



IX WORKSHOP MICOFOOD

3-4 OCTUBRE

WWW.MYCOTOXSPAIN.COM



OCCURRENCE AND EXPOSURE ASSESSMENT OF AFLATOXINS FROM COCOA POWDER

Herrera M¹, Salas G¹, Lorán S¹, Juan T^{1,2}, Concellón M¹, Herrera A¹, Carramiñana JJ¹, Ariño A¹

herremar@unizar.es

¹Instituto Agroalimentario de Aragón-IA2, 50013 Zaragoza, España (Facultad de Veterinaria, Universidad de Zaragoza-CITA); ² CITA, 50059 Zaragoza, España (Centro de Investigación y Tecnología Agroalimentaria de Aragón).

Aflatoxins (AF) B1, B2, G1, and G2, mycotoxins produced by some *Aspergillus* species, are classified as carcinogenic to humans (Group 1 by IARC), with AFB1 being the most toxic. EFSA's scientific opinion of 2020 highlights cocoa as a significant contributor to dietary AFB1 exposure across all age groups. Despite this, the European Union has not established maximum levels of aflatoxins in cocoa and its derivatives such as chocolate. The projected increase in the presence of aflatoxins due to climate change highlights the need to update contamination data and reference analytical methods.

In this study, total aflatoxins (B1+B2+G1+G2) were analyzed in 109 samples of cocoa powder using a validated analytical methodology. This involved solid-liquid extraction with a methanol/water mixture (80:20), cleanup using immunoaffinity columns, and determination by high-performance liquid chromatography with photochemical derivatization coupled to fluorescence detection (HPLC-PHRED-FLD). Subsequently, the risk exposure to aflatoxin B1 was assessed in different age groups: adults, pregnant women, and children aged 1 to 17 years using ENALIA surveys for Spain.

Results showed that 52.3% (n=57) of the samples had aflatoxin concentrations above the detection limit (0.02 µg/kg for AFB1 and G1 and 0.01 µg/kg for AFB2 and AFG2), ranging from 0.02 to 3.35 µg/kg, with an average concentration of 0.42 µg/kg. AFB1 was the most prevalent (n=47, 43.1%) with an average concentration of 0.29 µg/kg, followed by AFG1 (n=23, 21.1%) at 0.11 µg/kg, AFB2 (n=20, 18.4%) at 0.02 µg/kg, and AFG2 in only one sample with 0.04 µg/kg. Afterwards, margin of exposure (MOE) values were calculated for AFB1. MOE values were below 10,000 in the age groups of 1 to 3 years, 4 to 9 years, and 10 to 17 years, raising a health concern for these population groups. For adults and pregnant women, the MOEs were greater than 10,000, suggesting no significant risk associated with the consumption of this type of products, although the incidence of aflatoxins in more than 50% of the samples analyzed was not negligible.

Acknowledgements: The authors thank the financial support of the Spanish Agencia Estatal de Investigación (PID2019-106877RA-I00) and the Gobierno de Aragón (Grupo AESA A06_23R).

keywords: aflatoxin; cocoa; exposure.