Deep Frying Fats on the Base of Lards

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SUMMARY: Deep frying fats were made of fats originating from different carcass locations of two breeds (KA-HYB-39 and HUNGAHIB-39) and their chemical and physical changes were monitored during use. The significance of changes to fat life and to finished product quality were studied.The characteristics of the produced fats were compared with those of commercial frying fats and sunflower oil. It was established that the intestinal and the leaf-fat contained the highest amount of saturated fatty acids, therefore the oxidative deterioration was less pronounced during frying. The fatty acid composition from the same carcass locations in the two breeds was not substantially different. Among the lards, the intestinal fat was the most stable during frying at 180 °C with the least amount of decomposition products, followed by the leaf-fat. The sunflower oil was the least stable; the BHT was not, the methyl-silicone (5-10 mg/kg) was found to be protective against the fat oxidation during frying. The intestinal fat and the leaf-fat were proposed as raw materials for frying fats.

INTRODUCTION: The deep fat frying is one of the ancient culinary technics. The popularity of deep fried products is growing, because of their peculiar flavour, odour, and the rapid cooking process. During frying the fat breaks down, and the compounds formed by chemical reactions (such as oxidation, polymerization, hydrolysis, isomerization, pyrolysis etc.) have to be regarded as harmful and are absorbed by the food beeing fried in it (McGILL, 1980; FRITSCH, 1981; GERE, 1982). For this reason it is of vital importance to develop special frying fats and shortenings, which are fairly resistant to oxidative changes during the frying operation. Frying fats of available run are mostly hydrogenated vegetable oils (STEVENSON et al., 1984;McGILL, 1980), the animal based fats are despised because of their cholesterol content. Nevertheless, the health hazard from the different kind of fats has still been debated (GRUNDY, 1987; KINSELLA, 1988). In Hungary there is no special frying fat in retail. Sunflower oil, pork fat and seldom rape-seed oil or other oils are generally used by the house-wives and in catering. The aim of the presented experiments was to select the most suitable pork fats from different carcass locations for producing deep frying fat. The frying fats and shortenings are characterized by parameters, such as free fatty acid content, peroxide value, iodine value, AOM-value, smoke point, foaming, odour and flavour, discolouration, increase in viscosity, etc. The selection is carried out with the help of the above mentioned parameters.

MATERIALS and METHODS: The lards used in the experiments were rendered of fats originating from anatomically different carcass locations (back, leg, shoulder, chops, abdominal cavity, intestine) and of two breeds (KA-HYB-39 and HUNGAHIB-39). The fats were melted at temperature of 110-120 °C, filtered through gauze and stored at 5 °C. Commercial fats and oils such as sunflower oil, pork fat, more types of Frivissa, Ceres soft, Durkex 500 were used as a basis of comparison. Meat balls were covered with bread crumbs for frying (components: 1500 g of ground pork meat, 1,5% salt, 0,35% pepper, 0,05% garlic-emulsion, 5 pieces of eggs; the weights of balls: 10 g). BHT and dimetilsilicone were tested as additives.

The acid number (MSZ 3633-81), iodine value (MSZ 3634-80), UV-absorbancy (MSZ 3808-85), peroxide value (MSZ 19623-81), fatty acid composition (SZŐKE et al., 1965), polar materials (ERDÉLYI & GERE, 1979) were determined. The sensory properties (colour, flavour, odour, foaming, smoking) of the fats and fried products were evaluated by 5 panelists with hedonic scale (1=unacceptable, 10=very good). The test tubes of 50 cm^3 with the samples were placed in an oil bath and were heated at 180-187 °C for 5 hours daily for 4 days to the frying tests. The meat balls were fried at 180-187 °C and at surface: volume ratio of 0,4; the fat was used for 5 hours daily for 4 days and there was no dilution of the frying fat with fresh fat during the deep frying operation.

RESULTS and DISCUSSION: The analytical parameters and the content of total saturated fatty acids of the fats originating from the different carcass locations are listed in Table 1. Means are calculated from 3 bulked sample units each prepared from 5-5 animals. Table 1 shows that - regardless of the breed - the lard from the intestine is the most saturated ($\alpha < 0,01$) followed by the leaf fat.

Comparing the content of total saturated or unsaturated fatty acids of the intestinal fat and leaf fat with the commercial frying fats and oils (Table 2) it can be established, that the latters are more unsaturated; the total saturated fatty acid contents of the sunflower oil and Frivissa oil as well as the pork fat and Frivissa fat II, Ceres soft and back fat are very similar; Frivissa fat I contains mainly monounsaturated fatty acids (81,3%). The same results were obtained with the individual fatty acids (results are not presented here).

Table 1 - Analytical parameters of fats

Carcass locations	Total fatty acids (%) (C14:0+C16:0+C18:0)	Iodine value	Free fatty acid (mg/kg)	Peroxid value (meqv/kg)	UV-abs. 232 nm
KA-HYB-39					
Leaf fat	47,7	53,3	0,54	1,42	2,37
Intestinal fat	49,2	52,1	0,81	1,61	2,43
Back fat	34,3	65,4	0,62	2,16	2,82
HUNGAHIB-39					
Leaf fat	47,7	55,9	0,41	0,86	1,75
Intestinal fat	50,1	50,9	0,36	1,11	1,76
Back fat	38,6	64,1	1,35	0,83	2,12

Analysis of variance

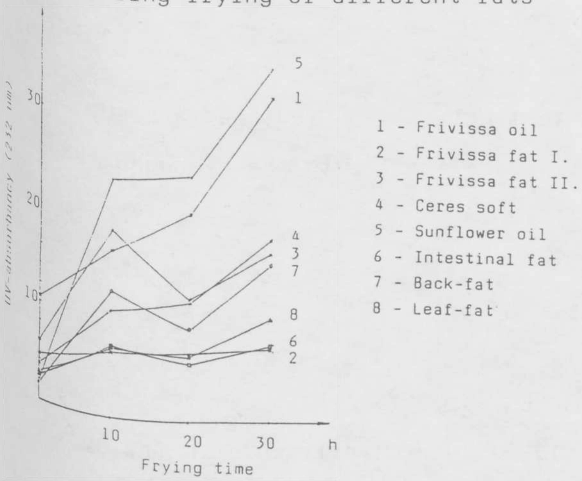
Source of variance	Significance level
Total	-
Carcass locations (A)	0,01
Breed (B)	ns
Repetition (C)	0,01
AxC	0,01
AxB	ns
BxC	0,01
AxBxC	0,01

Fig.1 shows the changes of the UV-absorbancies at 232 nm in the different fats during heating at 180 °C. Two additives (Fig.2) were tested to reduce the fat decomposition products. The experiments were repeated three times. As it can be seen in Fig.2 the intestinal fat was the most stable closely followed by the leaf fat. The back fat was less stable, and the sunflower oil was the least stable among all fats. Dimethylsilicone had a protective effect against fat decomposition. Its use as an additive to frying oils has become widespread to supress foaming which is an indirect result of the inhibition of oxidation (FREEMAN et al., 1973). The BHT did not inhibit the chemical

Table 2 - Total saturated fatty acids of commercial fats and oils

Type	Total saturated fatty acids (%)
Hungarian products:	
Lard I	38,8
Lard II	40,0
Sunflower oil	9,5
Foreign products:	
Frivissa fat I	18,7
Frivissa oil	9,8
Frivissa fat II	40,8
Ceres soft	30,1
Durkex 500	16,0

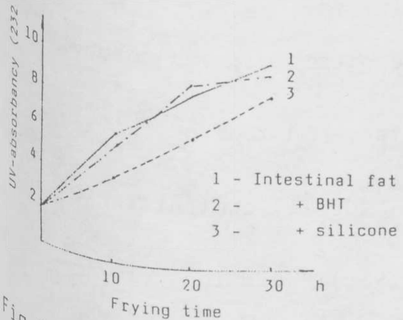
Fig.1 - Changes in UV-absorbancies during frying of different fats



reactions as it was reported by BUCK (1981), WARNER et al. (1986) and McGILL (1980), because presumably it is lost trough volatilization, when the fat is heated and used for frying. On the base of the polar materials formed and separated by TLC similar conclusion can be drawn as above.

Fig.1 shows the change of UV-absorbancies of commercial fats. As it can be seen from Fig.1 the intestinal fat is competitive with Frivissa fat I, which is one of the most heat stable frying fat. The amount of the formed polar materials in these fats is similar to which occurs at deep frying. The colour of the intestinal fat was already darker before and after heating as compared to the other fats. This might be due to the higher water- and free fatty acid content of the intestinal fat. The odour of frying fats of non Hungarian origin is less acceptable for the Hungarian consumers.

Fig.2 - Changes in UV-absorbancies during frying of fats with different additives



The changes in the UV-absorbancies (Fig.3) and in the peroxide value (Fig.4) of the different fats during the frying of meat balls show, that the intestinal fat containing 5 mg/kg dimethylsilicone is the most stable. The acid values related to the frying time (Fig.5) increased without exception but the highest values were observed in the intestinal fat and DURKEX 500 after 20 hours. Some smoke formation could be noted after 20 hours of frying and the flavour of the fried products in the various frying fats was different independently of the frying time (Fig.6). The formed polar materials can be seen on the thin layer chromatogram, the best fat is the intestinal fat with methylsilicone (Fig.7).

Fig.3 - Changes of UV-absorbancies in meat balls (See legend on Fig.4)

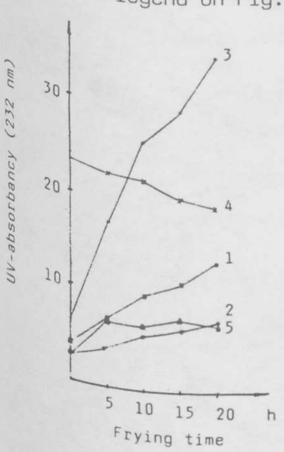
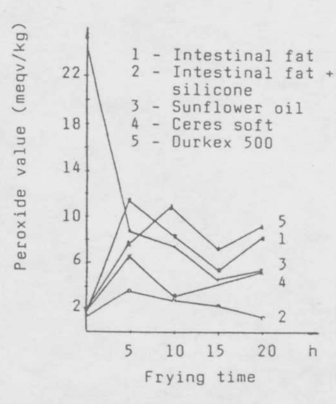


Fig.4 - Changes of peroxide value in meat balls



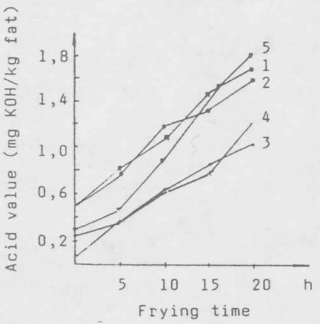


Fig.5 - Changes of acid value in meat balls

(See legend on Fig.4)

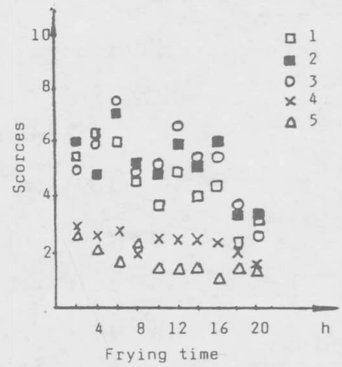


Fig.6 - Mean scores of flavour test during frying

(See legend on Fig.4)

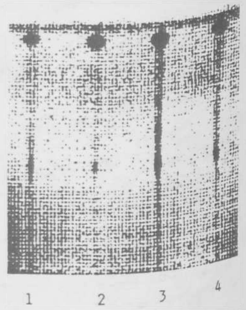


Fig.7 - Polar materials in the fats after frying for 20 hours

(See legend on Fig.4)

CONCLUSION: Comparative experiment showed that intestinal fat and leaf fat are suitable after proper treatments for frying and their properties are similar to the hydrogenated vegetable oils.

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