EFFECTS OF USING MECHANICALLY SEPARATED CHICKEN MEAT (MSCM) ON PHYSICAL AND SENSORY CHARACTERISTICS OF BATTER AND BREADED PATTIES

EXPEDITO TADEU FACCO SILVEIRA, NELSON JOSÉ BERAQUET, HANA KIYOKO ARIMA, ROSIRES DELIZA, SONIA DEDECA DA SILVA DE CAMPOS, ISSAO SHIROSE
Meat Technology Centre. Instituto de Tecnologia de Alimentos, Avenida Brasil, 2880, Campinas 13073, São Paulo, Brazil.

SUMMARY: This investigation was undertaken to determine the effect of levels of 20, 40, 60 and 100% MSCM on physical and sensory characteristics of batter and breaded chicken patties, formulated to contain 55% moisture, 25% fat and 13% protein. The analysis of variance showed that the functional relationship between shear values and levels of MSCM was given by the quadratic equation, $Y = 5.94 + 0.1734x - 0.001728 x^2$, where y = shear value, x = MSCM level. According to this equation a maximum shear value is reached at 50.2% MSCM level, shear values decreasing for higher levels. Quantitative Descriptive Analysis (QDA) revealed that aroma, appearance, cover crispness, meat portion softness, juiceness, ratio cover/meat layer were not significantly different between treatments. Cover firmness, taste and overall quality decreased with increaging levels of MSCM while off-Flavour increased. However, even the patty containing 100% MSCM was considered "good" by the panelists.

INTRODUCTION: Mechanically separated chicken meat (MSCM) is used in Brazil mostly in emulsion and comminuted paste type cooked meat products. As the use of cut up chicken for further processing is increasing so is the production of MSCM, bringing the need to diversify its industrial use. The inclusion of MSCM in battered and breaded chicken patties is an application with large potential to expand its use.

Chicken nuggets, commercially introduced in North America and around the world in early 1980's, were prepared initialy from slightly marinated breast meat which was battered and breaded. In 1985 it was estimated that 53.000 tons. of poultry nuggets were consumed (total value $ 328 millions) in North America, which represented 30% increase in consumption over the previous year (Barbut et al., 1989). Increasing demand in the past four years has forced the industry to utilize other parts such as thigh meat, trimmings, skin and MSCM.

However, confering texture similar to whole muscle when using MSCM in restructered products, requires special processing techniques. Various commercial ingredients designed to improve binding and texture, such as milk proteins (Hoogenkamp, 1986) and soy protein (Witte, 1986) have been suggested. This study was undertaken to determine the effect of levels of 20, 40, 60 and 100%

MSCM on physical and sensory characteristics of batter and breaded patties, formulated with a binder containing wheat and corn flour.

MATERIALS AND METHODS: Batter and breaded chicken patties were prepared with broiler breast meat, MSCM from backs and fat loin. A binder containing wheat and corn flour was added at levels of 1.4; 2.9; 4.3 and 7.2% corresponding respectively to levels of MSCM of 20, 40, 60 and 100%.

Common ingredients in all treatments were salt (2%), monosodium glutamate (0.07%), white pepper (0.17%), lemon juice (0.5%), garlic (0.07%) and onion (0.14%).

The batter and breaded patties were formulated to contain 55% moisture, 25% fat and 13% protein. They were formed, battered, breaded, deep fat fried (hydrogenated vegetable oil) on a pilot processing line according to a conventional commercial procedure, immediately cooled in a freezer (-20°C) and then packaged in polyethylene bags.

The frozen batter and breaded patties (17-20 g each) were kept at -20°C and evaluated after one week of storage.

Proximated composition of the meats and the products were carried out in triplicate. The moisture content was determined by oven drying, protein by Kjeldahl nitrogen estimation, fat by Soxhlet extration with petroleum ether and ash by incineration at 525°C as described in AOAC methods (1984).

Instrumental evaluation of firmness was carried out using the Texture Test System equipped with a 3000 lbf ring, compression shear standard cell and an eletronic recorder (Varian). Samples without burned corners were selected, weighed, and evaluated using 20 cm/min. downstroke speed. The results were expressed as maximum force pounds per gram of sample (lbf/g).

Sensory evaluation was performed using the Quantitative Descriptive Analysis (QDA) technique described by Stone et al., 1985. The aroma, appearance, crispness, cover firmness, meat portion softness, juiciness, ratio cover/meat layer, off-flavour and overall quality were evaluated by a ten pre-trained panelists using a nine point unstructered scale. The experimental design was in a balanced incomplete block design with six replicates, statistically evaluated by analysis of variance and Tukey test.

RESULTS AND DISCUSSION: The data of mean values of pH, moisture, fat, protein, ash of raw materials and products are given in a Table 1.

There were compositional difference between the two types of raw materials used which are in agreement with previously published data for chicken breast meat (Pikul et al., 1984) and MSCM (Babji et al., 1986). Although the products were formulated to present similar composition, it was observed a slight drop in protein and a 51.8% increase in ash contents as higher levels of binder were incorporated. The lower content of protein of MSCM and the addition of the binder are probably responsible for much compositional differences among the products.

The analysis of variance applied to regression showed a functional relationship between shear values and levels of MSCM, which was given by the quadratic equation, $Y = 5.94 + 0.017347x - 0.001728 x^2$, where y = shear value, x = MSCM level. According to this equation a maximum shear value is reached at 50.2% MSCM level, shear values decreasing for higher levels of MSCM. This finding differs from those reported for emulsion type products where increasing levels of MSCM in the formulation results in decreasing values for shearing. An explanation for this phenomenon relies on the interaction between the MSCM and the breast muscle fibers. Although containing intact muscle fibers (Vadehra & Baker, 1970) MSCM has the structure of a paste, and at levels up to 50.2% this paste spreads along the breast muscle fibers making the product texture harder. Above the level of 50.2% MSCM is in excess making its softness predominant, so the product is felt as soft. To counteract this effect of MSCM addition the binder was incorporated in all treatments to provide acceptable texture firmeness (Figure 1).

The sensory evaluation data are shown in Table 2. It can be observed that there was no significant differences between treatments concerning aroma, appearance, cover crispness, meat portion softness, juiciness, ratio cover/meat layer. The data also indicates that might exist a correlation between the sensory measured meat portion softness and the objective shear values.

Quantitative Descriptive Analysis (QDA), nevertheless, revealed that cover firmness, taste, off-flavour and overall quality were significantly different for the treatments investigated. Although, these quality characteristics decreased with the higher levels of MSCM added, the patties containing 100% MSCM was considered good by the panelists.

CONCLUSIONS: The results of this study have clearly shown that it is technically feasible to produce an acceptable batter and breaded chicken patties containing 100% MSCM.

Addition of high levels of MSCM, under the conditions of this investigation, did not affect the sensory characteristics of the patties which were as acceptable as the control.

REFERENCES:

- AOAC (1984) Association of Official Analytical Chemists, Washington DC.
- Babji, A.S., Froning, G.W. and Satterlee, L.D. (1986) Journal Food Scince 45:441.
- Barbut, S., Draper, H.H. and Hadley, M. (1989) Journal of Food Protection 52:55.
- Hoogenkamp, H.W. (1986) Broiler Industry 3:33.
- Pikul, J., Loszczynski, D.F. and Kummerow, F.A. (1984) Journal Food Science 49:704.
- Vadehra, D.V., Baker, R.C. (1970) Poultry Science 49:1446.
- Stone, H. and Sidel, J.L. (1985) Sensory Evaluation Pratices. Orlando Academic Press Incorporation.
- Witte, P.A. (1986) Poultry Processing 12:30.

Table 1. -Proximate composition of raw material and batter and breaded chicken patties. Values are means of triplicates.

Major Components	Raw materials		Levels of MSCM in the products (%)				
	Breast broiler meat	MSCM	0	20	40	60	100
pH	6.10	6.70	6.50	6.52	6.57	6.60	6.70
Moisture	73.03	63.91	56.20	55.02	55.28	55.31	55.98
Fat	6.80	21.20	24.22	25.02	24.74	25.15	24.98
Protein	19.16	13.89	14.48	14.72	14.58	13.57	12.72
Ash	0.98	0.98	3.15	3.57	4.01	4.32	4.78

Table 2. -Taste panel scores of batter and breaded chicken patties.

Descriptor	Levels of MSCM added (%)						LSD
	0	20	40	60	100	Fo	(5%)
Aroma	1.05_a	2.10_a	2.42_a	2.52_a	3.36_a	$2.49^{n.s.}$	-
Appearance	2.16_a	2.88_a	3.64_a	3.68_a	3.93_a	4.61^{*}	1.77
Cover crispness	3.26_a	3.11_a	2.92_a	3.12_a	4.18_a	$0.90^{n.s.}$	-
Cover firmness	5.25_a	3.46_b	3.12_b	3.04_b	3.48_b	8.65^{**}	1.33
Meat portion softness	3.75_a	3.61_a	4.17_a	4.09_a	3.97_a	$0.40^{n.s.}$	
Juiciness	4.46_a	4.88_a	4.93_a	3.88_a	4.10_a	$0.87^{n.s.}$	
Ratio cover /meat layer	4.59_a	4.88_a	4.96_a	6.09_a	5.28_a	$0.78^{n.s.}$	-
Taste	1.59_b	$3.11_{a,b}$	$2.80_{a,b}$	4.48_a	4.06_a	5.15^{**}	2.16
Off-flavour	0.92_b	$2.41_{a,b}$	2.48_a	2.82_a	2.72_a	3.91^{*}	1.70
Overall quality	2.29_b	$4.24_{a,b}$	$4.19_{a,b}$	4.52_a	5.45_a	5.85^{**}	1.01

LSD. Least significant difference of the Tukey test (α = 5%)

a,b Mean values without letter in common are significantly different.

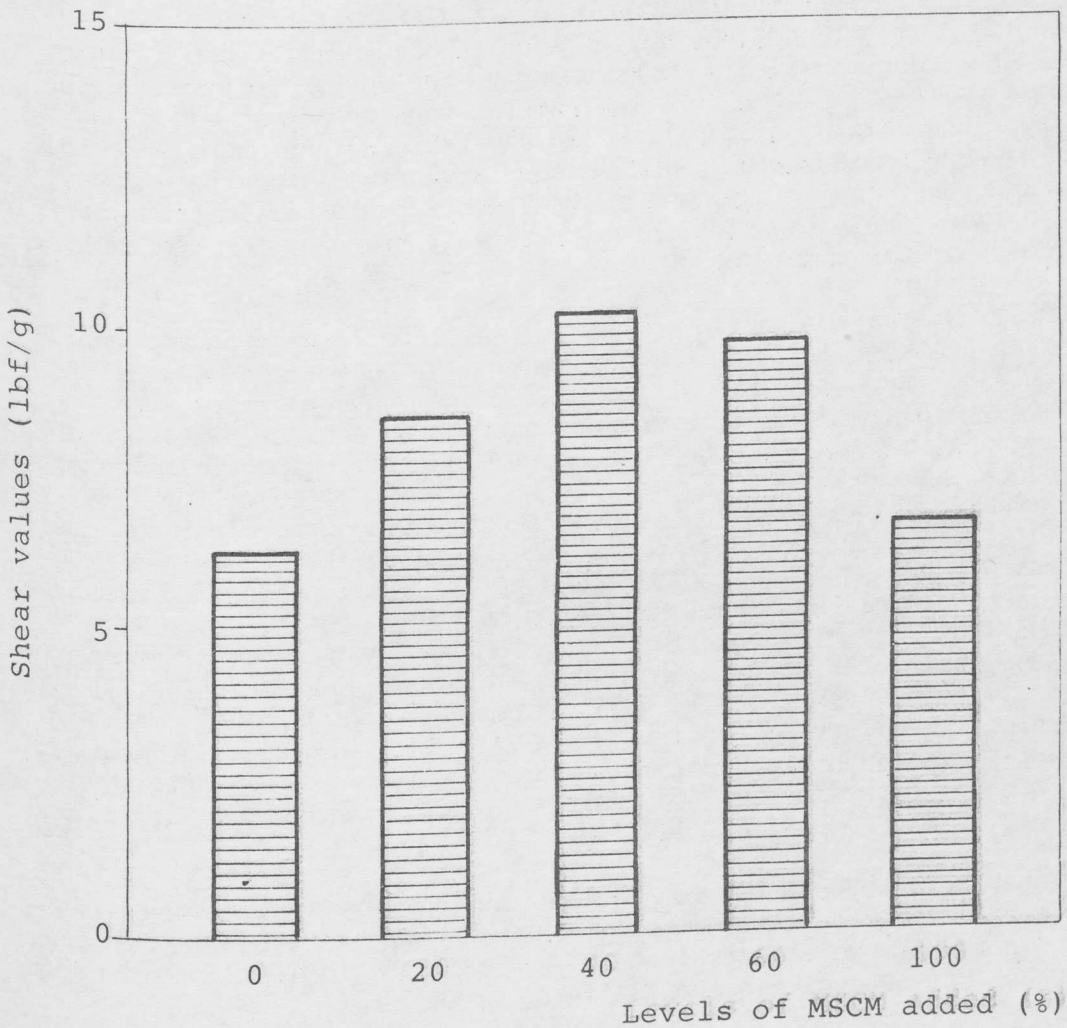

Figure 1. Shear value means for batter and breaded chicken patties.