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Microscopic fungi, a source for qualitative impairment of meat products

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Abstract

Since mycotoxins usually appear in various food products, this represents a serious problem of food security. There is a convincing evidence as concerning the association between aflatoxin and primary liver cancer. It also causes major damage in animal husbandry. Authors further developed existing data on the qualitative impairment of meat products, studing the fungi. Measures should be taken to prevent fungus growth and to avoid decomposition of toxins. Preventing only one of these two elements is not always effective. Meat products subject to mycological analysis were purchased from a hypermarket in Timisoara. Together with the evolution of existing fungi in meat products, genders has been determined that were favored by inadequate storage conditions. The results obtained after 7 days of incubation in a usual and also a special habitat, at 20º C, demonstrated that yeasts have exceeded the limits for permitted quality. This fact has been also established in filamentous fungi and the *Penicillium sp*.

Keywords: fungi, meat products, *Penicillium sp.*

1. Introduction

Although, current awareness of excreted secondary metabolites and fungi diversity is very high, the list of fungal toxins, as biochemical weapons, is limited. Their incorporation into human or animal diet is a great risk for health [6].

There is a convincing relationship between aflatoxin exposure and primary liver cancer. The manufacturing process includes steps to prevent contamination with molds, but nevertheless, it is difficult to maintain sterility of a product. There still is a possibility for the products to contain small amounts of mycotoxins [7].

Based on tests performed by Korukluoglu et. al. on fungal communities from factories dealing with meat products, we observed a higher degree of sensitivity in the case of yeasts [3].

Almost every known fungi have the potential ability to produce mycotoxins in pure culture and laboratory conditions. Fortunately, the presence of spores or the growth of specific fungi is not always followed by the appearance of mycotoxins.

The huge number and nature of toxic agents that cause food poisoning and severe disorders are often the consequence of non-compliance with storage and product processing [1].

Penicillium is not an accidental presence in studied products. Similar studies have shown that Penicillium may be found on the surface and inside other food products (sausages) made in certain agro-industrial factories in Russia [2].

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2. Materials and methods

Studied meat products are as follows: sausages made of chicken breast, chicken sausages, half dried salami, delicious salami, ham salami and cabanos sausage. Meat products had been purchased from a supermarket in Timisoara. Mycological studies consisted of determining yeast quantities, the filamentous fungi, and identifying the most important types of products.

The presence of yeasts and molds has been highlighted by the inoculum diffusion method [8]. For each product a decimal dilution (10^{-1}) has been prepared. The dilution has been inoculated on a culture with a potato extract. After 7 days of incubation at 20° C, studies have been performed using the following formula:

$$UFC / ml = \Sigma (n \times d) / N \times V$$

where: n - number of colonies developed in a Petri box; d - the inverse dilution of the samples; N - number of Petri boxes;V - sample volume in ml. Obtained values had been compared with the maximum value allowed by law (STAS 975/1988).

3. Results and Discussions

Values of the obtained results had been in accordance with the law [4,5]. Following the comparative studies, it has been established that the total number of yeasts exceed the permitted maximum amount 1 UFC/g. High values reveal the existence of certain factors (mostly temperature) which makes improper the storage of meat products (Fig. 1.).

A high microbial load has been registered especially at products like delicious salami, ham salami and chicken sausages. A possible explanation may be related both to inadequate storage conditions, but also to the existence of a similar chemical stimulant, as the three meat products are from the same company.

Based on every meat product (Fig.2.) we established the following:

- half dried salami (placed in quadrant I), although the number of yeasts is lower when compared to other products, this microbial segment exceeds the limit allowed by rules of food safety;
- the yeast load reached alarming standards in the case of chicken sausages (quadrant IV).

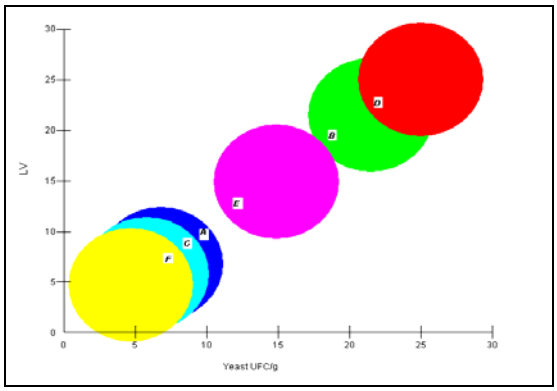

Figure 1. Evolution of yeasts in studied products (A. sausages made of chicken breast, B. chicken sausage, C. half dried salami, D. delicious salami, E. ham salami, F. cabanos sausage)

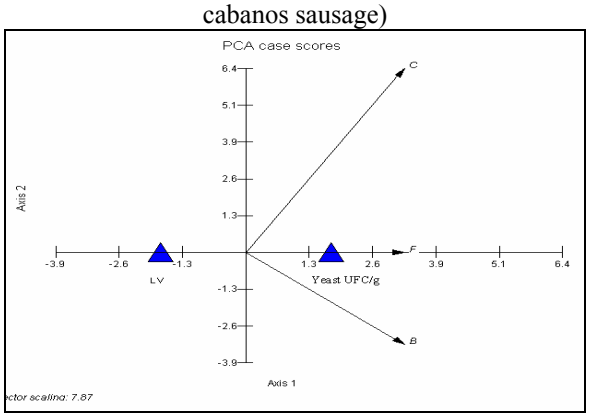

Figure 2. Quantitative evaluation of yeasts (A. sausages made of chicken breast, B. chicken sausage, C. half dried salami, D. delicious salami, E. ham salami, F. cabanos sausage)

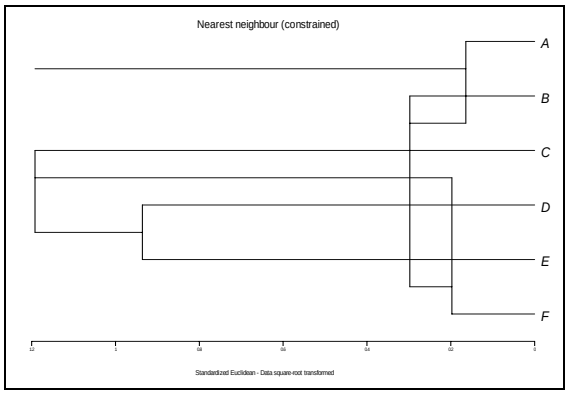

Figure 3. Yeasts differences and similarities (A. sausages made of chicken breast, B. chicken sausage, C. half dried salami, D. delicious salami, E. ham salami, F. cabanos sausage)

Statistic Cluster analysis, with the use of appropriate mathematical square root values (Fig. 3.) highlight the behavior similarity of yeasts between sausages made of chicken breast and chicken sausages. There is a clear distinction from the other products.

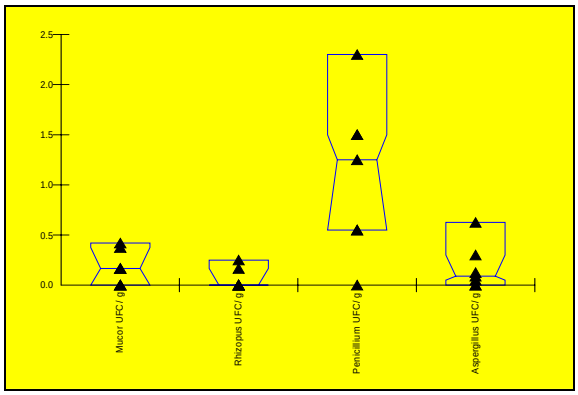

Figure 4. Fungal evaluation of meat products, separated by gender (A. sausages made of chicken breast, B. chicken sausage, C. half dried salami, D. delicious salami, E. ham salami, F. cabanos sausage)

As concerning the fungal dominance on studied products (Fig. 4.), we can mentioned four types and these are: *Mucor, Rhizopus, Aspergillus* and *Penicillium*. Quantitative values for *Mucor, Rhizopus* and *Aspergillus* reach the allowed level (1 UFC/1g). Penicillium exceeds the permitted value in 4 studied products (sausages made of chicken breast, chicken sausage, half dried salami, delicious salami, and ham salami) (Fig. 5.).

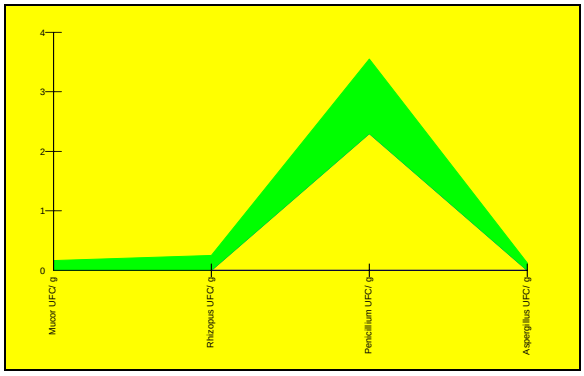

Figure 5. The maximum limit of *Penicillium* (A. sausages made of chicken breast, B. chicken sausage, C. half dried salami, D. delicious salami, E. ham salami, F. cabanos sausage)

There is a change concerning the presence and absence of these 4 products. *Mucor* does not appear in the sausages made of chicken breast. On the other hand, *Penicillium* recorded the biggest value. *Mucor* and *Rhizopus* does not appear in delicious salami. *Rhizopus* does not appear in the half dried salami and cabanos sausages.

Statistically processed values recorded for fungal load established that the (Fig. 6.), half dried salami presents the lowest values.

It has been placed in quadrant I. From the 4 studied molds types, the *Rhizopus* has been found in only 2 products. *Mucor* and *Aspergillus* were found in 4 products.

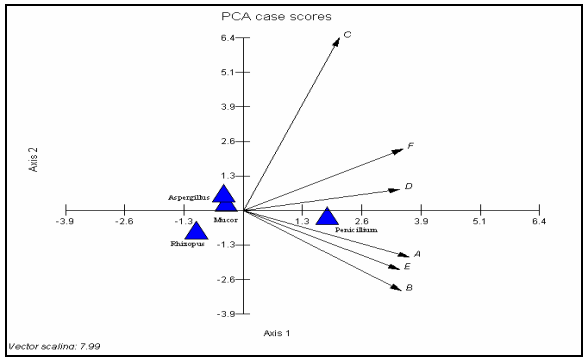

Figure 6. Fungal distribution of six meat products (A. sausages made of chicken breast, B. chicken sausage, C. half dried salami, D. delicious salami, E. ham salami, F. cabanos sausage)

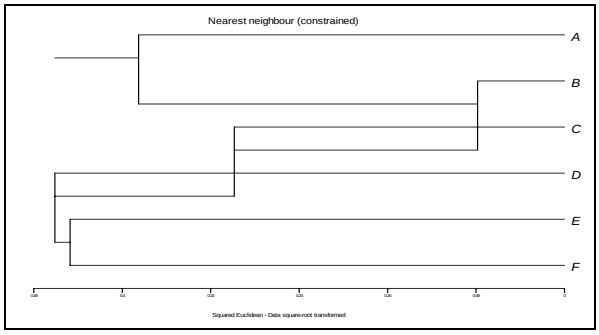

Figure 7. Differences and similarities between meat products with filamentous fungi (A. sausages made of chicken breast, B. chicken sausage, C. half dried salami, D. delicious salami, E. ham salami, F. cabanos sausage)

Cluster statistic analysis highlight a rather different behavior of the sausages made of chicken breast. There is a similarity of behavior between ham salami and cabanos sausages, as concerning the number of molds (Fig. 7.).

4. Conclusion

Obtained results reveal, in a quantitative term, that unicellular and filamentous fungi, exceed the limit accepted by law.

Similarities and differences arising from the total number of yeasts may be due to the fact that there are different products. Another cause may be that certain products have similar ingredients, because the products have been made by same company. We can mention that 4 of the studied products, concerning the fungal load, have an increased risk of deterioration and impairment that may endanger the health of consumers.

Due to the large number of species that belong to *Penicillium* (in most of the studied products) may indicate a potential contamination of mycotoxins. It is well - known that many Penicillium species produce such substances. Some of the substances are very toxic (aflatoxin, aflatrem, aflavinin, aspergilla acid, ciclopiazonic acid, 3-nitropropionic acid, paspalinin).

Discoveries made during this study reveal the danger of spoilage, the product depreciation and the great risk on human health.

References

1. Darău, P.A., *Igiena şi siguranța produselor alimentare de origine alimentară*, "Vasile Goldiş" University Press, Arad, Romania, 2008
2. Feofilova, E. P., Kuznetsova, L.S., Sergeeva, Ya.E., Galanina, L.A., Species composition of food-spoiling mycelial fungi, *Journal of Microbiology,* **2009***, 78*(1), 112-116
3. Korukluoglu, M., Sahan, Y., Yigit, A., The fungicidal efficacy of various commercial disinfectants used in the food industry, *Annals of Microbiology*, **2006**, *56*(4), 325-330, doi: 10.1007/BF03175025
4. Mişca, C.D., *Microbiologia produselor agroalimentare*, Editura Solness, Timişoara, Romania, 2001
5. Oprean, L., *Analiza microbiologică a produselor alimentare,* Editura Universității Lucian Blaga, Sibiu, Romania, 2002
6. Russell, R., Paterson, M., Fungi and fungal toxins as weapons, *Mycological Research.*, **2006**, *110*(9), 1003-1010, doi:10.1016/j.mycres.2006.04.004
7. Robert, A., Samson, E., S.van Reenen-Hoekstra, *Introduction to food-borne fungi*, Ediția a 3-a, Editura Grafisch Bedrijf Ponsen & Looijen b.v., Wageningen, 1988
8. Drăgan-Bularda M.: *Microbiologie generală*, Lucrări practice, Cluj-Napoca, Romania, 2000