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ORIGINAL ARTICLE

Microbiological quality of Argentinian paprika

María G. Melo González^a, Stella M. Romero^{b,*}, Mila Arjona^c, Ada G. Larumbe^b,
Graciela Vaamonde^b

^a Facultad de Ciencias de la Salud, Universidad Nacional de Catamarca, Av. Belgrano 300, (K4700AAP), Catamarca, Argentina

^b Instituto de Micología y Botánica (INMIBO), Universidad de Buenos Aires-CONICET, Facultad de Ciencias Exactas y Naturales, Ciudad Universitaria, Pabellón II, 4to piso (C1428EGA), Buenos Aires, Argentina

^c Facultad de Ciencias Exactas y Naturales, Universidad Nacional de Catamarca, Centro de Biología Molecular y Biotecnología (CEBIOTEC), Universidad Nacional de Catamarca, Av. Belgrano 300, (K4700AAP), Catamarca, Argentina

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KEYWORDS

Paprika;
Microbial
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Mycobiota

Abstract The aim of this study was to evaluate the microbiological quality of paprika produced in Catamarca, Argentina. Microbiological analyses were carried out for the enumeration of total aerobic mesophilic bacteria, coliforms, yeasts and molds, and the detection of *Salmonella* in samples obtained from different local producers during three consecutive years. The mycobiota was identified paying special attention to the mycotoxigenic molds. Standard plate counts of aerobic mesophilic bacteria ranged from 2.7×10^5 to 3.7×10^7 CFU/g. Coliform counts ranged from <10 to 8.1×10^4 CFU/g. *Salmonella* was not detected in any of the samples tested. Fungal counts (including yeasts and molds) ranged between 2×10^2 and 1.9×10^5 CFU/g. These results showed a high level of microbial contamination, exceeding in several samples the maximum limits set in international food regulations. The study of the mycobiota demonstrated that *Aspergillus* was the predominant genus and *Aspergillus niger* (potential producer of ochratoxin A) the most frequently isolated species, followed by *Aspergillus flavus* (potential producer of aflatoxins). Other species of potential toxigenic fungi such as *Aspergillus ochraceus*, *Aspergillus westerdijkiae*, *Penicillium chrysogenum*, *Penicillium crustosum*, *Penicillium commune*, *Penicillium expansum* and *Alternaria tenuissima* species group were encountered as part of the mycobiota of the paprika samples indicating a risk of mycotoxin contamination. *A. westerdijkiae* was isolated for the first time in Argentina.

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* Corresponding author.

E-mail address: smromero@conicet.gov.ar (S.M. Romero).

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PALABRAS CLAVE

Pimentón;
Contaminación
microbiana;
Hongos toxinógenos;
Micobiota

Calidad microbiológica del pimentón argentino

Resumen El pimentón es considerado una de las especias más proclives a contaminarse con diversos tipos de microorganismos, incluyendo patógenos como *Salmonella* y hongos capaces de producir micotoxinas. Existen muy pocos datos acerca de la contaminación microbiana del pimentón producido en nuestro país. El objetivo del presente trabajo fue evaluar la calidad microbiológica del pimentón (*Capsicum annum* L.) producido en la provincia de Catamarca, una de las principales zonas productoras del norte argentino. Se realizó el recuento de bacterias aerobias mesófilas, coliformes totales y mohos y levaduras, y la búsqueda de *Salmonella* en muestras obtenidas de diferentes establecimientos productores locales durante 3 años consecutivos. Se identificaron todas las cepas fúngicas (1.622 aislamientos) a nivel de género y se determinaron las especies pertenecientes a los géneros potencialmente toxinógenos. Los recuentos totales de bacterias aerobias mesófilas variaron entre $2,7 \times 10^5$ y $3,7 \times 10^7$ UFC/g. Los coliformes totales estuvieron en el rango de < 10 a $8,1 \times 10^4$ UFC/g. *Salmonella* no fue detectada en ninguna de las muestras analizadas. Los resultados obtenidos muestran un alto nivel de contaminación, que excede en varias de las muestras los límites máximos establecidos en las regulaciones alimentarias internacionales. El estudio de la micobiota demostró que *Aspergillus* fue el género predominante. Otros géneros encontrados fueron *Cladosporium*, *Rhizopus*, *Alternaria* y *Penicillium*. *Aspergillus niger* (potencial productor de ocratoxina A) fue la especie aislada con mayor frecuencia, seguida de *Aspergillus flavus* (potencial productor de aflatoxinas). También se encontraron otras especies toxinógenas, lo que indica un riesgo potencial de contaminación con micotoxinas. *Aspergillus westerdijkiae* fue aislado por primera vez en Argentina.

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Introduction

Spices and herbs have been used for centuries for the aroma and flavor characteristics they convey to foods. The increasing popularity of highly spiced cuisines as well as a desire for flavorful foods which are low in sodium and fat have resulted in a continuing interest in the use of spices and herbs in food products²⁹. Paprika (in Spanish referred to as "pimentón") is a powdered spice with a deep orange-red color and a characteristic non-pungent flavor resulting from the dried and ground fruits of certain varieties of pepper (*Capsicum annum* L. belonging to the family Solanaceae). Microbiological studies carried out with species, including paprika, have indicated high microbial loads which could pose a problem for food manufacturers^{4,7,9,25,29,31,33,39}. These commodities normally carry a great number of bacteria and molds, often of soil origin, and could be a major source of microbial contamination in foods. Current practices of harvesting, handling and production often cause additional contamination and microbial growth. Many spices are grown and harvested in poor sanitary conditions, which increase the risk of contamination even with pathogens such as *Salmonella*. A significant outbreak of human salmonellosis due to paprika and paprika-powdered potato chips was described and well documented in Germany in 1995²⁶. Owing to production conditions and poor storage practices, products derived from *Capsicum* are also susceptible to fungal contamination. Spoilage caused by fungi decreases the quality of the products and also imply a risk for health due to potential contamination with

different mycotoxins. Toxigenic molds such as *Aspergillus* spp., *Penicillium* spp. and *Fusarium* spp. have been detected by several researchers in the mycobiota of *Capsicum* powder as well as natural contamination with aflatoxins and ochratoxin A^{16,19,23,28,42,43,45}.

In Argentina, paprika production is a regional industry of increasing importance in some northern provinces (Catamarca, Salta and Tucumán). This study aimed to determine the microbiological quality of paprika from this region, paying a special attention to pathogenic microorganisms such as *Salmonella* and mycotoxigenic fungi.

Materials and methods

Samples

Fifteen samples of paprika (*Capsicum annum* L.) from Santa María Department, Catamarca Province, Argentina, belonging to 2010, 2011 and 2012 consecutive harvests were analyzed. These samples were obtained from different local producers. For each sample, 250 g of paprika were collected in sterile containers; all samples were kept at 5°C until analysis.

Water activity

Water activity was measured with a water activity meter (Aqualab, Decagon Devices CX3 02734) with an accuracy of ± 0.002 . Measurements were performed in duplicate.

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