

Contribution to the knowledge of inhibitory effects of potassium sorbate and smoke preparations (producer Etol Celje) on some sorts of molds isolated from sausage surface

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The aim of these investigations was to study the inhibitory effects of various concentrations of potassium sorbate (6%, 7%, 8% and 10%) on eight sorts of molds (*Mucor christianiensis*, *M. dimorphosporus*, *M. heterosporus*, *M. sciurinus*, *M. vosnessenskii*, *Penicillium concentricum*, *P. verrucosum* var. *cyclopium* and *P. verrucosum* var. *ochraceus*) isolated from the surface of meat products. Influence of potassium sorbate has been also investigated for the common cultures of the mentioned mold sorts. Simultaneously an inhibitory effect of smoke preparations of domestic production by Etol - Celje, in the concentrations of 0,5%, 1%, 1,5% and 2%, on the growth and multiplication of the chosen mold sorts and their particular cultures, has been investigated.

These experiments have been carried out in order to get better insight in the efficiency of particular preparation in the course of growth restraining on sausage surfaces.

Zur inhibitorischen Wirkung des Kaliumsorbates und der Rauchpreparate auf einzelne Arten des Schimmels welcher der Wurstopberfläche entnommen wurde

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In diesem Bericht wird die inhibitorische Wirkung verschiedenen Kaliumsorbit-Konzentrationen (6%, 7%, 8% und 10%) auf acht Arten Schimmel (*Mucor christianiensis*, *M. dimorphosporus*, *M. heterosporus*, *M. sciurinus*, *M. vosnessenskii*, *Penicillium concentricum*, *P. verrucosum* var. *cyclopium* und *P. verrucosum* var. *ochraceus*) von der Fleischoberfläche geprüft. Die Wirkung des Kaliumsorbates wurde auch hinsichtlich der integrierten Kulturen der genannten Schimmelsarten geprüft. Gleichzeitig wurde die inhibitorische Wirkung des Rauchpreparates der Fabrik Etol - Celje in Konzentrationen von 0,5%, 1%, 1,5% und 2% auf den Wuchs und Verbreitung der Schimmelpilzen geprüft.

Mit diesen Versuche wollten wir die Wirkung ausgewählten Mittel zur Hinderung der Schimmelentwicklung auf der Wurstopberhaut prüfen.

Une contribution à la connaissance de l'action inhibitoire du le sorbate de potassium et de la préparation de fumée (produit par Etol - Celje) sur certaines espèces des moisissures isolées sur les surfaces des saucisses

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Dans l'article l'influence inhibitoire des concentrations différentes du le sorbate de potassium (6%, 7%, 8% et 10%) sur huit espèces de moisissures (*Mucor christianiensis*, *M. dimorphosporus*, *M. heterosporus*, *M. sciurinus*, *M. vosnessenskii*, *Penicillium concentricum*, *P. verrucosum* var. *cyclopium* et *P. verrucosum* var. *ochraceus*), isolées sur les surfaces de la charcuterie, a été examiné. On a aussi examiné l'influence du le sorbate de potassium sur les cultures associées de cetttes espèces. A même temps, nous avons examiné l'action inhibitoir de la preparation de fumée, produit en Yougoslavie par Etol-Celje, avec les concentrations de 0,5%, 1%, 1,5% et 2% sur la croissance et reproduction des espèces sélectionnées et leurs cultures.

Le but de cetttes expériences était d'apercevoir l'efficacité des moyens sélectionés dans l'action d'arrêter la croissance des moisissures sur l'enveloppe des saucisses.

К вопросу ингибиторного действия К-сорбатов и препаратов дыма (продукт фабрики Етол-Целье) на некоторые типы грибов, выделенных с поверхности колбас.

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В работе исследовалось влияние различных концентраций К-сорбатов (6%, 7%, 8% и 10%) на восемь типов грибов / *Mucor christianiensis*, *M. heterosporus*, *M. dimorphosporus*, *M. sciurinus*, *M. vosnessenskii*, *Penicillium concentricum*, *P. verrucosum*, var. *cyclopium* и *P. verrucosum* var. ^{ochraceu} / которые были выделены с поверхности мясopодуктов. Исследовалось также влияние К-сорбатов на объединённые культуры упомянутых типов грибов. Одновременно исследовалось и ингибиторное действие препаратов дыма домашнего производства (фабрика Етол-Целье) в концентрациях 0,5%, 1%, 1,5% и 2% на рост и размножение отобранных типов грибов и их отобранные культуры. Целью экспериментов является разъяснение эффективности выбранных средств в процессах остановки роста грибов на поверхности колбасы.

Contribution to the knowledge of inhibitory effects of potassium sorbate and smoke preparations on some sorts of molds isolated from sausage surface

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Introduction

Certain number of fungi represent useful microflora in the industrial production of sausages with the desirable organoleptic properties (flavour, colour, taste). However, there is an increased number of authors concluding that from the sausage surface one can isolate various fungi which secrete mycotoxines with cancerogenic characteristics. Ciegler et al. (1972) have isolated from sausage surfaces certain number of kinds, Penicillium sorts, producer of mycotoxines, as: P. citrinum (citrinin), P. claviforme (citrinin), P. commune (ochratoxin, penicillious acid), P. verrucosum var. cyclopium (ochratoxin, penicillious acid), P. expansum (penicillious acid, patulin, citrinin), P. frequentans (tremortin), P. purpurascens (ochratoxin), P. janthinellum, P. palitans (tremortin), P. viridicatum (ochratoxin, penicillious acid) and P. variable (ochratoxin). Similar results have been given by Alperden et al. (1973) isolating P. expansum and P. urticae from sausage surface (patulin), as well as Aspergillus versicolor which produces sterigmatocystin. The same sorts A. versicolor has been isolated by Inze et al. (1976) from the hungarian salami beside the sorts of A. flavus and A. parasiticus (aflatoxin). Hadlok et al. (1971) have also carried similar investigations, isolating from meat products P. chrysogenum, P. expansum, A. repens and A. flavus.

Application of smoke preparates in the technological processing of sausages eliminates some components with the ascribed cancerogenic features, but makes the composition of natural smoke. According to the available literature there are hardly any data on the fungistatic reaction of smoke (Wolkowskaya et al., 1962). The greatest number of references are referred to its bacteriostatic, i. e. bactericide effect (Jensen, 1954; Kochanowski, 1962; Rašeta et al., 1962).

Taking into account frequent application of smoke preparations for meat products, we were interested for the possibility of its application as fungistatic for the exterior treatment of sausage covers.

Beside the smoke preparations, food industry has the legal allowance for the application of sorbic acid, as a conserving agent. According to the papers of some authors (Leistner et al., 1975) the mentioned preparation has a fungistatic effect, but do not change organoleptic characteristics of the product, nor effect on the humans health.

Therefore, we have isolated and determined from sausage surface various sorts of fungi, investigating an inhibitory effect of smoke preparation and potassium sorbate in various percent in laboratory scales.

Material and methods

In the course of these investigations we have used eight sorts of fungi and collective cultures of all investigated sorts obtained from sausage surfaces: Mucor christianiensis, M. dimorphosporus, M. heterosporus, M. sciurinus, M. vosnessenskii, Penicillium concentricum, P. verrucosum var. cyclopium and P. verrucosum var. ochraceus. In the course of isolation and determination of moulds we have used the following media: Czapek Dox agar, malt agar and Sabouraud agar. Determination have been carried according to Pidoplička et al. (1971) and Samson et al. (1976).

For the investigation of the inhibitorx effects of smoke preparations and potassium sorbate on the growth and multiplication of fungi, we have used the concentrations of 6%, 7%, 8% and 10%.

Inhibitory effects of the mentioned preparations have been investigated by disc methods.

Results and discussion

We have comparatively investigated the effect of smoke preparations and potassium sorbate on some sorts of moulds isolated from the sausage surface (Mucor christianiensis, M. dimorphosporus, M. heterosporus, M. sciurinus, M. vosnessenskii, Penicillium concentricum, P. verrucosum var. cyclopium and P. verrucosum var. ochraceus).

For the preliminary investigations of an inhibitory effect of smoke preparation on the mentioned sorts of moulds we have used lower concentrations (0,5%, 1%, 1,5% and 2%), which haven't expressed fungistatic characteristics. Concentration increase to 6%, 7%, 8% and 10% have been expected to effect the expression of an inhibitory effect of the used preparation. However, in no case we have observed inhibitory regions of growth, as is obvious from table 1.

Table 1

Inhibitory effects of smoke preparation and potassium sorbate on the growth of the isolatede fungi sorts

Fungi species	Inhibitory regions of fungi growth at the concentration of smoke preparation and potassium sorbate-mm			
	6%	7%	8%	10%
<u>Mucor christianiensis</u>	2	4	4	6
<u>Mucor dimorphosporus</u>	8	10	8	11
<u>Mucor heterosporus</u>	2	9	8	12
<u>Mucor sciurinus</u>	4	8	12	18
<u>Mucor vosnessenskii</u>	6	10	7	11
<u>Penicillium concentricum</u>	8	8	10	12
<u>Penicillium verrucosum var. cyclopium</u>	10	14	14	16
<u>Penicillium verrucosum var. ochraceus</u>	6	11	10	13
Collective cultures of all investigated sorts	4	7	8	11

Concerning the fungistatic effects of smoke preparations, according to literature data, opinions are divided. Sevar (1963) and Guinet (1948) notice that liquid smoke has a conserving effect, while Jensen (1954) and Ostertag et al. (1934) quote that liquid smoke has neither bacteriostatic nor fungistatic effect. Wolkowskaya et al. (1962) have investigated the effect of liquid smoke on the chosen sorts of bacteria and moulds, concluding that liquid smoke has an extremely bactericide and slightly smaller fungicide effect. According to their opinion bactericide phase and fungicide characteristics are caused by phenol content. Kochanowski (1962) has concluded that the greatest number of liquid smoke preparations have the expressed bacteriostatic features.

According to the review of the existing literature data as well as according to our results we are inclined to believe that some smoke preparations have no substance which initiates fungistatic, i. e. bacteriostatic effects. The fact is that this preparation couldn't be used as fungistatic for external treatment of sausage covers. But, this initiates considerations that this failure of fungistatic effect could be the favour in relation to smoke preparations, which have this feature, or even the favour over the natural smoke, as it doesn't contain substances which have cancerogenic features. Its primary function directed to the improvement of organoleptic characteristics of meat products doesn't degrade its validity.

Potassium sorbate has been established as the mean which stops mould growth, as in vitro, so on sausage surface will be contaminated with moulds. In order to compare the effects of fungistatic, i. e. fungicide effects of potassium sorbate and smoke preparations on the moulds isolated from sausage surface we have used the same concentrations of potassium sorbate and smoke preparations (6%, 7%, 8% and 10%). While the smoke preparations (in vitro) in the used composition haven't stopped mould growth, potassium sorbate has expressed inhibitor effects even in the smallest concentration (6%). Table 1 gives the inhibition regions measured after 7 days. On the enclosed photos it is seen that values of inhibitory regions vary depending on mould sorts (from 2-10mm). Concentration increase up to 7% increases inhibitory regions too, for all mentioned sorts (from 4-18mm). Even at the concentrations of 8% and 10% there is an increase of inhibitory regions, depending on the mould sorts. Each sort has expressed specific sensitivity to this conserving agent. Thus, the variations of inhibitory regions were a little smaller for Penicillium species (from 6-16mm) in relation to Mucor (from 2-18 mm), as it is seen on Figures 1, 2, 3 and 4.

While Mucor vosnessenskii has expressed extremely good inhibitory regions of growth for the used media (Fig. 1), M. christianiensis has expressed less sensitivity to the mentioned conserving agent (Fig. 2). An extremely expressed sensitivity to this agent has been observed for Penicillium species (Fig. 3), while at collective cultures of all investigated mould sorts, sensitivity proved to be significantly smaller (Fig. 4).

Summary

According to the carried analyses it was possible to conclude that:

- the concentrations of 6%, 7%, 8% and 10% of the investigated smoke preparation haven't expressed fungistatic and fungicid effect;
- potassium sorbate effects inhibitory on the growth both of individual and collective fungi cultures; the smallest variations in the values of inhibitory regions were observed at the concentration of 10%; Mucor species have expressed smaller sensitivity on this conserving agent than Penicillium species; the effect of potassium sorbate on the collective cultures of the investigated sorts of fungi is expressed by the increase of inhibitory region directly proportional to the concentration increase.

References

- CIEGLER A., MINTZLAFF H.-J., MACHNIK W. 1972. Die Fleischwirtschaft, 10, 1311-1314
- GUINOT H.M. 1948. Pyroligneous Liquors for Preserving Food Products and Method of Preparing the Same U. S. Patent Office. 2, 454-649.
- HADLOK R., BARTELS H. 1971. Die Fleischwirtschaft, 4, 517-519.
- INCZE K., FRANK K. 1976. Die Fleischwirtschaft, 2, 219-222.
- JENSEN L.B. 1954. Microbiology of meats. Illinois.
- KOCHANOWSKI J. 1962. Tehnologija mesa, Spec. Ed., 19.
- LEISTNER L., MAING Y.I., BERGMANN E. 1975. Die Fleischwirtschaft, 4, 559-563.
- OSTERTAG P.V., YOUNG T.D. 1934. Textbook of Meat Inspection, Chicago.
- PIDOPLIČKO N.M., MILJKO A.A. 1971. Atlas mukoraljnih gribov. Izdateljstvo "Naukova dumka", Kiev, 187 pp.
- RAŠETA J., ĆIRIĆ M. 1963. Tehnologija mesa, 5, 136.
- SAMSON R.A., STOLK A.C., HADLOK R. 1976. Revision of the subsection Fasciculata of Penicillium and some allied species. Centraalbureau voor Schimmelcultures Baarn, The Netherlands, 47 pp.
- ŠEVAR J. 1963. Tehnologija mesa, 5, 133.
- WOLKOWSKAYA I.L., LAPCHIN I.I. 1962. Tehnologija mesa, Spec. Ed., 26.

