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The ACB's of *Alicyclobacillus*

This spoilage bacteria commonly referred to as TAB or ACB, being Alicyclobacillus or thermo-acidophilic bacteria, are an unusual but increasingly important bacteria found in the beverage and concentrate industry.

Alicyclobacillus is a (mostly) gram-positive, non-pathogenic, thermo-acidophilic rod-shaped endospore forming genus of bacteria. Their slow and late growth, optimum pH range of 3.5 – 4.5, optimum temperature range of 40 – 60˚C, and heat-resistant spores have contributed to their known reputation of being the most serious threat in the fruit juice and concentrate industry. Although its presence in fruit juices and concentrates does not always lead to spoilage, this resilient bacteria's spores are capable of surviving thermal treatment during pasteurization and then germinate once conditions become favourable.

Figure 1: Alicyclobacillus acidoterrestris colonies grown in culture after five days of incubation.

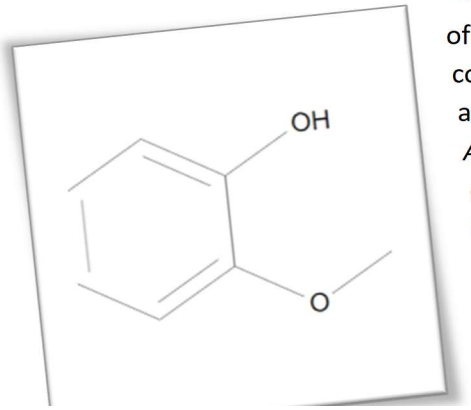

Figure 2: Guaiacol is the primary powerful tainting compound produced through Alicyclobacillus spoilage.

Contamination by the various strains of *Alicyclobacillus* often goes undetected until products reach the market and consumer complaints are received. Unlike yeasts, moulds and the few lactic acid bacteria that can survive the low pH conditions of fruit juices, *Alicyclobacillus* does not produce any gas leaving no tell tail sign of a swollen container. Spoilage is by means of the production of the powerful tainting compound Guaiacol which imparts a characteristic odour and taste described as medicinal, antiseptic, or disinfectant-like. The most important spoilage species in the genus is recorded as *Alicyclobacillus acidoterrestris*, however, 19 other *Alicyclobacillus* strains have been isolated from soiled products, with levels of 10^4 to 10^5 *Alicyclobacillus*/mL typically being associated with off-flavours and odours perceived.

Beverages, fruit concentrates and fruit juices are just some of the environments *Alicyclobacillus* species have been isolated. As soil is the natural habitat of *Alicyclobacilli* sources of contamination in these industries include the soil during harvest, fallen fruit that has not been thoroughly washed, cross-contamination by employees transferring spores from the soil to the manufacturing facilities, and water in the processing environment. Spoilage, therefore, starts at the beginning of the supply chain necessitating the implementation of highly effective chemical, physical and non-thermal methods ensuring quality and extended shelf-life.