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A Study to Elucidate The Effect of Temperature on the Lipase Activity of Different Nuts

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Abstract:

Lipase is one of the well-known industrially useful enzymes, as it can catalyze different reactions including hydrolysis of triglycerides. Lipases perform essential roles in digestion and process and transport of dietary lipids in most living organisms. So, to solve the issue of high fat in human body, we came up with a solution by studying the lipase activity of the most commonly available food to us, that is, nuts, to find which nut shows better lipase activity, for providing an easy and organic solution to obesity.

In our current study, we have found the lipase activity at different temperatures in three of the most common and available nuts in the market to find their optimum temperature range for lipase activity. We have also conducted an overall study to find which of the sample nuts have better lipase activity overall in comparison to the other samples.

Keywords: Lipase-activity, Thermo-activity of lipase enzyme, Partial characterization in different nuts, Seeds, Triacylglyserols

1. Introduction:

The lipase group of enzymes catalyzes the cleavage of the ester bonds of lipids [1]. In mammals, this includes pancreatic, hepatic, endothelial, and lipoprotein lipase. Lipases, are critical for the metabolism of lipids. Lipases also play key roles in cellular processes such as cell signaling and inflammation. Measurements of lipase activity are commonly used to screen for different injuries and diseases[2,3]. Lipases are widespread in nature and have been found in animals, higher plants and microorganisms. In plants, lipase activity is identified in various tissues but high concentration is found in seeds. Seeds are generally rich in triacylglyserols, which serves as source of energy for newly emerging plants. In the present study we study the isolation and characterization of lipase activity from different nuts.

2. Materials and methods:

2.1. Samples studied: Three samples were used- Cashew nut, Chestnut, Almond

2.1.1. Preparation of enzyme extract:

4g of each sample was taken and then their seed coat was removed. Their paste was made and dissolved in Acetone (at 4°C). They were then set up to be centrifuged at 3000 rpm (10 minutes) and 4000 rpm(10 minutes), each time using the soup. The diluted soup was then extracted and added in 25 ml Ammonium Sulphate. The solution was centrifuged again at 5000 rpm for 15 minutes. The soup extract and Tris-Cl buffer (pH 7) was mixed and kept overnight.

2.1.2. Substrate taken:

Vegetable oil was taken as the substrate

2.2. Estimation of lipase activity:

To 2.5 ml of substrate 0.1 ml of enzyme extract was added and it was incubated for 10 mins in refrigerator (4°C), room temperature (32°C) and in water bath kept at 100°C. Their O.D. values were measured at 410 nm just at time 0 (initial = A_i) and after 10 mins (final = A_f).

3. Results:

Lipase activity is measured with the help of the formula:

(A x Sample dilution factor) / (Reaction time x volume of sample)

The value of $A_i - A_f = A$

For cashew nuts the lipase activity at 32°C is 7.5 folds more than at 100°C and 1.5 folds more than at 4°C. For almonds, the lipase activity at 32°C is 11 folds more than at 100°C and 5.5 folds more than at 4°C.

For chest nuts, the lipase activity at 32°C is 19 folds more than at 100°C and 9.5 folds more than at 4°C.

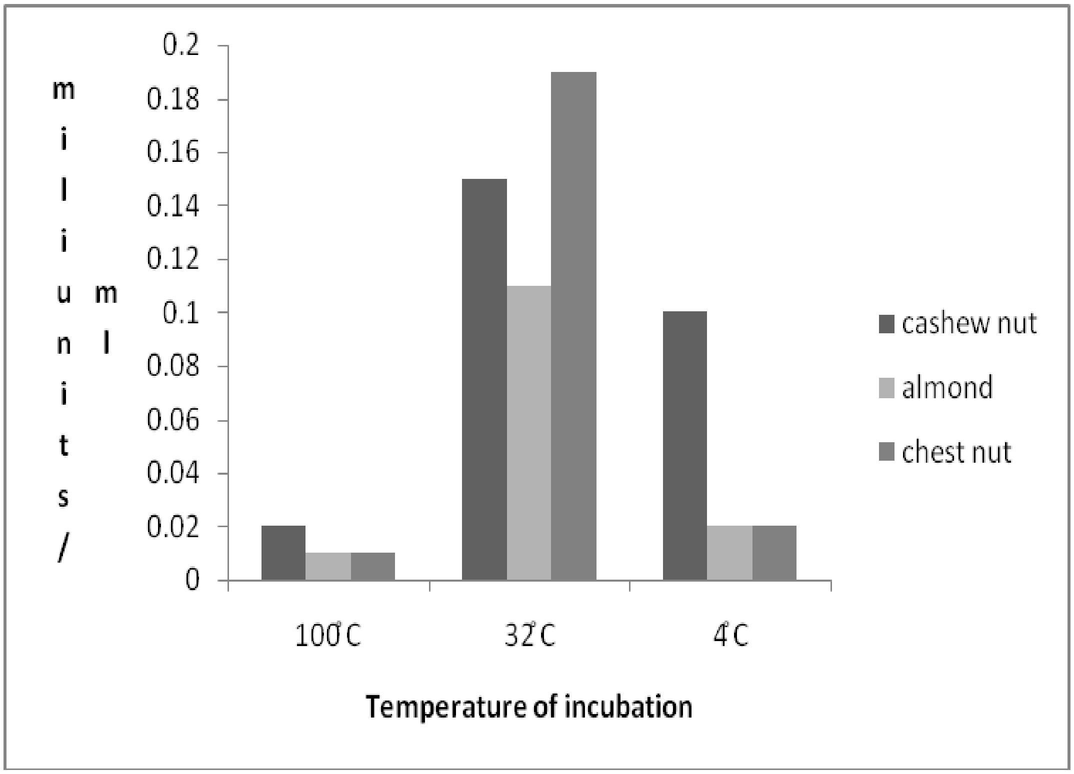

Figure 1: Lipase activity with variation in incubation temperature

4. Discussion

Lipase was isolated and partially purified from nuts. Each and every enzyme has an optimum temperature at which it maximally reacts with its substrate. Lipase which was purified from nuts was found to have an optimum activity at 32°C with the activity profile being 32°C>4°C>100°C. Lipases serve important roles in fermentation processes such as in yogurt and cheese fermentation. Currently, lipases are being used in different other industrial applications. They can serve important roles in For instance, it is used in applications such as baking, laundry detergents and even as biocatalysts [4], in alternative energy strategies to convert vegetable oil into fuel [5,6]. These enzyme industrial applications are more environmentally friendly and safe [7]. Our results point to the fact that enzymes such as lipase can be easily extracted from natural sources such as commonly available nuts at optimum temperature and used for various industrial processes. This is an economically feasible, environment friendly and easy method which has immense utilization potential.

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