

Mite control on seasoned pork products by modified atmospheres Preliminary tests.

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Summary

In the present study are described the results of treatments on seasoned pork meat in modified atmospheres. Purpose of the tests has been to verify the possibility to control with physical methods the mite populations which develop eating moulds growing on seasoning meat. The tests were conducted on mites which more frequently grow on seasoning pork products (genus Tyrophagus, Acarus). The complete disinfestation has been obtained after 6 days in a nitrogen saturated environment. Similar tests of three days have given unsatisfying results (death rate about 50 %). Exposures to 100 % carbon dioxide have given better results than those with N₂ even if the complete mortality has been achieved only with treatments of over 3 days. In the present study are also described the results of treatments with mixtures of CO₂/air and O₂/N₂ in different rates.

Introduction

Some kinds of food, such as seasoning pork meat and cheese, are kept at particular conditions of temperature and humidity which favour the growth of moulds. Moulds are an ideal substrate for the development of different species of mites. The control over these arthropods is made more difficult by the necessity of not damaging or altering the food. Chemicals in fact have the risk of binding with the meat in a stable way. Our researches have been directed only on seasoning meat. Our previous experiments with physical methods (Pagani, 1989), such as ultraviolet rays, microwaves etc, have given completely unsatisfying results. The survival of a small number of specimens, allows the mites to re-establish wide populations in a short time because of their short life cycle. We have then directed our attention on modified atmospheres. The results of our tests are described in the following.

Materials and methods

During our researches the tests have always been carried out on salami already infested by mites and at temperature, humidity and light conditions similar to those of the seasoning rooms. The salami were seasoned for at least a month. From each tested salami, samples of mites have been collected and the species identified. The used atmospheres are the following:

100 % N₂

100 % CO₂

20 % O₂ + 40 % CO₂ + 40 % N₂

5 % O₂ + 95 % N₂

For the choice of the types of gas and mixtures we have referred to the works of other authors (Bailey and Banks, 1980; Banks, 1979; Bell, 1984; Navarro *et al.*, 1979; Navarro *et al.*; 1985; Stepien, 1979) even if most of the available data are regarding insects more than mites. The infested products have been exposed to modified atmospheres for periods of 3, 4, 6 and 8 days, depending on the case. All the tests have been repeated twice. The tests have been carried out with the following procedure: first of all, it has been observed the mites present on the salami in order to estimate their number. We have used salami with mite population of some hundred units. Immediately after, the meat was placed in a plexiglass cylinder 40 cm long and 10 cm diameter. The gas was introduced through a valve placed at one end and at the beginning it was let out through a valve placed at the other end. In this way any possible different atmosphere was eliminated and the humidity inside the cylinder was reduced to values of about 50-60 % R.H.. Due to the meat evaporation during the tests, the humidity inside the cylinder was going back to 80-90 % R.H. (typical of seasoning rooms), without the risk of reaching 100 % R.H., with consequent death of the mites unascrivable to the gas effect. All the tests have been carried out placing the cylinder for the complete duration of the test, in a climatic room kept at 11-15 ° C and at an humidity rate of 85 ± 4 % in conditions of constant darkness, as it usually is in a seasoning room. At the end of each test the salami was extracted from the cylinder and examined by a stereoscopic microscope to verify mite conditions. Straight after, the salami was replaced in the same climatic room (out of the cylinder) at exactly the same humidity, temperature and light conditions. A second check of the mite population was done after 3 days to confirm the mortality rate.

Results

The mites present on the tested salami were Tyrophagus longior (Gervais) and Acarus farris (Oudemans).

100 % N₂

The complete disinfestation of the mites has been obtained with 6 days' treatments with 100 % N₂. The mortality rate has been checked after 3 and

8 days. Shorter period tests (3-4 days) have given unsatisfying results. At the end of the two tests lasting 3 days, the mites seemed completely dead, but, already the day after, many mites had restarted their activity and we could estimate a mortality rate of about 50 %. At the end of the two tests lasting 4 days, the estimated mortality rate was the same. At the end of the 4 days' tests, the mites which survived appeared still vital on the contrary to the shorter period tests.

100 % CO₂

Even with 100 % CO₂ complete mortality rate of the mites has been obtained with 6 days of treatment. Compared with N₂, the mortality rate after 3-4 days of treatment is higher. The first 3 days' test showed a mortality rate of 100 %. The second 3 days' test showed a mortality rate of about 90 %. At the end of the 4 days' tests the estimated mortality rates were: about 50 % in a case and over 95 % in the other one. Checks after 3 and 8 days have confirmed the first observations.

95 % N₂ + 5 % O₂

The 3 and 6 days' tests with this gas mixture have revealed a very low mortality rate. Even after 8 days the mortality was not complete, even if very high (about 90 %).

40 % N₂ + 40 % CO₂ + 20 O₂

This mixture has been effective only after the 8 days of treatment (100 % mortality rate). The 3 days' tests showed that only few tens mites (about 10 %) survived. After 4 days the mortality has been estimated around 80 %, whilst after the 6 days' treatment only few mites survived (about ten) of a population of many hundreds specimens.

Conclusions

The results of our tests, even if preliminary, seem to demonstrate that the use of modified atmospheres to control mites on seasoned products can give very good results. It is evident that the possibility to choose among gas mixtures of different components and quantities involves a wide range of tests. Currently 100 % CO₂ has given the best results and guarantees. 100 % N₂ has only a slightly lesser effect. Less satisfying has been the mixture of 20 % O₂ + 40 % N₂ + 40 % CO₂. After the limit of 8 days that we fixed for the tests, the mixture of 95 % N₂ + 5 % O₂ was completely ineffective. We consider that more effective gas types, to be used in mite control on seasoned pork products, could be identified through further tests.

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**ATMOSPHERES MODIFIEES CONTRE LES ACARIENS
INFESTANT LA CHARCUTERIE**

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RESUME

On présente les résultats des traitements par des atmosphères modifiées, effectués sur de la charcuterie après maturation. Ces essais ont été réalisés afin de vérifier la possibilité de détruire, par des moyens physiques, les populations d'acariens qui se développent aux dépens des moisissures. On a soumis aux traitements les acariens qui pullulent le plus fréquemment sur la charcuterie (genres *Tyrophagus*, *Acarus*).

On a obtenu la destruction totale des acariens en gardant pendant 6 jours la charcuterie dans un milieu ambiant saturé d'azote. Des essais analogues, ayant une durée de 3 jours, ont donné des résultats non satisfaisants (mortalité d'environ 50 %). Les traitements dans un milieu ambiant saturé de CO₂ se sont avérés plus efficaces que les traitements par N₂, même si la mortalité totale a été obtenue seulement lorsque la durée du traitement a dépassé les trois jours.

On examine aussi les résultats des traitements effectués avec des mélanges de CO₂/air et de O₂/N₂ dans différentes proportions.