Buckwheat: An Emerging Allergen

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J Investig Allergol Clin Immunol 2020; Vol. 30(1): 74-75
doi: 10.18176/jiaci.0452

Key words: Buckwheat. Quinoa. Food allergy.

Palabras clave: Trigo sarraceno. Quinoa. Alergia alimentaria.

Buckwheat (*Fagopyrum esculentum*) originates from Asia and is increasingly used for cooking in Europe [1]. There are numerous descriptions of allergic reactions in the region it comes from, but not in Western countries.

Despite its name, buckwheat has no taxonomic relationship with common wheat (Gramineae), since it belongs to the Polygonaceae family.

Buckwheat can be found as an ingredient in several types of pasta and bread and is a hidden allergen in various foods as well as in pillow fillings [1]. It is gluten-free, making it a suitable ingredient for celiac patients.

The 3 major allergens are as follows: Fag e 1, the β-subunit of 13S globulin (24 kDa), which is traditionally considered the main allergen [2,5]; Fag e 2, a 2S albumin (16 kDa), is the protein with the greatest allergenic potential; and Fag e 3, a vicilin (19 kDa), which is significant, as it is the most specific allergen for diagnosis [3,4]. Two recently described allergens are Fag e 4, a hevein (12 kDa), which may be responsible for cross-reactivity with latex [5], and Fag e 5, a vicilin-like protein (55 kDa) [5].

We present the case of a 48-year-old man with no significant history other than clinical symptoms of rhinoconjunctivitis in April and May that did not require treatment.

A few seconds after eating toasted buckwheat triangles (ingredients: 79% buckwheat, 5% quinoa, 5% amaranth, corn oil, and sea salt), he experienced a bitter taste in the mouth, together with pharyngeal foreign body sensation and dysphagia to both solids and liquids. Fifteen minutes later, he reported intense itchiness in the groin, arms, and face accompanied by erythema in the thoracic region.

Despite the severity of the clinical symptoms, the patient did not visit the emergency department, and his symptoms abated spontaneously in 2-3 hours. He ordinarily eats and tolerates all foods.

An allergogical assessment revealed positive skin test results to grass pollen and olive pollen. The results of skin tests to cereals were negative. ImmunoCAP (Thermo Fisher Scientific) revealed the following specific IgE values: buckwheat, 0.66 kU/L; quinoa, 0.18 kU/L; Phl p 1 and Phl p 5, 10.1 kU/L; Ole e 1, 1.56 kU/L; and total IgE, was 32.6 KU/L.

Extracts of buckwheat (toasted and cooked), toasted quinoa, and toasted amaranth were prepared and used for skin tests, SDS-PAGE, and immunoblotting.

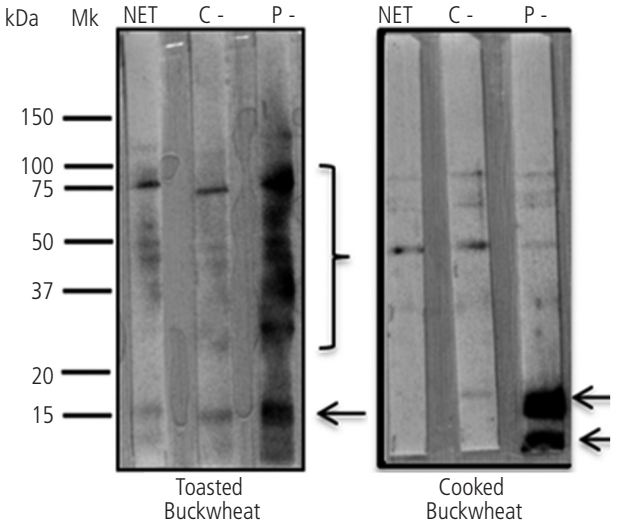

Figure. Immunoblotting with the patient's serum for cooked and toasted buckwheat. Lane 1, toasted buckwheat, NET; lane 2, toasted buckwheat, healthy control; line 3, buckwheat, patient; lane 4, cooked buckwheat, NET; lane 5, cooked buckwheat, healthy control; lane 6, cooked buckwheat, patient. NET indicates negative control; C, healthy control; P, patient.

The prick test was carried out using different dilutions of the extracts (1:10 and 1:50), which were previously processed with a 40-µm nylon filter [6]. The results were as follows: toasted buckwheat, positive 1:10 (10 × 10 mm) and 1:50 (20 × 10 mm); cooked buckwheat, positive at 1:10 (50 × 15 mm) and 1:50 (15 × 10 mm); toasted quinoa, negative; toasted amaranth, negative (Figure 1 in the Supplementary Appendix). Findings for 10 controls (5 atopic and 5 non-atopic) were negative.

After the negative ImmunoCAP and prick tests with the extract, an oral challenge carried out with quinoa (both toasted and cooked) yielded a negative result. Provocation with amaranth was not attempted, because the patient refused to undergo the challenge test.

SDS-PAGE and immunoblotting were carried out with the extracts of toasted and cooked buckwheat in a 12% polyacrylamide gel and transferred to nitrocellulose membranes. The membranes were blocked and incubated overnight with the patient's serum at 4°C. IgE was detected through incubation with biotin antihuman IgE 1:100 000 and horseradish peroxidase-streptavidin [7].

In the case of toasted buckwheat, the patient's IgE recognized 6 double bands of varying molecular weights, the lowest being 15-25 kDa and the highest 50-75 kDa (Figure). The relevant literature indicates that the case we describe could involve multiple sensitivity to Fag e 2 and Fag e 5, although this would only be confirmed with sequencing analysis, which could prove difficult given the high number of recognized bands.

In the case of cooked buckwheat, the patient's IgE recognized 2 double bands between 10 kDa and 25 kDa (Figure). Thermal processing of the food seems to modify the number of bands recognized by IgE.

The patient was finally diagnosed with allergy to buckwheat and *Gramineae*- and *Olea*-induced rhinoconjunctivitis. Allergy to quinoa was ruled out.

We present a case of allergic reaction to buckwheat. Cases of occupational asthma and skin rashes have been reported in Spain after ingestion of this food, although to date, their number is very low [8].

Of note, thermal processing (toasting) of buckwheat would enable the patient's IgE to recognize a greater number of bands and thus increase its allergenicity.

It is also important to highlight the role of buckwheat as a cause of allergic reactions because of its increasingly frequent use in cooking. Similarly, we must not forget that it is often a hidden allergen.

Funding

The authors declare that no funding was received for the present study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Manuscript received May 6, 2019; accepted for publication September 10, 2019.

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