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STRUCTURAL BASIS OF THE ALLERGENICITY TO STRAWBERRIES DUE TO Fra a 1.02

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Strawberry fruits are highly valued due to their flavor, aroma, and benefits for human health. Despite this, 30% of the population with food hypersensitivity also shows adverse reactions to strawberry (Franz-Oberdorf et al, 2016). The FaFra a 1 protein family, homologs of the major birch pollen allergen Bet v 1, is involved in this allergenicity to strawberry.

By RNAseq we have identified transcripts for 18 members of the *FaFra a 1* family (from 1.01 to 1.18) in strawberry fruits. Although expressed in all tissues analyzed, each family member presents a unique pattern of expression, which suggests functional specialization for each FaFra a 1 protein. FaFra a 1.02 (Fra2 from now on) is the most expressed one in red fruits and is also the most allergenic among the family members tested (Muñoz *et al.* 2010; Franz-Oberdorf *et al.*, 2016).

In order to understand the molecular bases of this allergenicity we crystallized Fra2 and obtained its structure by X-ray diffraction. Fra2 showed a very high structural homology to Bet v 1, and we asked whether the two proteins were recognized by the immune system in a similar way. For this, we generated five different mutant versions of Fra2 in sites described as important for allergenicity in Bet v 1 (Fernandes *et al.*, 2016), and studied their potential allergenicity as well as their crystal structures. Three of the mutants had substitutions in loop 4 (E46R, D48R, E46/48A) and the other two facing the cavity (A141F and Q64W). Compared to Fra2, all the mutants showed a significant reduction in their capacity to be recognized by the serum of patients with allergies to Bet v 1, and their crystal structures revealed conformational changes in the Bet v 1- IgG interaction sites. Together, these results support that Fra2 and Bet v 1 have

similar allergenic determinants We hope this research will aid in understanding how human IgGs interact with Fra2 and might help in the development of new cultivars with a lesser allergenic potential.

-Fernandes, et al (2013). *The FEBS journal*, 280(5), 1169-1199.

-Franz-Oberdorf et al. (2016). *Journal of agricultural and food chemistry* 64.18: 3688-3696.

-Muñoz et al. (2010). *Molecular Plant*, 3: 113–124.

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