

FATTY ACID ANALYSIS OF TOTAL LIPID IN CHICKEN LIVERS

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ABSTRACT

Studies were undertaken to analyze liver lipids and fatty acid composition of total lipids of broiler and domestic (*desi*) chicken by thin layer and gas liquid chromatography and to whether there are significant differences in the fatty acid composition of both the chicken varieties. Although, both types of chicken are used as protein source for human but present studies reported higher degree of unsaturation in broiler than domestic chicken.

INTRODUCTION

The chicken is a useful model for conducting studies in lipid chromatography because of the changes in lipid metabolism during development (Pfeifer *et al.*, 1993). The composition of the adipose tissue of simple stomach animals of which pigs and poultry are economically the most important and is markedly affected by the fat in the diet (Gurr & James, 1980). The fatty acid is made up of hydrocarbon chain from which the properties of lipid solubility derive and is terminal carboxyl group giving acidic properties (Gunstone & Norris, 1981).

The present study was undertaken to analyze liver lipids and fatty acid composition of total lipids of broiler and domestic (*desi*) chicken and to know whether there are significant differences in the fatty acid composition of both the chicken varieties.

MATERIALS AND METHODS

Extraction of total lipids was accomplished with chloroform methanol (2:1 v/v), 20-folds the volume of pre-weighed test samples according to the procedure of Folch *et al.* (1957).

The lipid classes were determined by spotting an aliquot of the extract on thin layer silica gel HF254, type 60 (0.5 mm thick) and activated for an hour at 110°C. Zones representing lipid classes were visualized with iodine vapours (Malins & Mangold, 1960). Reference standards were chromatographed along with the samples. Following solvent systems were used during the analysis of total lipids:

Petroleum ether	Diethyl ether	Acetic acid
90	10	1 (v/v Malins & Mangold, 1960).
80	20	1 (v/v Khan & Khalid, 1970).

Fatty acid methyl esters were analysed isothermally on Packard Model 430 Gas Chromatograph equipped with flame ionization detector. Methyl esters were separated on glass column (1 mm x 2 mm) packed with 10% SE on 80/100 mesh gas chrom and recorded on Packard Model 613 Recorder. The temperature of injection port, detector and oven was 270°C. Nitrogen, hydrogen and air flow rates were 25 mL minute⁻¹ and 1 atmosphere. Chart speed was 0.1 mm second⁻¹.

RESULTS AND DISCUSSION

The percentage composition of total lipids in the livers of both domestic and broiler chicken are presented in Table 1 which showed higher percentage of lipids in broiler chicken livers than the domestic one. In both varieties, the saponifiable matter gave higher percentage compared to non-saponifiable. Further, broiler chicken sample showed increased amount of saponified (56.40%) and non-saponifiable (27.00%) matter than the domestic chicken. The percentage composition of saturated and unsaturated fatty acids of total lipids in both the varieties showed variation and were calculated from the results of gas liquid chromatography.

Figure 1 represents the thin layer chromatographic analysis of lipids extracted from livers of broiler and domestic chicken. Also the spots of standards are visible which were run along the samples. Hydrocarbons, sterol esters, triglycerides, free fatty acids, 1,3-diglycerides, 1,2-diglycerides, sterols, monoglycerides and phospholipids appeared as lipid classes in both the samples.

Table 2 showed the saturated and unsaturated fatty acid composition of total lipid in chicken livers of both varieties as determined by the gas liquid chromatography. It is found that in both the cases

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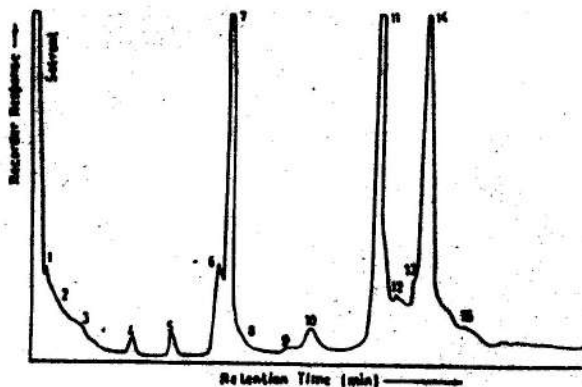


Fig. 2. Gas chromatograph of fatty acid methyl esters derived from total lipid of broiler chicken.

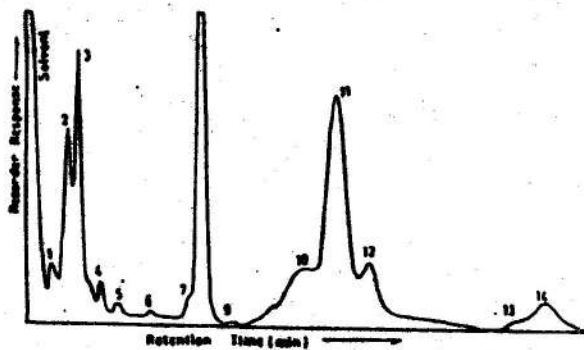


Fig. 3. Gas chromatograph of fatty acid methyl esters derived from total lipid of domestic chicken.

The percentage of lipids in broiler and domestic chicken livers is 8.08 and 6.12, respectively. This difference of percentage in total lipids may be due to defined/specific diet of the broiler chicken. From the data, it is evident that in domestic chicken the unsaturated fatty acids of total lipids were 58.43% as compared to 75.11% of broiler chicken. Similarly, 41.53% of saturated fatty acids in domestic chicken as compared to 11.75% of broiler chicken. Whereas Kairtrante and Reino (1979) reported that

chloroform:methanol extraction of white flesh gave an average lipid content of 3%. David and Paul (1969) reported the presence of saturated fatty acids in the liver lipids of broilers as 47% and unsaturated fatty acids ranged from 13% to 19%. Number of factors are responsible for variation in the proportion of fatty acids present in the chicken liver and flesh. Gomez and Fernandez (1988) reported that during chick embryo development there is slight increase in the ratio of unsaturated to saturated fatty acids. Number of researchers have reported that the activity and concentration of the animal fatty acid synthase vary depending upon the nutritional, hormonal and developmental status (Fischer & Goodridge, 1978; Joshi & Aranda, 1979; Kasturi & Joshi, 1982; Evangelista *et al.*, 1993; Maria *et al.*, 1991).

The lipids were separated by thin layer chromatography. In both varieties of chicken, phospholipids and hydrocarbons constitute major part of the total lipids, whereas sterol esters, free fatty acids and monoglycerides were present in less concentration. These findings are supported by Aleksandrova (1992) who used densitometric method for the quantitative determination of natural lipid composition. Gas liquid chromatographic patterns of both chicken samples (Fig. 2-3) revealed differences in saturated and unsaturated fatty acid proportion of the total lipids. Similar pattern of results were obtained by Kang *et al.* (1994) who studied effect of dietary energy level on the fatty acid composition.

The purpose of the current study was to determine the fatty acid composition of both broiler and domestic chicken. Data presented here is extensive and provide an insight into the range and proportions of fatty acids present in both types of chicken. Although, both types of chicken are used as protein source for humans but current studies reported higher degree of unsaturation in broiler than the domestic chicken.

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