

# Impact of cold plasma treatment on aflatoxin decontamination, nutritional composition, bioactive compounds, mineral content and anti-nutritional factors of groundnuts

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Groundnuts (*Arachis hypogaea* L.) are a globally consumed legume valued for their nutrition and affordability. Cold plasma (CP) processing, an innovative non-thermal technology, improves food safety and quality by inactivating microorganisms and reducing chemical contaminants. In the present study, groundnuts inoculated and non-inoculated with *Aspergillus flavus* were treated with CP at varying voltages (20–30 kV) and durations (1–15 min). CP treatment significantly reduced aflatoxin B1 levels (up to 82.1% at 30 kV, 15 min) while enhancing protein, fat, fibre, phenolics, flavonoids and mineral bioavailability. Anti-nutritional factors like phytates, oxalates and tannins decrease, improving nutrient digestibility. The present study demonstrates CP's potential as a sustainable, chemical-free method for enhancing groundnut quality and safety, with promise for large-scale application in the food industry.

**Keywords:** Aflatoxin, anti-nutritional factors, bioactive component, cold plasma treatment, groundnut.

(PUFA) fatty acids, dietary fibre, tryptophan and phytochemicals, all of which are known to provide significant health benefits<sup>2</sup>. Additionally, it is a good source of bioactive compounds like resveratrol, phenols, flavonoids and antioxidants<sup>3,4</sup>.

However, poor post-harvest handling, improper storage, and transportation, especially under warm and humid conditions, create a favourable environment for mould and fungal growth. This often leads to the production of mycotoxins, particularly aflatoxins, in agricultural commodities<sup>5–8</sup>. Groundnut crops are highly susceptible to fungal contamination, especially in tropical and subtropical regions where warm climates encourage the production of aflatoxins<sup>9</sup>.

Aflatoxins are toxic compounds primarily produced by two species: *Aspergillus flavus* and *Aspergillus parasiticus*, *A. flavus*, which is widespread in nature and primarily colonises the aerial parts of plants, and *A. parasiticus*, which is more soil-adapted with a limited distribution<sup>10,11</sup>. Of the 20 known derivatives of aflatoxins, the major ones include aflatoxin B1 (AFB1), aflatoxin B2 (AFB2), aflatoxin G1 (AFG1), and aflatoxin G2 (AFG2), produced