ISSN 2349-7823

International Journal of Recent Research in Life Sciences (IJRRLS)
Vol. 2, Issue 2, pp: (3-13), Month: April 2015 - June 2015, Available at: www.paperpublications.org

A Study on Biochemical Quality of the Food Materials under Freezing Temperature on Different Packaging Materials

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Abstract: **An attempt was made to evaluate the biochemical qualities of a meat samples under freezing condition in different packaging materials. Goat meat and chicken meat were used for the study. The meat samples were packaged in ALF, HDP and LDP materials for 15 days. The ash, moisture, cholesterol and phospholipids were estimated at 2 days intervals for 15 days. Also the samples were frozen in packaging materials for 45 days for the estimation of TBARS and catalase for every 15 days interval. The results showed that the ash, moisture, cholesterol and phospholipids were significantly decreased in all the packaging materials under frozen storage. The HDP showed a better performance in the retention of ash, moisture and protein content. The ALP showed a better performance in the retention of lipid fraction of cholesterol and phospholipids contents. LDP showed a poor retention in ash, moisture, protein, cholesterol and phospholipids contents. The results showed that the TBARS were increased in LDP and decreased in HDP. The values of catalase were increased in HDP and decreased in LDP. The results of the study confirmed that storage in refrigeration affects the biochemical qualities of the food samples. As the same way storage in packaging materials such as ALP, HDP and LDP also affects the nutrients contents of the food samples.**

Keywords: **packaging materials, ALP, HDP, LDP, TBARS, and Catalase.**

1. INTRODUCTION

In India, most of the meat is purchased by the consumers in fresh or frozen form. To adjust with the fast growing life style of urbanization, they hardly find time to purchase meat daily. Hence they purchase meat in bulk to meet their daily requirements. This meat is stored in refrigerator and consumed on definite intervals. Deterioration of meat quality in refrigerator storage may have great impact on the health of consumers. Meat and poultry products are chilled immediately after slaughter to acceptable internal temperatures which insure the prompt removal of the animal heat and preserve the wholesomeness of the products (Kandeepan *et al*., 2005).

Freezing preserves the nutritive quality similar to that of fresh raw foods. In general nutrient loss during freezing is negligible, using proper packaging and processing condition. Exception are small losses of vitamin C and other water soluble vitamins in vegetables and fruits during blanching and small unexplainable losses of water soluble vitamins in pork . Proper freezing condition are important to retain nutrients . The shelf life of frozen foods is shorter than that of canned foods because, not all the water in food freezes. This allows some chemical changes to occur, even in the frozen state (Shubhangini and Joshi, 2002).

The type of packaging material depends on the type of food being frozen, personal preferences and the types of material readily available. The packaging materials should be moisture, vapor resistant, durable and easy to seal and should not brittle at low temperatures .They are organic polymers of varying structure. These include cellophanes, cellulosics,

polyolefins, vinyl derivatives, polyesters, plioflim, polyfluorocarbons, polyamides and water soluble and edible films. These have numerous applications in foods because of their light weight and resistance to diffusion, to high temperatures and to solvents (Shubhangini and Joshi, 2002).Hence, an attempt was made to study the biochemical qualities of the meat samples under frozen storage condition in different packaging materials.

2. MATERIALS AND METHODS

The following are the materials and methods used for the study.

Food samples:

The food samples goat meat and chicken meat were used for this study .The food samples were purchased from local slaughter house.

Packaging materials:

Aluminium laminated foil (ALF), High density polythene (HDP), Low density polythene(LDP). The packaging materials were purchased from JAM JAM super market, Mayiladuthurai.

Experimental period 60 days.

Experimental Design:

The food samples were washed well and trimmed. Then the samples were divided into different lots of 50g each. Each lot of samples were sealed in 3 packaging materials viz, ALF, HDP, LDP and stored in the freezer. The samples were stored in the freezer for 15 days and taken at regular intervals of 2 days for the analysis of ash, moisture, total protein, cholesterol, phospholipids. For lipid peroxidation analysis the sample were kept in the freezer, for 60 days. Each samples were measured randomly at 15 days intervals .The lipid peroxides and antioxidant status of the samples were carried out by the analysis of TBARS, and catalase.

Estimation of Ash content:

A clean and dry empty crucible, was weighed to constant weight. For this, the crucible was kept in the oven for half an hour, then cooled in a desicator and weighted . Keeping the crucible in oven , cooling and weighting was done, until two weights were same. About 5gm of food materials was taken in it and weighted accurately. The crucible was placed in a muffle furnance at 600^{o}C for about 3 to 5 hours .To ensure completion of ashing, the crucible was heated for more than half an hour and then cooled and weighted. The ash was almost white or greenish white in color .

The ash content of the given food sample are expressed as g%.

Estimation of Moisture content:

A clean and dry empty crucible, was weighed to constant weight. For this, the crucible was kept in the oven for half an hour then cooled in a desicator and weighted . Keeping the crucible in oven ,cooling and weighing was done ,until two weights were same. About 5gm of food materials was taken in it and weighted accurately .The crucible was placed in hot air oven (105-110°C) for about 30 minutes. It was then cooled in a desicator. Heating, cooling and weighing were repeated to constant weight.

The moisture content of the given food sample are expressed as g%

Extraction of protein:

Weighed 500mg of the sample and ground well with a pestle and mortar in 5-10ml of the buffer, centrifuged and used the supernatant for protein estimation.

Estimation of total protein:

The protein content of tissue homogenate was estimated by the method of Lowry *et al*., (1951).

An aliquot of plasma or tissue homogenate was diluted to 1.0ml with saline then 1.0ml TCA was added .The mixture was centrifuged, the supernatants were discarded and the precipitate was dissolved in 1.0ml NAOH. From this, aliquots were taken for the estimation.4.5ml of alkaline copper reagent was added and the contents were allowed to stand at 37°C for 10 minutes .Then , 0.5ml dilute Folin – Ciocalteau reagent was added and allowed to stand at 37°C for 10 minutes. The blue color developed was read at 620nm after 20 minutes .:

The amount of total protein present is expressed as mg /dl.

Extraction of lipids:

Lipids were extracted by the method of Folch *et al*., (1957).

The tissues were homogenized with cold chloroform/ methanol (2:1 v/v) and the contents were extracted after 24 hours . The extraction was repeated four times.The combined filtrate was washed with 0.7% potassium chloride and the aqueous layer was discarded. The organic layer was made up to a known volume with chloroform and used for various estimations .

Estimation of total cholesterol:

The cholesterol content was estimated by the method of Zlatkis *et al*., (1953).

0.1ml aliquot of lipid extract was evaporated to dryness and 5ml of ferric chloride/ acetic acid reagent was added. Then, 3ml of conc. Sulphuric acid was added and the absorbance was read after 20minutes at 560 nm.

The values are expressed as mg/dl serum and mg/g wet tissue.

Estimation of phospholipids:

The phospholipid content was estimated by the method of Zilversmit and Davis (1950).

0.1 ml aliquot of the lipid extract was digested with 1ml of concentrated sulphuric acid and 1ml of concentrated nitric acid to give a colorless solution. To this, 1ml of 2.5% ammonium molybdate and 0.1ml of 1-amino-2-napthol-4-sulfonic acid(ANSA) were added. The volume was then made up to 5ml with distilled water and absorbance was read at 660nm.

The values are expressed as mg/dl and mg/g wet tissue.

Preparation of Tissue homogenate:

The required amount (1gm) was weighed and homogenized using a Teflon homogenizer. Tissue homogenate was prepared in 0.1 M Tris Hcl buffer (pH 7.4) and used for the estimation of TBARS.

Estimation of Thiobarbituric acid (TBAR):

Malondialdehyde was estimated by the thiobarbituric acid assay method of Beuge and Aust (1978).

Tissue homogenate was combined with 2.0ml of TCA-TBA-HCl reagent and mixed thoroughly. The solution was heated for 15minutes in a boiling water bath. The flocculants centrifuged at 1000 ×g for 10 minutes. The absorbance of the sample was read at 535nm against a blank without sample.

The values are expressed as nmol of MDA formed/mg in tissue.

Assay of Catalase (CAT):

The activity of CAT was determined by the method of Sinha,(1972).

Tissue homogenate was prepared in phosphate buffer. To 0.9 ml phosphate buffer, 0.1ml tissue homogenate and 0.4ml hydrogen peroxide were added . The reaction was arrested after 15,30,45, and 60 sec by adding 2.0ml dichromate acetic acid mixture .The tubes were kept in a boiling water bath for 10 minutes, cooled and the color developed was read at 590nm.

The specific activity of the enzyme are expressed as moles of hydrogen peroxide utilized /min /mg protein for tissues.

ISSN 2349-7823

International Journal of Recent Research in Life Sciences (IJRRLS)
Vol. 2, Issue 2, pp: (3-13), Month: April 2015 - June 2015, Available at: www.paperpublications.org

3. RESULTS AND DISCUSSION

Table 1: Changes in the ash content of Goat meat during frozen storage in different packaging materials for 15 days with 2 days interval

Packaging Materials	Days of storage					
	0	3	6	9	12	15
ALF	9.11 ±0.55	8.02 ±0.41	7.35 ±0.38	6.85 ±0.35	6.35 ±0.33	6.26 ±0.32
HDP	9.11 ±0.55	8.26 ±0.29	7.92 ±0.28	7.60 ±0.27	7.30 ±0.26	6.56 ±0.23
LDP	9.11 ±0.55	4.09 ±0.15	3.91 ±0.13	3.82 ±0.13	3.71 ±0.12	3.58 ±0.12

Values are expressed in g/100g tissue weight; Mean of the six values ± SD $P<0.05$ were highly significant;

ALP- Aluminium laminated foil , HDP-High density polythene , LDP- Low density polythene

Table 1 showed that the ash content in the goat meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. A better result was observed in HDP (6.56± 0.23). The ash content increase was less in LDP (3.58 ± 0.12) when compared to HDP and ALF (6.26±0.32) packed irrespective of packaging material used. It was clear that storage days and packaging materials were highly significant at $p<0.05$.The changes in ash content were found in all the packaging materials stored up to 15 days at 2 days intervals were highly significant.

Table 2: Changes in the ash content of chicken meat during frozen storage in different packaging materials for 15 days with 2 days interval.

Packaging Materials	Days of storage					
	0	3	6	9	12	15
ALF	8.33 ±0.52	7.30 ±0.50	7.26 ±0.48	6.86 ±0.42	6.54 ±0.38	6.25 ±0.32
HDP	8.33 ±0.52	7.90 ±0.46	7.65 ±0.43	6.40 ±0.37	6.35 ±0.22	6.33 ±0.20
LDP	8.33 ±0.52	6.94 ±0.24	6.85 ±0.21	5.84 ±0.17	4.90 ±0.14	4.44 ±0.11

Values are expressed in g/100g tissue weight; Mean of the six values ± SD $P<0.05$ were highly significant

ALP- Aluminium laminated foil ,HDP-High density polythene , LDP- Low density polythene

Table 2 showed that the ash content in the chicken meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. A better result was observed in HDP (6.33±0.20). The ash content increase was less in LDP (4.44±0.11) when compared to HDP and ALF (6.25±0.32) packed irrespective of the packaging materials used. It was clear that storage days and packaging materials were highly significant at $p<0.05$.The changes in ash content was found in all the packaging materials stored up to 15 days at 2 days intervals were highly significant.

Table 3: Changes in the moisture content of Goat meat during frozen storage in different packaging materials for 15 days with 2 days interval.

Packaging Materials	Days of storage					
	0	3	6	9	12	15
ALF	8.15 ±1.78	7.99 ±1.70	7.44 ±1.66	6.96 ±1.41	6.39 ±1.36	5.35 ±1.33
HDP	8.15 ±1.78	7.59 ±0.41	7.09 ±0.39	6.34 ±0.35	6.10 ±0.33	5.74 ±0.30
LDP	8 .15 ±1.78	4.22 ±0.15	4.20 ±0.14	4.06 ±0.14	3.81 ±0.13	3.36 ±0.11

Values are expressed in g/100g tissue weight; mean of the six values ± SD P<0.05 were highly significant

ALP- Aluminium laminated foil ,HDP- High density polythene , LDP- Low density polythene

Table 3 showed that the moisture content in the goat meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. A better result was observed in HDP (5.74±0.30).The moisture content increase was less in LDP (3.36±0.11) when compared to HDP and ALF (5.35±1.33) packed irrespective of packaging material used. It was clear that storage days and packaging materials were highly significant at p<0.05.The changes in moisture content was found in all the packaging materials stored up to 15 days at 2 days intervals were highly significant

Table 4: Changes in the moisture content of chicken meat during frozen storage in different packaging materials for 15 days with 2 days interval.

Packaging Materials	Days of storage					
	0	3	6	9	12	15
ALF	7.67 ±0.70	7.36 ±0.62	6.90 ±0.58	6.85 ±0.52	6.65 ±0.48	6.52 ±0.43
HDP	7.67 ±0.70	7.63 ±0.61	7.52 ±0.48	7.22 ±0.45	6.97 ±0.40	6.74 ±0.38
LDP	7.67 ±0.70	7.11 ±0.17	6.97 ±0.16	6.62 ±0.16	5.78 ±0.14	5.43 ±0.13

Values are expressed in g/100g tissue weight; Mean of the six values ± SD P<0.05 were highly significant

ALP- Aluminium laminated foil, HDP-High density polythene, LDP- Low density polythene

Table 4 showed that the moisture content in the chicken meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. A better result was observed in HDP (6.74±0.38). The moisture content increase was less in LDP (5.43±0.13) when compared to HDP and ALF (6.52±0.43) packed irrespective of packaging material used. It was clear that storage days and packaging materials were highly significant at p<0.05. The changes in moisture content was found in all the packaging materials stored up to 15 days at 2 days intervals were highly significant.

Table 5: Changes in protein content of Goat meat during frozen storage in different packaging materials for 15 days with 2 days interval.

Packaging Materials	Days of storage					
	0	3	6	9	12	15
ALF	9.13 ±0.50	7.61 ±0.42	7.45 ±0.33	5.38 ±0.28	4.66 ±0.27	4.30 ±0.22
HDP	9.13 ±0.50	7.09 ±0.39	6.34 ±0.35	6.10 ±0.33	5.74 ±0.30	5.82 ±0.32
LDP	9.13 ±0.50	4.89 ±0.17	4.66 ±0.16	4.44 ±0.15	4.07 ±0.14	3.92 ±0.14

Values are expressed in g/100g tissue weight; Mean of the six values ± SDP<0.05 were highly significant

ALP- Aluminium laminated foil ,HDP-High density polythene , LDP- Low density polythene

Table 5 showed that the protein content in the goat meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. A better result was observed in HDP (5.82±0.32). The protein content increase was less in LDP (3.92±0.14) when compared to HDP and ALF (4.30±0.22) packed irrespective of packaging material used. It was clear that storage days and packaging materials were highly significant at p<0.05.The changes in protein content was found in all the packaging materials stored up to 15 days at 2 days intervals were highly significant.

ISSN 2349-7823

International Journal of Recent Research in Life Sciences (IJRRLS)
Vol. 2, Issue 2, pp: (3-13), Month: April 2015 - June 2015, Available at: www.paperpublications.org

Table 6: Changes in protein content of chicken meat during frozen storage in different packaging materials for 15 days with 2 days interval.

Packaging Materials	Days of storage					
	0	3	6	9	12	15
ALF	11.36 ±0.62	11.32 ±0.60	9.45 ±0.51	8.17 ±0.45	6.66 ±0.38	5.85 ±0.31
HDP	11.36 ±0.62	8.26 ±0.31	7.92 ±0.29	7.60 ±0.27	7.32 ±0.25	6.82 ±0.23
LDP	11.36 ±0.62	4.44 ±0.15	4.32 ±0.13	4.21 ±0.12	3.94 ±0.10	3.76 ±0.11

Values are expressed in g/100g tissue weight; Mean of the six values ± SD $P<0.05$ were highly significant

ALP- Aluminium laminated foil , HDP-High density polythene , LDP- Low density polythene

Table 6 showed that the protein content in the chicken meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. A better result was observed in HDP (6.82±0.23). The protein content increase was less in LDP (3.76±0.11) when compared to HDP and ALF (5.85±0.31) packed irrespective of packaging material used. It was clear that storage days and packaging materials were highly significant at $p<0.05$.The changes in protein content was found in all the packaging materials stored up to 15 days at 2 days intervals were highly significant.

Table 7: Changes in cholesterol content of Goat meat during frozen storage in different packaging materials for 15 days with 2 days interval.

Packaging Materials	Days of storage					
	0	3	6	9	12	15
ALF	4.54 ±5.53	3.14 ±4.53	2.68 ±3.66	2.62 ±3.49	2.57 ±3.16	2.52 ±2.21
HDP	4.54 ±5.53	2.68 ± 0.13	2.63 ±0.13	2.36 ±0.12	2.30 ±0.12	2.26 ±0.11
LDP	4.54 ±5.53	2.60 ±0.14	2.44 ±0.13	2.36 ±0.12	2.33 ±0.12	2.30 ±0.10

Values are expressed in g/100g tissue weight; Mean of the six values ± SD $P<0.05$ were highly significant

ALP- Aluminium laminated foil ,HDP-High density polythene, LDP- Low density polythene

Table 7 showed that the cholesterol content in the goat meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. A better result was observed in ALF (2.52±2.21). The cholesterol content increase was less in LDP (2.30±0.10) when compared to ALF and HDP (2.26±0.11) packed irrespective of packaging material used. It was clear that storage days and packaging materials were highly significant at $p<0.05$.The changes in Cholesterol content was found in all the packaging materials stored up to 15 days at 2 days intervals were highly significant.

Table 8: Changes in cholesterol content of chicken meat during frozen storage in different packaging materials for 15 days with 2 days interval.

Packaging Materials	Days of storage					
	0	3	6	9	12	15
ALF	7.65 ±0.44	7.63 ±0.43	7.60 ±0.41	6.95 ±0.40	6.88 ±0.39	6.85 ±0.38
HDP	7.65 ±0.44	5.66 ±0.40	5.62 ±3.49	5.60 ±3.32	5.57 ±3.16	4.58 ±3.14
LDP	7.65 ±0.44	2.95 ±0.12	3.37 ±0.12	3.16 ±0.11	2.95 ±0.10	2.52 ±0.10

ISSN 2349-7823

International Journal of Recent Research in Life Sciences (IJRRLS)
Vol. 2, Issue 2, pp: (3-13), Month: April 2015 - June 2015, Available at: www.paperpublications.org

Values are expressed in g/100g tissue weight; Mean of the six values ± SD P<0.05 were highly significant

ALP- Aluminium laminated foil ,HDP-High density polythene , LDP- Low density polythene

Table 8 showed that the cholesterol content in the chicken meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. A better result was observed in ALF (6.85±0.38). The cholesterol content increase was less in LDP (2.52±0.10) when compared to HDP (4.58±3.14) and ALF packed irrespective of packaging material used. It was clear that storage days and packaging materials were highly significant at p<0.05.The changes in Cholesterol content was found in all the packaging materials stored up to 15 days at 2 days intervals were highly significant.

Table 9: Changes in phospholipid of Goat meat during frozen storage in different packaging materials for 15 days with 2 days interval.

Packaging Materials	Days of storage					
	0	3	6	9	12	15
ALF	4.80 ±0.45	4.73 ±7.19	4.70 ±7.34	4.23 ±6.55	4.16 ±6.44	4.10 ±5.72
HDP	4.80 ±0.45	3.75 ±0.43	3.73 ±0.42	3.72 ±0.42	3.68 ±0.41	3.65 ±0.40
LDP	4.80 ±0.45	2. 80 ±0.15	2.79 ±0.14	2.68 ±0.14	2.62 ±0.13	2.47 ±0.12

Values are expressed in g/100g tissue weight; Mean of the six values ± SD P<0.05 were highly significant

ALP- Aluminium laminated foil ,HDP-High density polythene , LDP- Low density polythene

Table 9 showed that the phospholipid in the goat meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. A better result was observed in ALF (4.10±5.72). The phospholipid increase was less in LDP (2.47±0.12) when compared to HDP (3.65±0.40) and ALF packed irrespective of packaging material used. It was clear that storage days and packaging materials were highly significant at p<0.05.The changes in phospholipid was found in all the packaging materials stored up to 15 days at 2 days intervals were highly significant.

Table 10: Changes in phospholipid of chicken meat during frozen storage in different packaging materials for 15 days with 2 days intervals.

Packaging Materials	Days of storage					
	0	3	6	9	12	15
ALF	1.17 ± 4.23	0.86 ±3.43	0.81 ±3.29	0.85 ±3.03	0.79 ±2.80	0.74 ±2.66
HDP	1.17 ±4.23	0.97 ±3.39	0.91 ±3.14	0.87 ±2.69	0.79 ±1.97	0.70 ±1.55
LDP	1.17 ±4.23	0.44 ±2.21	0.41 ±2.19	0.38 ±2.18	0.34 ±2.16	0.29 ±2.14

Values are expressed in g/100g tissue weight; Mean of the six values ± SD P<0.05 were highly significant

ALP- Aluminium laminated foil ,HDP-High density polythene , LDP- Low density polythene

Table 10 showed that the phospholipid in the chicken meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. A better result was observed in ALF (0.74 ±2.66). The phospholipid increase was less in LDP (0.29±2.14) when compared to HDP (0.70±1.55) and ALF packed irrespective of packaging material used. It was clear that storage days and packaging materials were highly significant at p<0.05.The changes in Phospholipid was found in all the packaging materials stored up to 15 days at 2 days intervals were highly significant .

ISSN 2349-7823

International Journal of Recent Research in Life Sciences (IJRRLS)
Vol. 2, Issue 2, pp: (3-13), Month: April 2015 - June 2015, Available at: www.paperpublications.org

Table 11: Changes in the TBARS value of goat meat during frozen storage in different packaging materials for 60 days with 15 days interval.

Packaging Materials	Days of storage			
	15	30	45	60
ALF	1.78 ^{s} ±0.11	2.72 ^{NS} ± 0.19	3.90 ^{NS} ±0.24	4.25 ^{NS} ±0.27
HDP	2.62 ^{NS} ±0.17	3.18 ^{NS} ±0.21	4.14 ^{NS} ±0.20	4.21 ^{NS} ±0.30
LDP	4.82 ^{NS} ±0.31	5.00 ^{NS} ±0.35	6.52 ^{NS} ±0.40	6.95 ^{NS} ±0.45

Values are expressed in g/100g tissue weight; Mean of the six values ± SD

ALP- Aluminium laminated foil, HDP-High density polythene , LDP- Low density polythene

Table 11 showed that the TBARS in the Goat meat were increased in storage interval for 15 days, as expected in all the packaging materials. It was observed that the TBARS value were more increased in LDP (6.95±0.45) when compared to ALF (4.25 ±0.27) and HDP (4.21+0.30) packed irrespective of packaging materials used. It was clear that storage days and packaging materials were not significant at $p<0.05$.The changes in TBARS values were found in all the packaging materials stored up to 60 days at 15 days intervals were not significant

Table:12 Changes in the TBARS value of chicken meat during frozen storage in different packaging materials for 60 days with 15 days interval .

Values are expressed in g/100g tissue weigh; Mean of the six values ± SD

Packaging Materials	Days of storage			
	15	30	45	60
ALF	3.90 ^{NS} ±0.75	4.23 ^{NS} ± 0.29	4.55 ^{NS} ±0.31	4.69 ^{NS} ±0.44
HDP	3.35 ^{NS} ±0.12	3.81 ^{NS} ±0.16	3.92 ^{NS} ±0.20	4.44 ^{NS} ±0.24
LDP	3.46 ^{NS} ±0.17	3.94 ^{NS} ±0.23	4.10 ^{NS} ±0.18	4.90 ^{NS} ±0.25

ALP- Aluminium laminated foil, HDP-High density polythene , LDP- Low density polythene

Table 12 showed that the TBARS in the chicken meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. It was observed that the TBARS values were more increased in LDP (4.90 ±0.25) when compared to ALF (4.69±0.44) and HDP(4.44±0.24) packed irrespective of packaging materials used. It was clear that storage days and packaging materials were not significant at $p<0.05$.The changes in TBARS values were found in all the packaging materials stored up to 60 days at 15 days intervals were not significant

Table:13 Changes in the catalase value (antioxidant status) of goat meat during frozen storage in different packaging materials for 60 days with 15 days interval.

Packaging Materials	Days of storage			
	15	30	45	60
ALF	290.00 ^{NS} ±10.75	282.54 ^{NS} ±10.29	277.7 ^{NS} ±9.31	252.53 ^{NS} ±8.86
HDP	254.15 ^{NS} ±.10.09	247.31 ^{NS} ±9.13	215.25 ^{NS} ±8.20	258.43 ^{NS} ±7.24
LDP	192.2 ^{NS} ±9.17	186.8 ^{NS} ±8.23	178.10 ^{NS} ±7.18	168.7 ^{NS} ±6.25

Values are expressed in g/100g tissue weight :Mean of the six values ± SD $P<0.05$ were not significant

ISSN 2349-7823

International Journal of Recent Research in Life Sciences (IJRRLS)
Vol. 2, Issue 2, pp: (3-13), Month: April 2015 - June 2015, Available at: www.paperpublications.org

ALP- Aluminium laminated foil ,HDP-High density polythene , LDP- Low density polythene

Table 13 showed that the catalase in the goat meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. It was observed that the catalase values were decreased in LDP (168.7 ±6.25) when compared to HDP (258.43±.7.24) and ALF (252.53±.8.86) packed irrespective of packaging materials used. It was clear that storage days and packaging materials were not significant at $p<0.05$.The changes in catalase values found in all the packaging materials stored up to 15 days at 2 days intervals were not significant.

Table:14 Change in the catalase value(antioxidant status) of Chicken meat during frozen storage in different packaging materials for 60 days with 15 days interval.

Packaging Materials	Days of storage			
	15	30	45	60
ALF	285.72 ^{NS} ± 9.91	276.11 ^{NS} ± 9.82	265.10 ^{NS} ±9.44	211.1 ^{NS} ± 8.87
HDP	290.8 ^{NS} ±11.09	282.8 ^{NS} ±10.13	240.12 ^{NS} ± 9.20	215.6 ^{NS} ±8.72
LDP	187.15 ^{NS} ±9.17	179.63 ^{NS} ±8.87	170.08 ^{NS} ±8.17	166 .92 ^{NS} ±7.91

Values are expressed in g/100g tissue weight ;Mean of the six values ±SD $P<0.05$ were not significant.

ALP- Aluminium laminated foil ,HDP-High density polythene , LDP- Low density polythene

Table 14 showed that the catalase in the chicken meat were decreased with increased in storage interval for 15 days, as expected in all the packaging materials. It was observed that the catalase values were decreased in LDP (166.6±7.91) when compared to HDP (215.6 ±.8.72) and ALF packed (211.1 ± 8.87) irrespective of packaging material used. It was clear that storage days and packaging materials were not significant at $p<0.05$.The changes in catalase values was found in all the packaging materials stored up to 60 days at 15 days intervals were not significant.

4. DISCUSSION

Changes in the ash content:

The table 1and 2 showed the changes in ash content in the goat meat and chicken meat. The initial ash content of food samples were (9.11 ± 0.52) and (8.33 ± 0.52) respectively. After 15 days of storage the ash content, in both the samples were significantly decreased in all the packaging materials ,but the best results were obtained in HDP and poorest retention were observed LDP. The similar findings was observed by Babarinde,(2009), who stated that the loss of ash content was not known. These results were in agreement with Gandotra *et al*., (2012). Arannilewa *et al*.,(2005) reported that the decrease in ash content was attributed to the drip loss during thawing process.

Changes in moisture content:

The table 3 and 4 showed the changes in moisture content in goat meat and chicken meat. Moisture also affects the stability and shelf life of the food product. It was found that moisture content in stored product increased with increasing storage period .During storage, liquid known as weep, exudes from meat. Excess weep is undesirable, because it detracts from the appearance of meat and results in effective loss of product (A.F. Egan ,1984) Oxidative damages to the sarcoplasm may also involved changes in moisture loss and texture (Ladikos and Lougovois, 1990).

Changes in the protein content:

The table 5 and 6 showed the changes in protein content in the goat meat and chicken meat also reported that the protein undergo a number of changes that affect the flavor and texture of the food samples .These changes were important since they determine the storage life of the frozen products and were a major considerations in grading the quality of frozen food items .The similar observations have been made earlier. The degree of protein denaturation due to drip loss to a certain extent resulting in surface dehydration ie, ice crystal formation and cell rupture .These results were in good

accordance with earlier reports. The meat protein, myoglobin molecule was responsible for the fresh meat color, and any change in this pigment changed meat appearance and color. Moreover, the level of the myoglobin not only affects the color of meat but the type of myoglobin and its chemical form, along with characteristics of other meat components, also affect the color (Lawrie 1998).

Changes in the lipid fraction (cholesterol and phospholipid):

The table 7,8and 9, 10 showed the changes in lipid content in the goat meat and chicken meat. During frozen storage, lipid deterioration increased. It was also the primary consideration in the storage stability of meat and meat products. Lipid fraction of frozen foods for a period of 15 days undergo oxidative reaction, which on initiated in membrane bound lipids, play a significant role in this process of lipid peroxidation . Pussa *et al* .,reported that PUFA' s were highly susceptible to lipid peroxidation due to active bisallyic methylene groups in their molecules , and both linoleic and arachidonic acids containing two and four double bonds, respectively. The decrease in lipid fraction might be due to breakage of tissues during frozen storage as a result of pressure exerted by the ice crystals and consequent release of protein and lipid from their natural compartments and unconventional lipid protein complex. A similar diminution was also found in pink perch. This variation in the total muscles lipid could probably be attributed to the inherent variation in lipid level was studied .

Changes in the lipid peroxide (TBARS and Catalase):

The table 11, 12 and 13, 14 showed the changes in lipid peroxides in goat meat and chicken meat. Lipid oxidation was one of the most important parameters that influence the quality and acceptance of meat. The significant losses of total lipids(table 7,8,9and 10) contents in both the samples have been considered to the auto oxidation of lipids. The results agreed with those reported by Igene *et al*., (1979). Sampaio (2012) suggested that the unsaturated lipids were more susceptible to lipid oxidation because hydrogen atoms could be more easily abstracted from PUFA than saturated fats . They reported that frozen raw beef and pork muscle had higher TBARS value than frozen raw chicken muscle was by the heme, content .Thus they concluded that heme pigment content in conjucation with catalase activity determines lipid peroxidation potential of raw meat and the content of PUFA was the major determinant for lipid peroxidation in cooked meats . Pikul *et al*., suggested that the phosholipid fraction contributed about 90% of the malonaldehyde measured in total fat from chicken meat. Also, the PUFA content of phospholipid was positively related to the development of rancidity . Sasaki *et al*., indicated that the extent of lipid peroxidation was correlated with phospholipid peroxidation in the initial period of storage, but was directly correlated with total lipid content in a later period.

5. CONCLUSION

The results showed that the ash, moisture, cholesterol and phospholipids were significantly decreased in all the packaging materials under frozen storage. The HDP showed a better performance in the retention of ash, moisture and protein content. The ALP showed a better performance in the retention of lipid fraction of cholesterol and phospholipids contents. LDP showed a poor retention in ash, moisture, protein, cholesterol and phospholipids contents. The results showed that the TBARS were increased in LDP and decreased in HDP. The values of catalase were increased in HDP and decreased in LDP. There was a significant interaction between the storage under frozen condition and the packaging materials.

REFERENCES

[1] AOAC,(2000), Official methods of analysis of the extract of celosia argentea leaves. Indian journal of pharmacology ,43(3): 278-285 .

[2] Arannilewa ST, Salawu, SO,Sorungbe, AA, and Olasa lawu, BB,(2005),Effect of frozen period on the chemical, microbiological and sensory quality of frozen tilapia fish (Sarotherod on galilaleus) ,Afr. J. Biotech, 4(8): 852-855.

[3] Babarinde GO, Fabunmi OA.(2009), Effects of packaging materials and storage temperature on quality of fresh okra (abelmoschus esculentus) fruit agricultura tropica et subtropica , vol. 42 (4)

[4] Baker RC, Bruce CA, (1995), Further Processing of Poultry. In Processing of Poultry Ed By Mead GC Chapman&Hall, London 251-282.

[5] Beuge JA and Aust SD,(1978) The thiobarbituric acid assay. Methods in Enzymology 52:pp306-307.

[6] Brewer MS, Wu SY. (1993),Display, packaging and meat block location effects on colour and lipid oxidation of frozen lean ground beef, J. Food Sci,58: 1219–1223.

[7] Conchillo A, Ansorena D and Astiasa´ran I, (2005), Intensity of lipid oxidation and formation of cholesterol oxidation products during frozen storage of raw and cooked chicken. J. Sci. of Food Agriculture 85: 141–146.

[8] Egan,AF ,(1984). Microbiology and storage life of chilled fresh meats. Proceedings of the 30th European meeting of Meat research Workers, Bristol,pp.211-214.

[9] Faris A and karim Hussain, (2009), Evaluating frozen beef and meat packaging material exposed to low levels of ammonia gas .

[10] Folch J, Less M and Solane SGH (1957) , A simple method for isolation and purification of total lipids from animal tissues . J Bio chem,26:487-509.

[11] Farouk MM, Swan JE(1998) Effect of muscle condition before freezing and simulated chemical changes during frozen storage on the pH and colour of beef. Meat Sci. 50: 245–256.

[12] Gandotra, R, Koul ,M Gupta, S. and Sharma S, (2012), Change In Proximate Composition And Microbial Count By Low Temperature preservation In Fish Muscle Of Labeo Rohita (Ham- Buch), IOSR Journal of Pharmacy and Biological Sciences (IOSRJPBS), 2(1): 13-17.

[13] Igene JO, Pearson AM, Merkel RA, and Coleman, TH, (1979), Effect of frozen storage time, cooking and holding temperature upon extractable lipids and TBA values of beef.and chicken, Journal of Animal Science, 49(3), 701-707.

[14] Kandeepan G, and S Biswas (2005), Effect of low temperature preservation on microbial and Sensory quality of buffalo meat .

[15] Ladikos, D and Lougovois , V (1990), Lipid oxidation in muscle foods, A review Food Chemistry, 35(4), 295–314.

[16] Lawrie RA, (1998) ,Lawrie's meat science. 6th. ed. United Kingdom: Technomic Publishing Company. p212-229.

[17] Lowry,OH , Rosebrough, NJ, Farr, AL and Randall, RJ.(1951), protein measurement with the folin' reagent , Journal of Biological chemistry, 193, p.265-276.

[18] Pikul J, Leszczynski DE,and Kummerow FA.(1984), Relative role of phospholipids, triacylglycerols, and cholesterol esters on malonaldehyde formation in fat extracted from chicken meat,J. Food Sci. 49: 704-708 .

[19] Püssa T, Pallin R, Raudsepp P, Soidla R, and Rei M. (2008) ,Inhibition of lipid oxidation and dynamics of polyphenol content in mechanically deboned meat supplemented with sea buckthorn (Hippaphae rhamnoides) berry residues, Food Chem, 107: 714-721.

[20] Sampaio,G.RT ,Saldanha RAM ,Soares, (2012), Effect of natural antioxidant combinations on lipid oxidation in cooked chicken meat during refrigerated storage Food Chemistry ,135 P: 1383–1390 .

[21] Sasaki K, Mitsumoto M, Kawabata, K.(2001) ,Relationship between lipid peroxidation and fat content in Japanese Black beef Longissimus muscle during storage. Meat Sci. 59: 407-410

[22] Shubhangini A and Joshi (2002) ,Nutrition and Dietetics second edition ,by Tata MC Graw- Hill publishing company limited .

[23] Shumaila Gul and Mahparasafdar (2009), Proximate composition and mineral analysis of cinnamon , Pakistan journal of nutrition, 8(9);1456-1460 .

[24] Sinha, KA ,(1972), Colorimetric assay of catalase. Anal. Biochem., 47: 389-394.

[25] .www.google.com.

[26] Zalatkis, A, Zak b and Boyle GJ. (1953), A method for the determination of serum cholesterol,J. Clin Med , 41: 486-492.

[27] Zilver Smit DB and Davis AK, (1950) ,Micro determination of plasma phospholipids by TCA precipitation. J.Lab Clin Med ,35: 155-159.