Study on the antioxidation of mango polyphenols

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Abstract. This study took mango polyphenol as the main research object. Ultrasonic extraction of mango seeds and DPPH radical scavenging were used to investigate the antioxidant and stability of mango polyphenols. The results shows that the optimum extraction conditions are as follows: extraction time 15 min, solid-liquid ratio 1:5 and 60% ethanol concentration. Mango polyphenols have a strong DPPH free radical scavenging activity and a higher antioxidant activity than vitamin C.

1. Introduction
Mango is a tropical fruit. Apart from fresh food, it is mainly processed into dried mango, canned fruit and jelly. This treatment method is very simple, discarding a large number of nuclear, leather and other byproducts, causing unnecessary waste of resources [1]. The discarded by-products (core and peel) contained a large number of polyphenols with high antioxidant activity. Therefore, this study extracted and isolated mango polyphenols from the by-products of mango. To effectively promote the deep processing of mango and the actual utilization value of mango resources, and avoid resource waste and environmental pollution, the results have very important significance.

Plant polyphenols have been the focus of research in recent years. Due to their excellent antioxidant and free radical scavenging effects, they have shown unique advantages in the prevention and treatment of diseases caused by free radicals, and have been widely used in cosmetics, clinical medicine, food science and other fields [2]. So far, researches on the antioxidant activities of plant polyphenols at home and abroad mainly focus on carotene, tea polyphenols, apple polyphenols, etc., but the antioxidant activities of mango polyphenols are rarely studied.

Plant polyphenols extraction and separation methods of many, but there are still insufficient. Ultrasonic method as a new extraction technology. In recent years, there is more literature reports ultrasonic used in plant active ingredient is the extraction of free radicals in the free state, and have many significant advantages such as short operation time, resource saving, strong selectivity, low solvent consumption and high extraction efficiency [3].

In this study, polyphenols were extracted from different parts of mango, and the extraction process and antioxidant activity of polyphenols were systematically studied to provide a basis for the comprehensive utilization and in-depth development of mango.

2. Materials and methods

2.1 Experimental materials

2.1.1 Crude Powder of Mango Seed
Mango on sale, peeled and meat removed, mango kernels, dried, crushed mango kernels crude powder.
2.1.2 The reagent
Folin-phenol, Gold Wheat; 1, 1-diphenyl-2-picryl hydrazine and vitamin C: Shanghai jinsui biotechnology co., LTD. Gallic acid: jiangsu yongkang pharmaceutical technology co. LTD

2.1.3 Instruments and equipment
Shimazu UV-2450 UV spectrophotometer; KH-300E type ultrasonic cleaner.

3. Method

3.1 Standard curve of gallic acid
Folin-phenol method was used for the determination of total polyphenols\cite{4}, and gallic acid was used as the standard. Accurately weigh 2.5 mg gallic acid, dissolve in 60% ethanol solution, constant volume to 25 mL, and prepare 0.1 mg/mL gallic acid standard solution. Take 0, 0.1, 0.2, 0.3, 0.4, 0.5 mL above solution in colorimetric tube, add 0.5 mL 1 mol/L FC, after 2 minutes, add 3 mL 7.5% Na$_2$CO$_3$, constant volume to 10 mL, colour rendering 1 h, measure absorbance value at 742 nm, draw standard curve, and draw standard curve. The regression analysis was carried out.

3.2 Extraction of Mango Polyphenols
Weigh 1 g mango kernel powder, add 5 ml 50% ethanol, and strain by ultrasound for 15 min. 0.01 mL of the extract was reacted with 0.5 mL Fc for 2 min, and 3 mL 7.5% Na$_2$CO$_3$ was added. The colour was developed for 1 h and detected at 742 nm.

3.3 Mango polyphenol scavenging DPPH free radical experiment
The antioxidant activity of mango polyphenols was determined by DPPH method\cite{5} 4 mg DPPH was accurately weighed, and 0.2mmol /L DPPH solution was prepared with anhydrous ethanol. 1 mL mango polyphenol solution was diluted with ethanol to 100 mL volumetric flask, and 85.7 g/mL mango polyphenol solution was obtained. 1.17, 2.33, 3.50, 4.67, 5.83, 7.00, 8.17, 9.33 mL mango polyphenols were extracted in a 10-ml volumetric flask, and the volume was fixed with 60% ethanol to obtain 10, 20, 30, 40, 50, 60, 70, 80 g/mL mango polyphenols.

Sample was added to the test tube as described below:
- A0 control group: 1 mL 60% ethanol +4 mL DPPH solution.
- A1 sample group: 1 mL sample solution +4 mL DPPH solution.
- Blank group A2: 1 mL sample solution +4 mL anhydrous ethanol solution.

Using anhydrous ethanol as the pool blank, uv absorbance value was measured at 517 nm and calculated. Formula: A0 is the same volume of ethanol solution instead of sample solution to determine the absorbance value; A1 is the different concentration of sample solution to determine the absorbance value; A2 is the same volume of anhydrous ethanol solution instead of DPPH solution to determine the absorbance value. Using the same concentration of vitamin C as a positive control, the above experiments were repeated to compare their antioxidant properties.

3.4 Antioxidant Stability of Mango Polyphenols
1 g mango seed powder was weighed, 5 mL 60% ethanol solution was added, ultrasonic extraction for 15 minutes, filtered and stored in a refrigerator at 4 C. DPPH free radical scavenging rate was determined at 0 h, 24 h and 48 h respectively by DPPH method, and the antioxidant effect was compared.

4. Results

4.1 Standard curve of gallic acid
Fig. 1 Standard curve of gallic acid

The graph shows that gallic acid is relatively stable in the concentration range of 0-0.06 mg/mL, and its absorbance value shows a good linear relationship. In this range, the linear regression equation is $y = 11.941x - 0.001$, $R^2 = 0.9999$.

4.2 Scavenging DPPH Free Radicals by Mango Polyphenols

As shown in fig. 2, the antioxidant activity of mango polyphenols and vitamin C increased with the increase of concentration, both of which showed a positive correlation of concentration-effect, and the free radical scavenging rate of mango polyphenols was higher than that of vitamin C. When the concentration of mango polyphenol extract was 50 g/mL, the clearance rate of ·OH was 91.04%. It can be seen that the preliminary purification of mango polyphenol has a good scavenging effect on ·OH.

4.3 Antioxidant stability test of mango polyphenols

It can be seen from figure 3 that the antioxidant activity of mango polyphenols does not change significantly over time, and is maintained between 84% and 89%. Therefore, mango polyphenols can be added into food and cosmetics as natural antioxidants to maintain the antioxidant activity of its products.
5. conclusion
The antioxidant capacity of mango polyphenols was studied. The ultrasonic extraction method was used to extract mango polyphenols, and the optimum process conditions were determined: 60% ethanol, 1:5 solid-liquid ratio, and 15 min. The conditions were low in energy consumption, providing guidance for large-scale industrial production. At the same time, the experiment also proves the mango polyphenol oxidation resistance and good stability, mango polyphenol oxidation resistance is stronger than vitamin C. When the concentration of mango polyphenol extract was 50 g/mL, the scavenging rate of DPPH radical was 91.04%, indicating that it had very good antioxidant activity. The antioxidant activity of mango polyphenols was relatively stable, and there was no significant change in antioxidant activity after 48h. Few papers have studied the antioxidant effect of mango polyphenols. This experiment fills the gap in the study on the antioxidant effect of mango polyphenols. Due to its excellent antioxidant properties, mango polyphenols can be used as an excellent food and skin care additive. The follow-up research will focus on the practical application of mango polyphenols.

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