CONTROL OF BLACK SPOT IN TROPICAL SHRIMPS

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Black discolouration on raw shrimps harvested from tropical and semi-tropical waters can cause a major marketing problem. This dark discolouration occurs on the head, abdominal shell segments and tail fins of shrimps as spot or ring. This black spot is produced by enzymatically controlled oxidative reaction on tyrosine by a group of phenoloxidase to form highly insoluble dark pigment (melanin). High order of this enzymatic activity is noticed in tail, shell and head extract of Indian shrimps. pH of tissue (6.5 to 7.5), activation of zymogen form of phenoloxidase by endogenous proteolytic enzymes, presence of copper ion, exposure to higher temperature upto 55 degree C and access of oxygen are important factors influencing black spot formation.

Prevention

Removal of head followed by rapid washing of shrimps and then immediate packing with proper quantity of good crushed ice or icewater helps to control black discolouration in shrimps in tropical region. Delayed handling, exposure to tropical ambient temperature and exposure to air initiate black spot formation. Thus additives are often suggested by many countries to avoid these practical difficulties.

Use of additives to control black spot

Food additives cannot be used without supervision of specialists. Food laws differ from one country to another. FAO (1982) suggested that shrimps, after sorting, deheading and washing, should be dipped in solution of 1.25% sodium bisulphite for one minute. United States Food and Drug Administration (USFDA) suggested the same FAO method and permitted 100 ppm as upper limit of residual sulphur dioxide in treated meat. Commonwealth Department of Primary Industry, Australia, approved the dipping of shrimps in 3000 ppm sulphite solution for 30 seconds and permitted 30 ppm as upper limit of residual sulphur dioxide in treated meat of shrimps exported from Australia (CSIRO, 1976).

Indian Standards Institution recommended 100 ppm of residual sulphur dioxide meat of raw shrimps (ISI-2237, 1985), but 30 ppm is the upper limit in many importing countries. Keeping in view the interest of importing countries and the problem encounterd by the Indian seafood export in the prevention of black spot, Kakinada Research Centre of Central Institute of Fisheries Technology conducted studies on the sulphite treatment of Indian shrimps.

Purity of Chemicals

During the survey on the purity of sodium metabisulphite collected from different places it was noticed that the purity varied from 69 to 96%. One of the major factors responsible for appearance of black spot in spite of bisulphite treatment of prawns, appeared to be varying grades of purity of the chemicals used for the purpose by the export trade. The purity of the chemical can be checked by titration with iodine solution in the presence of starch as indicator.

Good quality chemical of high grade purity should be used. More-over, sulphur dioxide is lost rapidly, when sodium metabisulphite is exposed to heat and moist condition. Thus it should be stored in an airtight drum, in dry and cool place. Periodic checking of purity of stock is necessary for preparation of solution of desired concentration.

Recommended Method

A dip in 0.3% sodium metabisulphite (100% purity) solution for 30 seconds can control black spot in raw headless washed *Penaeus monodon* and *Penaeus indicus*. However, a dip in 0.4% sodium metabisulphite (100% purity) solution for 30 seconds is necessary to control black spot in headless *Metapenaeusmonoceros*.

Preparation of Dipping Solution

Sodium metabisulphite solution should be prepared using clean potable water. The weight of sodium metabisulphite should be determined based upon purity of the chemical to get desired strength of solution. For example 0.3124% solution of sodium metabisulphite of 96% purity should be used for headless *P. monodon* and *P.indicus*, while 0.3% solution of sodium metabisulphite of 100% purity will be adequate for the same species of prawn. Similarly for *M.monoceros* 0.4167% solution of sodium metabisulphite of 96% purity or 0.4% solution of 100% purity will be required.

Dipping Method

Slow rotation/stirring of prawn in dipping solution is most effective. Just dipping and immediate removal of prawn

gives poor chemical contact. The time of dip must be carefully controlled as too short a time will be ineffective while too long exposure will discolour shrimps and results in high sulphite uptake. The ration of shrimp and dipping solution is 1:1.3 (W/W). After dipping second batch in the same solution, the dip solution should be discarded to ensure uniform concentration and to prevent bacterial contamination.

Residual Sulphur dioxide in treated prawn

Residual sulphur dioxide in treated meat of shrimp can be estimated by Monier William method (AOAC, 1975). The dipped shrimp should be thoroughly packed in crushed ice before despatching to freezing plants. Rapid loss of residual sulphur dioxide from prawn meat during short ice storage helps to bring down the residual sulphur dioxide below 30 ppm.

References

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