National Agricultural Research and Innovation Centre

VULNERABLE POINTS IN SPICE PRODUCTION CHAINS

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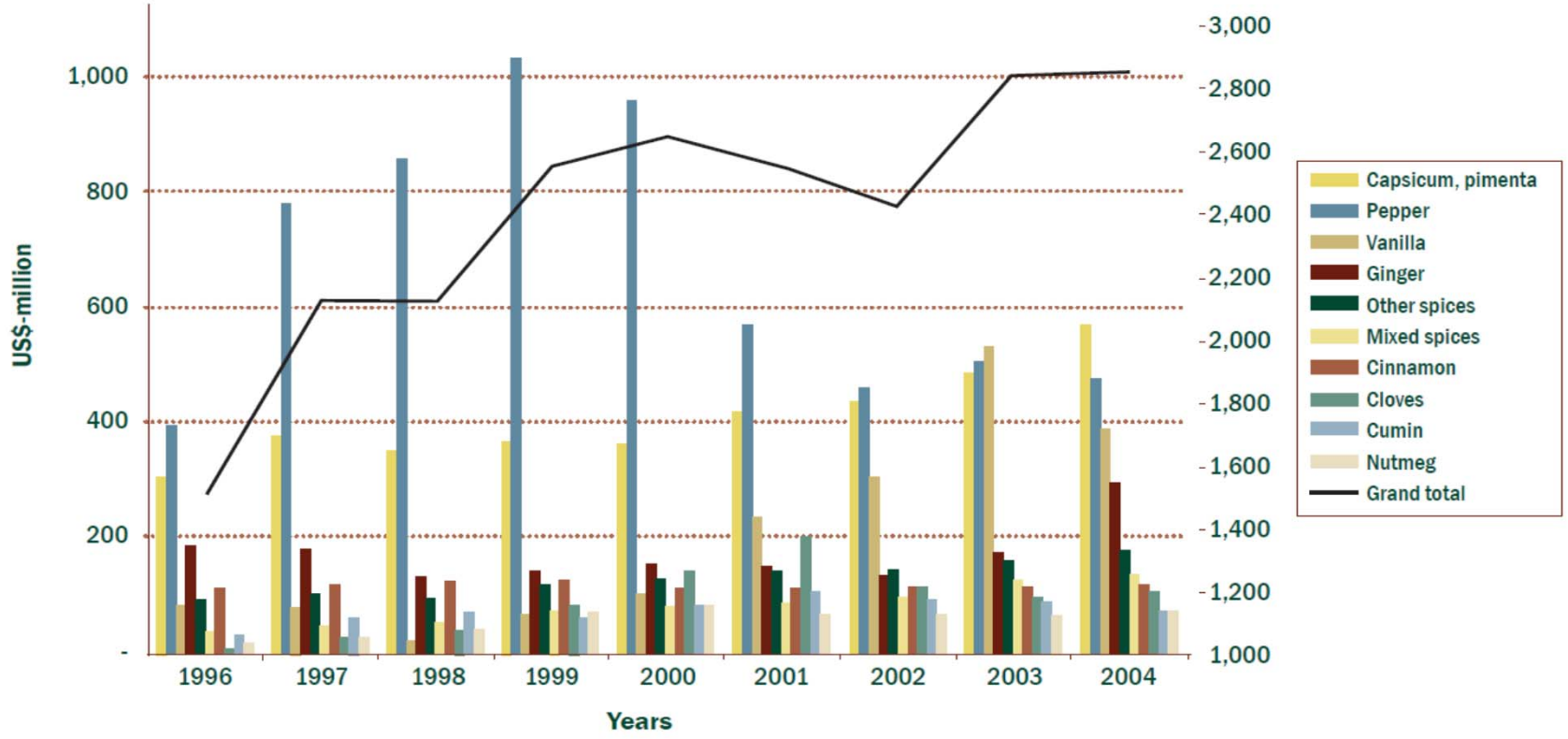
SPICED spices & herbs

Spice Paprika – an important spice commodity worldwide

Spice paprika is a major spice commodity in the European Union (EU), produced locally and imported from non-EU countries, reported not only for chemical and microbiological contamination, but also for fraud.



No. 2. spice commodity in Europe (after black pepper)
No. 1. spice commodity in Hungary

Quality management of spice paprika production

To demonstrate the importance of various contamination factors in the Hungarian production and EU trade of spice paprika, several aspects concerning food safety and quality of this commodity will be presented through a casestudy.

Kalocsai Fűszerpaprika Zrt.
(Kalocsa, Hungary)

- since the 1930s
- approx. 40% of domestic spice paprika
- 2-3% of world production, 4-5% of wor
- 70-80% of its production is spice papril
- 1500-2000 tons/year ground spice papri
  1200 tons/year canned paprika product
  350-400 tons/year dried paprika, + seas
- spice paprika seed production → provis
- canned products: soured products, can
- protection of cultural heritage, Hungaricum
- Kalocsai Szent István Paprika Order of Knights

Quality management of spice paprika production

Raw material

Qualification at arrival

Storage, post-ripening

Washing

Slicing

CCP1

Drying

Packaging

CCP3

Imported half-product arrival

Storage

Half-product

Grinding

Milling

Mixing

Sieving

Packaging

Storage

CCP3

Imported half-product arrival

Composition of a batch

Microbial decontamination

CCP2

Mixing

Sieving

Metal detection

Packaging

Quality assurance measures established along the spice paprika production technology are surveyed with main critical control points (CCPs) identified: at the drying step, at the microbial decontamination stage, and at the compositional and contamination checking of imported half-products

Strict technology control by the manufacturer reported to and regularly supervised by the government authority

Spice Paprika – cultivation, production

External factors, such as production factors, harvest procedures (*pesticide residues*),

Storage duration and temperature, processing protocols, conditions of water loss or post-ripening (*microbial contamination, mycotoxins, quality features)* affect the quality of the commodity.

Washing, slicing, drying and milling are the most critical steps of red pepper processing. Quality features, nutritive value, microbial contamination, and storage stability depends, to a high extent, on the conditions at which drying and milling are performed.

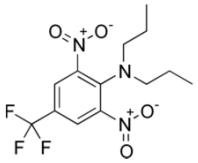
Because of mixing the batches or the imported half-products, the compositional and contamination checking and decontamination come into the front.

Assessment of paprika production technology monitoring contaminant levels in cultivated paprika

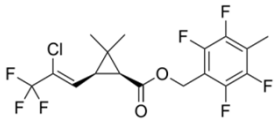
- **field experiments (3 organic farmers, 3 intensive)**
- **environmental contamination monitored:**

  114 + 45 soil samples, 6 locations for surface water

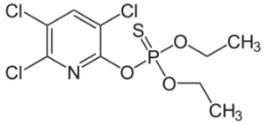
  soil contaminants: trifluralin (0.01-0.36 µg/g), tefluthrin (0.01-0.86 µg/g), chlorpyrifos (0.6-16.6 µg/g) and DDT (0.01-8.35 µg/g) /decomposition products (DDE (0.06-6.0 µg/g) and DDD (0.03-0.45 µg/g)), traces: diazinon, atrazine, metolachlor



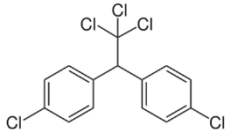
trifluralin



tefluthrin



chlorpyrifos



DDT

NO RESIDUES in paprika fruits

DDT, trifluralin, tefluthrin, chlorpyrifos

Effects of cultivar and harvesting method on the microbial load

Manual harvesting

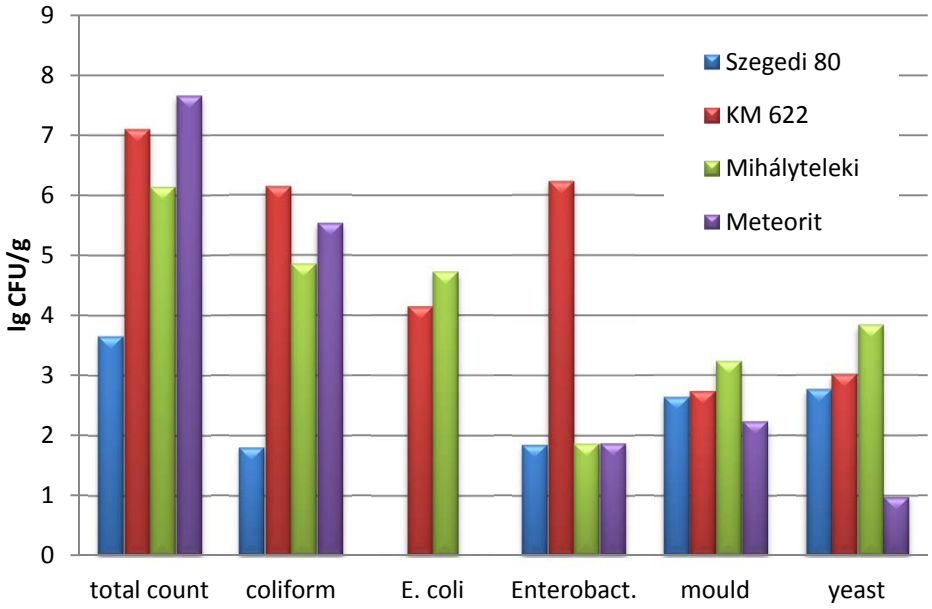
Mechanical harvesting

Szegedi 80

KM 622

Mihálytelki

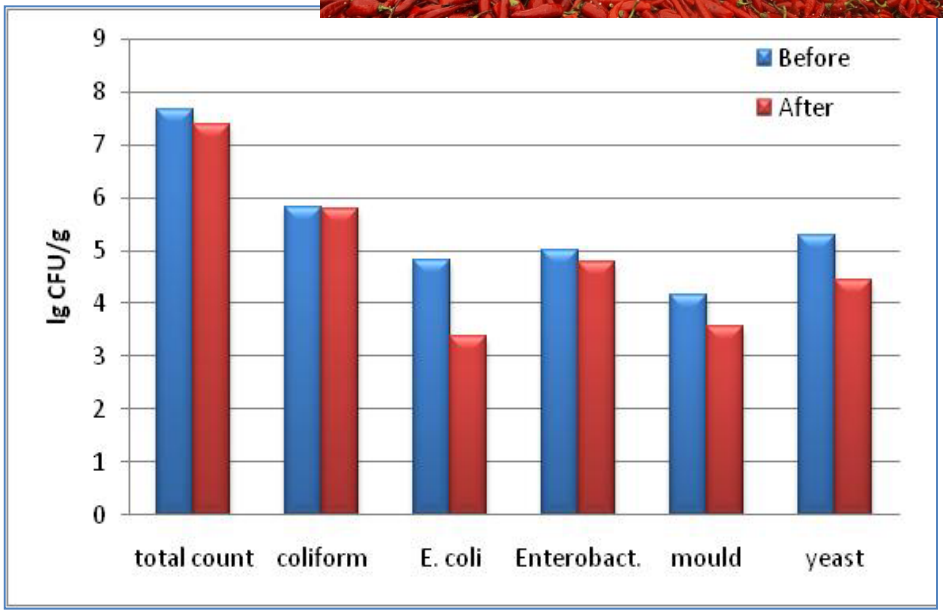
Meteorit



External factors, such as production factors, harvest procedures were investigated.

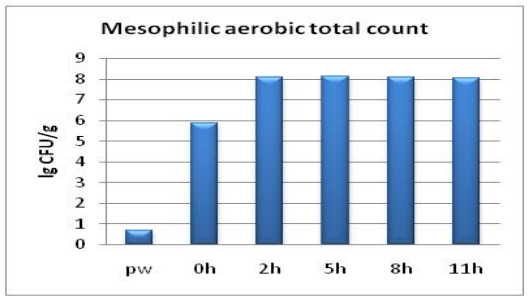
The differences found in the microbial contmination of spice paprika berries had no relation to the plant morphology or to the method of harvest.

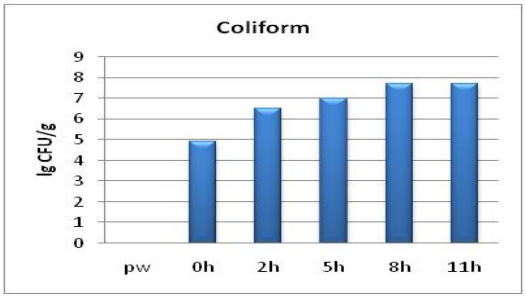
Microbiological changes during the washing of spice paprika

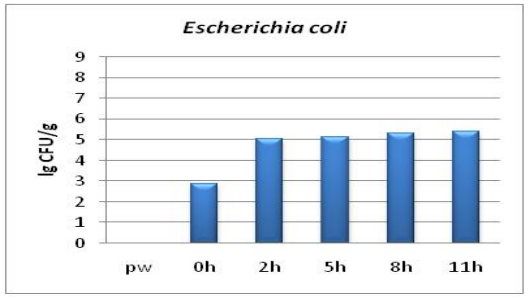


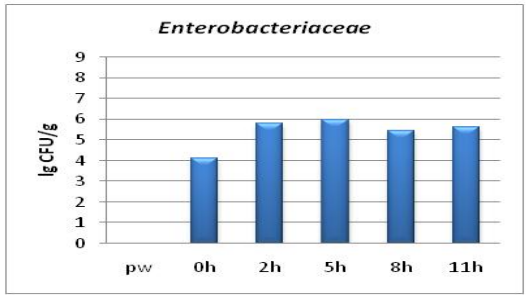
Washing step is only for the removal of the physical contamination, as the water used through 8-11 hours is saturated with microbes by the second hour.

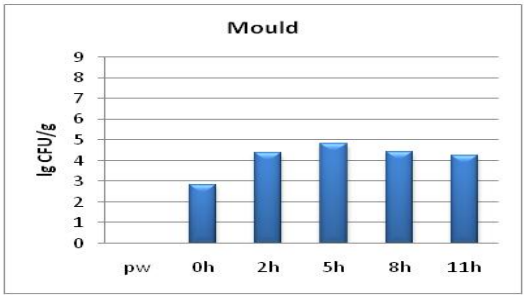
Microbiological changes during the washing of spice paprika

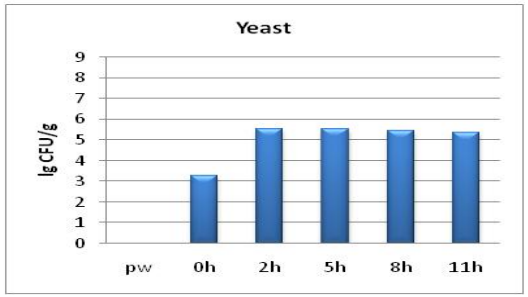






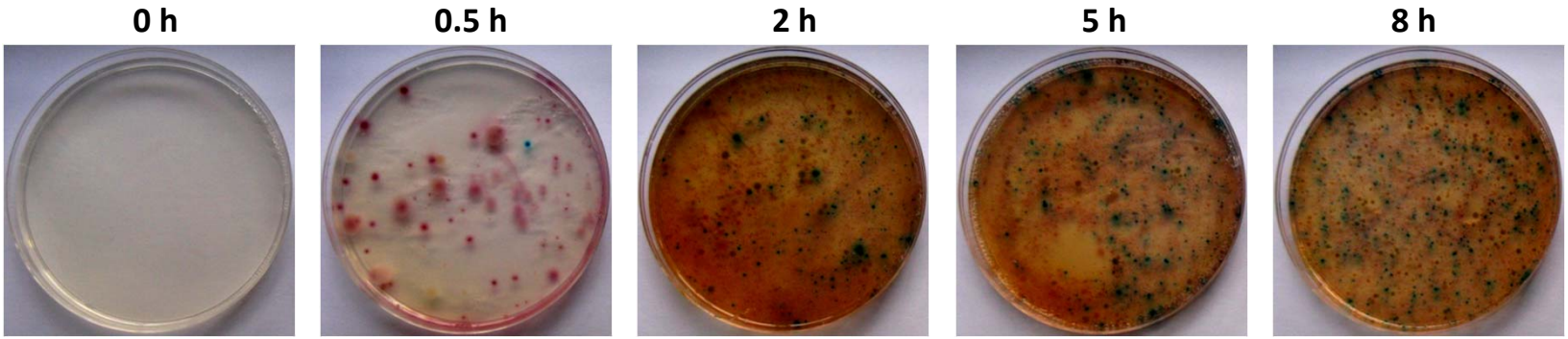






Changes in the microbial contamination of washing water through time

(pw- pipe water, 0h – tank filled with water before paprika is processed, 2-11h – time of processing)



Changes in the microbial and physical contamination of washing water plated in ChromobioColiform medium through time

Microbiological status of washing water

„*Daphnia* sp. acute immobilization test" (OECD 202)[1]

- fleas at L1 larval stage (<24 hours)
- 48-hour exposition, 5 animals per test/quadruplicates
- endpoint: immobilization

„Fish acute toxicity test" (OECD 203) [1]

- fish at 2±1 cm lenght stage
- 96 h exposition, 7 animalss per test/triplicates
- endpoint: mortality

***Aedes aegypti* larvae test according to WHO Guideline[2]**

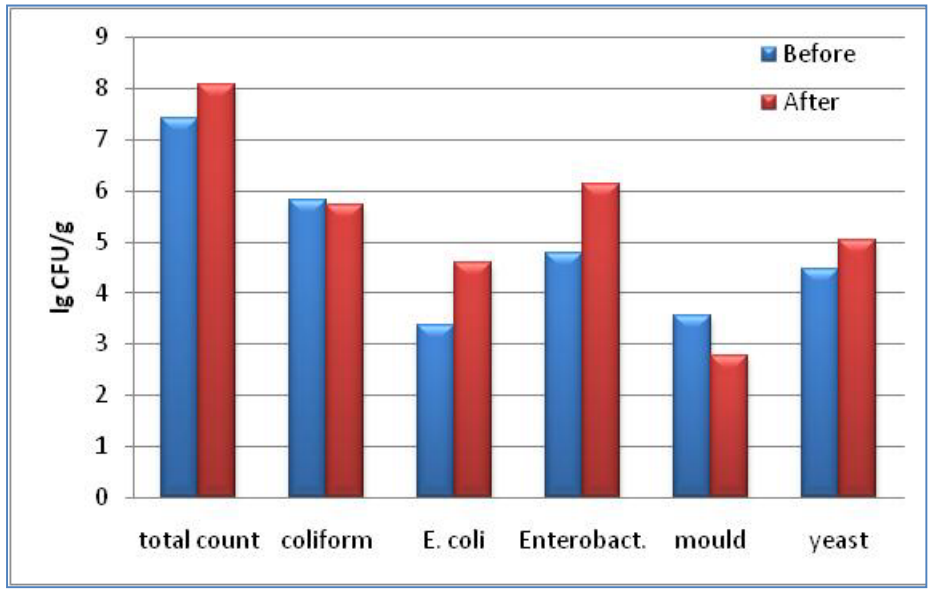
- mosquiotes at L4 larval stage
- 48 h exposition, 5 animals per test/quadruplicates
- endpoint: mortality

„Fish embryo acute toxicity (FET) test" (OECD 236) on *Danio rerio* [1]

- fish embryos at 16-cell stage
- 96 h exposition, 20 embryos per test/triplicates
- endpoint: mortality, sublethal effects

The washing water should be handle as hazard waste!

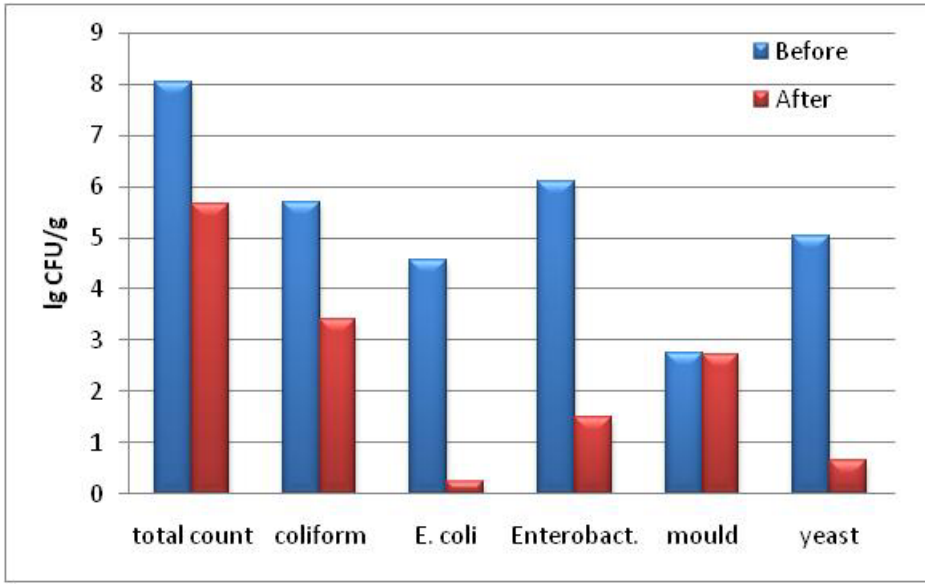
Microbiological changes during the slicing of spice paprika



During slicing, the microbial contamination of paprika increases, as the microbes present inside the berries emerge.

No *Salmonella* could be detected in any of the samples examined.

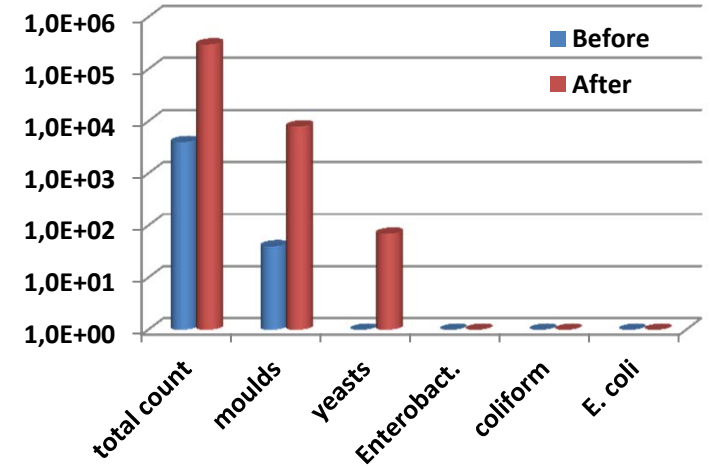
Microbiological changes during the drying of spice paprika



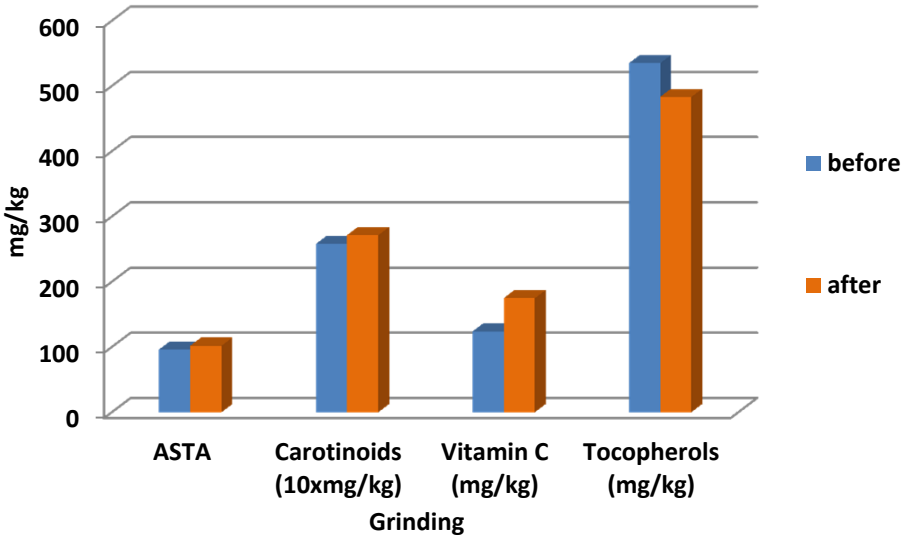
Drying greatly decreases the microbial contamination as most of the vegetative cells are killed. We have found 2-3 orders of magnitude reduction in the numbers of mesophilic aerobic total bacteria and coliform counts, *Escherichia coli*, *Enterobacteriaceae*, and yeasts have almost entirely disappeared.

The half-product can be stored up to months or even years in this phase without any change in its microbiological state.

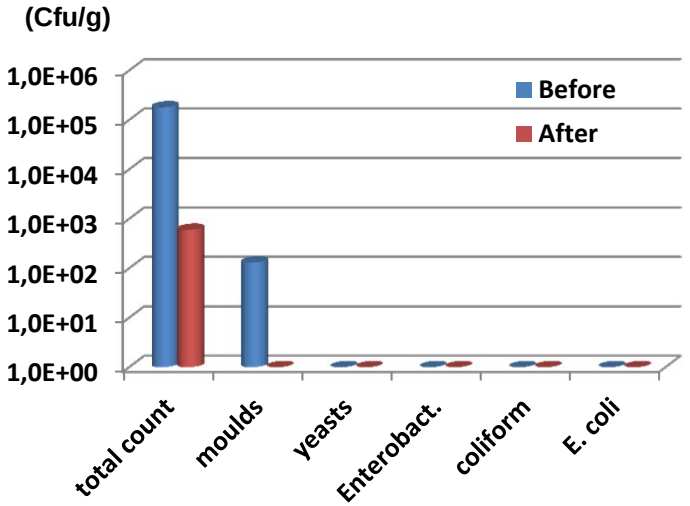
Microbiological changes during the grinding of spice paprika

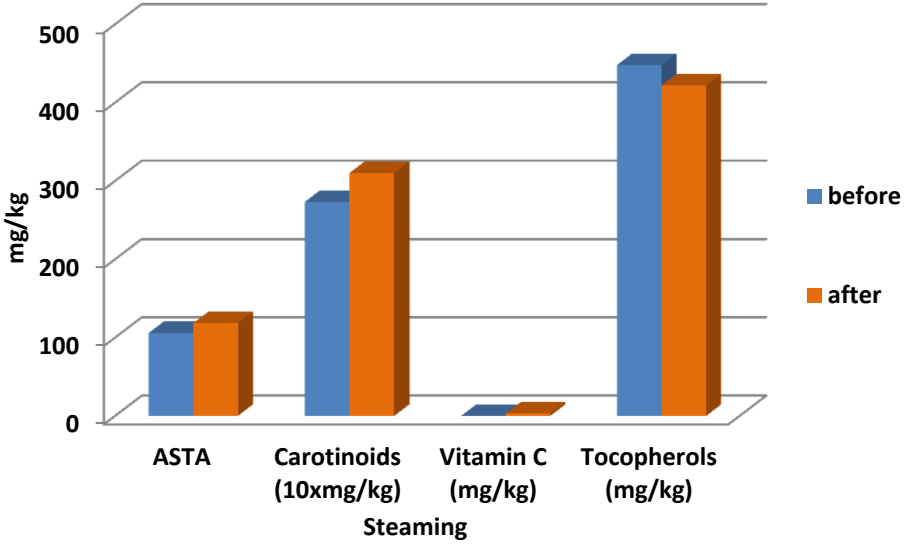


The mesophilic aerobic bacterial count and also the mould contamination increased with two orders of magnitude with grinding. This is due to the fact that the microbial load of paprika berries is not homogenous; a few heavily spoiled ones mixed with the healthy berries contaminate the whole produce.



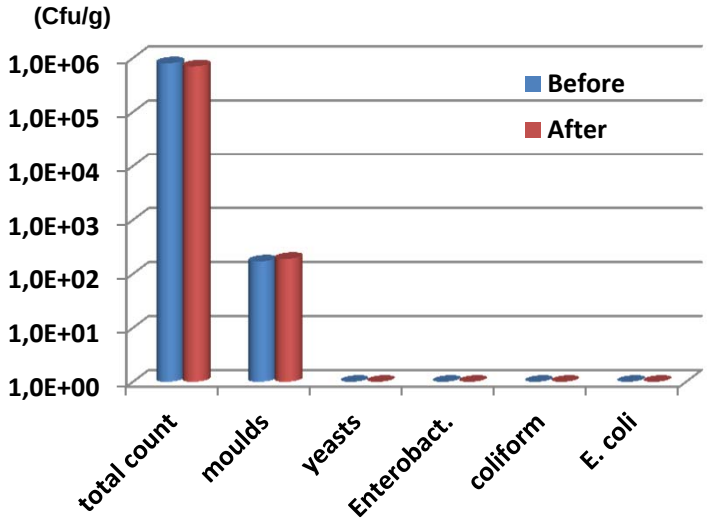
Steam treatment



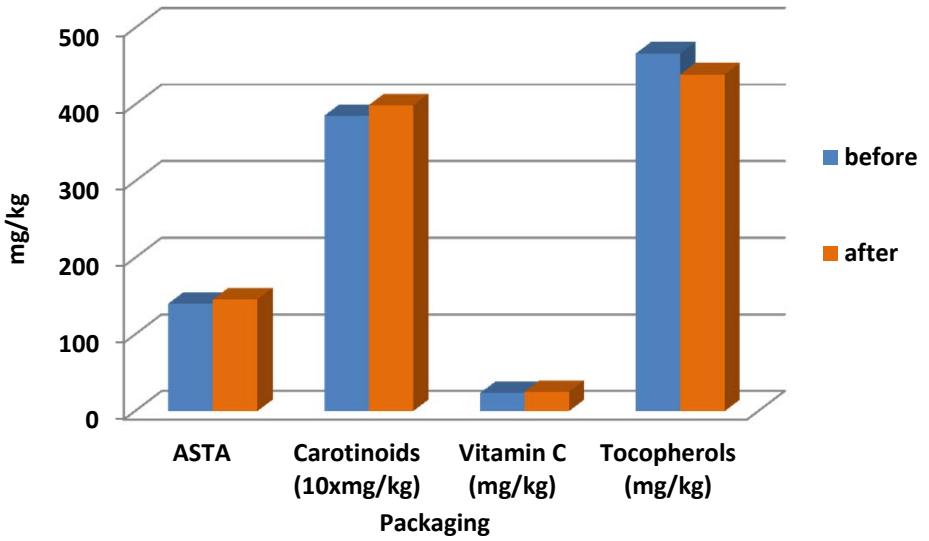


The steaming of spice paprika powder as decontamination procedure is effective. The bacterial and mould contamination could be reduced by 2-3 orders of magnitude. It is applied only in case the raw material is heavily contaminated, as it provides additional costs and it slightly reduces the colour of paprika powder.

Packaging



The packaging, carried out according to regulation, had no effect on the microbial load of the spice paprika powder.



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