Starch - Gelatinisation

Activity (1)

**Objectives**

To study the gelatinisation ability for different types of starch commonly used in cookery.

**Principles**

Starch is a complex carbohydrate and a major thickening agent in food industry. This complex carbohydrate consists of two fractions: amylose and amylopectin. When starch is mixed with water, it does not dissolve in water. When starch paste is heated, the viscosity of the paste increases. A gel will be formed when there is a sufficient amount of starch. The gelling ability of starch paste depends on the proportions of starch gel and water presence and the proportion of amylose in the starch.

**Apparatus and Materials**

|  |  |
| --- | --- |
| Apparatus | Materials |
| 6 bowls / beaker6 jelly moulds / small bowlsMeasuring jugs / cylindersWeighing scaleSpoonsWooden spoonSmall saucepan | 10g cornflour10g plain flour10g tapioca / arrowroot / bean flour570 ml water  |

**Procedures:**

1. Prepare starch paste of each sample by blending 5g starch with 20 ml water.
2. Heat the remaining water. Bring to the boil, add to starch paste and mix well. Return the whole mixture to the saucepan and boil until thickens.
3. Remove from heat and pour the cooked starch paste into small bowl / cup to set.
4. Turn out the set starch paste. Record firmness and appearance of cooled paste.
5. Represent the firmness and appearance by using the number of “+” (max 10”+”)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sample | Starch |  Water | Firmness | Appearance |
| 1 | 5g cornflour | 120 ml |  |  |
| 2 | 5 g cornflour | 70 ml |  |  |
| 3 | 5g plain flour | 120 ml |  |  |
| 4 | 5g plain flour | 70 ml |  |  |
| 5 | 5g tapioca / arrowroot / bean flour | 120 ml |  |  |
| 6 | 5g tapioca / arrowroot / bean flour | 70 ml |  |  |

**Questions for further thoughts**

* Besides viscosity, are there any differences among the cornflour, plain flour and tapioca pastes?
* What is the suitability of cornflour, plain flour and tapioca / arrowroot / bean flour in food production regarding their viscosity and other attributes?

Starch - Gelatinisation

Activity (2)

**Objectives**

To examine the effects of vinegar and sugar on the gelatinisation properties of starch.

**Principles**

Gelatinisation of starch depends on a variety of factors including the proportion of starch and water presence, proportion of amylose in the starch, presence of sugar and acid. Different strengths of starch gel would be required for thickening sauces, soups or fillings with different consistencies.

**Apparatus and Materials**

|  |  |
| --- | --- |
| Apparatus | Materials |
| 9 bowls / beakers9 small bowls / mouldsMeasuring jugs / cylindersWeighing scaleSpoonsSmall saucepan | 150g sugar 150 ml vinegar15g cornstarch15g plain flour15g tapioca / arrowroot / bean flour900ml water |

**Procedures:**

1. Prepare starch paste of each sample by blending 5g starch with 20 ml water. Add sugar or vinegar and mix well.
2. Heat the remaining water. Bring to the boil, add to starch paste and mix well. Return the whole mixture to the saucepan and boil until thickens.
3. Remove from heat and pour the cooked starch paste into small bowl / mould to set.
4. Turn out the set starch paste. Record firmness and appearance of cooled paste.
5. Represent the firmness and appearance by using the number of “+” (max 10”+”)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sample | Starch | Water | Vinegar | Sugar | Firmness | Appearance |
| 1 | 5g cornstarch | 100 ml | - | - |  |  |
| 2 | 5g cornstarch | 70 ml | 30 ml | - |  |  |
| 3 | 5 g cornstarch | 100 ml | - | 50g |  |  |
| 4 | 5g plain flour | 100 ml | - | - |  |  |
| 5 | 5g plain flour | 70 ml | 30 ml | - |  |  |
| 6 | 5g plain flour | 100 ml | - | 50g |  |  |
| 7 | 5g tapioca | 100 ml | - | - |  |  |
| 8 | 5g tapioca | 70 ml | 30 ml | - |  |  |
| 9 | 5g tapioca | 100 ml | - | 50g |  |  |

**Questions for further thoughts**

* What are the points to note when sugar or vinegar is used to season starch paste?
* Except sugar and vinegar, can other ingredients affect the gelatinisation of various starches?
* What are the functional properties of adding lemon juice / sugar to the filling of a pie?