Proposals for the Composition of Different Sorts of Canned Meat with regard to their Protein-Value and Manufacturing Technology

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Authors determined the nutritional value of proteins of different components applied in the course of canned meat production according to Morup-Olesen index based on Kofrányi's human experiments.
Protein values of 55 couple-mixtures of the components were calculated by computer, too, protein ratios having been changed by 5 % degrees.
The appropriate proportions of protein mixtures of beef-rice, beef-wheatflour, yeast-rice, egg-pea, wheatflour-bean, wheatflour-yeast, wheatflour-pea, were of significantly higher values than the single components.
On the basis of the calculations some technological proposals are made for the composition of canned meat approaching the optimum with regard both to its protein-value and organoleptic characteristics.

Plannung der Fleischkonservenzusammensetzung von Gesichtspunkt des Eiweissnährwerts und der Technologie

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Verfasser bestimmten die Nährwerten der Fleischkonservenherstellung vorkommenden Proteinsorten auf Grund des Morup-Olesen Index, welcher nach Kofrányi's human-Versuche festgestellt wurde.
Die Eiweisswerte wurden auch in 55 Mischungen zwei verschiedenen Komponenten mit Komputer berechnet, von welchen die Mischverhältnisse mit 5 % Raten geändert werden. Die bestimmte Verhältnisse der Proteinmischungen von Rindfleisch-Reis, Rindfleisch-Weizenmehl, Hefe-Reis, Ei-Erbsen, Weizenmehl-Bohnen, Weizenmehl-Hefe, Weizenmehl-Erbsen gaben signifikant höhere Werte als die einzelne Komponente.
Auf Grund der Berechnungen geben die Verfasser manche technologische Vorschläge für Entwicklung solcher Fleischkonserve, von welchen die Eiweisswerte und organoleptische Eigenschaften möglicherweise des Optimums annähren.

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Conception de la composition des conserves de viande au point de vue de la valeur alimentaire des proteines et de la fabrication

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Les auteurs ont établi la valeur alimentaire proteique des composants propres á la fabrication des conserves de viande par l'index Olesen-Morup se basant sur les experiences humains de Kofrányi et la quantité des aminoacides parmis les composents, necessaire pour les calcules choisi, comme les voleurs exactes moyens des plusieurs analyses publiés dans la literatur.

Les index proteiques sont calculé pour les paires des composants, en variant ses proportions pars les échelons de 5 %. On fait les calcules par une calculatrice électronique en examinant 55 paires des composants. On a constaté que dans 40 % des cas les mélanges d'une certaine proportion ont une valeur proteique plus grand que de la composés propres. Ils ont montrés comme trés avantageuses dés mélanges du viande de boeuf avec riz et avec farine de blé, aussi les mélanges d'oeufs avec pomme de terre, avec pois ét enfin avec féves de soya.

On a proposé l'élaboration technologique des conserves de viande prés d'optimum de la valeur alimantaire proteique éstimé par les calcul das qualités organoleptiques optimales.

Планирование составов мясных консервов с точки зрения питательной ценности белков и технологии производства

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С помощью индекса Морупа-Ользена, основанного на эксперименте Кофрани, проведенном на людях, авторы установили питательную ценность белковых компонентов, которые могут приниматься в расчет при изготовлении мясных консервов.

Питательная ценность 55 белковых пар была определена с помощью ЭВМ. Отношение смесей изменялось ступенчато на 5 %.

При определенной пропорции смеси следующих белковых пар - говядина-рис, говядина-пшеничная мука, дрожжи-рис, яйцо-горох, пшеничная мука-фасоль, пшеничная мука-дрожжи, пшеничная мука-горох - питательная ценность белка была значительно выше по сравнению с составляющими компонентами. На основании полученных результатов авторы высказали несколько технологических предложений по производству таких мясных консервов, которые по питательной ценности белков и вкусовым качествам приближались бы к оптимальным.

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When planning the composition of our foodstuffs - among them that of canned meat - it is an important standpoint to approach the optimal nutritional value, organoleptic and consistential characteristics. Since canned meats represent rich protein sources, in this paper we wish to deal with the nutritional value of proteins to be found in them.

A lot of results - based on animal experiments - are available in the literature for the determination of the nutritional value of certain proteins or protein-mixtures. A number of correlations have been found between the nutritional value and amino acid composition of proteins. Certain indices, among which the Chemical Score of Mitchell-Block and the EAA of Oser are the most remarkable, are based on these correlations.

In Kofrányi's human experiments the mixture of egg and potatoe proved to be the most valuable protein-couple while in animal experiments whole egg protein was in the first place. According to Kofrányi the protein-mixtures of egg-soya, egg-wheat, egg-rice, egg-potatoe, milk-wheat, beef-potatoe have higher nutritional value than the proteins of the single components.

Relying on Kofrányi's experiments acknowledged on an international scale, Morup and Olesen devised a new index /PV = protein value/ based on the correlation between the biological value and the amino acid composition.

It was our aim to determine the PV, CS and EAA indices in couple-mixtures of protein sources /yeast, bean, pea, beef, rice, potatoe, egg, soya, wheat-flour, casein, whey/ used generally in the course of canned meat production, the protein ratios being changed by 5 % degrees. An R-20 computer was used to carry out calculations. The necessary data concerning amino acids were taken from a number of sources /Souci-Fachman-Kraut, Tarján-Lindner, FAO Food Composition Tables /1970/ works of Kofrányi and others/ and were afterwards averaged.

Applying the PV index by calculation in the case of about 40 % of the 55 investigated protein-couples a certain proportion of components proved to be of higher value than the single components. In case of a part of these couples CS index showed a monotonous change depending on the ratio of components, which phenomenon is likely due to the slight completing effect of the limiting amino acids of the components of the protein-couples. The results of this group are shown in Table 1. The maximum of PV indices is caused by the fact that in case of a given proportion of components, one or more components of the essential amino acids approach the ones of reference protein employed by Kofrányi and Morup-Olesen.

In the other group of protein-couples at a certain proportion of components both PV and CS values have maximums. The ratios bringing about maximum values in the two methods of evaluation do not deviate considerably. Results are indicated in Table 2.

The maximum values of CS indices are caused by the protein components of couple-mixtures having different limiting amino acids /e. g. wheat and rice are poor in lysin; soya, yeast and casein are poor in methionine/. Mixing the components, the limiting amino acids produce the well-known completing effect. The maximum values of PV indices, because of the similarity of the percental distribution, are due, first of all, to the completing effect. A detailed analysis of the data indicates that besides the limiting amino acids the quantity of other essential amino acids approaching the reference plays a role in it as well.

Computers as compared to the laboursome biological experiments facilitate - based, first of all, on Kofrányi's work - to reveal a greater number of protein-couples of such ratios which give a higher value than the single components. The calculated values and ratios, naturally, need the approval of appropriate human observations. By all means, the optimal ratios estimated in advance may provide great help in planning the biological experiments.

As far as the facilities of their utilization are concerned, two mixtures of protein-couples have been selected the PV maximum of which - calculated by computer - exceed 100. These two mixtures are the following:

	beef-wheat-flour,	beef-rice-flour
protein ratios	90 : 10	45 : 55
PV indices	114	132.

We have made such products of the two mixtures which are fit both for human nutrition and even for canning industry.

The mixture of beef-wheat-flour protein was of no problem as it is equivalent to the 5,14:1 ratio of meat-flour. This mixture was formed into an excellent canned mince with the aid of different technological processes and by the addition of appropriate colouring agents and consistence stabilizers /Sodium-caseinate, soluprate, nitrite salt mixture in 0,02 %/ fat and spices. After a heat treatment /121 °C/ its organoleptic characteristics were of first-rate quality and their consistential features satisfying.

The mixture of beef-rice protein was more problematic as it is equivalent to 1:3,13 ratio of meat-rice-flour. In this mixture in spite of heavy seasoning the unpleasant taste of rice-flour was dominating and in this form it proved to be unfit for human nutrition. However, by the addition of 25 % pork-liver, containing 12,5 % fat and well seasoned an expressly tasty product has been gained which may be consumed as paste or used in cooking as e. g. stuffing in meats, liver dumplings in soups or as croquette. After a heat treatment /121 °C in 1/5 sized cans/ both its taste and consistential qualities were favourable.

The food additives and spices of both products are the ones which are customarily used

in the canned food industry and the technological processes are equivalent to those employed during the production of canned mince and liver-paste.

Similarly to this experiment we are planning to compound formulae and preserving industrial products using the rest of the protein-couples as well.

Table 1.

1. component /protein/	PV	2. component /protein/	PV	PV in the optimal mixture	Percental quantity of the first component
Beef	107	Rice	100	132	45
Beef	107	Wheat-flour	49	114	90
Soya	96	Egg	102	127	60
Soya	96	Wheat-flour	49	105	75
Soya	96	Potatoe	94	105	45
Egg	102	Casein	77	121	45
Egg	102	Potatoe	94	122	35
Egg	102	Pea	72	123	55
Egg	102	Bean	74	124	60
Egg	102	Rice	100	113	55
Wheat-flour	49	Potatoe	94	111	20

Table 2.

1. component /protein/	PV	2. component /protein/	PV	PV in the optimal mixture /%/	Percental quantity of the first component	Percental quantity of the first component by CS maximum /%/
Wheat-flour	49	Yeast	60	118	60	60
Wheat-flour	49	Pea	72	102	55	60
Wheat-flour	49	Bean	74	107	35	60
Wheat-flour	49	Casein	77	93	40	55
Rice	100	Soya	96	113	45	75
Rice	100	Yeast	60	120	85	80
Rice	100	Potatoe	94	113	50	70
Rice	100	Pea	72	109	85	80
Rice	100	Bean	74	111	70	80
Whey	49	Casein	77	109	35	50
Whey	49	Pea	72	101	40	45
Whey	49	Bean	74	95	45	50
Whey	49	Soya	96	113	25	40