SEMI-QUANTITATIVE ANALYSIS OF BORIC ACID AND BORATES IN MEAT AND MEAT PRODUCTS

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INTRODUCTION

Boric acid and borates are commonly used as preservatives. They act as anti-microbiological agents. However these preservatives are not permitted in the fishery products.

In the presence of boric acid (H_3BO_3) or sodium borate ($Na_2B_4O_7$) the turmeric test paper turns methyl red. This can be further confirmed by addition of NH_4OH which changes the test paper to dark blue-green, but it is restored to red by acid.

In the semi-quantitative analysis, the amount of boric acid or borates detected is compared with the degree of redness on the turmeric test paper prepared from a range of standard boric acid (0-1%).

This method is applicable to meat and meat products.

PREPARATION OF SAMPLE

Collect meat sample (≤ 100 g) and pass 2-3 times through food mincer, or chop very finely and mix thoroughly.

REAGENTS

a) Hydrochloric acid, conc.

b) 80% Ethanol

c) Preparation of turmeric paper

Add 100 ml 80% ethanol to 1.5 - 2.0 g turmeric powder in a 250 ml Erlenmeyer flask. Shake 5 min and filter. Dip sheets of Whatman No. 1 paper into the clean filtrate in flat-bottom dish (eg. petri dish). Hang paper to dry. After 1 hour, cut into 6 x 1 cm strips and store in a tightly stoppered container protected from light.

d) Preparation of reference standards

1. Dissolve 1.000 g H_3BO_3 in distilled water and dilute to 100 ml with distilled water.
2. Transfer 0.00, 0.10, 0.20, 0.50, 0.75, 1.00, 2.50 and 5.00 ml of the above H_3BO_3 solution to 15 ml test tubes.
3. Dilute to 10 ml with distilled water and add 0.7 ml HCl to prepare the reference standard.
4. Keep tubes tightly stoppered to prevent evaporation.

These reference standard solutions represent 0.00, 0.02, 0.04, 0.10, 0.15, 0.20, 0.50 and 1.00% H_3BO_3 in meat (based on 25 g sample extracted with 50 ml distilled water and 10 ml aliquot used for test). The standard solutions may be stored in pyrex test tubes for more than 6 months.

APPARATUS

1. Erlenmeyer flask (125 ml)
2. Glass rod for stirring
3. Watch glass
4. Bunsen burner
5. Test tubes
6. Petri dish
7. Forceps
8. Scissors and string

PROCEDURE

1. Disperse 25 g of ground meat in 50 ml distilled water in a 125 ml Erlenmeyer flask, using a flat-end stirring rod. Cover with watch glass.

2. Bring to boil over medium flame with agitation. Do not over-heat.

3. Cool in ice bath until fat is solidified (30 min).

4. Filter through pledget of glass wool.

5. Transfer 10 ml filtrate to a 15 ml test tube, add 0.7 ml HCl, stopper, and mix.

6. Mark identification on end of piece of turmeric paper and dip unmarked end into unknown solution to ½ the length of paper.

7. Quickly remove moistened paper and place on sheet of white filter paper. Flat-tipped forceps are useful in handling paper.

8. Place freshly prepared standard strips of test paper (made by dipping turmeric papers in similar manner into series of standard solutions) alongside sample turmeric strips.

9. After more than 1 hour (but < 2 hour) at room temperature, strips are dry enough for comparison. Good natural light is preferred.

INTERPRETATION OF RESULTS

Place standard strips ca 1 cm apart on white filter paper background and bring "unknown" sample strips between adjacent standard strips for close colour matching.

If colour intensity is beyond range of standards, repeat test with dilution of meat filtrate (eg. 5 ml filtrate, 5 ml distilled water, 0.7 ml HCl, and multiply final reading by 2). Use freshly prepared set of standards with each series of samples tested.

REFERENCE

Official methods of analysis of the Association of Official Analytical Chemists. 13th Ed. 1980. 20.33:328.