

Effect of Blanching and Drying Methods on the Quality of *Jawala* Shrimp during ambient storage

Abstract

Acetes is a little shrimp from the family Sergestidae, genus *Acetes*. In India, a large number of this group, known locally as 'Jawala' or 'Kolim,' is landed along the northwest coast of Gujarat and Maharashtra. Currently, it is consumed locally in either fresh or dried form. *Acetes* fresh use is highly limited due to their small size, high perishability, and fragile body, making it difficult to peel the shrimp manually or mechanically. The current study investigated the influence of blanching and drying temperatures on the quality of *Jawala* Shrimp. The study aimed to develop a high-quality dried shrimp product with an extended shelf life by using different combinations of salt concentrations (0%, 1%, and 2%), blanching temperatures (70°C and 80°C), and steaming at 100°C without salt, and further drying temperatures of 50°C and 60°C were evaluated for moisture, protein, fat, ash, TVB-N, TMA-N, TPC, upon treatments. The study found that shrimp with 2% salt blanched at 80°C and dried at 60°C to a moisture level of 14.33% had the best organoleptic and microbiological. Moisture content gradually increased during storage, while protein, fat, and ash decreased slightly but were better preserved in this combination, indicating the effect of storage on product stability.

Key words: *Acetes*, blanching, drying, shelf life, moisture, colour, quality.

1. Introduction

The shrimps (*Acetes indicus*) are in the family Sergestidae. They are a small community of planktonic crustaceans with a few members, but they are extremely valuable to the economy of waters in Asia and East Africa. At times during the year, *Acetes* comes together in large swarms from near the shore marine waters and is intensively fished using dol nets. The reason that they are easy to catch compensates for the reason that they are small (Omori, 1975).

Numerous members of *Acetes* group, also called "*Jawala*" or "*Kolim*," occur in Gujarat and Maharashtra on the northwest coast of India (Mahakal et al., 2016). *Acetes* is an epipelagic creature which lives on extensive surface water shoals. Four members of this genus *A. indicus*, *A. johni*, *A. sibogea*, and *A. japonicus* have been reported in commercial catches. Currently, the globe's fastest-growing food production sector is aquaculture. With a global production estimate of 7.5 million tons of shrimp from culture and capture, shrimp aquaculture is among the aquaculture sectors with the highest growth rate (Naik et al., 2020). Shrimp live in aquatic environments both in freshwater and saltwater organisms. Because of their alleged health attributes, gastronomic characteristics, and most importantly, protein value, they are now considered to be among the fastest-growing food commodity in international trade (Ajifolokun et al., 2018).

Depending on size and processing procedure, dried shrimp can be classified broadly under the categories of salted-dried shrimp, sun-dried whole shrimp, shelled dried shrimp, salting, and smoking. Locally, these products are referred to as *Royya pottu* (Andra Pradesh), *Chingri Shutki* (West Bengal), *Kunchi meen* or *Chennakkuni* (Tamil Nadu), *Jawala* (Maharashtra), and *Sukat* (Goa/Konkan). (MPEDA, 2023; CMFRI, 1985). Drying methods influence the preservation of valuable bioactive compounds, such as astaxanthin, a reddish-orange carotenoid pigment occurring naturally that is responsible for the characteristic colour of shrimp, as well as the preservation of nutritional quality of the shrimp. Besides being important for consumer acceptability, astaxanthin possesses significant antioxidant properties that enhance human health through reduced oxidative stress. Nonetheless, the temperature conditions applied during post-

harvest treatment play an important role in its preservation. Unsuitable drying temperatures may severely degrade astaxanthin, which reduces the nutritional and aesthetic quality of the dried marine shrimp. Compared to conventional sun drying, the research indicated that retention of astaxanthin was significantly improved through blanching prior to drying and controlled temperatures during drying. The findings underscore the importance of the optimization of pre-treatment and drying conditions to preserve *Acetes indicus* functional quality and enhance its market value. (Chakraborty et al., 2017).

Locals use *Jawala* on a regular basis fresh or dried up in the preparation of everyday food because there is not much use of *Acetes* fresh now. Being available throughout the year in the market, *Acetes* are taken predominantly in dry form; however, during the off-fishing season, when fresh fish is not accessible, dry *Acetes* consumption increases (Zynudheen et al., 2004). *Acetes* are hard to keep on board since they are small and fragile. Additionally, the hepatopancreatic enzymes inducing autolysis and proteolysis make it extremely perishable and easily degrade. The shrimp cannot be peeled manually or mechanically, (Zynudheen et al., 2004).

The conventional means of drying and preserving *Jawala* shrimp, though of economic and nutritional importance, are often not standardized by science. Uncontrolled sun drying, variable salt content, and absence of blanching are prevalent practices adopted by indigenous processors, which have the potential to lead to inconsistent quality, microbial spoilage, discoloration, and loss of nutrients. Product safety, shelf life, and acceptability of the product are all directly affected by these issues, especially when targeting high-end domestic or export markets. Moreover, most studies have only evaluated how blanching and controlled drying as individual factors influence the physicochemical, microbiological, and sensory characteristics of dried shrimp. It is, therefore, clear that improved and beneficial post-harvest processes need to be developed in an effort to enhance the quality, safety, and marketability of the dried *Jawala* shrimp. As a way of bridging these gaps, this research evaluates various permutations of salt concentrations, drying temperatures, and blanching times in an attempt to determine the best process for producing dried shrimp of high quality. Given this, the present study was done to identify the most effective treatment to reduce moisture content, extend shelf life, improve nutritional retention, and decrease the microbial load.

Objectives:

1. To study the effect of cabinet drying on quality of *Jawala* shrimp during storage.

2. Material and Methods

2.1 Sample preparation

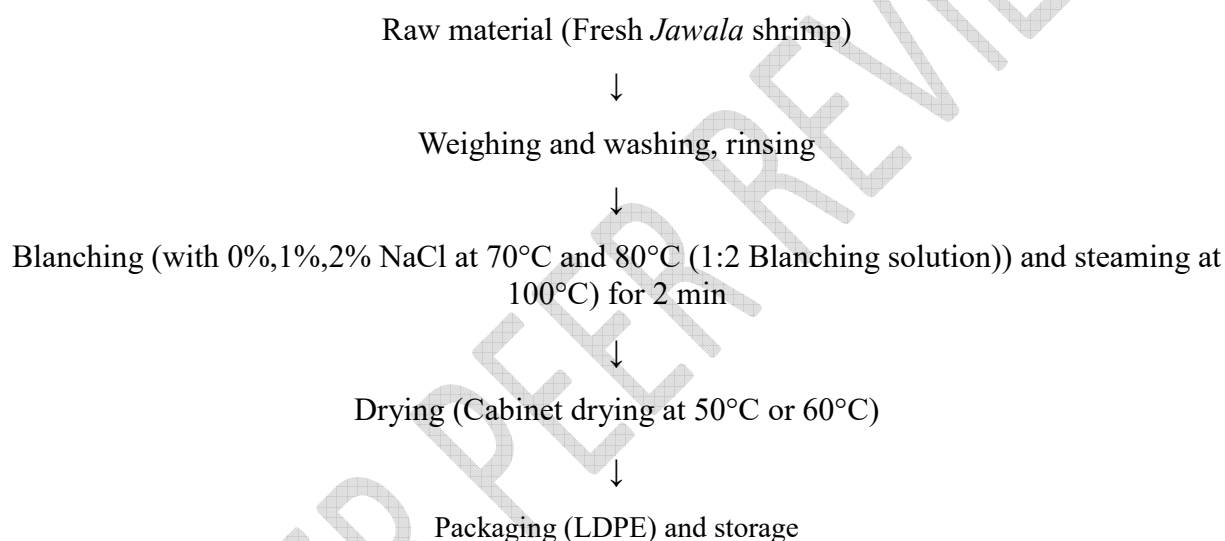
Fresh *Jawala* shrimp were procured from the local market, and then weighed and washed with water. Then rinsing and blanching operations followed as per treatments. After blanching samples are dried in a cabinet dryer, and then the dried samples are packed in LDPE bags and stored at ambient temperature.

Treatments

Treatments	Details
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T1	NaCl 0%, B-70°C Blanching temperature and D-50°C Drying temperature
T2	NaCl 1%, B-70°C Blanching temperature and D-50°C Drying temperature
T3	NaCl 2%, B-70°C Blanching temperature and D-50°C Drying temperature
T4	NaCl 0%, B-80°C Blanching temperature and D-50°C Drying temperature
T5	NaCl 1%, B-80°C Blanching temperature and D-50°C Drying temperature
T6	NaCl 2%, B-80°C Blanching temperature and D-50°C Drying temperature
T7	Steaming at 100°C and D-50°C Drying temperature
T8	NaCl 0%, B-70°C Blanching temperature and D-60°C Drying temperature
T9	NaCl 1%, B-70°C Blanching temperature and D-60°C Drying temperature
T10	NaCl 2%, B-70°C Blanching temperature and D-60°C Drying temperature
T11	NaCl 0%, B-80°C Blanching temperature and D-60°C Drying temperature
T12	NaCl 1%, B-80°C Blanching temperature and D-60°C Drying temperature
T13	NaCl 2%, B-80°C Blanching temperature and D-60°C Drying temperature
T14	Steaming at 100°C and D-60°C Drying temperature

Flow chart



2.2 Methods of Analysis

The stored samples of *Jawala* shrimp were analysed according to different Proximate parameters at 0 days (the day of storage) and at 15-day intervals subsequent up to 90 days.

2.2 Proximate, Biochemical and Microbial parameters of *Jawala* Shrimp

The proximate parameters of the *Jawala* shrimp samples were monitored till the end of the 90 days of storage periods. The proximate parameters of *Jawala* shrimp viz., moisture, ash, protein and fat content were estimated according to the methods described in AOAC (2005). Protein and fat were analyzed using Kjeldahl block digestion and steam distillation and Soxhlet extraction, respectively. The biochemical and microbial parameters of *Jawala* shrimp viz., TMA, TVB-N and TPC content were estimated according to the methods described in AOAC (2005).

2.5 Statistical analysis

Statistical analysis was performed using completely randomized design (CRD) for stored sample properties like moisture, protein, fat, ash, salt estimation, protein solubility, total volatile base nitrogen (TVB-N), trimethylamine nitrogen (TMA-N), physical parameters and sensory attributes i.e., appearance, colour, flavour, odour, texture and microbial analysis packed in LDPE

bags for 0, 15, 30, 45,60,75 and 90days was carried out by Microsoft Excel 2013. The critical difference (CD) was used in ANOVA for comparing means.

3. Result and Discussion

3. Changes in proximate parameters, Biochemical parameters and Microbial parameters of *Jawala* shrimp during storage

A. Before Drying Analysis of *Jawala* Shrimp (Fresh *Jawala* Shrimp)

3.1 Proximate parameters of fresh *Jawala* shrimp

In a fresh shrimp contains moisture content 87.41%, protein content 10.11%, fat content 0.90% and Ash content is 1.95% respectively. The initial composition was given by table 1. Seasonal changes, diet, and environmental conditions are the main reasons for variations of proximate composition among shrimp and fish. In the present study fresh *Jawala* shrimp consisted of 87.41% moisture, 10.11% crude protein, 0.90% fat, and 1.95% ash. Also, the result with Sonavane (2014) showed moisture, crude protein, fat, and ash in fresh *Jawala* as 84.23%, 12.08%, 1.0%, and 2.72%.

Table 1. Proximate parameters of *Jawala* shrimp

Sr. No	Particulars	Mean*
	Proximate parameters	
1.	Moisture (%)	87.41
2.	Protein (%)	10.11
3.	Fat (%)	0.90
4.	Ash (%)	1.95

*Values are the means of the three observations

B. After Drying Analysis of *Jawala* Shrimp (Dried *Jawala* Shrimp)

The fresh *Jawala* shrimp was dried according to treatments under a Cabinet drying temperature of 50°C and 60°C. The best sample was detected according to microbial analysis.

3.2 Effect of different treatments on proximate composition of dried *Jawala* shrimp

The proximate composition values of *Jawala* shrimp are shown in Table 2. Maximum moisture content was observed in T7 sample (18.20±0.04%) at the end of drying and minimum in T13 sample (14.33±0.03%). The moisture content went down with increase in drying temperature. This is advantageous for water evaporation from the product. The minimum protein content was found in T1 sample (61.21±0.02%), followed by T13 sample (66.60±0.02%). The apparent decline in protein content along with loss of moisture could be because of dilution effect on wet weight basis; however, on dry weight basis, protein concentration is usually constant or increases due to loss of water. The maximum fat content was found in T13 sample (2.57±0.04%) and minimum in T1 sample (1.80±0.03%). The minimum ash content was found in T1 sample (12.11±0.11%), whereas the maximum was found in T13 sample (2.57±0.04%). The higher ash content in T13 sample is due to its reduced moisture content and addition of 2% salt in blanching or drying, contributing to mineral content.

The *Jawala* shrimp dried samples indicated the treatment sample blanched at (70°C and 80°C) dried at 50°C (T1-T6) contained more moisture than samples blanched at (70°C and 80°C)

dried at 60°C (T8-T13). Similar results to those found by Balachandran, 2001 noticed that moisture content of dried Jawala was 16.72%, Protein content was 61.88%, Fat content was 1.88% and Ash content was 11.88%.

Table 2 Effect of different treatments on proximate composition of dried *Jawala* shrimp

Treatments	Moisture (%)	Protein (%)	Fat (%)	Ash (%)
T1	18.12±0.04	61.21±0.02	1.80±0.03	12.11±0.11
T2	17.24±0.03	62.44±0.03	1.87±0.08	12.30±0.04
T3	16.12±0.02	63.63±0.03	1.90±0.07	12.57±0.04
T4	17.81±0.04	61.56±0.05	1.96±0.03	12.14±0.09
T5	17.09±0.03	62.33±0.03	2.01±0.07	12.33±0.04
T6	16.04±0.02	63.34±0.04	2.10±0.07	12.77±0.06
T7	18.20±0.04	62.14±0.04	2.22±0.04	12.12±0.06
T8	16.22±0.02	62.28±0.03	2.26±0.05	12.32±0.04
T9	15.04±0.04	62.34±0.03	2.30±0.06	12.42±0.02
T10	14.40±0.03	64.10±0.08	2.35±0.04	12.94±0.04
T11	15.10±0.04	63.13±0.03	2.43±0.04	12.45±0.04
T12	14.72±0.02	62.85±0.04	2.47±0.05	13.03±0.07
T13	14.33±0.03	66.60±0.02	2.57±0.04	13.58±0.05
T14	17.14±0.02	64.26±0.02	2.00±0.07	12.28±0.04
C.D.	0.09	0.08	0.12	0.10
SE(m)±	0.03	0.03	0.04	0.03

3.3 Effect of different treatments on TVB-N and TMA-N of dried *Jawala* shrimp

The values of data shown in Table 3. Indicate T13 sample possessed minimum Total Volatile Base Nitrogen (TVB-N) value 8.70±0.06 mg/100 g, while T1 sample possessed maximum of 14.51±0.05 mg/100 g. Likewise, T13 sample lower trimethylamine nitrogen content (TMA-N) 2.02±0.09 mg/100 g in comparison to T1 sample 4.79±0.03 mg/100 g. T13 sample lower TVB-N and TMA-N values are presumably due to higher blanching and drying temperatures and 2% salt, which inhibit biochemical as well as microbial and enzymatic activity, reducing spoilage and nitrogenous compound formation.

The TVB-N and TMA-N analysis in dried *Jawala* shrimp samples of different treatments showed considerable variability. The samples blanched at 70°C and 80°C and dried at 50°C (T1-T6) had higher retained moisture contents, which most likely led to more enzymatic activity and bacterial degradation, hence higher values of TVB-N and TMA-N. In contrast, the treatments blanched at 70°C and 80°C, with higher drying temperatures of 60°C, including the samples T8-T13, had significantly lower values of these spoilage markers. In particular, the sample T13, blanched at 80°C, dried at 60°C, and treated with a 2% salt, had the lowest values of TVB-N and TMA-N, reflecting the best quality of preservation and least biochemical spoilage. This impact is due to the synergetic combined effect of thermal inactivation of enzymes during blanching, increased moisture removal during drying, and the antibacterial action of salt. The results clearly demonstrate that increased blanching and drying temperatures, accompanied by salt treatment, minimally decrease spoilage and maximize the shelf life of dried *Jawala* shrimp. A similar result was found that Verma et al. (2024) studied the impacts of microwave drying intensities (600 W, 1000 W at 60°C-70°C) on quality of brown shrimp. The initial TVB-N values were between 35.65±0.00 to 18.30±0.96 mg/100g. A similar result was found that Verma et al. (2024) researched microwave drying levels (600 W at 60°C to 1000 W at 70°C) influencing brown shrimp. TMA-N initial values ranging from 3.50±0.99 to 2.03±0.96 mg/100g.

Table 3 Effect of different treatments on TVB-N and TMA-N of dried *Jawala* shrimp

Treatments	TVB-N (mg/100g)	TMA-N (mg/100g)
T1	14.51±0.04	4.79±0.02
T2	13.80±0.03	4.40±0.03
T3	12.20±0.03	4.09±0.04
T4	12.81±0.04	3.90±0.04
T5	12.49±0.03	3.69±0.03
T6	11.88±0.05	3.50±0.04
T7	11.70±0.03	3.31±0.04
T8	11.28±0.04	3.10±0.04
T9	10.55±0.05	2.88±0.03
T10	10.19±0.03	2.69±0.04
T11	9.89±0.03	2.52±0.03
T12	9.21±0.04	2.31±0.04
T13	8.70±0.04	2.02±0.06
T14	9.39±0.03	2.20±0.04
C.D. at 5%	0.10	0.11
SE(m) ±	0.03	0.04

3.4 Effect of different treatments on the total plate count values of dried *Jawala* shrimp

The results presented in Table 4 indicate that the highest total plate count was observed in T1 sample 1.17×10^3 cfu/g, and the lowest one observed in T13 sample 0.38×10^3 cfu/g. The TPC count indicates the rising trend with the rising moisture percentage in *Jawala* shrimp. A similar result was found that Bambale (2019) noticed sun-dried small shrimp had TPC values ranging from 0.55×10^3 cfu/g to 1.15×10^3 cfu/g.

Table 4 Effect of different treatments on the total plate count values of dried *Jawala* shrimp

Treatments	Total Plate Count (TPC)
T1	1.17×10^3 (3.07)
T2	0.89×10^3 (2.95)
T3	0.76×10^3 (2.88)
T4	0.72×10^3 (2.86)
T5	0.58×10^3 (2.76)
T6	0.55×10^3 (2.74)
T7	0.42×10^3 (2.62)
T8	1.00×10^3 (3.00)
T9	0.83×10^3 (2.92)
T10	0.74×10^3 (2.87)

T11	0.49×10 ³ (2.69)
T12	0.42×10 ³ (2.62)
T13	0.38×10 ³ (2.58)
T14	0.35×10 ³ (2.55)
C.D. at 5%	0.13
SE(m) ±	0.05

(Bracket value indicates log₁₀ value)

The best treatment was found that T13 (NaCl 2%, B-80°C Blanching temperature and D-60°C Drying temperature) because lower Moisture Content, TVB-N, TMA-N and TPC count. This treatment was stored at ambient conditions in LDPE packaging material. The storage study was conducted. The result of the Storage study was given below

C. After Drying Analysis of Ambient stored *Jawala* Shrimp (Dried *Jawala* Shrimp)

3.5 Effect of storage on proximate composition of dried *Jawala* shrimp stored at ambient temperature

The information given in Table 5. indicates that the best treatment out of all was sample T13. dried *Jawala* shrimp samples of T13 were packed in LDPE pouches and stored at room temperature for 90 days. The water content of the dried *Jawala* shrimp increased over a period of time, as determined by studies done at 15-day intervals for 90 days starting on the date of sample procurement and packing (day 0 analysis). The moisture content of the dried *Jawala* shrimp was maximum 23.93±0.05% on day 90 of storage. Protein is a polymer of amino acids composed of carbon, hydrogen, oxygen, nitrogen, and sulphur. They are highly complex nitrogenous organic molecules of very large molecular size and are normally colorless, amorphous, and colloidal in nature (Balachandran, 2001). As per the findings, the protein in dried *Jawala* shrimp significantly reduced over storage, as observed in the study at 15-day intervals from day 0 to day 90. The highest protein content 66.60±0.03% was recorded at day 0 (pre-storage), whereas the minimum 57.58±0.05% was observed at day 90. Moisture content after processing influences the fat content in dried *Jawala* shrimp. Generally, moisture and fat content are negatively correlated; the higher the moisture, the higher the percentage of fat. This is not due to a rise in the levels of total fat in shrimp, but to the loss of water in drying, which is responsible for concentrating the rest of the elements, such as fat. Akonor et al. (2016). Dried *Jawala* shrimp contained the maximum fat content 2.57±0.04% on day 0 of storage and the minimum 2.11±0.04% on day 90. Ash is the residue left after the complete oxidation of the sample (Balachandran, 2001). The ash content of dried *Jawala* shrimp was found to decrease during the analysis period, based on the data. The highest ash content of dried *Jawala* shrimp was at 0 day 13.58±0.07% prior to storage and the lowest was 6.50±0.07% on day 90.

Table 5. Effect on proximate composition of dried *Jawala* shrimp stored at ambient temperature

Storage period (Days)	Moisture (%)	Protein (%)	Fat (%)	Ash (%)
0	14.33±0.03	66.60±0.03	2.57±0.04	13.58±0.07
15	15.61±0.04	66.49±0.07	2.49±0.06	12.39±0.05
30	17.34±0.05	64.52±0.03	2.41±0.07	11.22±0.08
45	18.59±0.04	63.33±0.08	2.34±0.05	10.05±0.10
60	19.54±0.03	61.75±0.06	2.22±0.03	9.85±0.05
75	21.65±0.04	60.31±0.06	2.16±0.01	8.64±0.04

90	23.93±0.05	57.58±0.05	2.11±0.04	6.50±0.07
C.D. at 5%	0.09	0.13	0.1	0.15
SE(m) ±	0.03	0.04	0.03	0.05

Each value is represented as the mean ± SD n=3

3.6 Effect on TVB-N content (mg/100g) and TMA-N (mg/100g) of dried *Jawala* shrimp stored at ambient temperature

The data represented in Table 6. shows the best treatment among all was T13 sample. the dried *Jawala* shrimp from T13 sample were packaged in LDPE pouches and stored at room temperature for 90 days. Total volatile base nitrogen is known as a product of bacterial spoilage and the action of endogenous enzymes. Its content is often used as index to assess the keeping quality and shelf life of seafood products (EEC, 1995). In present study the TVB-N of the dried *Jawala* shrimp 8.70±0.05 mg/100g at day 0 to 19.48±0.05 mg/100g at day 90 of storage. Hwang et al. (2012) noted that the salt level increased. Precisely, in all drying treatments (sun, hot air, and cold air with 0-15% salt), brined samples with greater NaCl contained less TVB-N, meaning less degradation of proteins and volatile nitrogen due to spoilage. Due to hot air drying, TVB-N decreased from 54.31 mg/100g (0% salt) to 36.42 mg/100g (15% salt). Verma et al. (2024) studied the impacts of microwave drying intensities (600 W, 1000 W at 60°C-70°C) on quality of brown shrimp. The initial TVB-N values were between 35.65±0.00 to 18.30±0.96 mg/100g.

The experiment proved to show that rising salt levels caused the TVB-N values to fall from the first day and throughout storage duration. These results were observed to be in the same range as reported in previous studies. this trend is in accordance with previous research that showed the preservation action of salt on seafood products.

The data represented in Table 6. shows the best treatment among all was T13 sample. the dried *Jawala* shrimp from T13 sample were packaged in LDPE pouches and stored at room temperature for 90 days. Trimethylamine nitrogen TMA-N is an important indication of enzymatic and microbiological deterioration in seafood items. Boran and Kose (2007). The TMA-N content of dried *Jawala* shrimp was 2.00±0.01 mg/100g on day 0, increasing to 6.70±0.05 mg/100g by day 90 of storage. Based on Zhang et al. (2011), TMA concentrations in seafood increase significantly when in storage owing to microbial breakdown of trimethylamine oxide (TMAO). Such transformation, primarily caused by spoilage bacteria, is a common source of the characteristic fishy smell and frequently employed as an indicator of freshness for marine products. The analysis indicated a rising trend in trimethylamine nitrogen levels at 0 and 28 days of storage, from 7.93 to 20.09 mg/100g. In current research, a rise in salt level led to significant decreasing TMA-N values from the initial storage period and across the entire period. The obtained values were similar and were in the same range as those measured in earlier research, highlighting the significance of salt in reducing the development of trimethylamine in seafood products. Similarly, Salami et al. (2024) reported that the TMA-N content in oven-dried African catfish ranged from 2.22±0.62 mg/100g on day 0 to 3.96±0.98 mg/100g on day 42 during storage. In a similar vein, Verma et al. (2024) researched microwave drying levels (600 W at 60°C to 1000 W at 70°C) influencing brown shrimp. TMA-N initial values ranging from 3.50±0.99 to 2.03±0.96 mg/100g.

Table 6. Effect on TVB-N content (mg/100g) and TMA-N (mg/100g) of dried *Jawala* shrimp stored at ambient temperature

Storage period (Days)	TVB-N (mg/100g)	TMA-N (mg/100g)
0	8.70±0.05	2.02±0.01
15	10.21±0.05	2.60±0.03
30	11.89±0.04	3.30±0.04
45	13.80±0.07	4.09±0.05

60	15.61±0.06	5.01±0.04
75	17.80±0.03	5.89±0.05
90	19.48±0.05	6.70±0.05
C.D. at 5%	0.11	0.091
SE(m) ±	0.04	0.030

Each value is represented as the mean ± SD n=3

3.4 Effect on total plate count (cfu/g) of dried *Jawala* shrimp stored at ambient temperature

The data represented in Table 7. shows the best treatment among all was T13 sample. the dried *Jawala* shrimp from T13 sample were packaged in LDPE pouches and stored at room temperature for 90 days. according to study showing the 0.38×10^3 cfu/g on day 0 and 1.08×10^3 cfu/g on day 90. Gh et al. (2018) established that total plate count rose by 2×10^3 cfu/g, 6.3×10^1 cfu/g, and 11.5×10^2 cfu/g following 1, 3, and 6 months of storage in dried small shrimp (*Macrobrachium nipponense*) meat. Balange et al. (2017) indicated that sun dried shrimp (*Acetes spp.*) contained 4.1×10^3 cfu/g TPC content. Surendran et al. (2006) set a safe level of bacterial count at 1×10^5 for dried fish at 37°C. Bambale (2019) noticed sun-dried small shrimp had TPC values ranging from 2.00×10^7 cfu/g on day 0 to 1.715×10^{10} cfu/g on day 90. In the current study, TPC values were found to be at a comparable range to those reported in earlier research, suggesting acceptable microbial quality of the dried shrimp.

Table 7 Effect on total plate count (cfu/g) of dried *Jawala* shrimp stored at ambient temperature

Storage period (Days)	TPC log ₁₀ (cfu/g)
0	0.38×10^3 (2.58±0.06)
15	0.43×10^3 (2.63±0.06)
30	0.56×10^3 (2.74±0.04)
45	0.68×10^3 (2.83±0.04)
60	0.82×10^3 (2.92±0.07)
75	0.93×10^3 (2.96±0.06)
90	1.08×10^3 (3.03±0.06)
C.D. at 5%	0.12
SE(m) ±	0.04

Each value is represented as the mean ± SD n=3

4. Conclusion

It was seen from the data that *Jawala* shrimp processed 2% NaCl with blanching at 80 °C for 2 min and then dried at 60 °C. concentration T13 sample had the best overall quality of all treatments throughout the 90 days storage at ambient storage temperature. The T13 treatment had lowest moisture 14.33 % and highest protein content 66.60 %, which was much higher than the among all treatment and held better fat, and ash content while keeping lower level of TVB-N and TMA-N. (T13). Therefore, this method efficiently enhances nutritional quality and shelf life.

Photographs:

Plate No. 1 Different treatments of dried *Jawala* shrimp (*Acetes indicus*)



Fresh *Jawala* Shrimp



After blanching fresh *Jawala* shrimp.



T1: 0% salt, B-70 °C, D-50 °C



T2: 1% salt, B-70 °C, D-50 °C



T3: 2% salt, B-70 °C, D-50 °C



T4: 0% salt, B-80 °C, D-50 °C



T5: 1% salt, B-80 °C, D-50°C



T6: 2% salt, B-80 °C, D-50 °C



T7: Steaming 100 °C, D-50 °C



T8: 0% salt, B-70 °C, D-60 °C



T9: 1% salt, B-70 °C, D-60°C



T10: 2% salt, B-70 °C, D-60 °C



T11: 0% salt, B-80°C, D-60°C



T12: 1% salt, B-80 °C, D-60 °C



T13: 2% salt, B-80 °C, D-60 °C



T14: Steaming: 100°C, D-60°C

References

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