INFLUENCE OF TIME-LAG ON QUALITY VARIATION IN NON-PENAEID PRAWNS

S. P. DAMLE, D. K. GARG, V. N. NAMBIAR* & A. P. VALSAN**

Bombay Research Centre of Central Institute of Fisheries Technology,
162 Saesoon Dock, Colaba, Bombay-400 005

Most of the samples were unsatisfactory owing to off smell, discolouration, excesssive extraneous matter, broken pieces, insects and high content of acid insoluble ash (Valsan *et al.*, 1985). These defects may be due to either intrinsic factors or extrinsic factors contributed by different methods of handling and drying. Extraneous matter, broken pieces and insect infaestation occur mainly due to extrinsic factors like improper and unhygienc way of drying. Garg *et al.*, (1987) have suggested a rapid and unhygienic method of drying non-penaeid prawns free from sand and extraneous matter. However, off odour, poor quality, discolouration and spoilage are some of the defects occuring due to intrinsic and extrinsic factors.

This paper details the influence of extrinsic factors, specially the time lag between hauling and landing of raw material as well as the finished product.

DOL-NET FISHERY:

The non-penaeid prawns are caught by 'dol' net, a type of stake net that are fixed out in sea. The mechanised boats which operate them, usually take anything between 2 to 6 hours to reach the fishing

* Present Address :-Central Institute of Fisheries Technology, Matsyapuri P. O, Cochin-682 029

** Presenr Addrsss :-Flat No. 11, 'A' wing ,Building No. 41, Brindavan Society, Thane (W), Maharashtra.

ground. Usually four boats operate together in a syndicate. The fishing is based on the tidal flow resulting from two high and two low tides of each day, at a phase of about 6 hours. Thus, as the tide changes, tidal flow changes in reverse direction every 6 hours. With the flow of tidal water, the fish gets accumulated in the cod-end and is hauled on board fishing vessel. This operation is repeated every 6 hours with the change in tide. The catch of each haul is stored as such, either on the deck or in bamboo baskets. The boats usually do fishing continuously four days at a stretch to reduce operational costs. However, one boat returns back to the landing place bringing the day's catch of all the four boats. Thus, each boat visits landing centre in turn every fourth day. The catch of four hauls is unloaded together. Hence, by the time material is landed, the time lag between hauling and landing for the first haul is almost 24 hours, for second haul it is about 18 hours, for third haul 12 hours and for the last haul i.e., the fourth haul it is 6 hours. These observations are based on the presumption that the Journey time between fishing ground and landing place is 6 hours. This time lag may further increase upto 6 hours depending on the time the fish is entangled in the net.

MATERIALS AND METHODS:

The study was conducted during the months of April-May which is the peak landing period for non-penaeid prawns in Bombay. The mean average highest and lowest temperature during the month of April were 32.3°C and 25.1°C while in May these were 33.3°C and 26.9°C. The highest temperature recorded during April and May were 34.0°C and 34.6°C and the lowest were 23.3°C and 24.0°C respectively (Regional Meteorological Centre, Colaba, Bombay-5, perso communication). The samples w collected from Versova region of Bomb which is one of the important non-penae prawn landing areas. ***Acetes indicus*** a ***Palaemon tenuipes*** are the main speci landed in this region. Hence, the studi were confined to these two species.

Fresh non-penaeid prawns were co lected seperately from each haul directe from the boats and were subjecte to critical organoleptic, biochemical ar bacteriological evaluations. All the san ples were then sun dried for 8 to 12 hou as is done in usual trade practice. Th quallty of the finished product was als assessed in the manner as for fres samples. The trials were repeated fou times for each species. Subjective test were employed fot organoleptic asses ment. Moisture was estimated by AOA (1975) method. Total Volatile Nitroge was estimated by microdiffusion metho of Conway (1947) and total Bacteria Count by IS: 2237 (1971)

RESULTS AND DISCUSSION:

Observations on the quality of fresh and sundried non-penaeid prawns are summerised in tables I-A, I-B, II-A, anc II-B. The results expressed are an average of four trials for each species. Observations on texture, odour, colour and overall appearance of the samples were used for subjective tests. Total Volatile Nitrogen was employed as an index of spoilage. Total Bacterial Count per gram was used as an index of contamination and bacterial spoilage.

The quality of fresh Jawala and Karadi, immediately after landing from boat is described in table I-A and II-A The overall quality of the material declined from fourth haul to first haul

owing to time lag. The biochemical and bacteriological results correlate well with physical and organoleptic observations. Significantly high values of total volatile nitrogen and bacterial counts for the first two hauls are an indicator of extent of spoilage of fresh samples. Corresponding high values are reflected in the dried finished product also.

Table I-B and II-B describe the observations from corresponding dry finished products. The moisture content was reduced to less than 10% in dried products. Defects like breakage, brittleness and powdery consistency in dried product may be due to textural defects in raw material itself. Discolouration persisted even after drying which was evident from the first and the second hauls. Off smell was also markedly pronounced in these two hauls.

The final quality of dried non-penaeid prawn is determined by overall influence of various factors. Quality defects like high acid insoluble ash (sand) content, insect infestation and extraneous matter can easily be controlled by adopting proper hygienic handling and drying practices. The spoilage in fish or crustacean is due to bacterial and enzymatic action and depends on intrinsic as well as extrinsic factors. Intrinsic factors like constitution of muscle and size are species specific and hence can not be altered. Size plays and important role in deciding the extent of spoilage. As unit size reduces, there is higher surface area available against same weight for the bacterial growth and action. In these crustaceans having maximum size of about 50 mm (average weight 100mg to 1 g) the bacterial penetration in muscle and subsequent spoilage will be much faster compared with other sea foods. Rate of spoilage is also significantly influenced by the extrinsic factors like initial bacterial load, temperature of storage and time duration.

The spoilage in fish or crustaceans is directely correlated to the above factors and any increase or decrease in them will alter the spoilage pattern and ultimately the quality of finished product. Higher ambient temperatures often recorded in tropical climate accelerate bacterial and enzymatic reaction. In Bombay, temperatures observed during the course of study were most suitable for the growth of mesophilic spoilage bacteria. In the case of non-penaeid prawns, heavy spoilage within first few hours of hauling is due to material being stored on deck in open sun without icing. This spoilage will accelerate further as the time lag increases resulting in poor quality finished product. It is interesting to note that even in case of last haul, the time lag will be between 6 to 12 hours which is enough to degrade the quality substantially.

These studies have clearly indicated the effect of time lag on the quality of raw material i.e., fresh non - penaeid prawns and subsequent dry product.

RECOMMENDATIONS:

1. Catch of cach haul should be kept seperately till the material is dried to avoid mixing of grades.

2. Proper cleaning of deck, fish holds, bamboo baskets and other surface coming in direct contact with fresh material is recommended to reduce initial bacterial load.

3. Maintenance of sanitation and hygiene on board fishing vessel is important to avoid contamination.

4. Use of sufficient quantity of ice and immediate icing of catch is essential to reduce spoilage and to obtain quality dried product. Since one out of four boats is returing daily sufficient quantity of ice, adequate for entire catch of four hauls, should be carried.

5. Reduction of time lag at each stage, right from hauling through processing to drying is necessary for avoiding further spoilage.

Obesrvation of these guidelines will considerably reduce spoilage and produce superior quality dried material, thereby reduceing heavy but avoidable losses incurred by poor fishermen dependent on this industry.

ACKNOWLEDGEMENT:

Authors wish to place on record their sincere gratitude to Sri M. R. Nair, Director, Central Institute of Fisheries Technology, for his permission to publish this paper.

Table I—A

QUALITY OF FRESH JEWALA (ACETES INDICUS)

Parameters	1st haul	2nd haul	3rd haul	4th haul
Organoleptic observations	Pasty & sticky. Discoloured Ammoniacal smell. Highly spoiled	Less pasty but ammoniacal smell Dicoloured, Slightly spoiled.	No off smell. No discolouration. Pinkish appearance. Just satisfactory.	No ammoniacal smell. Firm texture. Pinkish white appearance. Fairly good
Moisture (%)	79.19	80.01	79.07	75.31
Total volatile Nitrogen (mg.%)	131.70	110.20	70.80	39.40
Total bacterial count (count/g)	5.51×10^6	2.26×10^6	1.19×10^5	8.75×10^4

TABLE I-B

QUALITY OF SUN DRIED JAWALA (ACETES INDICUS)

Parameters	1st haul	2nd haul	3rd haul	4th haul
Organoleptic	Powdery & broken. Dull brownish colour. Off smell. Highly brittle. Poor quality	Broken pieces but not powdery. Greyish colour. Slighlly off smell. Poor quality	Less broken pieces. Pinkish white colour. No off smell. Fair quality	No broken pieces. Bright Pinkish colour. No off smell. good quality
Moisture (%) Total volatile	8.67	8.57	8.38	9.15
Nitrogen (mg.%) Total bacterial	98.80	81.00	56.00	21.50
count (count/g)	1.36×10^5	1.66×10^5	7.80×10^4	3.16×10^4

TABLE II-A

QUALITY OF FRESH KARADI (PALAEMON TENUIPES)

Parameters	1st haul	2nd haul	3rd haul	4th haul
Organoleptic obserations	Pasty and sticky. Discoloured. Putrid smell. Highly spoiled.	Sticky dull brown colour. Off smell. spoiled.	Slightly sticky. Brown colour. Ammoniacal smell. Soft texture. Fair.	Pinkish brown colour. No ammoniacal smell. Firm texture. Fairly good.
Moisture (%) Total volatile	79.30	78.92	79.72	79.62
Nitrogen (mg%) Total bacterial	180.00	160.40	122.20	102.50
count (count/g)	4.16×10^6	5.00×10^6	9.37×10^5	4.42×10^5

TABLE II-B

QUALITY OF SUN-DRIED KARADI (PALAEMON TENUIPES)

Parameters	1st haul	2nd haul	3rd haul	4th haul
Organoleptic observations	Powdery and broken pieces. blackish brown colour. Off smell. Poor quality.	Broken pieces Dark Brown. Off smell. Poor Quality	No broken pieces. Light brown colour. Slightly off smell. Fair.	No broken pieces Attractive Pinkish colour. No off smell. Good quality.
Moisture (%) Total volatile	9.67	9.96	9.37	9.05
Nitrogen (mg%) Total bacterial	117.6	82.00	71.4	57.8
count (count/g)	1.02×10^4	7.35×10^3	1.00×10^4	6.36×10^3

REFRENCES:

Anon (1987) An Appraisal of the Marine Fisheries in Maharashtra, C. M. F. R. I. Special Publications No. 37

AOAC (1975) *Official Methods of Analysis* (Horwitz, W., Ed.) 12th. Edn. Association of Official Analytical Chemists, Washington.

Conway, E. J. (1947) in *Microdiffusion Analysis and Volumetric Error*, Crossby Lockwood & Sons, London,

Garg, D, K., Damle, S. P., Nambiar V. N. and Valsan, A. P. (1987) *Proc. Symp. Diversification of Post Harvest Technology for Low Cost Fish*, Society of Fisheries Technologists (India), Cochin, India.

IS: 2237 (1971) *Indian Standard Specification for Frozen Prawns (Shrimps)*. First revision. Indian Standards Institution, New Delhi.

Rajan, K. N., Sukumaran, K. K. and Krishna Pillai, S. (1982) *Indian J. Fish.* 29, 29.

Valsan, A. P., Nambiar, V. N., Damle, S. P., Garg, D. K., Iyer, T. S. G. and Vasu, N. M. (1985) in *Harvest and Post-Harvest Technology of Fish*. P. 661, Society of Fisheries Technoiogists (India), Cochin. India. O