# Biochemical Detection of Yellow Bean Sprouts and Ming Bean Sprouts

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**Abstract:** Taking soybean sprouts and mung bean sprouts as research objects, the main nutritional components (vitamin C content, total sugar and reducing sugar content, protein content) were determined, and their peroxidase was analyzed. Generally speaking, the nutritional value of soybean sprouts is higher than that of mung bean sprouts, and it is also verified that there are five kinds of peroxidase isozymes of soybean sprouts and only three kinds of mung bean sprouts. This study analyzed the nutritional value of two kinds of bean sprouts from various aspects, which not only verified some medicinal value, but also provided a new basis for the purchase of consumers and the development of related products.

## 1. Introduction

In recent years, the research and development of food-related health products and drugs has become one of the hotspots of biological research, which has the following advantages: high safety, short production cycle, rich sources and so on. Bean sprouts are a kind of traditional high-quality vegetables that our people like to eat. It is white, tender and refreshing, delicious in taste, beautiful in appearance, pollution-free and has health care function. In China, the production technology, edible and medicinal functions of bean sprouts have been recorded in detail as early as ancient times. Especially in winter, with fewer fresh vegetables and higher prices, bean sprouts have become a favorite vegetable for ordinary people. The production technology, edible and medicinal uses of bean sprouts have been studied in our country[1]. Modern medicine shows that bean sprouts contain a large number of anti-acid substances, have a good anti-aging function, can play an effective role in detoxification, as well as reducing blood lipids and softening blood vessels, preventing coronary heart disease and diabetes and so on. In addition, bean sprouts are also rich in crude cellulose, with the role of laxative weight loss, middle-aged and elderly people eat more mung bean sprouts, which is beneficial to health[2]. There are also many kinds of bean sprouts, such as mung bean sprouts, soybean sprouts, black bean sprouts and so on. Common bean sprouts on the market are soybean sprouts (soybean sprouts) and mung bean sprouts. The body of soybean sprouts is larger and longer, the cotyledons are large and thick, and the water is sufficient. The sprouts of mung bean sprouts are slender and thin, and the cotyledons are full of water. In this study, soybean sprouts and mung bean sprouts were taken as the research objects, and the nutritional values of soybean sprouts and mung bean sprouts were compared from the aspects of protein, reducing sugar, total sugar, vitamin C content, peroxidase activity and peroxidase isozymes. to provide a new basis for consumers purchase and products development, in addition, the use of related enzyme preparations can also be used for reference in bio-pharmaceuticals.

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## 2. Materials and Methods

### 2.1. Materials and reagents

Table 1 Fresh soybean sprouts and mung bean sprouts (both on the market)

| Experimental project | Experimental reagent |
|---|---|
| Determination of vitamin C | 1% oxalic acid solution, 2% oxalic acid solution, vitamin C standard solution (1ml oxalic acid solution contains 0.1mgVc), oxidized 0.02% 2-dichlorophenol indophenol solution (dye solution) |
| Determination of total sugar and reducing sugar content | Standard glucose solution (0.1mg/ml), anthrone reagent, 6mol/L HCl, 20%NaOH solution |
| Determination of protein | Coomassie brilliant blue G-Mel 250 protein reagent, standard protein solution (1.0mg/ml or 0.1mg/ml, globulin or bovine serum albumin), Tris-HCl buffer (pH6.8,0.05mol/L) |
| Peroxidase analysis | A (separation gel buffer), B (concentrated gel buffer), C (separation gel storage solution), D (concentrated gel storage solution), E (riboflavin), F (sucrose), electrode buffer, sealing glue, sample extract, staining solution, frontier indicator (1% bromophenol blue) |

### 2.2. Determination of vitamin C--Oxidized dye titration

Preparation of fresh fruit and vegetable liquid: weigh 20.0g bean sprouts into 50mL mortar, add 2% oxalic acid solution to 40mL scale; Absorb 1.0mL vitamin C standard solution into a conical bottle, add 9ml 1% oxalic acid solution, titrate with dye solution until reddish for 15 seconds without fading is the end point. Titrate the sample solution: absorb the 10.0mL sample solution and titrate it with the same operation as above.

### 2.3. Determination of total sugar and reducing sugar content[3]

Under the action of concentrated sulfuric acid, sugar can be dehydrated to form furfural or furfural derivative, and then react with anthrone to form blue-green furfural compound, which has the maximum absorption at 620nm, and the color is proportional to the content of sugar, so it can be used for the quantitative determination of sugar.

Take 6 clean test tubes and they were numbered 0-5 in turn, and the same amount of glucose standard solution was added according to different concentration gradients, and then distilled water 1.0,0.9~ 0.5 was added sequentially. After bathing in ice water for 5 minutes, all the six test tubes were added with anthrone reagent 4ml, boiled for 10 minutes and then cooled for 10 minutes, and then colorimetric at 620nm.

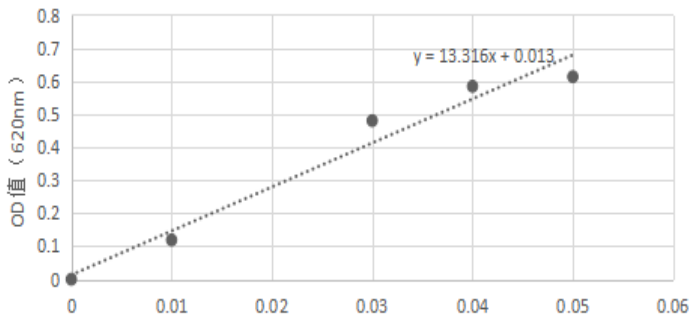


Fig. 1 Standard curve of glucose

### 2.3.1. Extraction and determination of reducing Sugar in samples

Weigh 1g of mung bean sprouts and 1g of soybean sprouts, add about 3 mL of water, grind into a homogenate in a mortar, transfer to a triangular flask, rinse the mortar with about 30mL distilled water for 2 times and 3 times, and the washing solution is also transferred to the triangular flask. Soak the reducing sugar in a water bath at 50 ℃ for about 0.5 h, remove it, cool it and fix the volume to 100mL. Dilute 10 times, immerse it in ice bath for 5 minutes, then add 4mL anthrone reagent, fully vibrate and bathe in boiling water for 10 minutes, other conditions are the same as the standard curve. The measured absorbance value can be used to calculate the sugar content of the sample solution from the standard curve.

### 2.3.2. Extraction, hydrolysis and determination of total sugars in samples.

Weigh 1 g of mung bean sprouts and 1 g of soybean sprouts, add about 3 mL of water, grind into a homogenate in a mortar, rinse the mortar with about 12mL distilled water for 2 times and 3 times, and the washing solution is also transferred to the triangular flask. Then 10 mL of 6mol/L hydrochloric acid was added to the triangle flask, hydrolyzed in boiling water bath for 0.5 h, cooled and neutralized with 20%NaOH solution until pH was neutral. Then the volume was fixed to 100ml with distilled water, and the final dilution of 1mL total sugar was determined by the same method as above.

### 2.4. Determination of protein content in fruits and vegetables-- Coomassie brilliant blue method[4]

Six test tubes were numbered 0-5, then 100 μ g / mL bovine serum albumin solution 0,0.2,0.4 ~ 1.0ml, then distilled water 1.0ml and 0.8~0ml were added sequentially, and finally 5ml Coomassie brilliant blue solution 5ml was added. After placing 2min, the A595 was measured by colorimetry at 595nm wavelength.

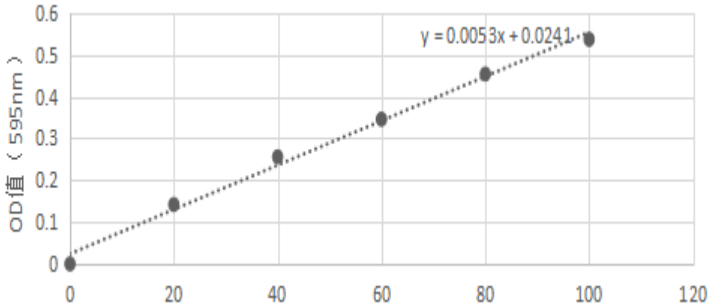


Fig. 2 Standard curve of protein

### 2.4.1. Sample preparation and determination[5]

1 g of mung bean sprouts and 1 g of soybean sprouts were placed in a mortar on an ice bath, mixed with 1 mL distilled water or Tris-HCl buffer (pH6.8,0.05mol/L) to form a homogenate, then washed off the grinding samples attached to the bowl wall with 2 mL water or buffer and transferred to a centrifuge tube to fix the volume. The supernatant was the protein extract for analysis.

### 2.5. Analysis of Peroxidase in fruits and vegetables

### 2.5.1. Separation of peroxidase isozymes

The separation and identification of proteins by polyacrylamide gel mainly depends on the charge effect and molecular sieve effect of the gel.

### 2.5.2. Preparation of samples

Take 2g bean sprouts, grind the sample extract with appropriate amount of quartz sand and 5mL into a homogenate, place it in a centrifuge tube, wash the bowl with a small amount of extract, put the washing solution into the centrifuge tube, centrifuge at a speed of 14 000r/min for 15min,

dissolve the supernatant to 10ml and store it in a cryogenic refrigerator.

### 2.6. Determination of peroxidase activity[6]

The sample extract was 2.5 ml and the volume 50 ml. One of the two test tubes was added with reaction mixture 3ml and phosphate buffer 1ml, and the other was added with reaction mixture 3ml and supernatant 1ml. 470nm colorimetry, every 1min reading, make a record.

## 3. Result

Table 2 List of nutritional components in bean sprouts

| Fruits and vegetables | Vitamin C content (mg/100g) | Soluble reducing sugar% | Total sugar content% | Protein content (ghammer 100g) |
|---|---|---|---|---|
| Soybean sprouts | 1.14 | 1.4 | 15.9 | 2.13 |
| Mung bean sprouts | 2.02 | 1.9 | 16.9 | 0.41 |

Table 3 Determination of nutritional components in bean sprouts by peroxidase activity

| Fruits and vegetables | Ming Bean Sprouts | Yellow Bean Sprouts |
|---|---|---|
| t/min | OD(A470) | OD(A470) |
| 0 | 0.036 | 0.251 |
| 1 | 0.166 | 0.488 |
| 2 | 0.258 | 0.688 |
| 3 | 0.325 | 0.875 |
| 4 | 0.381 | 1.013 |
| Slope/k | 0.0849 | 0.1911 |
| Peroxidase activity(U) | 6792 | 15288 |
| Specific activity of peroxidase/(g*min) | 3396 | 7644 |

## 4. Conclusion

In this study, vitamin C content, reducing sugar and total sugar content, protein content, peroxidase isozyme separation and peroxidase activity of soybean sprouts and mung bean sprouts were studied by 2-dichlorophenol indophenol titration, anthrone colorimetry, Coomassie brilliant blue colorimetry, polyacrylamide gel electrophoresis and colorimetry. The results showed as follows:

(1) The nutritional value of soybean sprouts was higher, in which the reducing sugar, total sugar andprotein content of soybean sprouts were higher than those of mung bean sprouts, especially the protein content was more than 5 times that of mung bean sprouts.

(2) The vitamin C content of mung bean sprouts is twice as much as that of soybean sprouts.

(3) The peroxidase activity of soybean sprouts was 2.3 times higher than that of mung bean sprouts.

(4) Generally speaking, the nutritional value of soybean sprouts is higher than that of mung bean sprouts. This experiment provides a theoretical basis for consumers' purchase and product development.

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