KEEPING QUALITY OF BUFFALO'S LIVER AND KIDNEY UNDER MARKETING CONDITIONS

AWAD H. AWAD
Dept. of Food Sci., Fac. of Agric., Minia University, El-Minia, Egypt.

ABSTRACT
Keeping quality of buffalo's livers and kidneys was assessed by the determination of type and microbial population, lactic acid production, pH changes, protein breakdown, hydration and sensory attributes. Fresh livers and kidneys barbered a mixed population of aerobic, anaerobic mesophilic proteolytic, psychrophiles,enterococci, lactic acid and gram negative bacteria. Presumptive coliforms and staphylococci were recovered at a level of logic 1.26 - 1.42 CFU/g and logo 2.36 - 2.85 CFU/g, respectively. Most ofthese microbial grouping increased in numbers during storage at 2°C for 15 days, except those of coliforms which declined at day 9. When samples were rejected organoleptically after c. 6-7 days at 2°C, souring was the main cause of spoilage, pH declined along with an increase in lactic acid production and microbial population. Loss of hydration i.e. decrease in water holding capacity and increase in extract release volume, amino N. and volatile bases nitrogen were remarkable at time the samples were rejected.
It is suggested that both samples could be kept at refrigerator temperature for 6 to < 9 days without fear of spoilage. Changes in microbial load, hydration and the release of amino N. any of these along with pH changes could be a more reliable parameters for determining the keeping quality of buffalo's livers and kidneys.

INTRODUCTION

Quality and shelf - life of food products have been of particular interest for researchers. Numerous reports are available in the research literature which describe the number and types of bacteria on fresh muscle meats, but only a few reports relates to the microbial flora of organs such as livers, kidneys and hearts (Gardner, 1971;Shelef, 1975; Patterson and Gibbs, 1979; Hanna, *et al* 1982 and Awad, 1990). Shelef 1975 reported that after 7 - 10 days of beef liver storage at 5°C, total microbial load was 7-8 x 107 cell/g at which the samples were rejected due to souring when pH fell from 6.3 to 5.9. Patterson and Gibbs, 1979 found that the shelf - life of some edible offals was 7 - 10 days at 4°C. Hanna *et al.* 1982 reported that the initial microbial flora of fresh livers, kidneys and hearts was varied with corynefrom bacteria and micrococcus sp. often constituting a major pert (>25%). Pseudomonas sp. became a major part after 5 days of storage at 2°C. Types and numbers of microorganisms in the spoilage of refrigerated beef and buffalo livers were examined by Awad,1990,suggesting that livers could be kept at cold temperature for 6:<10 days without fear of spoilage. The keeping quality of organ meats is important to the meat industry since large quantities, primarily beef livers, are shipped in the frozen state for subsequent retail display and sale or for manufacturing purpose. Since liver and kidney are widely acceptable by Egyptian consumers, the present study deals with assessing the keeping quality of buffalo's liver and kidney in order to gain more understanding on the cause of spoilage and which measurements would be reliable in detecting spoilage.

MATERIALS AND METIIODS

Samples: Liver and kidney samples of buffalo, obtained from local abattoir (Egypt), were transported to the laboratory and immediately stored at 2 °C . Analyses were carried out on samples at 0 time and at appropriate intervals over 15 days.

Microbial analysis: All microbial groups (total aerobes, total anaerobes, psychrophiles, mesophilic proteolytic bacteria, coliform groups, gram negative bacteria, faecal streptococci, staphylococci and yeasts and molds) were determined with the plate count method following the procedures of the American Public Health Association (Anon,1966). Salmonella and shigella were detected according to Difco Manual (1970) method.

Chemical analysis: Samples were analyzed for moisture, fat, ash, pH, protein, lactic acid, free amino N (FAN) and total volatile bases N(TVBN)contents following the method described in AOAC (1985). Carbohydrate was calculated by differences. Hydration of liver and kidney samples was determined by the extract release volume (ERV) method of Jay (1964) and water holding capacity (WHC) using the methodgivenbyGolavin(1969). **Sensory evaluation:** Changes in odor, color, consistency and appearance of samples were visually assessed by trained persons.

RESULTS AND DISCUSSION

Proximate composition : Table 1 showed that the proximate composition of buffalo liver and kidney samples differ substantially from corresponding values for fresh muscle meat (Lawrie,1976). Clear differences were also apparent between the two kinds of variety meat studied. In contrast to skeletal muscles which are reported to contain negligible amounts of carbohydrate (Shelef,1975), liver contained a high percentage of carbohydrate (6.9%).

Table (1): The pro.`imate composition offresh huffalo liver and ki(lney "on wet basis"

Analysis (%)	Liver	Kidney
Moisture	69.5	75.6
Protein	19.2	15.4
Fat	3 7	7 9
Ash	1.2	1.2
Carhohy(lrate	6.9	1.1

Microbial population: Counts of microflora present in river end kidney samples when fresh and during storage at 2°C for 15 days are shown in Table 2 . The number of staphylococci was found to be comparatively less than those reported by Shelef (1975) for liver and by Hanna et al. (1982) for kidney . Faecal streptococci, salmonella and shigella were absent in all samples, while yeasts and molds were recovered from both samples. All microbial grouping showed steady increase during storage up till the 9th day. Thereafter, the number of coliforms declined, whereas those of total aerobes, psychrophiles, anaerobes and enterococci continued to increase but at slow rate . The number of mesophilic proteolytic bacteria and staphylococci did not show great changes over the storage period. Lactic acid bacteria showed faster increase in liver samples than that in kidney samples.

Hydration and pH: The pH value of fresh liver dropped at a faster rate during the first 9 days of storage while that of kidney decreased but at lower rate. On further storage, the pH appeared to slightly decreased. Gill and Delacy (1982) observed that, in sheep livers, the pH tended to increase at the last 2 days (10 days at 10°C) which had been attributed to the enhanced ammonia production. Similar results were reported by Awad (1990) for bovine livers. Fresh liver was highly hydrated indicated from the initial WHC (53.8) and low initial ERV (2.25), While corresponding results indicated that kidney is less hydrated (WHC,52.4 and ERV,3.2) . However,WHC gradually decreased and ERV increased

along with total aerobes growth and drop of pH which appears that WHC and ERV are highly dependent on pH value.

Protein breakdown: Both samples showed that FAN tended to increase sharply up to the 9th day, after which the increase was very small (Table 2). TVBN increased at slow rate over the storage period. Gardner (1965) reported that psychrophilic bacteria growing on meat are the main cause of protein breakdown during cold storage. The growth of psychophiles shows a continuous increase up till the 9th day, coincide with a sharp increase in the amino N. content.

Sensory evaluation: Little changes in appearance, odor and/or consistency were observed on the samples at 6-9 days; after the 9th day color became pale, texture became soft and sour odor was noticeable in liver samples.

The foregoing results clearly demonstrated that spoilage commenced at day 9ofcold storage in both liver and kidney; samples could be kept at refrigeration temperature for 6 :< 9 days without fear of spoilage. The present study also suggests that besides the common quality parameters a number of other measurements could be used as indicators of spoilage in liver and kidney such as FAN and TVBN values and WHC and {RV values

REFERENCES

AOAC, 1985, 14th ea., AOAC, Washington, DC.

Anon, 1966, Recommended Methods for the Microbiological Evaluation of Foods, American Public Health Association, N.Y.

Awad, A.H., 1990, Minia J. Agric. Res. & Dev. Vol. 12: 240.

Difco Manual, 1970, DiDco Manual of Dehydrated Culture Media and Reagents for Microbiological Clinical Lab. Procedures, Detroit, Mich, USA.

Gardner, G.A., 1971, J. Food Tech., 6: 225.

Gill, C.O. and Delacy, K.M., 1982, Appl. and Environ. Microbiol., 43: 1262.

Golavin, A.M., 1969, Control of fish products. Pishcevaio Premishlemest Publishers, Mosco, Russia.

Hanna, M.O., Smith, G.C., Savell, J.W.; Mckeith, F.K. and Vanderzant, ., 1982, J. Food Prot., 45: 63.

Jay, J.M., 1964, Food Tech., 18: 1633.

Lawrie, R.A., 1976, Meat Science, Pergamon Press, London. Patterson, J.T. and Gibbs, P.A., 1979, Meat Sci., 3: 209.

Shelef, L.A. 1975, J. Appl. Bact., 39: 273.

Table (2): Keeping quality of buffalo liver and kidney.

Analysis	Liver				Kidney			
	Fresh	6 days	9 days	15 days	Fresh	6 days	9 days	15 days
pH	6.5	5.6	5.5	4.9	6.6	6.1	6.1	5.8
Lactic acid %	0.72	0.86	1.1	1.4	0.36	0.7	0.8	1.1
FAN mg/lOOg	118	210	260	245	92.0	108	156	150
TVBN mg/lOOg	9.5	12.7	16.7	18.0	7.5	11.5	14.3	16.2
WHC value	53.8	47.1	45.1	32.2	52.4	47.0	45.7	30.5
ERV ml	2.25	6.9	9.8	27.1	3.2	7.5	9.4	27.2
Total aerobes *	3.83	6.17	7.82	8.7	2.58	4.42	5.8	7.7
Total anaerobes	2.77	5.19	5.8	6.52	1.57	3.3	3.7	4.6
Psychrophiles	3.35	6.08	7.78	8.35	2.15	4.2	5.6	7.5
Enterococci	2.85	4.45	5.22	5.72	1.95	3.0	3.6	4.5
G bacteria	2.45	3.68	4.4	6.15	1.15	2.45	3.5	5.1
Coliform groups	1.26	2.65	3.4	2.54	1.42	2.2	3.2	2.9
Lactic acid bacteria	2.3	4.7	5.2	6.1	1.1	2.3	2.6	3.1
Mesophilic Proteolytic	2.4	3.3	3.2	3.5	1.38	2.1	2.6	3.5
Staphylococci Faecal	2.36	2.4	2.4	2.45	2.85	2.9	2.9	3.2
streptococci	-	-	-	-	-	-	-	-
Salmonella & Shigella								
Molds & yeasts	<10	<10	<10	<10	<10	<10	<10	<10

Data are average of 5 samples .

* LoglO colony forming unit CFU/g.