CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY

Name(s)
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Project Number
J1716

Project Title
Got Turmeric? The Magic Spice! Investigating the Anti-Bacterial Properties of Turmeric on the Shelf Life of Milk

Abstract

Objectives/Goals
To determine if turmeric has anti-bacterial properties that can preserve milk? If so, what is the optimum turmeric level required?

Methods/Materials
MATERIALS: 72 test tubes (10ml), turmeric powder, milk, test tube racks (6), Methylene Blue, graduated cylinder (10ml), electronic scale (0.1g-100g), calibration weight, liquid dropper
PROCEDURE:
A. Boil test tubes to sterilize. Calibrate scale using calibration weight. Weigh turmeric qtys. into test tubes creating turmeric milk solutions of varying concentrations (.1-.8g turmeric in 5-8ml of milk).
B. Perform Methylene Blue Test: Add a drop of Meth. Blue to each test tube. Measure the time taken for the contents of each test tube to turn white which happens when the contents have spoiled.
C. Repeat step B, 6 times for a total of 36 test tubes.
D. Follow-up test to determine optimal qty. of turmeric. Create more dilute solutions (.1g turmeric in 50-200ml milk) in sterilized cups. Note which cup that takes the longest to spoil compared to plain milk based on Meth. Blue Test.

Results
A. Test tubes with turmeric took an average of 7 to 15 hours longer (depending on the qty of turmeric) to turn white in Meth. Blue Test compared to test tubes with plain milk.
B. Test tubes holding more turmeric took longer to change color than test tubes with less turmeric.
C. In the follow-up experiment, the concentration that was effective was 0.1g/50ml. At this level turmeric milk lasted 9 hrs longer than plain milk. Taste and color of turmeric were negligible and only detected on careful examination. More dilute levels (0.1g/100ml and 0.1g/200ml) showed behavior closer to plain (control) milk.

Conclusions/Discussion
My hypothesis was supported. Turmeric slowed the growth of bacteria that spoil milk. I observed that higher concentrations lasted longer than lower. This discovery is relevant in underdeveloped countries where many cannot afford refrigerators (according to WHO about 50% of world population lacks refrigeration). A pinch of turmeric can slow their milk from spoiling for an additional 9 hrs. It would also be easier for small dairy farmers and other producers to keep milk from spoiling before it reaches market. One caveat is turmeric imparts a mild taste and yellowish tint that some may not like. Even at the lowest effective turmeric level the light yellow tint of turmeric was visible while taste was harder to detect.

Summary Statement
Investigate if the anti-bacterial properties of turmeric can extend the shelf life of milk & its potential to benefit underdeveloped countries lacking refrigeration.

Help Received
Father helped with Excel;mother with board.