Factors Affecting the Rising of Bread Dough - Ingredients

Objective

To study the effects of adding certain ingredients on the rising of bread dough.

Principles*

Yeast is a single-cell microbe that has important roles in bread-making: leavening and gluten development. When combined with flour and water to make bread dough, enzymes in the yeast break down the starch of flour into sugar. The yeast uses sugar as its food and gives off the byproducts of carbon dioxide and alcohol through alcoholic fermentation:

$$\underset{\text{(glucose)}}{C_6H_{12}O_6} \xrightarrow[\text{fermentation}]{\text{yeast}} \underset{\text{(alcohol)}}{2\ C_2H_5OH} + \underset{\text{(carbon dioxide)}}{2\ CO_2}$$

The released carbon dioxide bubbles are held in the dough's gluten network. Each time the yeast gives off another puff of carbon dioxide, the gas expands the gluten network and causes the bread dough to rise. The rising of the bread dough, therefore, depends on the growth and activity of the yeast. Factors that favour yeast growth and its activity should help facilitate the rising of bread dough.

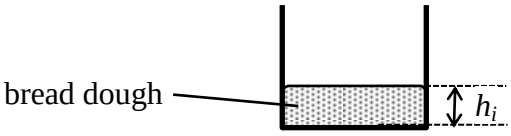
Part I – Experimental Work

Apparatus and Materials

Apparatus		Materials
transparent plastic cup (glass cup) / 250 ml beaker*	× 4	80 g bread flour
chopstick / glass rod*	× 4	4 tsp instant yeast
weighing scale	× 1	¼ tsp salt
measuring spoons	× 1 set	¼ tsp sugar
round-headed knife	× 1	¼ tsp honey
measuring cylinder#	× 1	120 ml distilled water
thermometer	× 1	
ruler	× 1	

Procedure

1. Label the transparent plastic cups (beakers) as A, B, C and D. [* Refer to the Note on p.6]
2. Add **20 g bread flour** and **1 tsp instant yeast** into **each** cup. Mix well with the stirrer (glass rod).
3. Add **30 ml distilled water** (6 tsp water) into cup A. Stir the contents to make a wet dough. Press the dough to fill up any airspaces at the bottom of the cup and level the dough at the top. Measure and record the initial height of the dough (hi). Leave cup A at room temperature for 25 minutes.



4. Add ¼ **tsp honey** into cup B (refer to Table 1). Repeat step 3. Leave cup B at room temperature for 25 minutes.
5. Add ¼ **tsp salt** into cup C (refer to Table 1). Repeat step 3. Leave cup C at room temperature for 25 minutes.
6. Add ¼ **tsp sugar** into cup D (refer to Table 1). Repeat step 3. Leave cup D at room temperature for 25 minutes.

Cup / Beaker			
A	B	C	D
20 g bread flour 1 tsp yeast 30 ml distilled water	20 g bread flour 1 tsp yeast 30 ml distilled water	20 g bread flour 1 tsp yeast 30 ml distilled water	20 g bread flour 1 tsp yeast 30 ml distilled water
--	¼ **tsp honey**	¼ **tsp salt**	¼ **tsp sugar**

Table 1

7. When the time allowed for fermentation is up (i.e. 25 minutes), measure and record the final height of the dough (h_f) in each cup. Note and record the texture of the dough in each cup.

Results

Cup (Beaker)	Substance added	Height of the dough		Rise of dough (cm)	Appearance /texture ❖
		h_i (cm)	h_f (cm)		
A	--				
B	honey				
C	salt				
D	sugar				

Photos showing the results

Part II - Report Writing

Discussion

1. Compare the height of the dough in each cup with that in cup A (the control), state the addition of which investigated ingredient(s) favour(s) the rise of the bread dough. Explain why the adding of the substance(s) helps yeast fermentation.

2. Compare the height of the dough in each cup with that in cup A (the control), state the addition of which investigated ingredient(s) inhibit(s) the rise of the bread dough. Explain why the adding of the substance(s) inhibits yeast fermentation.

3. In light of the findings from this experiment, suggest what ingredients to be added to the dough in making bread/pizza to enhance thorough rising of the dough?

4. There are many factors that can affect yeast fermentation, e.g. moisture, food temperature. Suggest one investigation on any of these factors which can shed light on bread making.

Conclusion

(Summarise your findings from this experiment regarding the ingredient(s) favourable for yeast fermentation; the ingredient(s) inhibiting yeast fermentation; and what you should do to ensure successful dough rising.)