

Influence of Species and Size on Weight Loss during Thawing of Frozen Shrimps

T.N.Venugopal*

M/s K.E.Kesavan & Sons, P.B.322, Cochin-682 002, India

Weight loss of two species of frozen shrimps viz. *Parapenaeopsis styliifera* and *Metapenaeus dobsoni* packed as peeled and undeveined and as has peeled and deveined were studied. In both species weight loss increased as the size of the shrimps decreased and the difference in weight loss of large and small shrimp was found significant in both PD and PUD. Between the two species there were no significant differences in weight loss in both PD and PUD meat of same size grades except in PUD 200/300 grade.

Frozen shrimps form the major item of sea food export from India. In 1990-91 India exported 62,377 tonnes of frozen shrimps valued at Rs.662.93 crores. Block frozen shrimps constituted 86.4% of total shrimp export in 1990-91 with 53,886 tonnes (Anon, 1991). In the importing countries these block frozen shrimps are thawed and reprocessed into domestic/retail packs.

Freezing & thawing of frozen shrimp blocks always result in weight loss generally known as "thaw-drip loss". The extent of weight loss from frozen shrimps depends on a number of factors like species of shrimps (Venugopal, 1986), quality of raw materials, freezing rate, thawing rate, storage temperature etc. To compensate this weight loss, an excess weight, usually 10 to 12% of the net weight is added. It has been reported that weight loss in frozen shrimps varied from 7 to 12% in peeled and deveined shrimp (Unnithan *et al.*, 1976). Not much work has been done on the extent of weight loss in different size grades of frozen shrimp. The present work is to study the extent of weight loss in different size grades, of two types of products viz. peeled and undeveined and peeled and deveined of two species of shrimps viz. *P.styliifera* and *M.dobsoni*.

Materials and Methods

The two species of shrimps used in the present investigation, viz. *Parapenaeopsis*

styliifera and *Metapenaeus dobsoni* were procured from peeling sheds around Cochin. 144 samples each of the two species with 24 samples each in 6 size grades, viz. 80/120, (80 to 120 pieces per pound), 100/200, 200/300, 300/500, 300/600 and broken (BKN) were used in the case of peeled and undeveined (PUD) and 60 samples each of *P.styliifera* and *M.dobsoni*, with 20 samples in each size grades of 130/200, 200/300 and 300/500 were used in the case of peeled and deveined (PD) shrimp.

The raw material, on receipt, was washed in potable water chlorinated to 10 ppm level. It was then further washed in a mechanical shrimp washing machine to remove bits of shell, antennae and other extraneous material. The washed material was then spread on a perforated table and drained for 10 min. The drained material was then weighed (2.550 kg) and put into 175 gauge LDPE bag to which about 200 ml of chilled water at +2°C was added as glaze and was then arranged in trays of 5 cm height. The trays were then placed for 90 min in a multiplate double contact horizontal plate freezer. Wooden spacers of the same height as the trays were used between each plate to prevent excess pressure on the product (Anon, 1983) and the material was frozen at -40°C. The frozen

*M/s Poylakada Fisheries (P) Ltd., Parameswar Nagar, Chinnakada, Quilon

slabs were then packed in corrugated 5 ply master cartons lined with a polythene bag with 10 slabs in each carton and stored at -18°C .

To determine weight loss, the frozen samples were thawed after 24 h of cold storage. The slabs were thawed in running water after enclosing them in water tight polythene bags. The thawed contents were emptied into a 12" dia U.S.No.8 standard sieve. The material was weighed after draining for 2 min (Anon, 1981, 1986). The results were statistically analysed by 'F' test between size grades and by 't' test between processing styles and between species.

Results and Discussion

Table 1 gives the analysis of variance (ANOVA) of weight loss in block frozen PUD meat from *P.stylyfera*. The loss was significantly least in the 80/120 grade and maximum in BKN. No significant differences in weight losses were found between 100/200 and 200/300 as well as between 300/500 and 300/600. From Table 2 it can be seen that there was no significant difference in weight losses of block frozen PUD meat from *M.dobsoni* between the grades 80/120, 100/200 and 200/300, but the weight losses in these grades were significantly lower than those in size grades 300/500 and 300/600. The weight loss in BKN was significantly higher than all the grades except 300/600. Table 3 & 4 show the ANOVA of weight losses in PD meat of *M. dobsoni* & *P.stylyfera* respectively. It was seen that in *M.dobsoni* no significant differences in weight losses were there between size grades of 100/200 and 200/300 and between 200/300 and 300/500, but weight loss in 100/200 was significantly less than that in 300/500. Similar results were obtained in the case of *P.stylyfera*.

In general it can be seen that weight loss increased progressively as the size of the prawn decreased. In fish large sized ones

Table 1. Analysis of variance of % weight loss from PUD frozen blocks of *P. stylyfera* of various size grades

Source	SS	df	ms	F	
Total	385.5287	71	-	-	
Grades	337.0354	5	67.4071	91.75**	
Error	48.4933	66	0.7347		
LSD at 5% level 0.9028					
Count	80/120	100/200	200/300	300/500	300/600 BKN
Mean weight loss, %	6.17	7.93	8.51	10.12	10.82 11.69

** p < 0.01

have been reported to keep better than small ones of the same species (Connell, 1980, Bandhyopadhyaya *et al.*, 1985; Joseph, 1989). The same condition may be applicable to prawns too; i.e. the small prawns might have spoiled faster than large ones during handling and processing. Also large prawns have smaller surface area to volume ratio compared to small ones. Hence more thaw drip and weight loss can be expected in prawns of small size grades.

Table 2. Analysis of variance of % weight loss from PUD frozen blocks of *M. dobsoni* of various size grades

Source	SS	df	ms	F		
Total	351.7978	71	-			
Grades	241.2895	5	48.2574	28.82**		
Error	110.5053	66	1.6744			
LSD at 5% level 1.36						
Count	80/120	100/200	200/300	300/500	300/600	BKN
Mean weight loss, %	6.76	7.06	7.27	9.67	10.85	11.17

** p < 0.01

The weight loss between PD and PUD meat of *P.stylyfera* as well as *M. dobsoni* of the same size grades were compared by the 't' test. No significant difference was noticed between the weight loss of PD and PUD meat of *P. stylyfera*, but in *M.dobsoni* significant difference at 5% level was noticed between the PD and PUD meat of the size grade 200/300.

Table 3. *Analysis of variance of % weight loss of PD frozen blocks of M. dobsoni of various size grades*

Source	SS	df	ms	F
Total	71.587	29	-	-
Grades	17.898	2	8.949	4.50*
Error	53.689	27	1.988	
LSD at 5% level	1.294			
Grade	130/200	200/300	300/500	
Mean weight loss, %	8.08	9.31	9.94	

*p < 0.05

Similarly the weight loss between the PD as well as PUD meats of *M.dobsoni* and *P. styliifera* in all the size grades were analysed by the 't' test. Only in PUD meat significant difference was noticed in the

Table 4. *Analysis of variance of % weight loss of PD frozen block of P. styliifera of various size grades*

Source	SS	df	ms	F
Total	76.6230	29	-	-
Grades	18.7760	2	9.3880	4.38*
Error	57.8470	27	2.1425	
LSD at 5% level	1.3432			
Grade	130/200	200/300	300/500	
Mean weight loss, %	8.87	10.15	10.77	

thaw drip between *P. styliifera* & *M. dobsoni* of the size grade 200/300.

In general it was observed that the weight loss increased significantly as the size of shrimps decreased. Difference in weight loss between the same grade of the two species and two packing styles was rarely observed.

The author wishes to express his sincere gratitude to Dr. T.S.G. Iyer, Central Institute of Fisheries Technology, Cochin-29 for his valuable suggestions and

encouragements, and to Mr. H. Krishna Iyer, CIFT, Cochin-29 for statistical analysis of the results. Thanks are also due to Mr. K. Madhu Kumar, Managing Partner, M/s K.E.Kesavan & Sons, Cochin-2 for the facilities provided during the studies.

References

- Anon (1981) *Codex Standard for Quick frozen Shrimps or Prawns*. (World wide standard) CODEXSTAN 92-1981 FAO
- Anon (1983) *Infofish Marketing Digest*, **83**, 42
- Anon (1986) *Pre-shipment Inspection and Quality Control Manual on Fish and Fishery Products*, Quality Development Centre, Export Inspection Agency, Madras
- Anon (1991) *Marine Product Export Review 1990-91*. Marine Product Export Development Authority, Cochin-15
- Bandhyopadhyay, J.K., Chattopadhyaya, A.K., & Bhattacharya, S.K. (1985) in *Harvest and Post-harvest Technology of Fish*, p.381, Society of Fisheries Technologists (India), Cochin
- Connell, J.J. (1980) *Control of Fish Quality*, 2nd Edn. Fishing News (Books) Ltd., London
- Joseph, J. (1989). *Effect of raw material quality on the shelf life of frozen stored fish and fishery products*, Ph.D. Thesis, Cochin University of Science and Technology, Cochin, p. 122
- Unnithan, G.R., Krishna Iyer, H. & Krishna Rao, K. (1976) *Fish. Technol.* **13**, 133
- Venugopal, T.N. (1986) *Seafood Export Journal*, **27**, 7