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Decontamination and detoxification of hazelnut with atmospheric and low-pressure non-thermal plasmas

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In this study, decontamination and detoxification effects of non-thermal atmospheric pressure and low-pressure plasma systems were investigated on hazelnuts artificially contaminated with 7.9±0.06 log (CFU/mL) of *Aspergillus parasiticus* (*A. parasiticus*) and 7.8±0.06 log (CFU/mL) of *Aspergillus flavus* (*A. flavus*) spores. Different plasma parameters for atmospheric plasma (plasma frequency: 16-20-25 kHz, reference voltage: 40-100, plasma jet velocity: 50-100 m/min, gas flow rate: 3000-5000 L/h, raster offset: 3-5 mm, cycle time: 5, temperature, gases: high purity air or nitrogen) and low-pressure plasma (treatment time, gases: high purity oxygen, air or nitrogen) were tested for decontamination purposes. Optimum parameters for both plasma systems were determined according to remained viable spores counted after plasma treatments. Additionally, the effects of optimum plasma conditions on different concentration of aflatoxin B1(1-1000 ppb) and total aflatoxins (B1+B2, 1-1000.39 ppb) were also determined and compared with the effect of gamma radiation (10 kGY Cobalt-60 for 10 min). Improved spore inactivation of 5.6 and 4.7 log (CFU/mL) in A. paraciticus and *A. flavus*, respectively were achieved after 100 W-30 min of low pressure plasma treatment by using air as the plasma forming gas. Similarly, 5.5 and 5.4 log (CFU/mL) in A. paraciticus and *A. flavus*, respectively, were achieved after atmospheric pressure air plasma at 100 voltages, 25 kHz frequency, 3000 L/h flow rate, 60 m/min plasma jet velocity, 3 mm raster off set and 5 cycle time. 89-90% of AFB1 reduction was achieved when 10-50 ppm of pure AFB1 was treated with low-pressure air plasma at optimum conditions. On the other hand, highest AFB1 reduction of 75 % was achieved when 50 ppb of AFB1 was treated atmospheric pressure air plasma at optimum conditions.

Biography

Baran Onal-Ulusoy is working as an Associate Professor at Cankiri Karatekin University in Turkey. She received her BSc, MSc and PhD degrees in Food Engineering from Hacettepe University. Her research interests include "Plasma polymerization technique for surface modification, plasma sterilization and detoxification, adsorption and other separation techniques (membranes, MIP, TLC, chromatography), validation and accreditation of food analysis methods, chromatographic instrumental analysis techniques and food chemistry. She is the author of 14 papers and one international book chapter and she has worked in 11 projects in which five of them were international projects (COST, Koranet, IOWA State Univ. Inc.). She has one US patent on antioxidants used for frying oil.

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