

**FROZEN STORAGE CHARACTERISTICS OF CULTURED
MACROBRACHIUM ROSENBERGII (DE MAN)**

S. BASU AND M. K. CHOUKSEY

*Central Institute of Fisheries Education
(Deemed University),
Versova, Mumbai-400 061*

ABSTRACT

Cultured *Macrobrachium rosenbergii* (Scampi, about 30 g each) in headless shell-on form was individually quick frozen in a spiral freezer. The frozen samples were glazed and packed in polythene bags, which were further packed in master carton and stored at - 18 °C. Samples were drawn at regular intervals and subjected to biochemical, bacteriological and organoleptic analysis to study its storage characteristics. The data on the above parameters showed that the samples were in prime acceptable condition when stored upto 23 weeks. No appreciable change in colour and odour was noticed in the raw muscle. Afterwards, organoleptic evaluation of the cooked muscle revealed slight change in the flavour. Texture also appeared little tougher. These changes in organoleptic characters were well supported by the biochemical bacteriological changes in the muscle.

Keywords : Storage characteristics, biochemical, bacteriological organoleptic

INTRODUCTION

Export of fishery products from India has steadily increased over the years both in quantity and value. The export earning in the year 1998-99 was Rs. 4626 crores, showing a slight decline over the previous year. There is a quantitative change in the different fishery items exported. While in 1985-86, 60.2% of the quantity and 82.9% of the value of Indian fishery export was contributed by frozen shrimp, the figure changed to 32.3% and 67.3% respectively in the year 1995-96.

Fisheries export has diversified over

the years but the quantity of prawn exported has almost reached a plateau. For further increase in the quantum of export of prawns, the raw material has to come from aquaculture. In recent years, the aquaculture of fresh water prawn, *M. rosenbergii* (de Man) in gaining immense popularity, both in the maritime as well as in the inland states, because of its ability to grow in freshwater and low saline waters, compatibility for polyculture with carps, low disease incidence and good consumer preference both in domestic as well foreign markets. Considering tremendous potential in the culture and export, it was felt

necessary to study the frozen storage characteristics of *M. rosenbergii*.

MATERIAL AND METHODS

M. rosenbergii (30-35 g) were collected from a private farm near Mumbai. The animals were decapitated and transported to the freezing plant in crushed ice, in about 5 hrs. The prawns were washed in potable water containing 5 ppm chlorine and individually quick frozen in a spiral freezer which took about 20 min for the core temperature to reach -20 °C. The frozen samples glazed and packed in polythene bags were further packed in master carton and stored in cold store at -18 °C. The samples were drawn at regular intervals and subjected to biochemical, bacteriological and organoleptic analysis. Moisture, total nitrogen (TN), non-protein nitrogen (NPN) and total ash of the muscle of the prawns were determined by AOAC (1995), salt soluble nitrogen by the method of Ironside & Love (1958), total volatile base nitrogen by Conway micro diffusion method (1947) and alpha-amino nitrogen by the method of Pope and Stevens (1939). Total bacterial count was determined by the standard pour plate method using tryptone glucose agar medium, incubating the plates of room temperature (30±2 °C). Free fatty acid was estimated by IS 5734 method (1970) and the peroxide value by the method followed by Lima *et al.* (1981). Fat was estimated by Soxhlet apparatus, using petroleum ether (B. P. 40-60 °C). A 2:1 (water : muscle) homogenate was used for measuring pH of the muscle using a digital pH meter. The overall acceptability of cooked prawns were evaluated organoleptically by a panel of

experienced judges on a 9 point hedonic scale, 9 being extremely good and 1 being extremely poor, 5 being neither good, nor bad. Prawns were boiled in 2% brine for 10 min and served to the panel members while still warm.

RESULTS AND DISCUSSION

The proximate composition of the edible portion of prawn was as follows: moisture - 78.82±0.25%, protein - 18.37±0.32%, fat - 1.29±0.21% and ash - 1.57±0.11%. The figures represent the average of 5 findings of the prawns weighing 30-35 g each. The analysis was done in one season i.e. between November-December.

Table 1 shows the storage characteristics of *M. rosenbergii* in frozen storage at -18 °C. The moisture content of the thawed muscle decreased very slowly over 26 weeks of storage. This may be due to the drip loss of the frozen sample. Salt soluble nitrogen decreased gradually with storage. This shows gradual increase in denaturation of protein as the storage period increased (Dyer, 1971) rendering the protein insoluble. Denaturation of protein reduces the water holding capacity of the protein, which is evident from the very slow decrease in the moisture content of the thawed prawns. Denaturation also makes the muscle tough and enhances the drip loss through low water holding capacity. There was gradual increase in toughness and gradual loss of flavour as the storage period increased which was reflected in the overall acceptability of the prawns.

The total plate count decreased after freezing and continued to decrease till one

Table 1 : Frozen storage characteristics of *M. rosenbergii* at -18°C.

parameters Storage period (Weeks)	Moisture %	SSN as % of Total Protein N	alpha- amino nitrogen mg%	NPN mg%	TVN mg%	PV milli eq. of peroxide /1000 g fat	FEA % of oleic acid	pH	TPC cfu/g	Overall acceptability (9 point hedonic scale)
Fresh prawn (before freezing)	78.82	49.47	134.77	643.68	10.73	ND	ND	7.10	8.92x10 ⁴	9.0±0
0 (Immediately after freezing)	78.67	47.84	123.94	649.71	10.02	ND	ND	7.13	3.30x10 ⁴	9.0±0
4	78.69	47.94	123.62	645.20	14.32	2.21	1.83	7.17	2.0x10 ⁴	8.3±0.3
9	78.52	46.21	121.70	648.37	13.11	3.12	5.34	7.21	2.1x10 ⁴	7.9±0.4
13	78.55	43.12	119.51	646.37	15.91	5.57	4.60	7.26	2.3x10 ⁴	7.3±0.3
17	78.44	41.43	117.71	643.91	16.12	9.24	11.59	7.30	6.0x10 ⁴	6.9±0.3
23	78.42	39.94	118.25	639.11	16.25	7.12	11.21	7.35	8.5x10 ⁴	6.4±0.2
26	78.32	34.83	116.31	634.38	17.23	11.47	19.12	7.37	9.2x10 ⁴	6.1±0.4

month period, after which count increased gradually with storage period. This may be due to the fact that the mesophilic bacteria present in the prawns died after freezing and during one-month storage due to thermal shock. Psychrophilic bacteria present in the prawns started growing slowly showing an increase in total count after one month. Alpha-amino nitrogen and non-protein nitrogen values remained almost constant during initial period of storage, thereafter showing slight fall in both the values. This may be due to the consumption of small nitrogenous compounds by bacteria, whose number grew gradually with time. Gradual increase in bacterial count is well reflected in the gradual increase in TVN values, showing bacterial degradation of protein. Similar trends were observed in frozen prawns by Pillai *et al.*, (1961) and Lakshmi *et al.*, (1962). Free fatty acid and peroxide value increased gradually with storage period thereby encouraging alkaline protease (Chander and Thomas, 1999). The organoleptic score (overall acceptability) decreased gradually with storage period. The organoleptic study revealed that the prawns were in very good acceptable condition upto 23 weeks. After that period, the texture became little tough and there was little decrease in flavour of the muscle leading to sharp drop in overall acceptability.

ACKNOWLEDGEMENT

The authors are thankful to Dr. S. Ayyappan, Director, CIFE for providing the facilities to carry out the present investigation.

REFERENCES :

- AOAC 1995.** Official Methods of Analysis, 16th edition. *Association of Official Agricultural Chemists*, Washington.
- Chander, R. and Thomas, P.** 1999. Heat stable alkaline protease from shrimp waste, *Fishery Technology*, 1999, **36** (2): 82-86.
- Conway, E. J.** 1947. *Microdiffusion Analysis and Volumetric Error*, Crossby, Lock Wood & Sons, London.
- Dyer, W. J.** (1971). In *Fish Inspection and Quality Control* (Kreuzer, R, Ed.), Fishing News (Books) Ltd; England. p. 77.
- Ironside, J.I.M. & Love, R. M.** 1958. Determination of salt soluble nitrogen in muscle protein *J. Sci. Fd. Agric.* **9**: 579.
- IS : 5734**, 1970. *Indian Standard Specification for Sardine oil*. Bureau of Indian Standards, New Delhi. IS : 5734, p. 6-7.
- Laxshmi, A., Govindan, T.K. & Pillai, V.K.** 1962. Observation of some aspect of spoilage in fresh prawns. *Indian J. Fish.* **9**: 58.
- Lima Dos Santos, C.A.M.D. James and F. Teutscher**, (1981). Guidelines for chilled fish storage experiments. *FAO Fish. Tech. Paper*, 210: pp 17.
- Pillai, V.K., Sastri, P.V.K. & Nair, M.R.** 1961. Observations on some aspects of spoilage in fresh and frozen prawns. *Indian J. Fish* **8**(2): 430-435.
- Pope, C.G. & Stevens, M.F.** 1939. Determination of amino nitrogen using a copper method, *Biochem J.* **33** : 1070.