Team Number: SBBC181

Project Title: Combating diabetes by a-amylase inhibitors found in food

Project Type: Investigation

I.   Background

In recent years, obesity and diabetes have become problems of more and more heated discussion. In 2016, more than 1.9 billion adults worldwide were overweight. Of these over 650 million were obese. Most of the world's population live in countries where overweight and obesity kills over 4 million people each year. Obesity triggers a number of related diseases like diabetes, cardiovascular complications and is even associated with various types of cancers including endometrial, liver, gallbladder, kidney and colon etc. While diabetes will also lead to adverse associated conditions, including blindness, limb amputations, and the need for dialysis.

Some people may be reluctant to take medicine prescribed by doctors as they may often lead to undesirable side effects and also the fear of taking unknown chemicals into the body. Therefore we put our research focus on the natural food items as a non artificial way to reduce glucose absorption, and therefore blood glucose concentration.

II.   Objectives

To find a natural amylase inhibitor so that less starch will be broken down into glucose and absorbed after the intake of food. Thereby achieving the effect of low glucose absorbance in each meal and lower the fat deposited in the body.

III.   Hypothesis

The Mulberry leaves can inhibit the action of amylase. This means less starch will be broken down into glucose and absorbed when Mulberry leaves are present.
The starch concentration in food will be measured under the presence and absence of mulberry leaves

IV.   Methodology

Materials used
Mulberry leaf tea of concentrations of 0.0682 g/cm^3, 0.0341 g/cm^3 , 0.00682 g/cm^3
1% starch solution
1mM iodine solution
0.2% α-Amylase solution
2 M hydrochloric acid

Experimental protocol
4 cm^3 of Mulberry leaf tea of each concentration are each treated with hydrochloric acid. After some time, sodium hydrogencarbonate solution was added to each of them to neutralize all the acid. The resulting pH of the mixture is 7-8.

Different solutions were added to the cuvette using a pipette by the following order:
1. 1% starch solution
2. Mulberry leaf tea at different concentrations
3. 0.2% α-amylase solution

Allow the mixture to react for 5 minutes. At 5 minute, 2 cm^3 of iodine solution was added to the cuvette. The absorbance of the reaction mixture was measured immediately by a colorimeter.
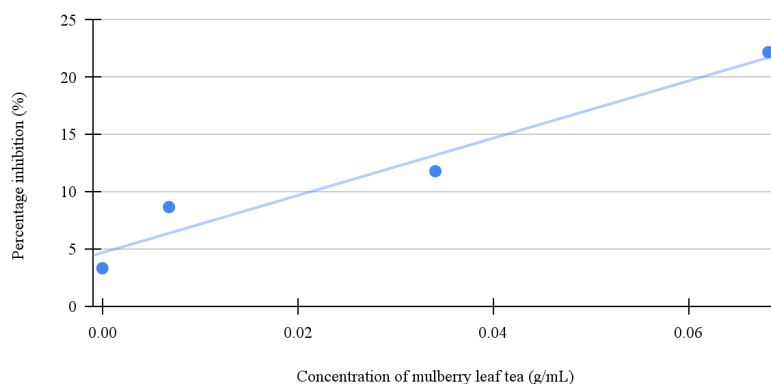
Analysis

Percentage inhibition : $\frac{A-C}{B-C} \times 100\ \%$

A = absorbance of the sample, B = absorbance of blank (without α-amylase), C = absorbance of control (without starch)

V.   Results

Percentage inhibition of alpha-amylase for mulberry leaf tea at different concentrations

VI.   Conclusion

It can be concluded that Mulberry leaf tea has, and is able to retain its α-amylase inhibitory ability after being treated with strong acid. Higher the concentration of Mulberry leaf tea, stronger its α-amylase inhibitory effect. We successfully found a natural amylase inhibitor from this research.