

Determination of amylase activity in four selected grains (Ragi, Green Gram, Chickpea, and Fenugreek) at various germination stages

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ABSTRACT

Introduction: Grains and cereals worldwide are extremely important for both human and animal nutrition. More than plain grains, sprouted grains have more nutrition and energy while eating. Sprouts are rich in digestible energy, vitamins, minerals, amino acids, proteins, and phytochemicals, as these are necessary for a germinating plant to grow. Hence, from the current study, it was found that the sprouted grains show an increased enzyme activity which can be used for the maximum yield of enzymes in industries. **Materials and Methods:** The different grains used (Ragi, Green Gram, Fenugreek, and Chickpea) were collected from the local supermarket. All apparatus used was sterilized adequately with hot water at about 100°C to avoid infection and alteration of results. **Results and Discussion:** Amylase activity of chickpea and green gram showed increased enzyme activity on day 1. 4th day, fenugreek showed a greater increase in enzyme activity. On the final day, green gram showed a decrease in its graph while the other grains remained the same. From the research, it was found that the fermented grains show an increased enzyme activity on a particular day. **Conclusion:** This study exhibits that extraction done on a particular time of seed germination that can give a maximum enzyme yield.

KEY WORDS: Enzyme activity, Grains, Health benefits, Industrial applications, Sprouting

INTRODUCTION

No healthy diet advice seems to be complete without a mention of whole grain. Grains and cereals worldwide are extremely important for both human and animal nutrition, and their economic importance is becoming great in a wide range of products. Whole grains provide carbohydrates, proteins, fibers, vitamins, and minerals which are good for health. Dietary fibers from whole grains or other foods may help reduce blood cholesterol levels and may lower risk of heart disease, obesity, and type 2 diabetes.^[1]

Finger millet, commonly called as ragi, is a short day plant with a growing optimum 12 h of daylight for most varieties. Its main growing area ranges from 20°N to 20°S, meaning mainly the semiarid to arid tropics.^[2] The mung bean (*Vigna radiata*), alternatively known

as the green gram, maash, or moong is used as an ingredient in both savory and sweet dishes. Mung bean sprouts can be grown under artificial light for 4 h over the period of a week. They are usually simply called “bean sprouts.” The chickpea is an annual gram, which is variously known as Bengal gram garbanzo bean and Egyptian pea. Chickpea seeds are high in protein, and it improves protein digestibility.^[3] Fenugreek is cultivated worldwide as a semiarid crop. Its seeds and its leaves are common ingredients in dishes from South and Central Asia. Some people are allergic to fenugreek, and people who have peanut allergies or chickpea allergies may also have a reaction.^[4]

Natural germination process by which seeds and plants produce new leaves or buds or other newly developing parts is called sprouting. Sprouting can be done in all viable seeds, but some sprouts should not be eaten raw. Eating sprouted seeds have various health benefits. It provides high energy and nutrition than the original beans. In all the sproutings, intended care should be provided. Sprouts are rich in digestible

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energy, vitamins, minerals, amino acids, proteins, and phytochemicals, as these are necessary for a germinating plant to grow.^[5]

Almost all biochemical reactions in living things need enzymes. Enzyme is protein molecule in cells which work as a catalyst. With an enzyme, chemical reactions go much faster than they would without the enzyme.^[6] The substances at the start of the reaction are called substrates. The substances at the end of the reaction are the products. Enzymes work on the substrates and turn them into products.^[7,8] In the past decade, enzymes have become increasingly important in grain processing.^[9,10]

Hence, the study was conducted to determine the enzymatic activity of the four selected grains at various germination stages.

MATERIALS AND METHODS

Sample Collection and Sterilization

The different grains used (Ragi, Green Gram, Fenugreek, and Chickpea) were collected from the local supermarket. All apparatus used was sterilized adequately with hot water at about 100°C to avoid infection and alteration of results.

Sprouting of Sample

All the collected grains were cleaned and soaked in water for overnight. After 12 h, the soaked grains were drained and transferred to sprouting dish. Moreover, they were allowed to dry by spreading in a white cotton cloth.

Preparation of Sample

About 10 g of the germinating grains (Ragi, Green Gram, Fenugreek, and Chickpea) was individually weighed. After germination, each of the sprouted grains was put into a mortar and crushed with a pestle. 10 ml of distilled water was added to the crushed grains and mixed thoroughly using a glass rod. The solution was filtered with a filter paper to remove all the larger debris. The filtered solution was kept in four different test tubes and labeled accordingly.

Enzyme Assay

The enzyme (Amylase) activity of all the sprouted grains was assayed by DNase method where starch is used as a substrate. The enzyme activity was expressed in micro moles/ml/min.

RESULTS AND DISCUSSION

Results

The 1st day of germination was seen to have the highest amylase activity of chickpea with green gram.^[11] On the 2nd day, chickpea showed a great increase in its

enzyme activity, while all the other grains remained in the same state.^[12] Green gram and chickpea decreased than its usual level while fenugreek increased a little bit and ragi remains the same on the 3rd day. 4th day, fenugreek showed the highest amylase activity.^[13] On the 5th day, green gram decreased its amylase activity while the other grains does not show any observable notice [Graph 1].^[14]

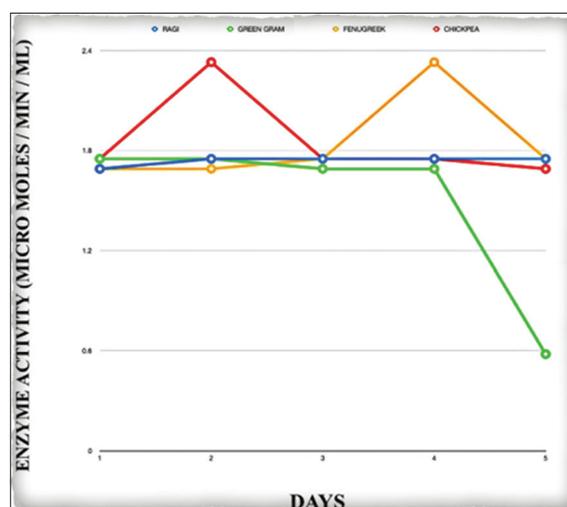
Discussion

According to the study, it is proved that sprouted grains have more nutritional benefits than raw grains.

The benefits of consuming fenugreek sprouts for those living with diabetes are astounding. Fenugreek boasts of properties enabling it to stimulate the production of insulin in the body to counteract elevated sugar levels in the blood.^[15] Sprouted chickpeas are rich in carbohydrates and dietary fiber, both of which will prolong the sensation of fullness after a meal.^[16] Eating the DRI of dietary fiber keeps your digestive tract healthy, promotes heart health and helps prevent constipation.^[17] Sprouted ragi is fed to babies than the plain ragi, as it has a tremendous level of nutritional value for the younger ones.^[18] Sprouted grains improves the bioavailability and absorption of minerals like Calcium, Iron. It also increases the protein content in food.

Moong dal sprouts are good source of Vitamin K. Vitamin K is essential for the process of blood clotting. It also regulates bone mineralizations and helps in maintaining bone density.^[19] It also lowers the risk of cardiovascular disease. It is also rich in iron which also the growth of cells that facilitates the immune response and attack infected cells.^[20]

Amylase also has a potential application in food, textiles, and pharmaceuticals industries. Amylases can be obtained from plants, animals, and microorganisms.



Graph 1: Determination of amylase activity

However, enzymes from fungal and bacterial sources have dominated applications in industrial sectors. The production of amylase is essential for the conversion of starches into oligosaccharides.^[21] Hence, from the current research, it was found that the fermented grains show an increased enzyme activity on a particular day. Thus, the data can be used for the maximum yield of enzymes in industries.^[22]

CONCLUSION

Industries and productions get improved from the knowledge acquired from scientific research. Amylase is an enzyme with wide industrial applications. Extraction of amylase is done regularly on a large scale. This study exhibits that extraction done on a particular time of seed germination that can give a maximum enzyme yield. Thus, further research can be done to enhance the enzyme yield. Hence, the sprouted grains have an immense amount of nutritional value; on the particular day of sprouting, it can be used for industrial purposes.

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