OCCURRENCE OF A DEEPER RED COLOUR IN PRAWN PULP PREPARED FROM ICED-PRAWNS

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In commerce, great importance is given to the colour of the dry prawn pulp in its quality evaluation. The possible correlation between this colour factor to the iced or uniced condition of the raw prawn used, is investigated. The study reveals that as the icing period of the raw material increases the colour of the finished product proportionately intensifies to a bright red compared to light brownish yellow or orange colour of the product from the uniced prawn, and at the same time all the other characteristics like flavour and taste deteriorates as the time of icing advances. This finding tend to show that the colour factor does not reflect the true quality of prawn pulp. Based on chemical data it is suggested that "browning" due to Maillard reaction may have an important role in this colour phenomena.

INTRODUCTION

Of late prawn has come to occupy a privileged position in the Fishery Economy of India, especially as a lucrative foreign exchange earner. In addition to freezing and canning, a major bulk of the prawn landing is processed by blanching and drying, and converting into the hard dried prawn pulp. During the process of blanching the natural pigments in the prawn attain an attractive orange, reddish or brownish tint, which remains fast even after sundrying. In commerce the colour of the finished product has an important bearing in the quality rating of the product. Balachandran and Bose (1965) consider the brown colour as defect in the product. During the course of a laboratory investigation it was casually observed that prawn pulp and semi-dried prawns prepared from samples stored in ice, took an unusually bright deep red colour in contrast to the light brownish yellow or orange product obtained from the same lot of fresh uniced prawns. Wood (1951) states that on blanching the carotenoid pigments, tetraxanthin and/or astaxanthin present in the prawn are released and these provide

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the characteristic colour to the product. However no mention is made about the change in the intensity of colour due to ice-storage. This colour difference appeared very interesting especially in view of the commercial importance given to it in the quality evaluation of the product. Hence, further efforts were made to confirm and investigate this colour phenomena.

Materials and Methods

Fresh *Metapenaeus Dobsoni* (size range 9 to 12 cm.), one of the most common commercial catch of this area was used for the study. One portion of the sample was immediately processed into dry prawn pulp and semi dried prawn by the usual commercial method described by Chari and Pai (1946). The other portion in shell-on condition was mixed with crushed ice, in 1:1 proportion, in a polythene bucket and kept in an insulated box. Provision was made to periodically drain out the water and replenish with fresh crushed ice. Sample lots were withdrawn at an interval of 3, 6, 10, 14 and 16 days respectively and were processed into dry prawn pulp and semidried prawn by the same method as in the case of fresh prawns. The final moisture content of semi-dried prawn and prawn pulp in all these samples were uniformly maintained at a level of 35 to 37% and 15 to 16% respectively. The samples in the fresh condition and at each stage of ice storage were subjected to chemical and bacteriological analysis. Moisture was estimated by A. O. A. C. method (1955). NPN was determined by the microkjeldahl method. Amino Nitrogen was determined by the Pope and Stevens method (1939). Folin and Wu's micromethod (A. O. A. C., *loc cit*) was adopted to estimate free reducing sugars. Total bacterial count was obtained by plating serial dilutions of the homogenates on to sea water agar and incubating for 48 hours at room temperature. The pH was determind using an electrical pH meter. The intensity of colour in the finished product was recorded by visual observation only, since the colour difference was found to be very distinct between most of the samples. The taste and flavour assessment were carried out by a pannel of experienced members and were done on the finished product itself, without further cooking, lest there might be further masking or leaching of the flavour characteristics.

Observations

The experiment was repeated four times and findings were found to concur in all the cases exceptingfor minor variations. The analytical results presentented in Table I are from one of the typical experiments.

It was observed that the dry prawn pulp as well as the semi-dried prawns (S. D. P.) from fresh un-iced prawns were found to have a light yellowish orange colour with a brownish shade. The finished product prepared from prawn of 3 days icing had a very distinct deeper red colour. The product from 6 days of icing was found to be still deeper red in colour. Subsequent samples did not show any further intensification of colour. This colour intensification was very distinct and was conspicous by the absence of any brownish tint, found present in the product prepared from un-iced prawns. This colour variation was noticeable both in the case of dry prawn pulp as well as in S. D. P. However, the taste panel studies revealed that as the period of ice storage advanced, the taste and flavour characteristics decreased almost in proportion to the number of days of ice storags. While the product from the uniced sample had an appealing flavour with an excellent sweetish taste, those from the iced samples were insipid and were lacking in flavour, making it clear that icing only improves the colour and not the tasting qualities.

TABLE I CHEMICAL COMPOSITION OF THE RAW MATERIAL JUST PRIOR TO PROCESSING

(Moisture Free basis)

Sample details	Moisture %	pH	T. V. N. mg%	Bacterial count per gram	Amino Nitrogen mg%	N. P. N. mg%	Free reducing sugars as glucose mg%
Fresh sample	76.38	6.65	43.60	370000	1020 0	2381.0	68 57
3 days icing	80.09	6.95	51.23	140000	844.3	2427 0	44.75
6 days icing	81.64	7.2	75.16	330000	763.0	1973.0	73.08
10 days icing	81.90	7.6	83.97	490000	773.0	1715.0	27.72
14 days icing	82.35	7 5	140.60	530000	698.1	1418.0	43.93
16 days icing	85.06	7.6	196.10	603000	562 2	1275.0	–

While the experimental samples were in storage, the red colour of the product was found to fade slightly, still keeping up the colour gradation from sample to sample. However the sample prepared from fresh uniced prawns was found to take up a dark brownish colour with a slight tinge of black. The colour difference was discernible even after six months of storage, in the case of dry prawn pulp.

Discussion

A review of the chemical data presented in table I indicates that there has been a gradual increase in moisture content, TVN and pH–almost proportional to the period of ice-storage. This roughly suggests that prawn is undergoing a process of gradual deterioration. This fact is further corroborated by the physical and organoleptical characteristics as well by the increased load of bacteria at each stage examined. The non-protein nitrogen and free alpha-amino nitrogen depicted a steady and appreciable fall. The free reducing sugar did not indicate a steady value. It has been indicated by Braverman (1963), Jones (1963) and Nagayama (1960) that the Maillard reaction between the free amino acids and reducing sugars is one of the main contributing factors for the phenomena of "Browning" found in cured fish products. Shrimp is well known to contain comparatively higher levels of glycogen and free reducing sugars. This proposition suggests that the gradual decrease in the free amino acid content (due to leaching) in the ice-stored shrimp might have relatively lessened the intensity of Maillard reaction and the consequent browning effect (Braverman, *loc cit*). This might have caused the red pigmentation in the shrimp product to assert itself fully, without getting it masked or dullened by the brown discolouration. Based on the same reasoning, the intensity of Maillard reaction in the case of products from uniced fresh shrimp, might have been more and the resulting brownish colour might have masked the brightness of the red pigmentation.

Even though a definite and close relationship is established between the period of icing and the intensification of the red colour of the finished products, the data presented appear to be insufficient to make categoric deductions about the exact mechanism of the colour phenomena. A more intensive probe taking into considera-

tion the physiological and other biochemical conditions of the shrimp is indicated.

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