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Alternaria mycotoxins and its incidence in fruits and vegetables

Andrea Patriarca

*Departamento de Química Orgánica, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Buenos Aires, C1428EGA Argentina; *Email: andreap@qo.fcen.uba.ar*

Alternaria is a ubiquitous fungal genus, widely distributed in the environment and a range of different habitats. It includes both plant pathogenic and saprophytic species, which can affect crops in the field or cause post-harvest spoilage of plant fruits and kernels. Numerous *Alternaria* species cause damage to agricultural products including cereal grains, fruits and vegetables, and are responsible for severe economic losses worldwide.

Most *Alternaria* species have the ability to produce a variety of secondary metabolites, which may play important roles in plant pathology as well as food quality and safety. Alternariol (AOH), alternariol monomethyl ether (AME), tenuazonic acid (TeA), tentoxin (TEN) and altenuene (ALT) are considered the main *Alternaria* compounds thought to pose a risk to human health. However, food-borne *Alternaria* species are able to produce many additional metabolites, whose toxicity has been tested incompletely or not tested at all. Both alternariols are mutagenic and their presence in cereal grain has been associated with high levels of human esophageal cancer in China. TeA exerts cytotoxic and phytotoxic properties, and is acutely toxic in different animal species, causing hemorrhages in several organs. The possible involvement of TA in the etiology of onyalai, a human hematological disorder occurring in Africa, has been suggested. Altertoxins (ALXs) have been found to be more potent mutagens and acutely toxic to mice than AOH and AME. Other metabolites, such as TEN, are reported to be phytotoxins, and their toxicity on animals has not been demonstrated up to now.

Vegetable foods infected by *Alternaria* rot are obviously not suitable for consumption. Thus, whole fresh fruits are not believed to contribute significantly with *Alternaria* toxins to human exposure. However, processed vegetable products may introduce considerable amounts of these toxins to the human diet if decayed or moldy fruit is not removed before processing.

The taxonomy of the genus is not well defined yet, which makes it difficult to establish an accurate relationship between the contaminant species and their associated mycotoxins. Great efforts have been made to organize taxa into subgeneric taxonomic levels, especially for the small-spored, food associated species, which are closely related and constitute the most relevant food pathogens from this genus.

Several crops of agricultural value are susceptible to infection by different *Alternaria* species and can contribute to the entry of *Alternaria* mycotoxins in the food chain. The distribution of *Alternaria* species was studied in different commodities grown in Argentina. These food populations were characterized through a polyphasic approach, with special interest in their secondary metabolite profiles, to understand their full chemical potential. *Alternaria* species associated with tomato, bell pepper, blueberry, apples and wheat cultivated in Argentina showed a surprisingly high metabolomic and mycotoxigenic potential. The natural occurrence of *Alternaria* toxins in these foods was also investigated. The results here presented will provide background for discussion on regulations for *Alternaria* toxins in foods.