DETERMINATION OF STARCH

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INTRODUCTION

Starch is commonly used in the production of fish jelly products. Its main functions are:

1) as an extender to increase the bulk of production

2) as a binding agent

Starch is readily convertible into glucose by hydrolysis either by an enzyme such as diastase or by heating with an acid and its estimation usually depends upon this reason.

The hydrolysed glucose is determined by Somogyi method (see D-3). The content of starch in the sample is then back calculated from the content of the glucose.

For confirmation of the presence of starch in a fish jelly product, the sample is first heated with water. The starch granules will swell up and burst at about 70°C, resulting in a sticky feel. When iodine solution is added, a characteristic blue colour is developed, due to starch iodide, which is decomposed on heating, but is reformed on cooling.

SAMPLE PREPARATION

Collect fish jelly product sample (< 100 g) and pass 2-3 times through food mincer, or chop very finely and mix thoroughly.

REAGENTS

a) 8% potassium hydroxide (KOH) in alcohol.

Dissolve 8 g KOH in 4 ml of distilled water completely and mix with 96 ml absolute alcohol. (Potassium hydroxide must be dissolved in water first as it is insoluble in ethanol).

b) 50% ethanol.

c) 2.5% hydrochloric acid (HCl)

14 ml conc. HCl in 186 ml distilled water (Conc. HCl is 35%).

d) 15% Sodium hydroxide (NaOH)

15 g NaOH (Technical grade) dissolved in 85 ml distilled water.

e) Somogyi solution A

Sodium potassium tartrate 90 g
(K Na $C_4H_4O_6.4H_2O$)

$CuSO_4.5H_2O$ 30 g

H_2O 500 ml

Trisodium phosphate
$Na_3PO_4.12H_2O$ 225 g

H_2O 700 ml

KIO_3 3.5 g

H_2O 100 ml

Make up to 2 litres with distilled water

Keep at room temperature.

f) Somogyi solution B

Potassium oxalate 90 g
($K_2C_2O_4.H_2O$)

KI 40 g

Make up to 1 litre with distilled water.

Keep at room temperature.

g) 2N H_2SO_4

Conc. H_2SO_4 (60 ml) dilute to 1 litre with distilled water. (Conc. H_2SO_4, 36N, is 95-97 wt %).

h) Starch indicator

Dissolve 1 g soluble starch and 0.1 g salicylic acid in 99 ml distilled water. Boil to dissolve the suspension.

i) Dried KIO_3

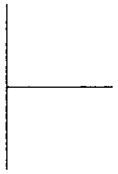
Weigh about 2 g KIO_3 and dry in oven at 120°C for 1 hour.

j) 2.5% KI

Dissolve 2.5 g KI in distilled water and make up to 100 ml.

k) 0.05N $Na_2S_2O_3$ solution

Sodium thiosulphate $Na_2S_2O_3.5H_2O$ 13g



Na_2CO_3 0.3 g

Make up to 1 litre with decarbonated distilled water.

Determination of factor, F, of 0.05N $Na_2S_2O_3$

Weigh 1.5 g dried KIO_3 accurately and dissolve in 500 ml distilled water in volumetric flask.

To 10 ml of KIO_3 solution and 10 ml distilled water (BLANK) each add 2.5% KI (20 ml) and 2N H_2SO_4 (20 ml).

Titrate with 0.05N $Na_2S_2O_3$ using starch indicator.

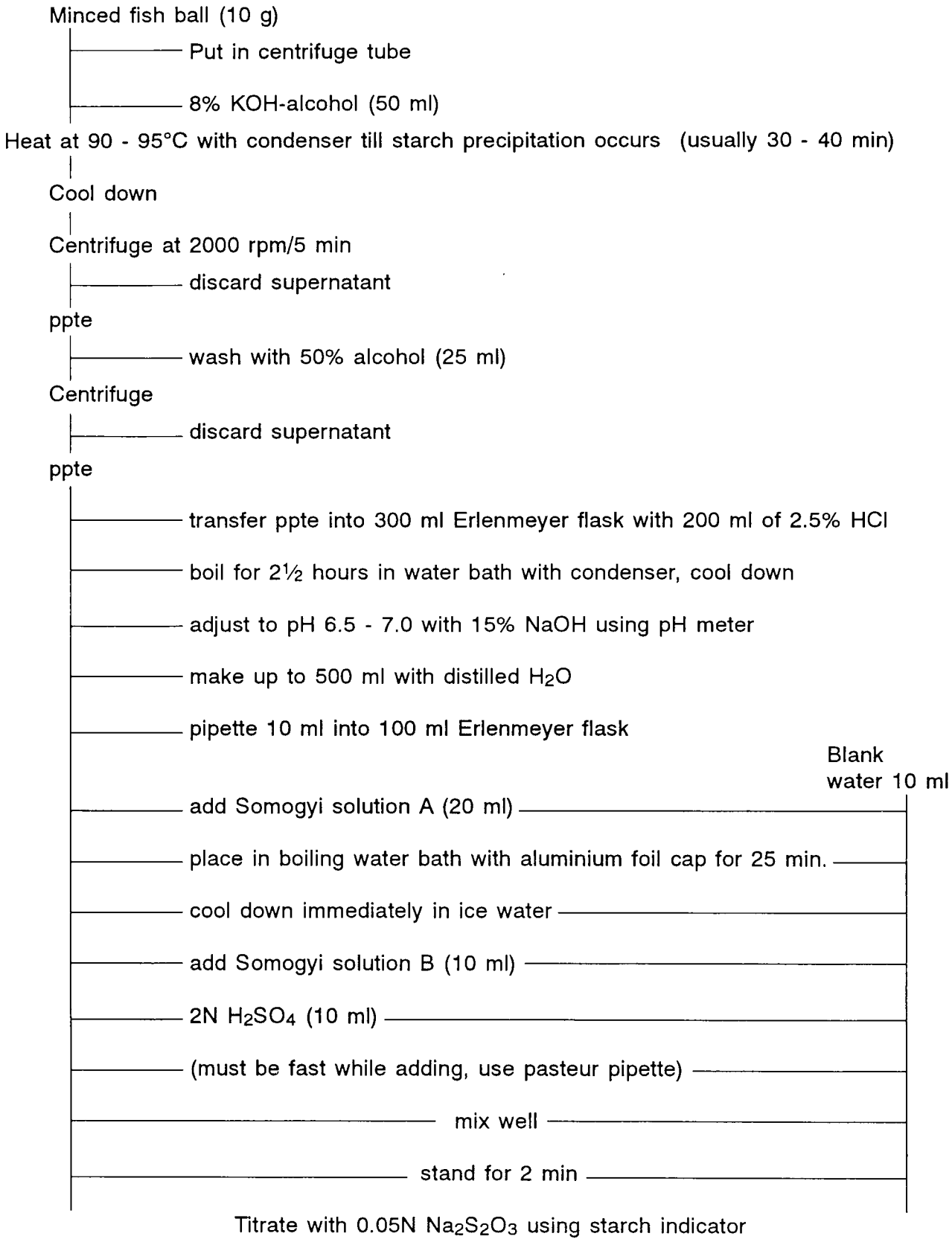
$$\text{Factor, } F = \text{Wt. of } KIO_3 \times \frac{10}{500} \times \frac{1}{0.0017835} \times \frac{1}{(B - A)}$$

where 0.0017835 : conversion factor of 1 ml 0.05N $Na_2S_2O_3$ to KIO_3

A : titration volume of KIO_3 solution (ml)

B : titration volume of blank (ml)

PROCEDURE



(Note: colour changes to light blue).

The blank test with distilled water (10 ml) should be carried out simultaneously with the supernatant sample.

CALCULATION

$$\text{Starch (\%)} = 0.001499\ (B - A)\ F \times \frac{500}{10} \times 0.9 \times \frac{1}{S} \times 100$$

A	=	titration volume of sample (ml)
B	=	titration volume of blank (ml)
F	=	Factor of 0.05N $Na_2S_2O_3$
0.001449	=	Conversion factor of 0.05N $Na_2S_2O_3$ (ml) to glucose (g)
0.9	=	Conversion factor of glucose to starch
S	=	Weight of sample (g)

REFERENCE

Official methods of analysis of the Association of Official Analytical Chemists. 13th Ed. 1980. 24.057:383.