

Mould and yeast species contaminating Norwegian dry-cured meat products

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Abstract

Dry-cured meat production has a long tradition in Norway. Presently, the annual production is around 1700 tons with an approximate per capita consumption of 0.5 kilos. However, many producers are facing a significant quality and economic problems due to uncontrolled fungal growth. With the aim of assessing the diversity of fungi contaminating Norwegian dry-cured meat products, 72 samples were collected from five producers. Moulds and yeasts were isolated either by inoculating the aerial mycelium of visible fungal colonies or by directly plating small pieces of meat on suitable agar media. A polyphasic approach of species identification was employed to identify the isolates. In total, 96 isolates were obtained; of which 77 were moulds while 19 were yeasts. The moulds were identified in to 14 species belonging to *Penicillium*, *Cladosporium*, and *Eurotium*. The genus *Penicillium* contributed by 10 species covering 59 % of the total isolates. The rest were from *Cladosporium* spp. and *Eurotium* spp. covering 16 % and 5 % of the isolates respectively. Yeasts accounted for 20 % of the mycobiota of the products investigated. In general, species of *Penicillium* were associated with Norwegian dry-cured meat products.

Introduction

Dry-cured meat production has a long tradition in Norway. Presently, the annual production is around 1700 tons with an approximate per capita consumption of 0.5 kilos. The demand for safe products of high quality has been increasing. However, many producers are facing a significant quality and economic problems due to uncontrolled fungal growth. As some of the moulds growing on the products are mycotoxigenic, they can have a potential health hazard to the consumers. To reduce quality and economic problems and minimize the potential health risk, the fungi growing on the dry-cured meat products should be identified and characterised. The aim of present study was to obtain an initial overview of moulds and yeasts growing on the surfaces of Norwegian dry-cured meat products.

Materials and methods

A total of 72 samples of mouldy dry-cured meat products were received from five different producers in Norway. Moulds and yeasts were isolated either by inoculating the aerial mycelium of different fungal colonies or by directly plating small pieces of meat at three points on Petri dishes containing Dichloran 18 % glycerol agar (DG-18) (Pitt & Hocking, 1999). The Petri dishes were incubated in darkness for 7 days at 25 °C and inspected for genus identification. The identified fungal genera were sub-cultured on suitable agar plates for species identification. All moulds belonging to the genus *Penicillium* were plated on MEA (Malt extract agar), CYA (Czapek yeast extract agar), YES (Yeast extract sucrose agar), CREA (Creatine sucrose agar), NO₂ (Nitrite sucrose agar). Other moulds and yeasts were sub-cultured on MEA and PDA (Potato dextrose agar). MEA, CYA, YES and PDA were incubated at 25 °C, while CREA and NO₂ at 20 °C for 7 days. A polyphasic approach was used in the identification process of the isolates. Macroscopic and microscopic morphological characters were mainly used to identify moulds at a genus and species level. Erlich test was performed to differentiate certain species of *Penicillium*. Molecular techniques by sequencing the ITS regions of fungal DNA were used for the identification of yeasts and some moulds which were difficult to identify by the traditional methods. All the isolates were identified according to Frisvad and Samson, 2004 (Frisvad & Samson, 2004), Pitt and Hocking, 1999 (Pitt & Hocking, 1999) Pitt, 1979 (Pitt, 1979). Each species isolated from one piece of dry-cured meat product was considered as one isolate.

Results

In total, 96 fungal isolates were identified; of which 77 were moulds while 19 were yeasts. The mould isolates were composed of 14 different species belonging to *Penicillium*, *Cladosporium* and *Eurotium*. The genus *Penicillium* contributed by 10 species that covered 59 % of the total isolates, where as yeasts came on

the second place with a 20 % contribution. The remaining four mould species were from *Cladosporium* spp. and *Eurotium* spp. that accounted for 16 % and 5 % of the total isolates respectively.

Conclusions

Generally, the genus *Penicillium* was dominant on Norwegian dry-cured meat products. Some species of *Penicillium* are known for their ability to produce toxic secondary metabolites (mycotoxins and antibiotics), which can have a potential health hazard to the consumers if released on the products. Yeasts are also important group of contaminants on dry-cured meat products, although their significance remains uncertain in a quality as well as food safety context.

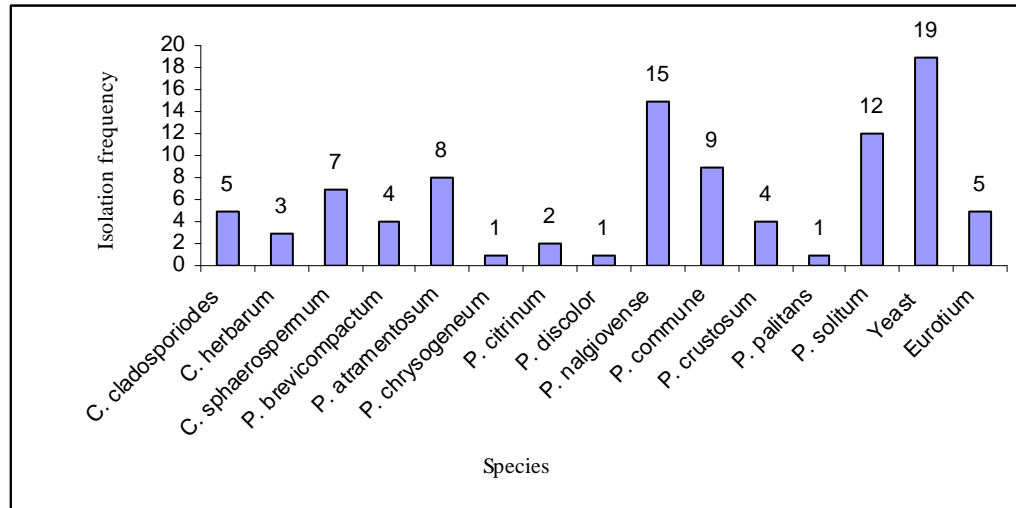


Figure 1. The mycobiota of Norwegian dry-cured meat products.

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