

Title Effect of harvest maturity, duration of storage and shelf life of apples on the allergen Mal d 1, polyphenoloxidase activity and polyphenol content

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Abstract

Freshly consumed apples can cause allergenic reactions because of the presence of allergens (in middle Europe Mal d 1) and their cross-reactivity with sensitising allergens of other species. Knowledge of endogenous factors affecting the allergenic potential of apples would provide important information to apple breeders, growers and consumers for the selection of hypoallergenic genotypes, adoption of agricultural practices for decreasing the allergenic potential and the consumption of fruits with reduced amounts of allergens.

Fruit samples were collected from three apple varieties and from fruits of two different trials, set up to assess the effect of ripeness on synthesis of Mal d 1 at harvest date, as well as on Mal d 1 after storage and shelf life. Oxidative reactions catalysed by polyphenol oxidase (PPO) and/or peroxidase (POD), present in apple, may be involved in decreasing its allergenicity. So, we focused on the classification of varieties according to the activity of polyphenol oxidase and polyphenol content. The apple allergen Mal d 1 was ripening-related; the amount increased with duration of storage. In most cases no differences were found in Mal d 1 content in regard to the stage of ripeness at harvest. Tendendiously, storage and shelf life led to higher Mal d 1 levels in unripe and overripe harvested fruit. Storage and stage of ripeness did not affect PPO activity. The allergenicity of apple fruits was affected by different internal factors, such as PPO activity, polyphenol content, especially catechin and epicatechin, and the antioxidative capacity. Whereas higher PPO activities and polyphenols contents result in less extractable Mal d 1, higher antioxidative activity can inhibit the interaction between oxidised phenols and Mal d 1, resulting in higher allergenicity (extractable Mal d 1). The extractable Mal d 1 was greatest in ‘Topaz’ fruit (at medium), followed by ‘Golden Delicious’ and ‘Braeburn’. This study represents one of the first attempts to evaluate any relationship between Mal d 1 content and PPO, total phenol content and antioxidative capacity in different apple varieties.