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Environment & Health

FUNGAL CONTAMINATION IN COFFEE SAMPLES

A PUBLIC HEALTH CONCERN



Arabica

Robusta



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Introduction

Fungi are natural coffee contaminants and under certain environmental conditions have the potential to produce toxins.

Many studies revealed that the important toxigenic fungal genera (*Aspergillus* and *Penicillium*) are natural coffee contaminants, and are present from the field to storage.



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Introduction

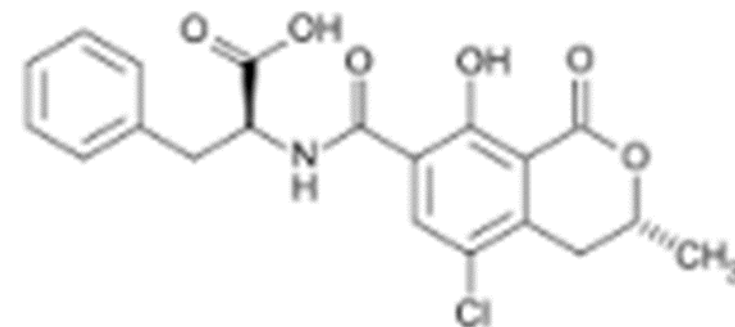
Aspergilli from the *Circumdati* and *Nigri* sections are known to produce high levels of ochratoxin A, a mycotoxin known as nephrotoxic for animals and humans.

(Ciegler, 1972; ICMSF, 1996; Joosten et al., 2001; Abarca et al., 1994, 2001)



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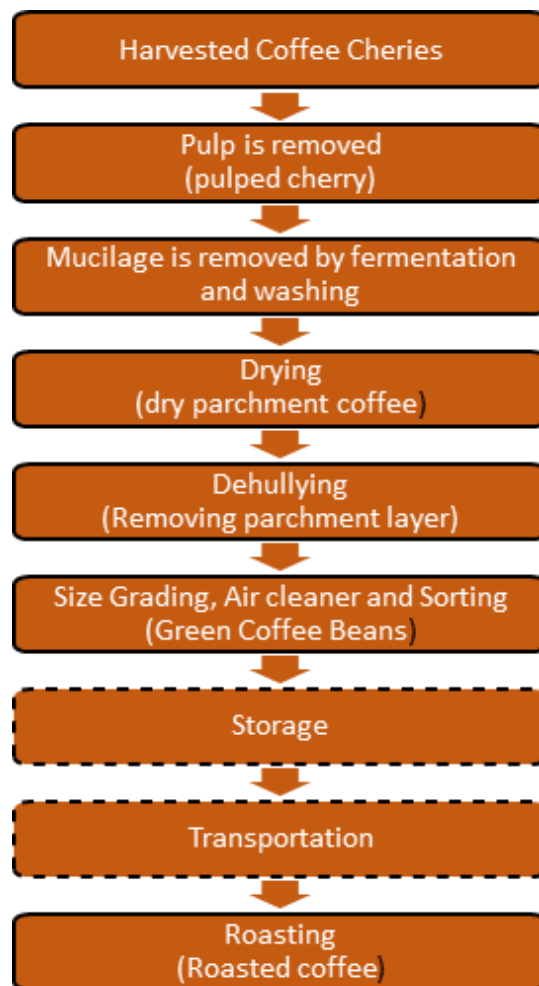


Introduction

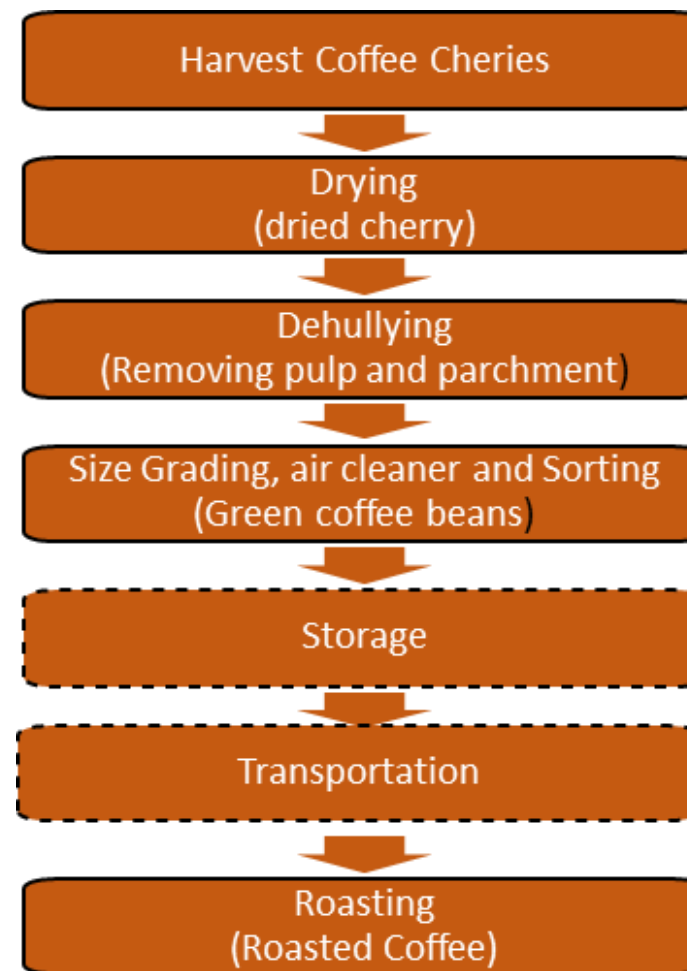


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WET METHOD



DRY METHOD



Introduction



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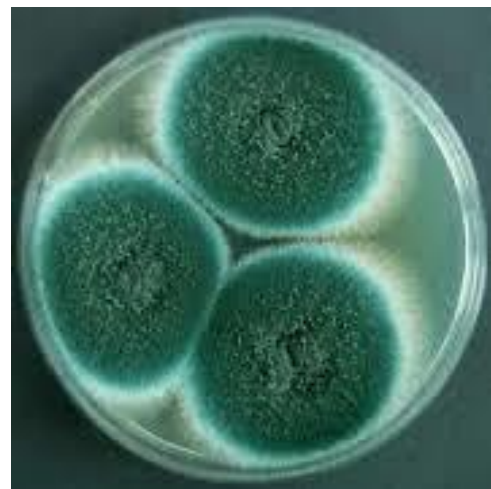
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Number of samples	Roasting conditions	OTA reduction %	References
4	200°C/10-20 min	0-12	Tsubouchi et al. (1988)
2	175°C/5-6 min (dark)	90-100	Micco et al. (1989)
3	252°C/100-190seg	14-62	Studer-Rohr et al. (1995)
2	252°C/100-190 seg	2-8	Studer-Rohr et al. (1995)
6	223°C/14 min	84	Blanc et al. (1998)
3	200°C/10 min (medium roasting)	22.5	Urbano et al. (2001a)
3	200°C/15 min (medium roasting)	48.1	Urbano et al. (2001a)
3	200°C/10 min (medium roasting)	39.2	Urbano et al. (2001a)
3	200°C/15 min (medium roasting)	65.6	Urbano et al. (2001a)
3	200°C/10 min (dark)	88.4	Urbano et al. (2001a)
3	200°C/15 min (dark)	93.6	Urbano et al. (2001a)

Introduction

This work aimed to evaluate fungal distribution and also the prevalence of *Aspergillus* sections *Fumigati*, *Flavi*, *Nigri* and *Circumdati* from *Coffea arabica* (Arabica coffee) and *Coffea canephora* (Robusta coffee) green samples.



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Introduction

Assessing the distribution of fungi present in the coffee beans allows:

- Planning prevention and control strategies implementation
- Avoid coffee spoilage and prevent the mycotoxin production
- Diminish the risk of exposure to mycotoxins through coffee consumption.



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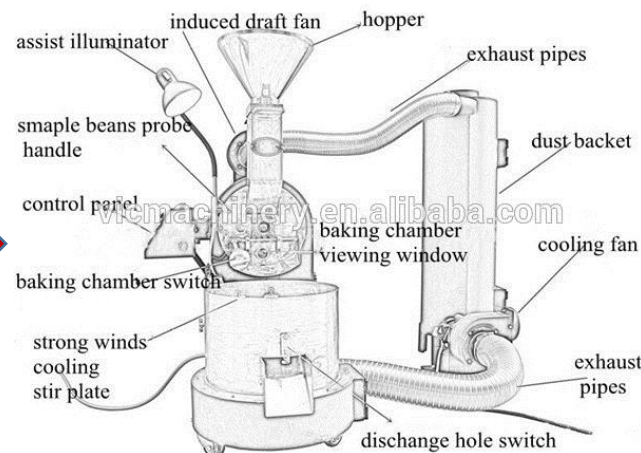
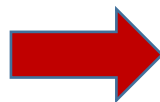
Introduction

- 28 samples from different origins
- Waiting for roasting process
- All to be introduced in Portuguese coffee market



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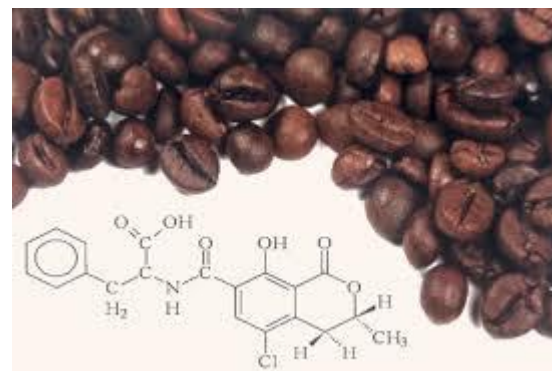
Introduction



B

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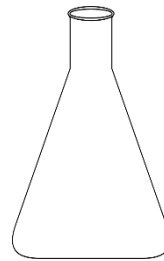
Materials and methods

20 g

180 mL dH₂O



+



Supernatant
collection



Innoculation on MEA
and DG18

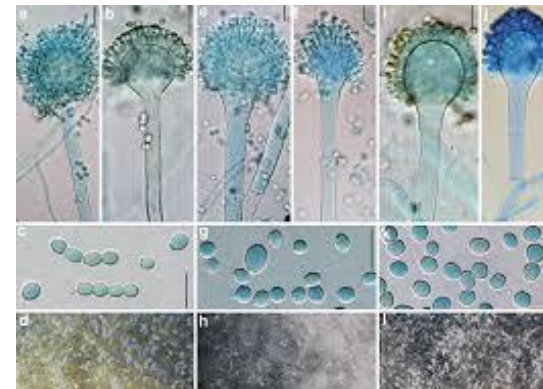
Mixing 20 min; 200 rpm



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Results

Table 1 - Percentage of contaminated samples and CFU/g

Contaminated samples	%
Total	64.3
<i>< 1500 CFU/g</i>	66.7
<i>1500 - 3000 CFU/g</i>	11.1
<i>> 3000 CFU/g</i>	22.2



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Fungal load in the coffee samples analyzed ranged from 0 to 12330 CFU/g

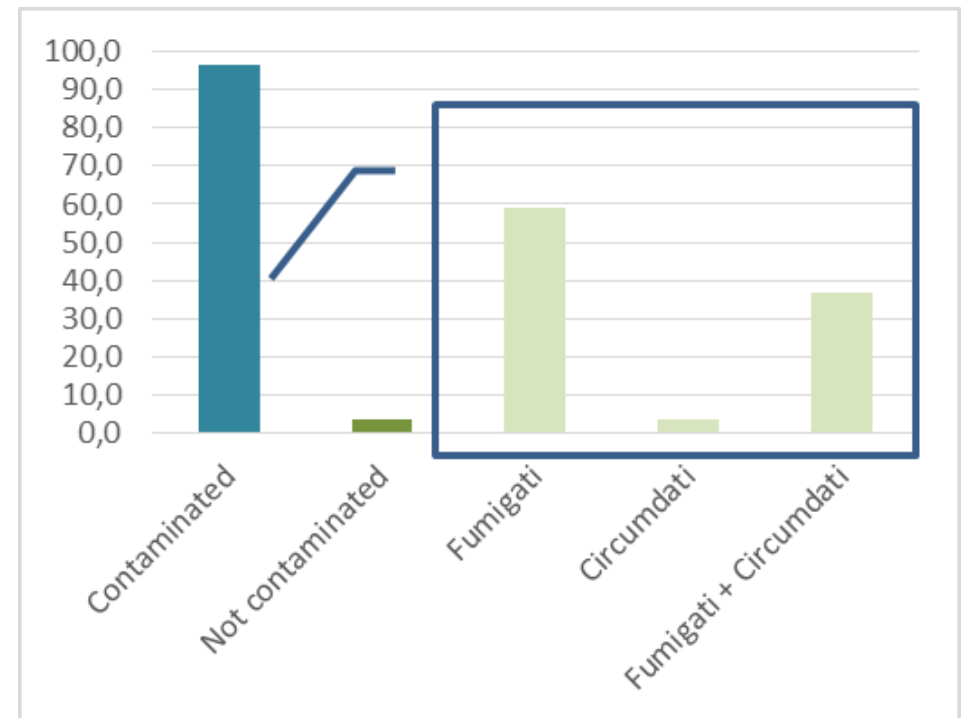
Results

Aspergillus sections *Nigri* (30.1%), *Circumdati* (20.4%) and *Nigri* and *Circumdati* concomitantly (17.9%) were the most commonly found in the analyzed samples.



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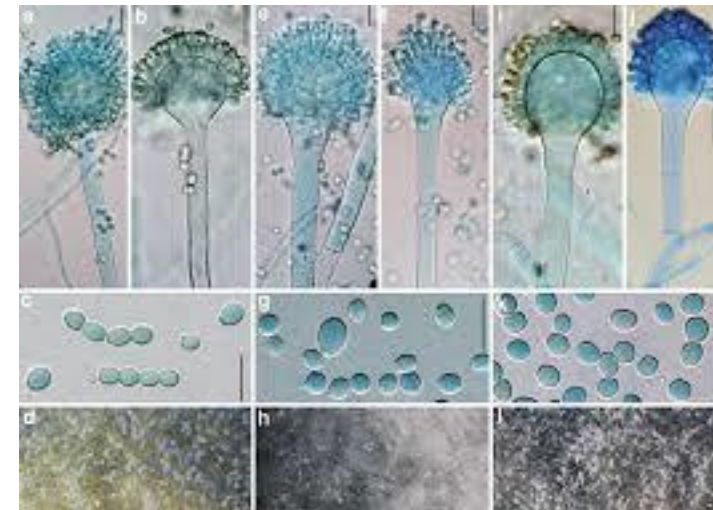
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Results

Aspergillus sections:

- *Fumigati*
- *Versicolores*
- *Aspergilli*



Penicillium genus



All with toxigenic potential



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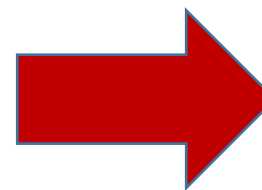
Discussion

Coffee is one of the most widely consumed beverages in the world and its contribution to the individual OTA dietary intake could be relatively high (Stegen et al., 1997).



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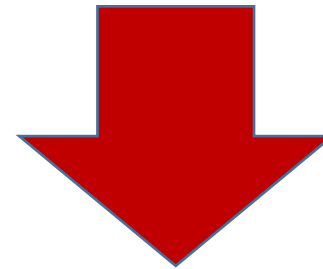
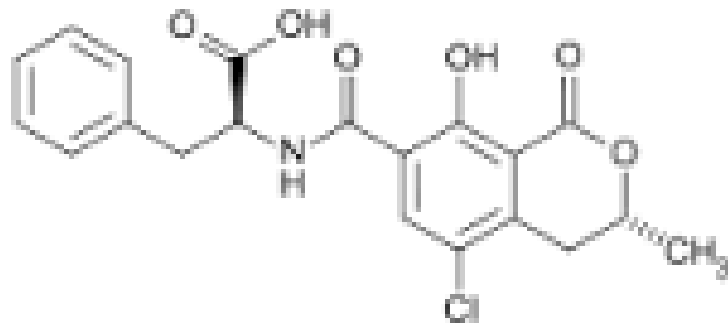
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2.5 ng of OTA.

28 cups per week by a 60-kg person would correspond to 1% of the Provisional Tolerable Weekly Intake (WHO, 1996).

Discussion



To know which fungal isolates produces mycotoxins and under what conditions

(Urbano et al., 2001)





Discussion

Prevention measures should be applied:

- Crop fungicide application after dominant **fungal isolates testing**
- Crop infection with dominant **atoxicogenic fungal strains**
- Temperature and humidity **monitoring and control** during transportation and storage
- Ensure **roasting optimal conditions** to eliminate all mycotoxins present
- Package roasted coffee in **adequate hygienic conditions**



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Conclusions

- Prevalent species found **corroborate the fungal burden associated to coffee beans** already reported in other studies.
- The presence of these fungi, which are potential producers of ochratoxin A and several other mycotoxins, can ultimately be considered a real risk since, contrary to fungi, **the mycotoxins can resist to the roast process and may persist in the final product.**
- Besides ochratoxin **we should consider co-exposure to other mycotoxins** by coffee consumption.



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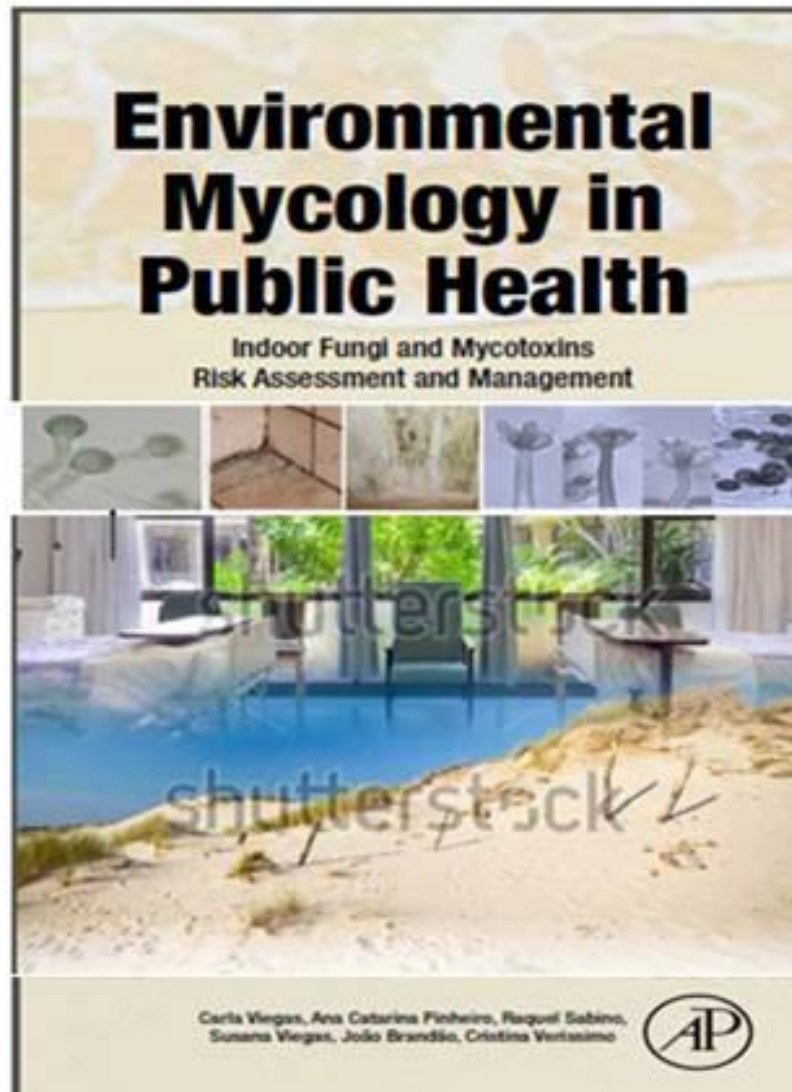


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Thank you for your attention