A STUDY ON THE QUALITY OF PRAWNS DURING PROCESSING IN PRAWN–FREEZING FACTORIES

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A study on the occurrence of defective pieces of prawns at three different stages of processing of headless shell on and peeled and deveined varieties was undertaken, each in one freezing factory. The average percentages of the defective prawns together with the standard deviation observed over a period of one year at the three stages are mentioned. Correlation is indicated between the occurrence of the defective pieces at the pre-freezing stage and those of earlier stages.

Introduction

The quality of frozen products of prawns is influenced to a great extent by the quality of the raw material used and the processing practices adopted by the individual factories. The quality of the finished product thus varies not only between different factories but is likely to vary in the same factory between different days. Earlier workers have studied the quality of the material stored in ice and processed in factories from chemical and bacteriological points of view (Govindan, 1962; Iyer and Pillai, 1964; Pillai *et al.*, 1965). In the year 1964–65 a study was undertaken to follow changes taking place in the organoleptic quality characteristics during the processing of prawns. Occurrence of discoloured and deteriorated pieces in the thawed condition (of the frozen block) have been recognised as important quality factors in deciding the acceptability of lots of frozen prawns (IS:2237–1962). The same quality characteristics have been taken up as factors in this study and the results obtained are reported here.

Material and Methods

The types of product chosen for this study were headless shell on and peeled and deveined varieties of prawns. Each of them was studied in one factory during the course of one year. Trained staff of the Institute engaged in the quality control inspection of frozen prawn products were employed in the collection of the required data. The numbers of discoloured and deteriorated pieces were counted in samples

of 50 prawns and these counts were used to estimate the precentages of defective pieces in the material. Three stages in the processing line were selected in each factory for estimating the quality of the product at each stage of processing. They were (1) at the raw material stage where the material consisted of different size-grades combined together, (2) at an intermediate stage where the material was sorted into different size-grades after some of the defective pieces were removed and (3) at the pre-freezing stage where the material was weighed and filled into the trays to be kept in the freezer. Where the material was sorted into different size-grades, each size-grade was sampled separately for estimation of quality. Since the larger size-grades of the material would be available only in small quantities, the number of samples of 50 pieces was restricted uniformly to three. The percentages of defective pieces were estimated from these samples.

Though subjective in nature, the quality factors considered here for study have not shown significant differences among the staff engaged in the collection of data. Hence this aspect was not taken into consideration in the present study.

Results

The percentages of the defective pieces estimated as described earlier have been considered over the period of study for each type of pack. Since the occurrence of all size-grades in the material is not uniform, the number of observations for the different size-grades was not same in either of the products. From the data obtained, the mean percentages and their standard deviations have been calculated for different size-grades at different stages and are presented in Table I, for both types of pack. Further, the correlation coefficients between the counts at stages I and III and stages II and III have been calculated for both the quality characteristics and the values obtained are given in Table II together with the level of significance at which they were found to be significant. It can be seen that between stages II and III, there is consistently very high correlation between the counts of occurrence of the defective pieces. The correlation between stages I and III, though significant in number of instances, is not consistent in peeled and deveined product.

Discussion

From Table I, it is seen that discolouration and deterioration for both types of products are low in larger size-grades while these gradually increase as the size-grade becomes smaller and smaller. Also as a quality characteristic, deterioration showed less variability over the period than discolouration. The standard deviation for the quality of raw material and that of smaller size-grades can be seen to be almost equal throughout. The variability in the quality of the raw material is thus found to be reflected more in the quality of the smaller size-grades than the larger ones. Further, the standard deviation of the largest size-grade in this study for headless shell on variety (viz) 11-15 is quite low suggesting thereby that the quality of this size-grade remained consistent. A comparison of percentages of defective pieces shows that this size grade contained the least percentage of defective pieces of all sizes of headless shell on type. Since this size-grade occurs in relatively small quantities in the raw material, additional attention towards improvement of the quality of this size-grade is made possible.

The significance of the correlations between stages II and III in the quality characteristics at both the processing factories shows that the quality changes

taking place between these two stages were consistent over the period of study. From Table I, it can be seen that no further improvement in quality was taking place between these two stages for peeled and deveined variety, whereas for headless shell on variety there appears to be an improvement as indicated by consistently lower percentages of discoloured and deteriorated pieces at stage III as compared to stage II. By practical verification in the concerned factory it was found that no time was being lost between stages II and III for peeled and deveined product and no removal of further discoloured and deteriorated pieces was also being undertaken between these two stages. On the other hand for headless shell on product, it was found that further removal of defective pieces was being done between stages II and III in the other factory.

The significance of correlation in headless shell on type between stages I and III in all size-grade except one, shows that the quality of the raw material influences uniformly all size-grades for both the defective factors. The quality of the size-grade 11-15, as mentioned earlier, appears to be independent of the quality of the raw material processed. However in peeled and deveined variety no such consistent picture between stages I and III is brought out. Of the eight correlation coefficients whose values were calculated for deterioration, 2 were significant at 0.1% level, 3 were significant at 5% level and 3 were not significant at all. Thus the quality of the raw material could not be considered as the only factor influencing the quality of the final product for peeled and deveined type in the second factory. The lack of correlation in this instance can be attributed to the influence of other variable processing factors viz, proportion of ice used during processing, time lag between raw material stage and pre-freezing stage etc. As compared to headless shell on type, peeled and deveined variety has higher rate of spoilage and the spoilage is caused by such factors as mentioned above.

Summary

From a study carried out on the quality of prawns during processing in two prawn-freezing factories, it is observed that

1) the occurrence of defective pieces in the material increases with the small size-grades.

2) the variability in the quality of raw material is reflected in the quality of smaller size-grades at the pre-freezing stage.

3) as a quality characteristic, deterioration has less day to day variability than discolouration.

4) the quality of the size-grade 11-15 of headless shell on type remained consistent and was independent of the quality of the raw material processed.

5) the quality of final product in each size-grade is highly correlated with the quality at the intermediate stage and

6) the quality of raw material was an important consideration for headless shell on variety whereas for peeled and deveined type, besides raw material other processing conditions also ihfluenced the quality of the final product.

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TABLE I MEANS AND STANDARD DEVIATIONS FOR PERCENTAGES OF DAY TO-DAY OCCURRENCE OF QUALITY CHARACTERISTICS FOR THE PRODUCTS.

(1) *Peeled and deveined type.*

Size-grade (by numbers/ pound).	Discolouration				Deterioration			
	Stage I: Mean: 16.6 Standard deviation: 3.5.				Stage I: Mean: 6.5 Standard deviation: 1.8			
	Stage II		Stage III		Stage II		Stage III	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
26—30	9.6	1.8	9.7	2.2	2.4	1.5	2.1	1.7
31—40	10.2	1.9	10.1	2.3	3.4	2.0	3.1	1.9
41—50	10.0	2.2	10.1	3.0	3.4	1.8	3.2	2.0
51—60	10.5	2.1	10.2	3.1	3.4	1.9	3.0	1.8
61—80	11.3	1.7	11.2	2.1	3.2	1.7	3.0	1.8
81—100	12.5	1.8	12.6	2.3	4.1	1.8	3.9	2.0
101—120	14.4	2.2	14.6	2.1	5.5	2.2	5.2	1.8
121 up	14.0	2.9	14.5	3.1	5.1	1.4	5.0	1.5

(2) *Headless shell on type.*

Size-grade (by numbers/ pound).	Discolouration				Deterioration			
	Stage I: Mean: 14.0 Standard deviation: 3.0				Stage I: Mean: 8.4 Standard deviation: 2.6			
	Stage II		Stage III		Stage II		Stage III	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
11—15	4.4	1.4	3.2	1.1	2.2	0.9	1.0	0.7
16—20	6.2	2.7	4.8	2.5	3.0	1.0	1.5	0.8
21—25	7.6	2.7	5.8	2.4	3.8	1.2	2.2	0.9
26—30	8.8	2.8	7.0	2.8	4.4	1.5	2.6	1.2
31—35	10.0	2.8	8.0	2.6	4.8	1.8	3.1	0.4
36—42	11.0	2.3	9.2	2.4	4.9	1.7	3.2	1.5
43—50	10.6	2.1	8.9	2.2	4.6	2.0	3.0	1.6
51—60	11.8	1.7	10.5	1.4	4.2	2.0	3.1	1.4
61—70	12.2	3.3	10.1	2.6	5.1	2.4	3.4	2.1
71—90	12.6	2.9	11.0	3.3	6.1	2.9	4.5	2.5

TABLE II. VALUES OF CORRELATION COEFFICIENTS AND THEIR SIGNIFICANCE BETWEEN QUALITY CHARACTERISTICS AT DIFFERENT STAGES OF PROCESSING

(1) *Peeled and deveined type*

(a) *Discolouration*

Size-grade	Stages I& III	DF	Level of signifi-cance.	Stages II & III	DF	Level of significance.
26—30	0.38	17	Not significant	0.84	17	<0.001
31—40	0.63	21	<0.01	0.79	21	<0.001
41—50	0.58	30	<0.001	0.80	30	<0.001
51—60	0.56	32	<0.001	0.75	32	<0.001
61— 80	0.48	47	<0.001	0.78	47	<0.001
81—100	0.37	42	<0.05	0.59	41	<0.001
101—120	0.64	34	<0.001	0.88	34	<0.001
121 up.	0.74	10	<0.01	0.70	11	<0.01

(b) *Deterioration*

Size grade	Stages I&III	DF	Level of signifi-cance.	Stages II & III	DF	Level of significance
26— 30	0.33	17	Not significant	0.81	17	<0.001
31— 40	0.70	21	<0.001	0.90	21	<0.001
41— 50	0.42	32	<0.05	0.70	32	<0.001
51— 60	0.31	36	Not significant	0.72	36	<0.001
61— 80	0.31	54	<0.05	0.77	53	<0.001
81—100	0.31	47	<0.05	0.80	46	<0.001
101—120	0.58	41	<0.001	0.77	41	<0.001
121 up	0.04	11	Not significant	0.62	11	<0.05

(2) *Headless shell on type.*

(a) *Discolouration*

Size-grade	Stages I & III	DF	Level of significance	Stages II&III	DF	Level of significance
11—15	0.11	56	Not significant	0.95	55	<0.001
16—20	0.42	98	<0.001	0.93	102	<0.001
21—25	0.40	136	<0.001	0.92	141	<0.001
26—30	0.38	110	<0.001	0.92	117	<0.001
31—35	0.39	92	<0.001	0.91	94	<0.001
36—42	0.30	64	<0.05	0.90	63	<0.001
43—50	0.55	21	<0.01	0.87	22	<0.001
51—60	0.63	17	<0.01	0.81	17	<0.001
61—70	0.43	19	<0.05	0.79	19	<0.001
71—90	0.72	12	<0.01	0.92	12	<0.001

(b) *Deterioration*

Size-grade	Stages I & III	DF	Level of significance	Stages II&III	DF	Level of significance
11—15	0.15	66	Not significant	0.81	66	<0.001
16—20	0.32	116	<0.001	0.87	118	<0.001
21—25	0.45	156	<0.001	0.80	156	<0.001
26—30	0.51	129	<0.001	0.85	129	<0.001
31—35	0.57	104	<0.001	0.87	104	<0.001
36—42	0.60	66	<0.001	0.82	66	<0.001
43—50	0.64	23	<0.001	0.91	23	<0.001
51—60	0.79	18	<0.001	0.91	18	<0.001
61—70	0.74	20	<0.001	0.92	20	<0.001
71—90	0.83	13	<0.001	0.96	13	<0.001

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