctival hyperemia, repeated sneezing, watering rhinorrhea, and pharyngeal and palatal pruritus in March and April. He associated the occurrence of symptoms to agricultural activities (pruning and weeding) in the vineyards.

Since 1987, atmospheric pollen sampling has been performed in the Ciudad Real area. The sampler used was a Burkard 7-day volumetric spore trap (Hirst-type). During the *D eruroides* pollination period, another similar collector was placed in a vineyard.

Skin prick tests (SPTs) were performed with a standard aeroallergen battery that included *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, *Lolium perenne*, *Olea europaea*, *Salsola kali*, *Artemisia vulgaris*, *Alternaria alternata*, *Cladosporium herbarum*, *Aspergillus fumigatus*, and cat and dog dander. SPTs for pollen extracts of trees that pollinate in March and April (*Betula verrucosa*, *Alnus glutinosa*, *Ulmus pumilla*, *Pinus nigra*, and *Populus nigra*) and *Diplotaxis eruroides* (10 mg/mL, Bial-Aristegui Laboratories) were also tested. Specific IgE determinations were estimated by using an enzyme allergosorbent test.

The cross-reactivity studies were performed with serum from patient 1 by means of RAST-inhibition assays, as previously described.⁵ *D eruroides*, *O europaea*, *L perenne*, and *S kali* pollen extracts were used in both solid (inhibited) and free (inhibitor) phases.

The conjunctival provocation test was carried out with *D eruroides* pollen extract, according to the method of Möller et al.⁶ A nonspecific bronchial reactivity test with methacholine, as described by Chatham et al,⁷ was performed 2 days after the symptoms appeared. Patient 1 was asked for a daily peak-flow measurement during March, indicating the working days at the vineyards or at any other cultivations. A specific bronchial provocation test (BPT) was done with *D eruroides* pollen extract, according to the method of Chai et al.⁸ To assess the bronchial late-phase response, the patient monitored peak expiratory flow rate (PEFR) values and spirometry recordings himself with a portable Mini-Wright peak flowmeter for a 24-hour period.

SPTs, conjunctival provocations tests, and BPTs were also performed on a group of control subjects (5 vineyard workers and 5 patients allergic to other pollens).

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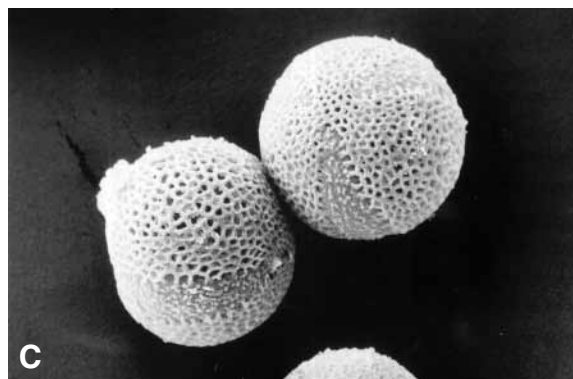
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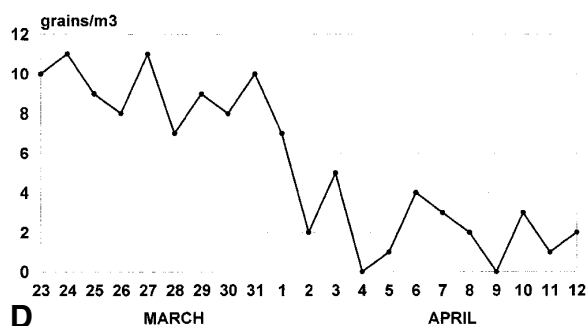
B

RESULTS

The *D eruroides* pollen grains are medium sized (20 μ m), reticular, and trizonocolporate (Fig 1). *D eruroides* is found in very small quantities in vineyards, with a maximum daily average of 11 grains per cubic meter; its presence was not detected by a Burkard collector situated in the outskirts of Ciudad Real.



C



D

FIG 1. A, *Diplotaxis eruroides* plant. B, *D eruroides* pollen viewed by means of optical microscopy. C, Scanning microscopic image of *D eruroides*. Microphotograph was a kind donation of M. Jerez and J. Subiza. D, Pollen grains of *D eruroides* were gathered in a vine during the pollination period (March 23-April 12).

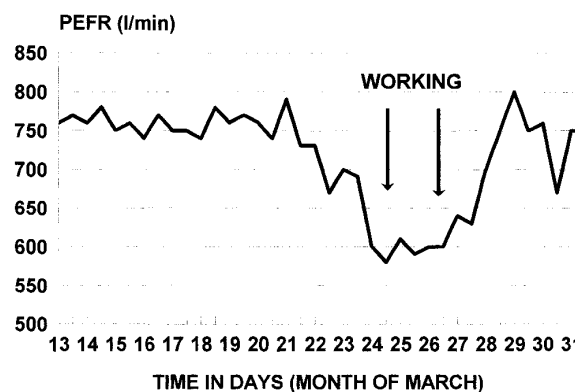


FIG 2. Daily record of PEFR (patient 1).

Both patients had positive SPT results to *D eruroides* pollen extract. SPT responses to a battery of inhalants were positive to *L perenne*, *O europaea*, *A vulgaris*, and *S kali* for patient 1 and *L perenne*, *O europaea*, *A vulgaris*, and *S kali* for patient 2. Both patients showed high levels of specific IgE (class 3 or 4) to pollen extracts of *D eruroides*, *A vulgaris*, *L perenne*, and *O europaea*. SPT results for pollen extracts of trees that pollinate in March and April were negative.

The RAST-inhibition assays carried out with serum from patient 1 showed a high cross-reactivity between *D eruroides* pollen extract and *O europaea*, *L perenne*, and *S kali* pollen extracts. The results revealed the existence of a broader similarity of antibody recognition between the *D eruroides* pollen proteins and those from *O europaea* and *L perenne* than between *D eruroides* and *S kali* pollen proteins. Inhibition in the range of 65% to 80% was obtained in the assays performed to study the cross-reactivity between *D eruroides* and *O europaea* or *L perenne* no matter which extract was used in the solid (inhibited) or free (inhibitor) phase. However, in the *Diplotaxis/Salsola* species cross-reactivity study, *S kali* pollen extract inhibited 75% to *D eruroides* when this extract was used in the solid phase, whereas *D eruroides* only produced a 20% inhibition when *S kali* was used in the solid phase.

Patient 1 showed a positive nonspecific BPT response to methacholine ($PD_{20} = 75$ AU). Peak-flow measuring during a working shift at vineyards in March showed a 30% decrease in PEFR despite the established inhaled bronchodilator and corticosteroid treatment (Fig 2). Peak-flow measures taken while working at other cultivations were normal. The BPT response to an antigen concentration of 0.05 mg/mL was also positive, with values decreasing to 36% for FEV_1 and 52% for PEFR, respectively. No delayed reaction was detected by using the peak flowmeter during the 24 hours after BPT. Conjunctival provocation test responses were positive to an antigen concentration of 0.5 mg/mL. In patient 2 the conjunctival provocation test result was positive at 0.5 mg/mL *D eruroides* pollen extract.

None of the control subjects had a positive response to SPTs, conjunctival provocation tests, or BPTs.

DISCUSSION

The present study describes 2 patients, one with rhinoconjunctivitis and the other with rhinoconjunctivitis and bronchial asthma. Symptoms appeared exclusively in March and April related to agricultural activities at vineyards during the *D eruroides* pollination period.

Nevertheless, we can find pollens with this behavior involved in occupational allergy in some specific cases. It has been proved that saffron pollen of a large size (80 μ m) and non-aeroallergen capacity can cause respiratory symptoms in 6% of workers exposed to it during the stigma collection.⁹ Similarly, another entomophilous

plant, the sunflower (*Helianthus annuus*), induces occupational rhinoconjunctivitis, asthma, or both when its pollen is liberated during the harvest.¹⁰

This work demonstrates that although *D eruroides* pollen is found in small quantities at the vineyards, close contact with these plants during the working day causes an increase in the frequency and severity of symptoms (occupational rhinoconjunctivitis, asthma, or both), which rendered patients unable to perform their agricultural activities. Other pollen sensitization detected in our patients by means of prick tests and cross-reactivity studies demonstrated high structural similarity among *D eruroides* pollen proteins and proteins from *O europaea*, *L perenne*, and *S kali* pollen, but the fact that the patients showed symptoms only during *D eruroides* pollination period (noncoincidentally with *O europaea* or *L perenne* pollination periods) confirms this pollen as the sensitizing agent. It also proves its allergenic capacity, which, as in the case of rape, does not seem to demonstrate any greater prevalence caused by its entomophilic character.

Further studies concerning the prevalence of this new sensitization among exposed workers are necessary to determine the allergenic relevance of *D eruroides* pollen among farmers who work in areas with a significant density of this Crucifera species.

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