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CHEMICAL AND SENSORY CHARACTERISTICS OF FROZEN STORED CHICKEN PATTIES FRIED IN DIFFERENT VEGETABLE OILS

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Chicken patties were fried in three different vegetable oils i.e. sunflower, soybean and canola to determine the best suitable vegetable oil for frying with prolonged storage stability. The patties were evaluated chemically for moisture, crude protein, crude fat, ash, pH, peroxide value and organoleptically for color, flavor, taste, juiciness, chewability, tenderness and overall acceptability at 15 days interval during 60 days storage. Among all the treatments vegetable oils used for frying and storage interval were found to have significant effect on chemical as well as sensory attributes. However, the chicken patties fried in canola oil offered better characteristics than sunflower and soybean oils. So, it was suggested that canola oil is comparatively the best one for frying of chicken patties among the vegetable oils under investigation with enhanced storage stability, shelf life and sensory attributes.
Keywords: Chicken patties, frying vegetable oils, sensory characteristics

INTRODUCTION

Chicken patties are battered products and after frying usually served by placing between buns in the form of burger. Poultry meat occupies a unique place in human diet due to its specific nutritional characteristics. It is particularly suited for further processing due to its bland flavor, which can be enhanced by condiments and can be used readily in traditional ethnic dishes.

The utilization of poultry meat has increased in various snack foods. The sweet delicate flavor and tender juicy texture of poultry meat can be brought to perfection by roasting, frying, barbecuing, boiling, steaming and stewing. However, frying is the best way, which results in almost full retention of protein, carbohydrates, minerals and vitamins B_1, B_2, B_6 and Vitamin C (Bognar, 1998). Frying produce remarkable changes in the chemical and organoleptic characteristics i.e. fat content, free fatty acid (FFA), pH, texture, taste and color of the product being fried and these changes depend upon the type of oil being used for frying (Jacobson, 1991).

Different methods of preservation like dehydration, smoking and canning may be used for snack foods but these can produce undesirable changes in many ways including inactivation of vitamins, discoloration, off flavors, denaturation and even coagulation of proteins. As the chemical and physical changes occurring in meat are slight as compared to other methods, low temperature freezing is gaining more popularity (Norman and Joseph, 1995).

Chicken patties are better in quality than made from mutton because chicken emulsion has significantly higher pH, protein and emulsion stability than mutton emulsion. Appearance, flavor and overall acceptability of chicken patties were also better than mutton patties (Anand *et al.*. 1991). Flavor intensity, juiciness and tenderness of meat are directly related with fat content. Among the commonly used vegetable oils, the usage of canola oil/fats in snack foods has been increasing due to better sensory and instrumental attributes (Hawrysh *et al.,* 1996). The major oilseed crops include cottonseed, rapeseed/mustard, sunflower and canola contributing 478000, 59000, 214000 and 58000 tons, respectively (GOP, 2006-07). The present study was conducted to determine the most suitable vegetable oil for the frying of chicken patties, which retained best chemical and sensory attributes of the product during frozen storage.

MATERIALS AND METHODS

Raw materials

Frozen boneless chicken meat (breast meat), three vegetable oils (sunflower, soybean, canola oil), salt, fine flour and spices, and plain poly bags) were procured from local market.

Preparation of chicken patties

Recipe

Boneless chicken minced meat	2Kg
Black pepper powder	2g
White pepper powder	2g
Salt	According to taste
Sugar	2.3g
Cumin seed powder	2g
Coriander seed powder	2g
Turmeric Powder	2g
Mono sodium glutamate	2g
Sodium tri-phosphate	1g
Batter	50-60mL
Oils	As per frying requirement

Procedure

Chicken patties were prepared by thawing frozen boneless chicken meat at refrigeration temperature for

3-4 hours before use. After thawing, the meat was washed and minced using a mechanical mincer. A spice mix was prepared according to a pre-set recipe and thoroughly mixed with minced meat by using meat mixer. Spice blended mince meat was frozen at temperature –2 to 0°C to facilitate shaping of chicken patties. A batter was prepared by dissolving 200g fine flour and 4g table salt in 100mL water. Now frozen spice blended mince meat was formed by using mould of specific shape. Batter was applied uniformly on formed chicken patties and then fried in three different vegetable oils including sunflower oil (T_1), soybean oil (T_2) and canola oil (T_3) in separate lots at 180 °C for 2-3 minutes until a brown color was obtained.

Packaging and storage of chicken patties

After frying, chicken patties were cooled upto 10 °C and packed in polyethylene bags. Patties were subjected to frozen storage at –18°C for subsequent chemical and organoleptic analysis.

Chemical analysis

The prepared chicken patties were analyzed for moisture, crude protein, crude fat, ash, pH and peroxide value after 0, 15, 30, 45 and 60 days interval according to their respective methods given in AOAC (1990).

Sensory evaluation

The chicken patties were evaluated for sensory parameters such as color, flavor, taste, juiciness, tenderness, chewability and overall acceptability after 0, 15, 30, 45 and 60 days interval by a trained panel of five judges deputed for evaluation of patties by using 9-point hedonic scale according to method described by Poste *et al*. (1991).

Statistical analysis

The data obtained was subjected to statistical analysis by conducting analysis of variance (ANOVA) technique using completely randomized design (CRD) while variation treatment and storage means were compared by Duncan's multiple range (DMR) by following the procedure described by Steel *et al.* (1997).

RESULTS AND DISCUSSION

Chicken patties were fried in sunflower, soybean and canola oil and subjected to frozen storage for 60 days. The patties were analyzed for their chemical and sensory characteristics at the interval of 15 days during the whole storage.

Chemical analysis of chicken patties

All the treatments of frying vegetable oils were significantly affected with respect to moisture (%), crude protein (%), crude fat (%) and peroxide value (meq/Kg) where as ash content (%) and pH value were found to be non-significant. Similarly all chemical parameters were significantly affected during 60 days storage except pH value. Means values for chemical analysis of frozen stored chicken patties both for treatments and storage period are presented Table I and Table II.

Table I. Mean for effect of different frying oils on chemical characteristics of frozen stored chicken patties

Treatments	Moisture (%)	Crude protein (%)	Crude fat (%)	Ash (%)	PH	Peroxide (meq/Kg)
T_1	38.72^{b}	32.78^{b}	12.28^{a}	2.344^{ab}	6.48^{a}	1.18^{a}
T_2	40.44^{a}	33.38^{b}	11.14^{b}	2.442^{a}	6.49^{a}	1.00^{ab}
T_3	36.82^{c}	34.57^{a}	10.06^{c}	2.222^{b}	6.48^{a}	0.89^{b}

T_1 = Chicken patties fried in sunflower oil; T_2 = Chicken patties fried in soybean oil; T_3 = Chicken patties fried in Canola oil

Table II. Mean for effect of storage on chemical characteristics of frozen storage chicken patties

Storage (days)	Moisture (%)	Crude protein (%)	Crude fat (%)	Ash (%)	pH	Peroxide (meq/Kg)
0	42.43^{a}	31.68^{d}	12.84^{a}	2.010^{d}	6.300^{d}	0.82^{c}
15	40.45^{b}	32.47^{cd}	11.96^{ab}	2.140^{d}	6.383^{cd}	0.92^{bc}
30	37.56^{c}	33.47^{bc}	11.02^{bc}	2.323^{c}	6.487^{bc}	1.04^{abc}
45	36.77^{c}	34.57^{ab}	10.24^{cd}	2.520^{b}	6.580^{ab}	1.12^{ab}
60	36.10^{c}	35.71^{a}	9.74^{d}	2.687^{a}	6.687^{a}	1.23^{a}

Note: Superscripts indicate the implementation of statistical technique DMR (Duncan's Multiple Range test) values. Mean values for selected treatments carrying same letters in a row are not significantly different

It is evident from the results that chicken patties fried in different vegetable oils differed significantly with one another with respect to moisture content. The moisture content for treatments was found to be the highest (40.44%) in patties fried in soybean oil, followed by fried in sunflower oil (38.72%) and then in canola oil (36.82%). While for storage, the moisture content of patties stored at 0 and 15 days were differed significantly where as at 30, 45 and 60 days were found to be statistically non-significant with each other. The crude protein content of chicken patties was significantly the highest (34.57%) in case of canola oil and the lowest (32.78%) in patties fried in sunflower oil. However the crude protein content of patties fried in sunflower and soybean oils did not differed significantly.

During storage, the crude protein content was affected significantly for all the treatments of fried chicken patties (Table II). Average fat content of chicken patties was observed significantly the highest (12.28%) in sunflower oil fried products, followed by fried in soybean oil (11.14%) and canola oil (10.06%). A decline in fat content was observed during the whole storage period. Ash content of fried chicken patties was comparable with one another for treatments and storage conditions. There was no significant difference among the pH values of the treatments and remained almost identical (6.48) with in the treatments. But pH values affected significantly during 60 days storage period. On the same way, peroxide value was significantly the highest (1.18 meq/kg) for patties fried in sunflower oil, followed by fried in soybean oil (1.00 meq/kg) and then for canola oil (0.89meq/kg) and affected significantly for storage intervals from 0 to 60 days. The variable results of these parameters are in line with the findings of Puttarajappa *et al*. (1971), Natarjan and Siddique (1981), Sharma *et al*. (1982) and Espla and Neill (1993) who had reported changes in crude protein, ash and peroxide values of fried materials using different frying oils.

Sensory Evaluation of chicken patties

The sensory evaluation is very important criterion in food industry. The chicken patties fried in three different commercial vegetable oils were stored in polyethylene bags at –18 ^{o}C for 60 days. The patties were analyzed for color, flavor, taste, juiciness, tenderness, chewability and overall acceptability at 0, 15, 30, 45 and 60 days interval. A gradual decline in sensory attributes was observed during the storage in all treatment. Means values for sensory analysis of frozen stored chicken patties both for treatments and storage period are presented Table III and Table IV.

Table III. Mean for effect of frying oils on sensory characteristics of frozen stored chicken patties

Treatments	Color	Flavor	Taste	Juiciness	Tenderness	Chewability	Overall acceptability
T_1	4.58^{c}	5.27^{c}	5.34^{c}	7.280^{c}	7.16^{c}	7.060^{c}	5.34^{c}
T_2	5.56^{b}	5.87^{b}	5.82^{b}	7.640^{b}	7.30^{b}	7.520^{b}	5.83^{b}
T_3	6.69^{a}	6.83^{a}	6.85^{a}	8.040^{a}	8.06^{a}	7.980^{a}	6.49^{a}

T_1 = Chicken patties fried in sunflower oil; T_2 = Chicken patties fried in soybean oil; T_3 = Chicken patties fried in Canola oil

Table IV. Mean for effect of storage on sensory characteristics of frozen stored chicken patties

Storage (days)	Color	Flavor	Taste	Juiciness	Tenderness	Chewability	Overall accept-ability
0	7.03^{a}	6.98^{a}	7.02^{a}	8.067^{a}	7.90^{a}	8.00^{a}	6.77^{a}
15	6.37^{b}	6.47^{b}	6.42^{b}	7.867^{b}	7.70^{ab}	7.767^{ab}	6.43^{b}
30	5.69^{c}	5.95^{c}	6.15^{c}	7.633^{bc}	7.43^{bc}	7.567^{b}	5.90^{c}
45	4.77^{d}	5.95^{c}	5.40^{c}	7.467^{cd}	7.33^{c}	7.200^{c}	5.40^{d}
60	4.18^{c}	5.07^{c}	5.03^{c}	7.233^{d}	7.16^{c}	7.067^{c}	4.93^{c}

Note: Superscripts indicate the implementation of statistical technique DMR (Duncan's Multiple Range test) values. Mean values for selected treatments carrying same letters in a row are not significantly different

In frying, color serves as an important sensory attribute which is correlated with changes in aroma and flavor. Color for chicken patties fried in different vegetable oils differed significantly for treatments and storage intervals. The color score for fried chicken patties was significantly the highest (6.69) for patties fried in canola oil, followed by fried in soybean oil (5.56) and then in sunflower oil (4.58). The color value during storage intervals differed significantly but the values at 30 and 60 days were remained statistically the same. A similar variable trend was also detected in flavor character of

prepared patties with treatments and storage intervals. Significantly the highest flavor score (6.83) was observed in chicken patties fried in canola oil among the treatments and also affected for the storage intervals from 0 to 60 days. The taste score for patties fried in canola oil was found significantly the highest (6.85) followed by patties fried in soybean oil (5.82). Almost similar trend in juiciness, tenderness and chewability scores were obtained among treatments and different storage period. Tenderness and chewability characters of chicken patties did not differ significantly at 45 and 60 days storage intervals. When overall acceptability score of prepared patties was estimated, the highest value (6.49) was obtained for chicken patties fried in canola oil, followed by fried in soybean oil (5.83) and the lowest for sunflower oil fried patties (5.34). A significantly different overall acceptability values were observed during frozen storage. These results of sensory characteristics are in line with the findings of Ristic and Schon (1980), Vombergar *et al*. (1987) and Egbert *et al*. (1991) who had observed various changes in sensory characteristics of broiler meat in relation to thawing and re-freezing which was previously fried in different vegetable oils. However the best overall acceptability score was obtained by the chicken patties fried in canola oil.

On the basis of the results obtained, it was concluded that all the vegetable oils under investigation have given acceptable results but canola oil fried patties gave better results among the vegetable oils for the frying of snack foods such as chicken patties.

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