Food Sample Test For Starch & Adulteration – Experiment, Viva Voce

EXPERIMENT

Aim
To test

1. The presence of starch in the given food sample
2. The presence of adulterant metanil yellow in dal

Theory

1. **Carbohydrates:** The energy-giving food that contains carbon, oxygen, and hydrogen.
2. **Glucose:** It is the simplest form of carbohydrate, formula: $C_6H_{12}O_6$. It instantly gives energy on oxidation during respiration.
3. **Starch:** The long chain of glucose forms starch, e.g., rice, potato.
4. **Iodine:** It is a halogen, brown coloured liquid solution present in lab used for starch test.
   Iodine + Starch $\longrightarrow$ Blue black colour.

Adulteration

1. When food is mixed with undesirable substances which can cause harm to our body, this is called adulteration.
2. Long time consumption of adulterated food causes severe health problems which may lead to cancer, stomach ulcers, brain damage, etc.
3. **Adulterant:** Any substance that is added to the food and degrades the quality of food material is called an adulterant.
4. Adulteration of food affects the health of the people.
5. **Food staff and their common adulterants**

S.No.	Food	Adulterant	Test for detection
1.	Milk	Starch Water	Iodine test Lactometer
2.	Sweets	Starch	Iodine test
3.	Dal	Metanil yellow	Dissolve a little sample in water, transfer water extract to another tube. Add conc. HCl → pink colour appears
4.	Butter and Khoya	Starch	Iodine test

Harmful effects of Adulteration on health:

1. Mixing of argemone oil in mustard oil results in dropsy, gastrointestinal disturbances, swelling of limbs etc. Dropsy has also caused death in some cases.
2. Mixing of Kesari dal in Arhar dal causes crippling of lower limbs.
3. Mixing of lead chromate in turmeric causes paralysis, mental retardation, brain damage and stiffening of limbs.
4. Mixing of artificial colour (coal tar) in tea leaves causes cancer.

Diseases caused by adulterants:

S.No.	Food article	Adulterant	Diseases caused
1.	Yellow dal	Metanil yellow	Paralysis, liver damage
2.	Black Pepper	Dried seeds of Papaya	Cancer, liver damage
3.	Butter/Pure Ghee	Starch, animal fat	Stomach irritation
4.	Cereals–wheat and rice	White mud	Stomach disorder
5.	Milk	Water + starch	Stomach disorder
6.	Turmeric	Metanil yellow + starch, lead chromate	Anaemia, paralysis, brain damage
7.	Honey	Jaggery and sugar	Stomach disorder, bad for diabetics
8.	Coriander powder	Horse-dung	Stomach disorder
9.	Mustard seeds	Argemone seeds	Dropsy
10.	Saffron	Dried tendrils	Cancer

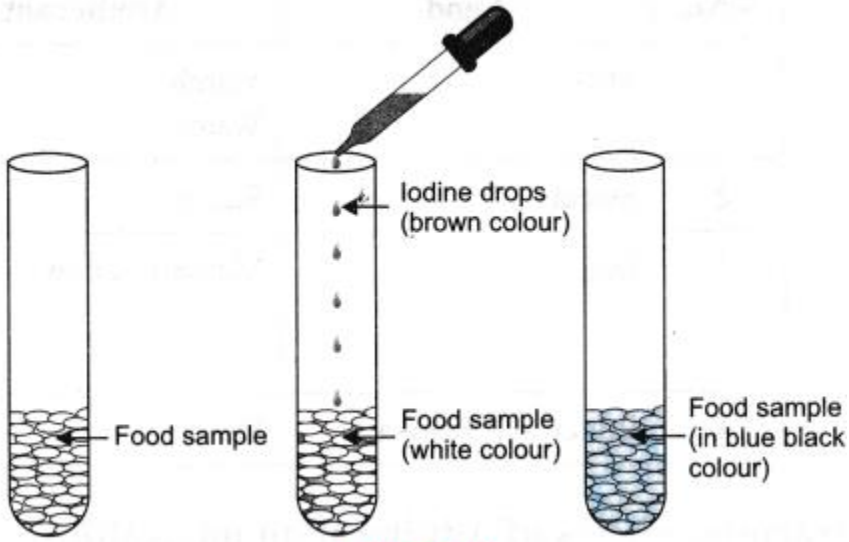
Metanil Yellow

1. It is a yellow colour dye, generally used for colouring food material. For e.g., starch when dyed with metanil yellow looks like turmeric. Poor quality dal when dyed with metanil yellow looks superior quality dal.
2. **Test for Metanil Yellow:** On addition of hydrochloric acid, the metanil yellow solution turns into pink colour.
3. Disease caused by metanil yellow consumption: Paralysis, brain damage, anaemia and abortion.
4. Prevention of Food Adulteration (PFA): It is an act passed by Government of India to check the adulteration in food.
5. Food articles with “Agmark” and FPO (Food Products Order) label are safe with unadulterated food in it.

(A) To test the presence of starch in the given food sample.
Materials Required
Test tube, test tube stand, dropper.
Chemicals required
Given food sample, Iodine solution.

Procedure

1. Take a clean test tube and add a little given food sample and water in it.
2. Add few drops of iodine solution in the given food sample. Shake the contents of the test tube. Observe the change in colour.



Starch Test

Observation
The colour of the given food sample changes to blue-black on adding iodine solution to it.

Conclusion
The given sample of food contains starch (only if iodine changes its colour to blue-black).
Given food sample + Iodine solution ⟶ Blue-black colour

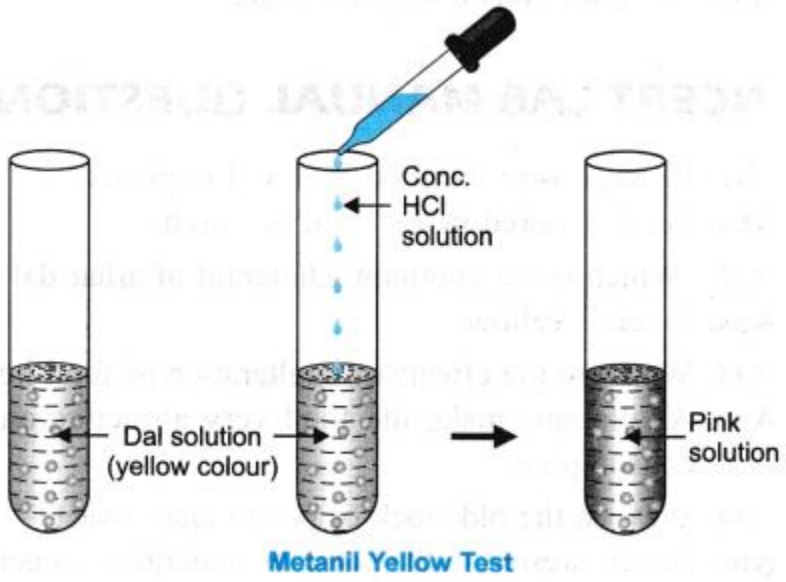
(B)To test the presence of the adulterant metanil yellow in dal.

Materials Required
Test tubes, test tube holder, test tube stand, dropper.

Chemicals required
Any yellow dal (arhar), cone, hydrochloric acid

Procedure

1. Take any yellow dal in a test tube in powdered form. Add 2-3 mL of water and shake well.
2. Add 2-3 drops of concentrated hydrochloric acid in the test tube, shake the contents.



Metanil Yellow Test

Record your observation.

Observation
A pink colour solution appears in the test tube.
Conclusion
The given sample of dal contains metanil yellow adulteration.

Precautions

1. Use clean and dry test tubes.
2. Handle concentrated HC1 carefully.
3. Use chemical judiciously. Do not waste unnecessarily.

VIVA VOCE

Question 1:
Name the polymer of glucose.
Answer:
Starch.

Question 2:
Name the main source of starch.
Answer:
Plants.

Question 3:
In which form food is stored in animals?
Answer:
Glycogen.

Question 4:
Name the adulterant present in turmeric and yellow dal.
Answer:
Metanil yellow.

Question 5:
Name the acid used to test the metanil yellow in dal.
Answer:
Hydrochloric acid.

Question 6:
Name the solution used to test the presence of starch.
Answer:
Iodine solution.

Question 7:
Give the full form of FPO and Agmark.
Answer:
FPO ⟶ Food Products Order.
Agmark ⟶ Agricultural Marketing.

PRACTICAL BASED QUESTIONS

Question 1:
What is the difference between starch and carbohydrate?
Answer:
Starch is a stored food under the nutritional group—carbohydrates.

Question 2:
What is adulteration?
Answer:
The addition of cheaper food material in better quality food is called adulteration.

Question 3:
Starch is a polymer of glucose, will glucose turn blue-black with brown iodine solution?
Answer:
No, glucose is a simplest sugar.

NCERT LAB MANUAL QUESTIONS

Question 1:
In what form the food is stored in plants?
Answer:
Food is stored in the form of starch.

Question 2:
Which is the common adulterant of arhar dal?
Answer:
Metanil Yellow.

Question 3:
What are the effects of adulteration of food items?
Answer:
Adulterants make the food very attractive and colorful but it also makes the food toxic and dangerous for consumption.

Question 4:
Why do the old stock of potato taste sweet?
Answer:
Starch present in the potatoes undergoes a chemical change over a long period of time and break down to form simple sugars due to which it tastes sweet.

Question 5:
What are the different adulterants commonly used in foods?
Answer:
The commonly used adulterants in food are:

1. Black pepper: dry seeds of papaya
2. Honey: jaggery
3. Red chili powder: red brick powder
4. Mustard seed: argemone seeds

MULTIPLE CHOICE QUESTIONS (MCQs)
Questions based on Procedural and Manipulative Skills

Question 1:
Carbohydrates contain
(a) carbon
(b) hydrogen
(c) oxygen
(d) all of these.

Question 2:
Acid used to test the presence of metanil yellow in dal is
(a) nitric acid
(b) sulphuric acid
(c) hydrochloric acid
(d) carbonic acid.

Question 3:
The cheaper materials which are added to superior food items for profit is called
(a) drugs
(b) adulteration
(c) metanil yellow
(d) adulterant.

Question 4:
Meenu was trying to test the presence of starch in potato tuber. She forgot the reagent with which the starch gives blue colour. Help her to select the correct stain from the following
(a) Safranin
(b) Methylene blue
(c) Iodine
(d) Eosin.

Question 5:
The following statements describe the steps to detect the presence of metanil yellow in dal. One of the four statements given below is incorrect.
(a)Take 2 mL of potato extract
(b) Grind 3-5 g of dal and prepare solution
(c) Filter the contents and collect the filtrate
(d) Add 2-3 drops of concentrated hydrochloric acid.
The incorrect statement is
(a) (i)
(b) (ii)

(c) (iii)
(d) (iv)

Question 6:
In a school laboratory most commonly used chemical to test the presence of metanil yellow in a dal is
(a) iodine solution
(b) cone. HCl
(c) safranin
(d) alcohol.

Question 7:
Metanil yellow is used as an adulterant for
(a) cereals
(b) pulses
(c) yellow dal
(d) yellow dal and turmeric powder.

Question 8:
Institute set up by Govt, for setting food standard
(a) PFA
(b) Agmark
(c) BIS
(d) all of the above

Question 9:
The food in plants is stored in the form of
(a) Glucose
(b) starch
(c) sucrose
(d) none of the above

Question 10:
The commonly found adulterant in chilli powder is
(a) chalk powder
(b) starch
(c) brick powder
(d) sawdust

Questions based on Observational Skills

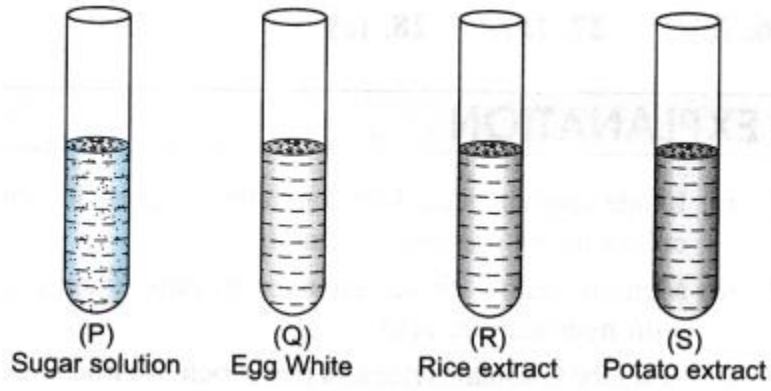
Question 11:
When iodine solution is added into starch solution the colour obtained is
(a) brown

(b) blue
(c) blue-black
(d) yellow.

Question 12:
The colour obtained on addition of HCl to metanil yellow is
(a) red
(b) crimson
(c) pink
(d) blue.

Question 13:
The test tubes A, B and C are taken with food samples of dal, mustard and rice respectively in powdered form. On adding iodine solution the blue-black colour is observed in
(a) Test tube A
(b) Test tube B
(c) Test tube C
(d) None of these.

Question 14:
Four test tubes P, Q, R and S shown below contain the following:



Sugar solution on adding 2 drops of iodine to each test tube, which will show blue-black solution?
(a) P and Q
(b) Q and R
(c) R and S
(d) all

Question 15:
When iodine solutions is added to starch solution, the colour produced is
(a) red
(b) pink

(c) blue-black
(d) brown-red

Questions based on Reporting and Interpretation Skills

Question 16:
Starch is present in
(a) rice
(b) potato
(c) bread
(d) all of these.

Question 17:
Which one of the following food material will not give blue-black colour on the addition of iodine?
(a) rice
(b) sugar
(c) wheat
(d) potato.

Question 18:
Arun wanted to test the adulteration of arhar dal. He washed a few grains of dal with water which turned yellow. He then added a few drops of HCl. The yellow water turned pink in colour. This showed that the dal was adulterated with:
(a) Metanil yellow
(b) Crimson yellow
(c) methylene yellow
(d) Methyl yellow.

Question 19:
Substance 'X' was added to a test tube containing water and grinded arhar dal to test the presence of metanil yellow. The colour of the solution changed to pink. Identify 'X'.
(a) H_20
(b) NaOH
(c) H_2C0_3
(d) HCl.

Question 20:
Filtrate of a food product is taken in four test tubes marked A, B, C and D. Few drops of the following is added to the test tubes to test the presence of starch.
(A) sulphuric acid to test tube A
(B) iodine solution to test tube B
(C) chlorine solution to test tube C
(D) sodium hydroxide to test tube D

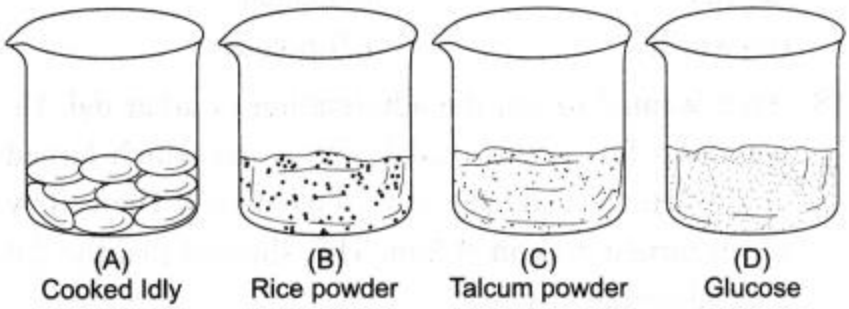
Blue black colour will appear in the test tube
(a) A
(b) B
(c) C
(d) D

Question 21:
When 2-4 drops of cone, hydrochloric acid are added to the given sample of arhar dal, the pink colour is due to
(a) metanil yellow
(b) starch
(c) turmeric powder
(d) chalk powder

Question 22:
Iodine solution was added to four samples of food I, II, III, IV. Which will develop blue-black colour?
I. boiled rice
II. crushed potatoes
III. boiled arhar dal
IV. powdered arhar dal
(a) I, II
(b) I, II, III
(c) I, II, IV
(d) I, III, IV

Question 23:
Which of the under-mentioned food groups will not turn blue black when treated with iodine? –
(a) rice, potato, bread
(b) bread, wheat, com flour
(c) rice water, boiled potato, com starch
(d) dal, fish, meat.

Question 24:
Students were instructed to add a few drops of iodine solution to each of the following samples.
The content turned blue-black in:



(a) A and B
(b) B and C
(c) C and D
(d) D and A

Question 25:

Four students A, B, C and D carried out test for the adulteration of metanil yellow in arhar dal and recorded their observations as given below. The procedure followed correctly is that of student:

Student	Procedure	Observation	Inference
A	5 g dal + 5 mL H_2O + 2 drops HCl	Dal turns yellow	Metanil yellow present
B	5 g dal + 5 mL H_2O + 2 drops HCl	Solution turns pink	Metanil yellow present
C	5 g dal + 5 mL H_2O + pinch of metanil yellow	Water turns yellow	Metanil yellow present
D	5 g dal + 5 mL H_2O + 2 drops HCl	Water turns yellow and then pink	Metanil yellow absent

(a) A
(b) B
(c) C
(d) D

Question 26:
A food sample turned blue-black after addition of a few drops of iodine solution. This sample contains
(a) fat
(b) glucose
(c) starch
(d) protein

Question 27:
While doing an experiment with a potato, a student accidently dropped a liquid on it, which made the potato slice blue-black. The liquid that got dropped may be
(a) sulphuric acid
(b) hydrochloric acid
(c) Benedict's solution
(d) Iodine solution

Question 28:
Metanil yellow, an adulterant used in arhar dal is basically
(a) an acid
(b) a detergent
(c) a dye
(d) none of the above.

SCORING KEY WITH EXPLANATION

1. (d) Carbohydrates are the compounds of carbon, hydrogen and oxygen.
2. (c) Metanil yellow colour changes to pink when heated with hydrochloric acid.
3. (d) Adulterant are cheap substances added to food for profit and are very dangerous to health.
4. (c) Starch test is done with iodine solution, it turns blue black when added to starch.
5. (a) For testing metanil yellow adulterant potato is not required.
6. (b) Metanil yellow colour changes to pink when heated with hydrochloric acid.
7. (d) Metanil yellow is added as an adulterant to any food substance that is yellow in colour.
8. (d) All these are Indian Standard Institutes for testing and setting food standard and quality.
9. (b) Plants store the food in the form of starch.
10. (c) Chili powder is red in colour hence brick powder (red in colour) is added as an adulterant.
11. (c) Iodine solution is used for starch test, it gives blue-black colour in the presence of starch.
12. (c) Metanil yellow colour changes to pink when heated with hydrochloric acid.
13. (c) Test tube C contains rice and rice is rich in carbohydrates.

14. (c) Both rice and potato contain starch and the iodine solution will turn blue-black when added to these food items.
15. (c) Iodine gives blue-black colouration with starch solutions.
16. (d) Starch is complex carbohydrate and is present in rice, wheat (bread), potato.
17. (b) All rice, wheat and potato contain starch but sugar does not contain starch. Iodine turns blue-black in presence of starch only. .
18. (a) Metanil yellow colour changes to pink when heated with hydrochloric acid.
19. (d) Metanil yellow colour changes to pink when heated with hydrochloric acid. Hence the substance X added to yellow dal is HCl.
20. (b) Starch test is done with iodine solution, it turns blue- black when added to starch.
21. (a) Metanil yellow colour changes to pink when heated with hydrochloric acid. Hence the substance X added to yellow dal is HCl.
22. (a) Rice and potato contain starch in it but yellow dal does not contain starch.
23. (d) Dal, fish and meat are rich in proteins but do not contain any starch in it.
24. (a) Idly is made from rice which contains starch but talcum powder and glucose does not contain any starch.
25. (b) On taking dal + water + dil. HCl, the solution turns pink due to metanil yellow.
26. (c) Only starch turns blue-black with iodine solution.
27. (d) Iodine solution is used for starch test, it gives blue-black colour in presence of starch.
28. (c) Metanil yellow is used in dal as an adulterant for colouring. Its presence can be tested in dal by adding a few drops of HCl to a test sample, if the solution turns pink in colour, it indicates the presence of metanil yellow.