STORAGE STUDIES ON PRAWNS DRIED IN ROTARY DRUM DRYER

K. K. BALACHANDRAN

Central Institute of Fisheries Technology, Cochin-682011

Storage study carried out with prawns processed in rotary drum dryer showed that the deteriorative changes taking place are mostly due to the presence of air and oxygen. By storing under inert atmosphere of nitrogen or carbon dioxide the original characteristics can be maintained over a considerable length of time.

INTRODUCTION

A process of dehydration of prawns using a rotary drum dryer where cooking, drying and deshelling took place simultaneously in a very short period of 3-4 hours was reported by Balachandran and Bose (1964; 1969). However, the product on storage in ordinary commercial packing materials like polythene, gunny etc., and subsequent rehydration and cooking suffered a deterioration in flavour though there did not occur much change in the texture. There is much literature on the processing of semidried and dried prawns (Chari and Pai, 1946; Venkataraman & Srinivasan, 1953; Chari & Venkataraman, 1957; Balachandran & Bose, 1964,1965) but it is scarce on the effect of storage variables on the product quality during storage. Lusk, Karrel and Goldblith (1964) have reported the effect of air, nitrogen and temperature of storage on the loss of astacene pigment in freeze-dried shrimp. Only a comparison of visual and organoleptic characteristics of sun-dried prawns stored in different types of containers has been reported from India (Anon, 1964). Therefore, it was felt necessary to study the behaviour of drum-dried prawns with respect to the different atmospheres of storage and correlate with the undesirable changes in flavour.

MATERIALS AND METHODS

Fresh prawns, *Parapenaeopsis stylifera* (count 200-240 nos./kg.) were beheaded and dried as described by Balachandran and Bose *(loc. cit.)* to an approximate moisture content of 15% and allowed to equilibrate by keeping in a closed container for two days. It was then packed in polythene bags (gauge 300), and in cans under atmospheres of air, nitrogen, carbon dioxide and oxygen and then sealed her-

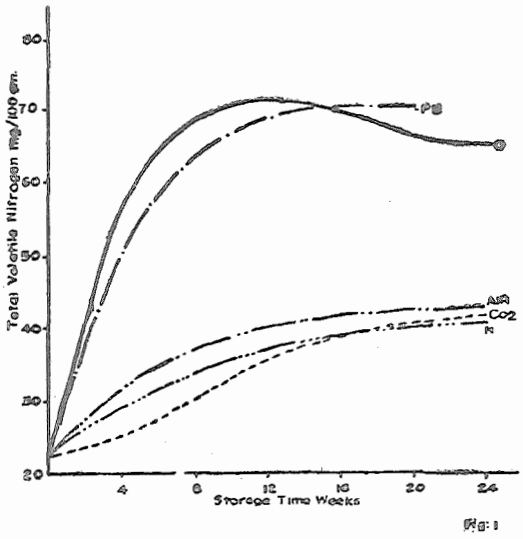

Fig. I

metically. Sufficient number of samples were prepared under each group to continue the study for a sufficient length of period. All the samples were stored at room temperature (29±2°C). Samples were drawn at regular intervals and analysed for changes in thiobarbituric acid(T.B.A) values, volatile acid nitrogen (V. A. N), total volatile nitrogen (T. V. N), free fatty acids (F.F.A) and examined for changes in colour, flavour and reconstitution property.

T. B. A value was estimated by the method of Tarladg's *et al.* (1960), F. F. A by the A O.C.S. (1946) method. and V.A N by the A.O.A.C. (1960) method. T. V. N was estimated as follows: 10 g. of the sample was ground well and extracted with 95% ethanol and final volume made up to 100ml. A known volume was distilled with excess of saturated sodium borate. The total volatile compounds evolved were absorbed in boric acid solution and titrated against N/70 hydrochloric acid.

Reconstitution property of dry prawns was determined by soaking 20 g. of material in sufficient water at room temperature for two hours, since optimum uptake of water was found to take place by this time in laboratory experiments, draining over a mull cloth and finding the increase in weight after removing the adhering water with blotting paper. Organoleptic evaluation was made on the cooked reconstituted samples.

Results And Discussion

Changes in the chemical indices of spoilage as a result of storage are presented in fig 1 - 4.

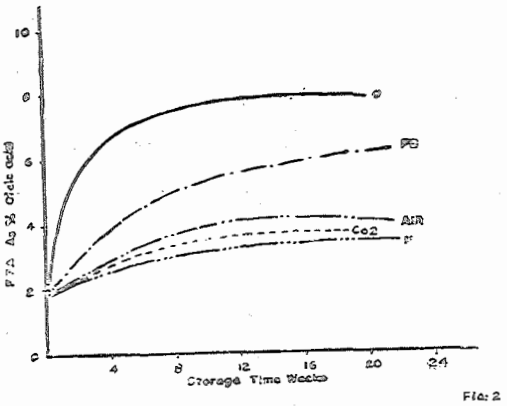

Fig. 2

It can be seen from the figures that nitrogen gas exerts a greater influence in maintaining the indices of spoilage well controlled followed by carbon dioxide and then air. Sudden increase in the indices is exhibited in the case of material packed in oxygen and that packed in polythene bag falls in between those packed under oxygen and air.

In conformity with the observations on the chemical indices of spoilage was the trend of organoleptic characteristics of the stored materials. Deterioration of

colour and flavour was sudden in prawns packed under oxygen. The characteristic colour was destroyed within 2-3 weeks storage with development of yellowish brown tint. The flavour became flat by this time and gave oxidised unpleasant odour during subsequent storage. Changes occurring in prawns packed in polythene bag were similar, but slow. At the end of 20 weeks' storage the sample packed under air in can showed some discolouration and loss of flavour, whereas those under nitrogen and carbon dioxide remained without appreciable change. By this period prawns packed under oxygen became inedible and that packed in polythene bag tended to approach inedibility. At the end of six months of storage, upto which period the study was continued, the colour retention of the material in different packs were in the order nitrogen > carbondi oxide > air > polythene bag > oxygen. Similar was the gradation in their organoleptic evaluation also.

Nitrogen and carbon dioxide, since they provide inert atmospheres, are expected to maintain the quality of dry prawns

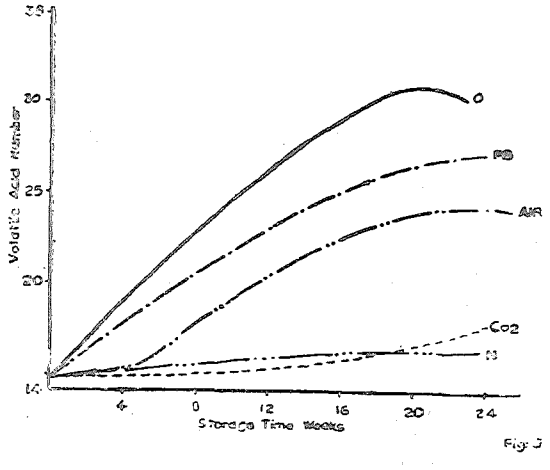

Fig. 3

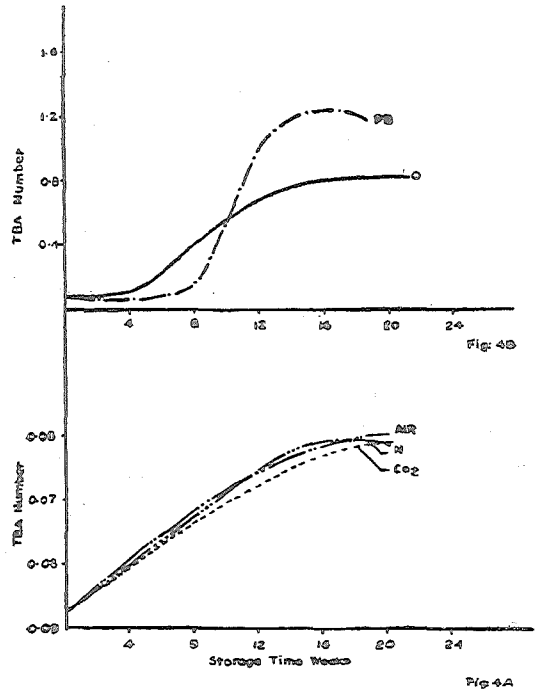

Fig. 4

without appreciable change for a considerable period. In packings where there is either presence of or access to oxygen the material is found to be more deteriorated suggesting the changes are mainly of an oxidative nature. This is particularly so with respect to colour of dry prawns as reported by Lusk *et al. (loc. cit)* that presence of even small amounts of oxygen along with nitrogen under which freeze-dried shrimp was packed was highly deleterious to the product, especially as regards the retention of the astacene pigment. The rather slow deteriorative changes observed in material packed under air in sealed can, compared to that packed in gunny bag, may be due to the minimum amount of oxygen available. Polythene permits slow permeation of moisture (samples in polythene bag showed an increase in moisture content from

15.46 to 19.36 in six months, whereas the other samples did not show much variation) besides exposing the material to light which has been found to be destructive to the carotenoid pigment astacene/astaxanthin present in prawns. These together with the presence of oxygen can accelerate the deteriorative changes.

From the observations made above it is reasonable to assume that the deteriorative changes in dry prawns are brought about mainly by the presence of oxygen. By excluding it the material can be kept for a considerable length of time without major changes. Dry prawns packed under air in sealed cans can maintain the quality upto 5 months and but for some loss in colour and flavour, remains edible upto 6 months. Inert atmospheres like nitrogen and carbon dioxide maintain the material in good condition even beyond this period. Other medium and packaging material tried, *viz.* oxygen and polythene bag, were very poor in maintaining the quality. Even rehydration value (calculated as kg. of water absorbed by 100kg. bone dry material) scored very poorly with the above samples, as shown below:

Packing/ Medium	Original	Rehydration value At the end of six months storage
1) Polythene bag	102	88
2) Can/Air	,,	86
3) Can/Oxygen	,,	74
4) Can/Nitrogen	,,	90
5) Can/Carbon di oxide	,,	95

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