PACKAGING FRESH AND CURED MEAT

INCREASING THE STORAGE LIFE OF HASH BY IONIZING IRRADIATION

I. CHANGES IN FATS AND ORGANOLEPTIC QUALITIES

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Summary

Hash (consisting of pork, 60%, and beef, 40%) packed in polythene bags in the presence of air was irradiated at the doses of 0, 0.2, and 0.4 Mrad. A Co^{60} gamma unit, with a dose power of 0.7 Mrad/hr, was used as the source of radiation. Irradiation was effected at room temperature. The hash was stored at the temperature of 0 to 2°C. Changes in the peroxide number of fats were followed, an UV spectrum was taken, benzidine and thiobarbituric test was determined spectrophotometrically. The flavour, aroma and consistency of heat-processed hash were determined. With the doses applied, an insignificant change in fats is observed. With heat-processed hash, diversions in flavour and aroma are hardly found till the 25-th day of storage under refrigeration.

PROLONGEMENT DU DÉLAI DE STOCKAGE DE LA VIANDE HACHÉE PAR IRRADIATION À L'AIDE DE RAYONS IONISANTS

I. MODIFICATION DES GRAISSES ET DES QUALITÉS ORGANOLEPTIQUES

N. Dimitrova, S. Tentcheva, R. Brankova

Résumé

On effectua une irradiation de la viande hachée /60% de viande de porc et 40% de viande bovine/, conditionnée en présence d'air sous des enveloppes de polyéthylène aux doses de 0, 0.2 et 0.4 Mrad. Comme source de rayonnement fut employé un appareil gamma avec Co^{60}, à une puissance de la dose 0.7 Mrad/h. L'irradiation fut effectuée à température ambiante. La viande hachée fut conservée à une température de 0 à 2°C. On observa les modifications des quantités de peroxydes, le spectre UV, ainsi que les tests thiobarbiturique et benzidique au spectriphotomètre. On a établi le goût, la flaveur et la consistance de la viande hachée après traitement thermique. On a apprécié un changement insignifiant des gras pour les doses appliquées. On n'a presque pas signalé de changements dans le goût et la flaveur de la viande hachée après traitement thermique au bout de 25 jours de stockage frigorifique.

VERLÄNGERUNG DER LAGERUNGSDAUER VON HACKFLEISCH DURCH BESTRAHLUNG MIT IONISIERUNGSSTRAHLEN

I. VERÄNDERUNGEN DER FETTE UND DER SENSORISCHEN EIGENSCHAFTEN

N. Dimitrova, S. Tentscheva, R. Brankova

Zusammenfassung

In Polybeuteln verpacktes Hackfleisch /60% Schweinefleisch und 40% Rindfleisch/ wurde in Gegenwart von Luft mit Dosen von 0,0.2 und 0.4 Mrad bestrahlt. Als Strahlungsquelle wurde eine Gamma-installation mit Co^{60} bei einer Dosisleistung von 0,7 Mrad/St. verwendet. Die Bestrahlung wurde bei Zimmertemperatur durchgeführt. Das Hackfleisch wurde bei einer Temperatur von 0 bis 2°C aufbewahrt. Es wurden die Veränderungen in der Peroxidzahl der Fette verfolgt und das UV-Spektrum aufgenommen, sowie ein Benzidin- und Thiobarbiturtest spektrophotometrisch bestimmt. Ausserdem wurden der Geschmack, der Geruch und die Konsistenz des hitzebehandelten Hackfleisches bestimmt. Bei den verwendeten Dosen wurde eine geringe Veränderung in den Fetten ermittelt. Somit werden bei dem hitzebehandelten Hackfleisch bis zum 25. Tage der Gefrierlagerung fast keine Abweichungen im Geschmack und im Geruch festgestellt.

УДЛИНЕНИЕ СРОКА ХРАНЕНИЯ ФАРША ПУТЕМ ОБЛУЧЕНИЯ ИОНИЗИРУЮЩИМИ ЛУЧАМИ

I. ИЗМЕНЕНИЯ В ЖИРАХ И ОРГАНОЛЕПТИЧЕСКИХ КАЧЕСТВАХ

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Аннотация

Облучали фарш /60% свинины и 40% говядины/, упакованный в полиэтиленовых мешочках в присутствии воздуха в дозах 0, 0.2 и 0.4 Мрад. В качестве источника лучения использовали гамма-установку с Co^{60} в дозе 0.7 Мрад/ч. Облучение проводили при комнатной температуре. Фарш сохраняли при температуре от 0 до 2°C. Прослежены изменения в перекисном числе жиров, снят спектр, спектрофотометрически определен бензидиновый и тиобарбитуровый тест. Определены вкус, запах и консистенция термически обработанного фарша. При примененных дозах установляется незначительное изменение в жирах. При термически обработанном фарше изменений во вкусе и запахе почти не установлены до 25 дня холодильного хранения.

INCREASING THE STORAGE LIFE OF HASH BY IONIZING IRRADIATION
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Hash is one of the highly demanded products on the market in this country. Its shelf life, however, due to the high microbial count, is minimal upon storage at room temperatures, as well as under refrigeration. This makes both production and realization very difficult. Means have to be sought for the prolongation of shelf life. There are data available about the effect of sodium sulphite as meat colour stabilizer (1, 2) and a means of its shelf life prolongation (3). An addition of 0,06% of sodium sulphite provides for the storage of ground meat at room temperature without physico-chemical or organoleptic changes for 96 hours (4).

The objective of the present work is to determine the organoleptic changes and the changes in fats setting in upon the irradiation of hash with low doses of ionizing rays with a view to shelf life prolongation.

MATERIAL AND METHODS

Hash with 2 % of salt (60% of pork and 40% of beef) packed in double bags of polythene foil in the presence of air, was subjected to irradiation. The polythene foil applied was tested for microbiological permeability by the method of Rousivalli (5). A type RX 20, Co^{60} gamma unit was used as the source of radiation, with a dose power of 0,7 Mrad/h. Irradiation was performed at room temperature. Doses of 0, 0,2 and 0,4 Mrad. were applied. Experimental and control samples were stored under refrigeration (0 - +2°C) and were tested periodically by the following indices: for fats, a benzidine test was determined spectrophotometrically, by Koudela (6), a thiobarbituric test by Wertheim (7), the UV spectrum of a 0,5% isooctane solution of fats was taken in the range of 220-280 nm by Waller (8), Nessler's test, pH - electrometrically. An organoleptic evaluation was made of heat-treated (grilled) hash, without any spices added, in terms of taste, aroma, consistency, juiciness, and total scores. Evaluation was made by a nine-score hedonic scale (9) by trained taste-testers. Results were processed following the variance statistical method, while Range analysis was used for doubtful data. Reliability was determined using Student-Fisher's table, with $P > 95\%$.

RESULTS

The results obtained from the organoleptic evaluation of the selected indices are shown in Figs. 1-5. Immediately after irradiation, the scores for all indices are higher in the control, compared to irradiated samples where a scarcely perceptible 'irradiated' flavour is felt, better expressed with the higher dose. In the control, there is an increase in scores for all indices till the third day, after which they are sharply reduced. In the samples irradiated at the doses of 0,2 and 0,4 Mrad., scores increase gradually till the 15th day of storage, as a result of the course of the ageing process and the disappearance of the foreign odour, after which they are slowly reduced, but till the 25th day they are still good quality scores. A difference was found in the action of the two doses applied. With the lower dose (0,2 Mrad), scores are higher in the beginning, till they reach a maximum value, after which they are reduced comparatively quicker. With the higher dose (0,4 Mrad), scores are lower in the beginning, but after reaching a maximum, they stay at that level for some time, decreasing slowly afterwards and remaining till the end of storage higher than those with the 0,2 Mrad dose.

The spectrum of 0,5% isooctane solution of fats is shown in Fig. 6. According to Waller (8), in the formation of dienes characteristic of fat quality deterioration, spectral curves change their character in the range of 240-245 nm, where expressed peaks are formed. Upon the observation of fat spectral curves immediately after irradiation, in the 240-245 nm range absorption value can be seen to increase with the increase of the dose applied, but there are no expressed peaks. This speaks of an increase in diene amount resulting from irradiation. In the 260-280 nm range, with the 0,4 Mrad dose a displacement of the curve is observed with an absorption maximum at 270 nm, probably resulting from the formation of fat degradation products. After 25 days of storage, absorption values in the range of 240-250 nm have increased, being nearly equal for the three variants of the experiment. Neither in the beginning, nor in the course of storage, are clearly expressed peaks observed. A certain increase in absorption value at 270 nm is obvious.

In the determination of secondary fat oxidation products (Table 1) using thiobarbituric acid, they are found to be in a greater amount in irradiated samples, compared to controls, which is increased with the increase in dose. During the storage of irradiated samples, the amount of thiobarbituric acid-reacting carbonyl compounds, expressed as malonic aldehyde, increases. With a dose of 0,4 Mrad, that increase is more pronounced. No differences are found immediately after irradiation in the content of aldehydes determined using the benzidine test. After 25 days of storage, there is an increase in values which are considerably higher in irradiated samples than in the control.

During the whole term of storage, pH does not show any considerable changes in any of the three variants. Nessler's test remains negative till the end of the storage period in the meat irradiated with either dose.

Table 1. Changes in the fats of ground meat.

Dose Mrad	Thiobarbituric test		Benzidine test	
	Days of storage		Days of storage	
	0	25	0	25
0	0,68	0,48	0,46	0,70
0,2	0,78	1,02	0,45	1,02
0,4	0,92	1,36	0,45	1,08

CONCLUSIONS

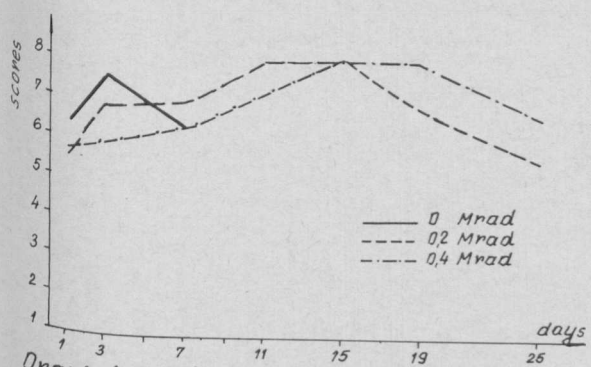
1. The scores from the organoleptic analysis of hash, packed in polythene foil in the presence of air, irradiated with 0,2 and 0,4 Mrad doses and stored at 0 - +2°C for up to 25 days, are good quality scores.

2. The changes in hash fats upon ionizing irradiation and during refrigerated storage (0 - +2°C) for 25 days, are not in a degree capable of significantly affecting the organoleptic properties of hash.

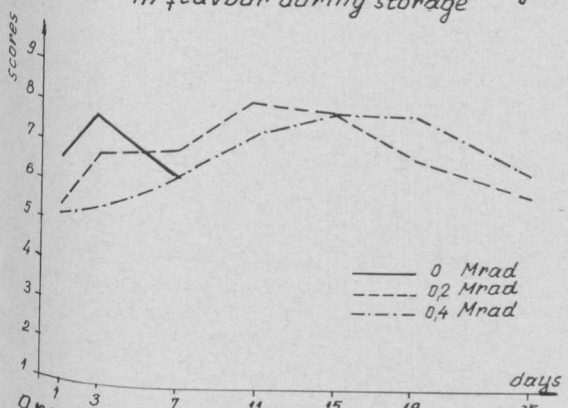
3. Having in mind the results from the organoleptic evaluation and the changes setting in in fats, we consider either dose applicable, depending on the desired term of storage.

REFERENCES

1. Лясковская Е.Н. и др. Применения химических консервантов, антиокислителей, стабилизаторов и ионообменных смол в мясной промышленности, Пищевая промышленность, Москва, 1967
2. Krol P., P. Mocrman, Z. Lebensm. Untersuch. u. Forschung, 112, 3, 246, 1960
3. Хейфец М., Мясная индустрия 2, 7, 1965
4. Tutundjiev N., A. Gakev, IX European Meeting of Meat Research Workers, V. IV, p. 1447
5. L. Rousivalli, Food Techn. 1966, 8, 98
6. K. Koudela, cit. de Klein, Fleischw. 1966, 5, 535
7. Wertheim J. H. et al., J. Dairy Science 1956, 391
8. Waller K., M. Naggy, Fleischw. 1968, 8, 1052
9. Technical Reports Series No. 114, IAEA, Vienna, 1970, p.56



Graph 1. Evaluations reflecting changes in flavour during storage



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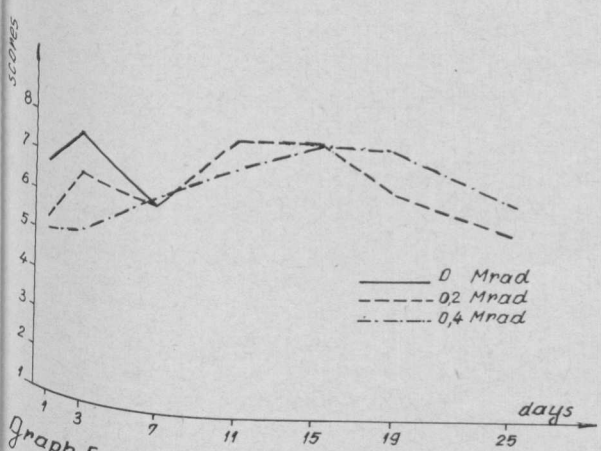
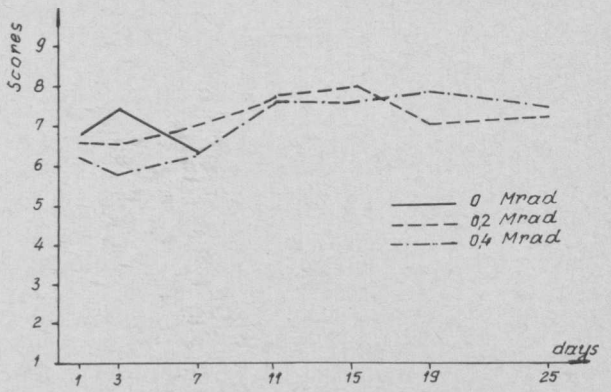
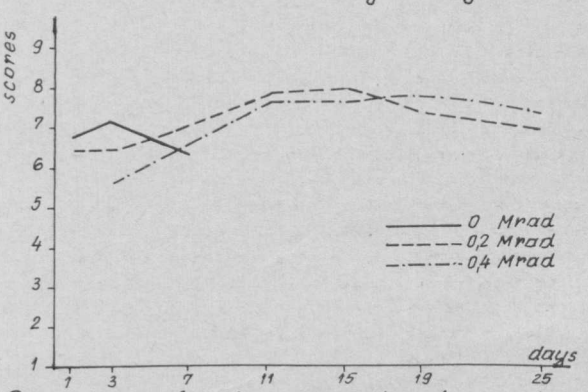


Graph 5. Changes in total evaluation during storage



Graph.3 Evaluations reflecting changes in consistence during storage



Graph.4. Evaluations reflecting changes in juiciness during storage

Graph.6.UVSpectrum of fat from minced meat