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Anti-oxidation and Anti-aging of Functional Components of Blueberry Wine Based on Medical Imaging Information System

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Abstract: With the maturity of blueberry planting technology and the continuous expansion of China's planting area, due to the high nutritional value of blueberry itself and people's desire for health, research on the functions of blueberries in my country has gradually increased. Blueberry processing products are also growing and becoming more diversified. Blueberry wine is a kind of fruit wine made with blueberries as raw materials. It is made according to the winemaking process. On this basis, the aging conditions (temperature, H2O3, single color) were studied. Light) on the quality of blueberry wine. The results showed that after immersing the fermentation raw materials and pre-fermenting at 16℃ for 72 hours, blueberry wine was prepared with Saccharomyces cerevisiae Y3 strain, with a total inoculation amount of 0.2g/L and adding a dose of 40mg/L of SO2 to the aged beverage It is deep ruby color, transparent and mellow, and has a rich rose aroma. At the same time, in order to explore the anti-oxidation and anti-aging ability of the functional ingredients of blueberry wine, this paper proposes to use the medical imaging information system to measure its ability. The final measurement results show that the anti-oxidation and anti-aging ability of blueberry wine exists. And more outstanding

1. Introduction

1.1. Background and Significance

Pay more attention. As a major fruit producing country, China's fruit wine research has also made great progress[1], and some advanced technologies have been adopted in fruit juice production, such as fruit juice pretreatment, low-temperature fermentation, enzyme engineering, clarification technology and aging technology. This application greatly improves the quality of the product,

coupled with the highly recognizable packaging and the strong influence on medical care, it is welcomed by consumers at home and abroad[2].

1.2. Domestic Research

My country's blueberry wine has a long history of research, a large number of consumer groups and a broad consumer market. Especially as people pay more and more attention to the health function of blueberry wine, consumers' demand for high-nutrition and healthy fruit wine is also increasing. Our country has already begun to produce blueberry wine during the planned economy period, and has knowledge and development experience of wild berries [3]. Since the 1970s, with the strong development of the brewing industry, wineries in the Greater Xing'an Mountains have processed and produced Dussi wine and blackcurrant wine, which are very popular with consumers. Due to the small collection of wild blueberries and the unstable production of artificially planted raspberries, many wineries only use them as auxiliary products and follow the blueberry wine industry, without forming a complete industry or stable sales market [4-5]. Beginning in the 1990s, several factories specializing in the production of raspberry wine in northeast my country began to produce blueberry wine on a large scale and gradually opened up the blueberry wine market. At present, the production of blueberry wine has become a trend.

1.3. Foreign Research

For blueberry products, foreign countries started early and have now become systematic production. HidalgoC and others use natural microorganisms and inoculated acetic acid bacteria as ingredients to acidify blueberry wine, so that blueberry wine has a special flavor .The conclusion is that bananas can be used as a dietary supplement for yeast, and can solve the problems of viscosity and slowness in the fermentation process of blueberry wine [6-7]. Malin et al. used berry wine in mice with amnesia, and the results showed that by prolonging the treatment time, the amnesia of the mice was significantly improved [8]. Studies by the United States and the Canadian Department of Agriculture have shown that blueberry juice can significantly improve the ability to learn from the elderly and memory, and delay human aging. The reason why blueberry wine was developed so early abroad is closely related to the concept of medical care. A long time ago, fruit wine appeared on their table [9-10]. It has now occupied most of the European and American markets and has become an inseparable beverage.

1.4. Innovation

This article compares the effects of different fermentation processes and process parameters on anthocyanins, total phenols and antioxidant capacity in blueberry wine. The results showed that the content of anthocyanins and total phenols in the fermentation process of blueberry wine was reduced, the loss during the aging stage was large, and the loss during the main fermentation process was small.

2. Research Methods

2.1. Blueberries

Blueberry is a plant of the genus Vaccinaceae in the Vaccinaceae family. It is an evergreen or deciduous fruit tree that is widely distributed in the northern hemisphere. It not only contains sugars, amino acids, organic acids, vitamins and minerals, but also has more physiologically active

components of proanthocyanidins, anthocyanins and other polyphenols. These components make blueberry fruits have strong antioxidant properties and antioxidant properties [11- 12]. Promote the reorganization of retinoic acid, improve diabetes complications, reduce inflammation, enhance heart function, anti-cardiovascular disease, anti-aging, anti-cancer and anti-mutation and other physiological activities. Blueberries have many beneficial effects, so the American Blueberry Association endows blueberries with "the third generation of fruits in the world" after apples and oranges [13]. Figure 1 shows several common blueberry wines on the market.

Figure 1. Several common blueberry wines on the market

Blueberries are divided into wild blueberries and blueberries. The fruits of wild blueberries are small, with an average weight of 0.5-2.5 grams. They have thin skins and are easy to break. The fruits are not easy to preserve whole grains. The flesh is thin, the color is deep purple, easy to fade, some are acidic, and the blueberry flavor is purer. Raspberry fruits have a longer planting time. The heavier fruits can reach about 12 grams. The skin is hard and not easy to break, the color is dark purple, not easy to fade, and the flesh is clean and firm, sweet and delicious. The taste of blueberry is not pure enough, and the blueberry fruit is rich in nutrients, and is called "the king of fruits in the world" [14]. Blueberry wine is easy to lose its luster, turbidity, precipitation and even oxidized aroma during processing, storage and transportation, which seriously affects its sensory quality. The brewing process of blueberry wine is shown in Figure 2:

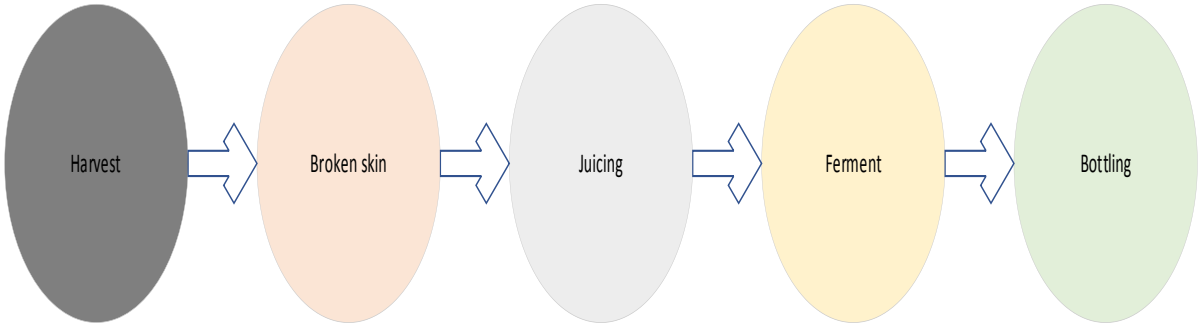

Figure 2. The brewing process of blueberry wine

Due to its rich content of proanthocyanidins and polyphenols, blueberries are very popular in the healthcare market [15]. Many countries in the world have developed a variety of processed products using blueberry fruits as raw materials. They are mainly used as ingredients for cakes, candies, yogurt, jelly, ice cream, pies and other products. In addition, they are processed into canned foods, jams, preserves, quick-frozen fruits, juice beverages and extracts of deep-processed products to meet market demand. With the rapid development of China's beverage industry and the continuous improvement of human health awareness, deep-processed products such as blueberry wine will

gradually become top products. Its application is shown in Figure 3:

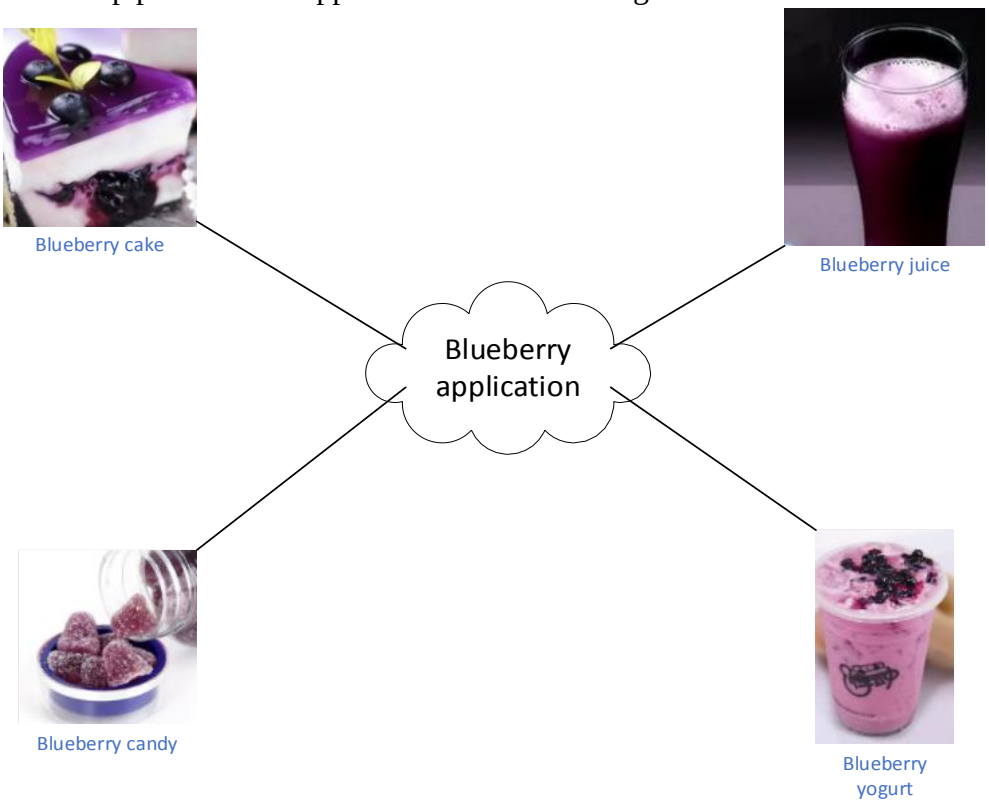

Figure 3. Related application products of blueberry

2.2. Blueberry Pharmacological Action

Antioxidant: Studies have shown that the antioxidant capacity of blueberries is related to the content of total phenols and anthocyanins in blueberries. Anthocyanin is a very important water-soluble pigment, and a large number of most effective bioactive antioxidants have been discovered. Blueberries are rich in anthocyanins, and eating more blueberries every day can delay aging. Studies have shown that different varieties of blueberry fruit extracts have the ability to remove DPPH free radicals.Blueberries also have anti-cancer, anti-aging, prevent heart disease, enhance resistance, and improve microcirculation.

Anti-inflammatory: Anthocyanin itself has a good anti-inflammatory effect, which can promote wound healing and kill bacteria. Anthocyanins also have anti-inflammatory effects on the human body. Studies have shown that it has a very good effect in treating arthritis and skin wounds. The mixture of anthocyanins can reduce inflammation in patients with hypercholesterolemia. In addition, various anthocyanin compounds have been found to have additional or synergistic effects in mediating anti-inflammatory responses in extracellular cell culture assays.

Protective strength: The anthocyanins rich in blueberries have strong oxidizing properties and can inhibit the oxidation of vitamin A, thereby increasing the content of vitamin A in the retina. Eating more blueberries in daily life can prevent myopia, improve eyesight and play a role in improving eyesight. In addition, the anthocyanins in blueberries can enhance the elasticity of the capillaries around the eyes by inhibiting the destruction of eye cells, promoting blood circulation and protecting eyesight.

Other effects: Blueberries also have anti-cancer, anti-aging, prevent heart disease, enhance resistance, and improve microcirculation [16-18]. The specific effect is shown in Figure 4:

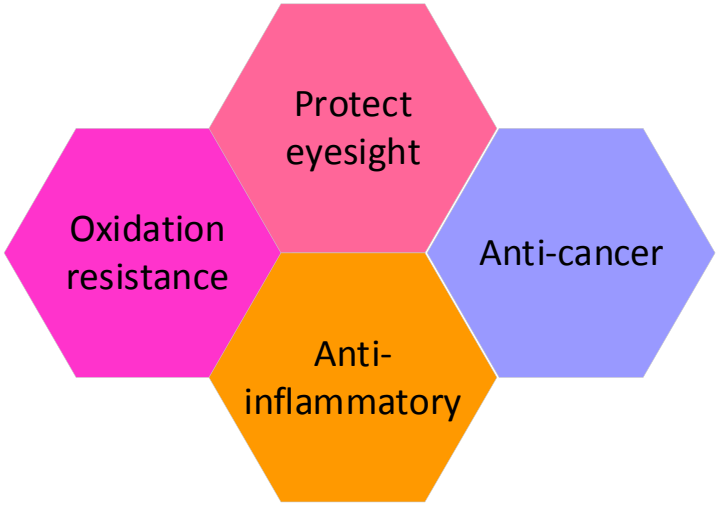

Figure 4. The pharmacological effects of blueberries

2.3. The Main functional Components and Functions of Blueberries

Polyphenols: One of the secondary metabolites of plants is a substance necessary for the normal activities of plants, which promotes plant pigments and plant growth, can resist pathogenic bacteria, and is a source of bitterness and astringency [19]. At present, about 10,000 plant-derived phenolic compounds have been researched and discovered. Their chemical structures range from simple molecules to complex polymers, mainly including flavonoids, flavonoids, phenolic acids, stilbene, lignin and wood. Vegetarian. Among anthocyanins and anthocyanins, flavonoids include flavonoids, flavonols, isoflavones, flavans, flavanols, dihydroflavanols and flavanones. The polyphenols in blueberries can regulate the transmission of nerve signals, reduce oxidative stress, compensate for the decline in perception and motor function caused by aging, inhibit lipid peroxidation, and protect the gastrointestinal tract. The most important functional component contained in blueberry is the main factor of blueberry function.

Anthocyanin: It is usually dispersed in the sap of plant cells, mainly in flowers and fruits. It is a pigment with glycoside groups. After sugar is combined with sugar and removed, it is called anthocyanin. Blueberry anthocyanins are mainly found in raspberry peels, which can protect the fruit from UV damage and stress. Blueberry anthocyanins have antioxidant and anti-inflammatory properties, can stimulate nerve cells, enhance memory, help relieve tension and negative emotions, reduce DNA damage, and can regulate the expression of NPCIL1, ACAT-2, MTP and ABCG8 genes in the intestine, and improve Sterol excretion reduces the toxicity of cadmium and hydrogen peroxide. Small consumption can also reduce the risk of obesity. Compared with other glycoside compounds, it is easier to eliminate organisms.

Flavonoids: Almost all green plant cells can synthesize essential substances in higher plants. It usually exists in cell vacuoles in the form of O-glycosides and less C-glycosides. Flavonoids have anti-inflammatory, anti-allergic and antiviral effects, and have auxiliary functions in the treatment of liver diseases, cataracts and cardiovascular diseases. Blueberry flavonoids are one of the antioxidant sources of blueberries [20]. They have been used to treat kidney disease, gray hair, urethritis and diarrhea. Studies have shown that flavonoids extracted from blueberry leaves have the effect of lowering blood lipids and antioxidant properties, which are beneficial and can prevent or treat hyperlipidemia.

Tannin: It can be divided into three categories: sebacic acid, diphenyl dimethyl glycol tannin and red tannin powder. The first two types are water-soluble tannins, which are also called gallic acid

and ellagic acid after hydrolysis. They are French tannins and ellagitannins. Water-soluble tannins are widely found in fruits, vegetables and other foods. They are abundant in Rosaceae, a small amount in single fruit trees and Messiah, and almost none in Caryophyllaceae and Magnolia. Tannins are known for their bitterness and astringency. However, a large number of studies and epidemiological studies have also found that tannin has a certain connection with reducing the incidence of cancer, preventing cardiovascular diseases and delaying aging. Water-soluble tannins also have anti-oxidant and antibacterial properties, and have a protective effect on food. Blueberry tannin is one of the aromatic substances in raspberry wine, which has a specific effect on the softness and color of the wine. Studies have shown that blueberry tannins can increase the number of beneficial bacteria and improve intestinal health [21]. The composition of blueberry wine is shown in Figure 5:

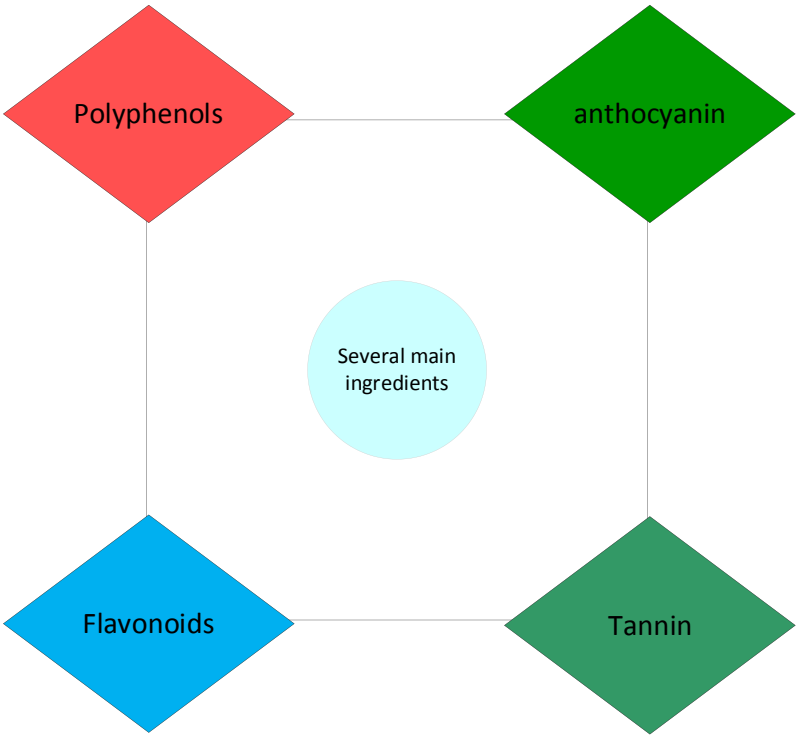

Figure 5. The main ingredients of blueberry wine

2.4. Blueberry Wine

Blueberry wine is a low-nutrition health wine made from natural fermentation of blueberry berries. It makes the berries look more natural, better preserves the anthocyanins, pectin, vitamins and other nutrients and functions in the blueberry wine, delays aging, protects eyesight, and enhances human immunity. Due to the concentrated production period and short storage period of blueberries, blueberries are quickly frozen and then cooled for processing. The taste of blueberry wine mainly depends on the tannins and acid content in it [22]. In addition, the ingredients of blueberries have a special aroma, which can be seen in the brewing process of the ingredients to produce the taste of blueberry wine.

Use one or more berries as raw materials, immediately wash, break or adjust the ingredients, then inoculate Saccharomyces cerevisiae to ferment or press the berries to obtain blueberry juice, then adjust the ingredients and inoculate yeast. Aging is done through the same brewing process as the wine brewing process; it not only has high nutritional value and high resistance to raspberry oxidation, but also contains a variety of biologically active ingredients, and has the quality of a fruit

wine with esters. Containing alcohol and organic acids and other substances, the wine has a unique aroma and full aroma [23].

2.5. Risk Factors

Due to the high content of organic acids in blueberry wine, the body is very sour, the taste is rough and the body is not coordinated, which destroys the taste and quality of the wine, so the acidity of blueberry wine must be strictly reduced. At present, there are three main methods to reduce the acidity of blueberry wine, namely the method of reducing chemical acid, the method of reducing natural acid and the method of reducing microbial acid. The reduction of natural and chemical acids requires a lot of energy and auxiliary materials, which has a greater negative impact on blueberry wine, and can selectively reduce acids. On the contrary, reducing microbial acid has obvious advantages, while reducing the acidity can increase the stability of blueberry wine and enhance the complexity and taste of blueberry wine.

Use yeast to reduce acidity. Usually, Schizosaccharomyces pombe is used to decompose malic acid into ethanol and CO2 in malol fermentation (MAF), thereby reducing the acidity of blueberry wine, and it is not limited by the freshness and taste of blueberry wine. Reduce acidity during fermentation. However, the fermentation capacity of fission yeast is weak, and it produces foul smell. Using dough to reduce the acidity of fruit wine is a relatively new area of research. At present, there are few studies on the selection of yeast used to reduce acidity in blueberry wine. This study aims to use bacteria on the surface of blueberry skin as the initial strain. After natural sorting and UV mutagenesis, the test dough has the strong ability to reduce acidity and fermentation ability, and explores the application of fermentation characteristics to the fermentation of blueberry wine to achieve fermentation while reducing fermentation [24].

This strain can be tested in experiments as a new production strain, enriching the idea of reducing the biological acidity of fruit wine, and will lay a foundation for improving the taste and quality of blueberry wine, and its application prospects have great development [25]. At the same time, yeast is also widely used, as shown in Figure 6:

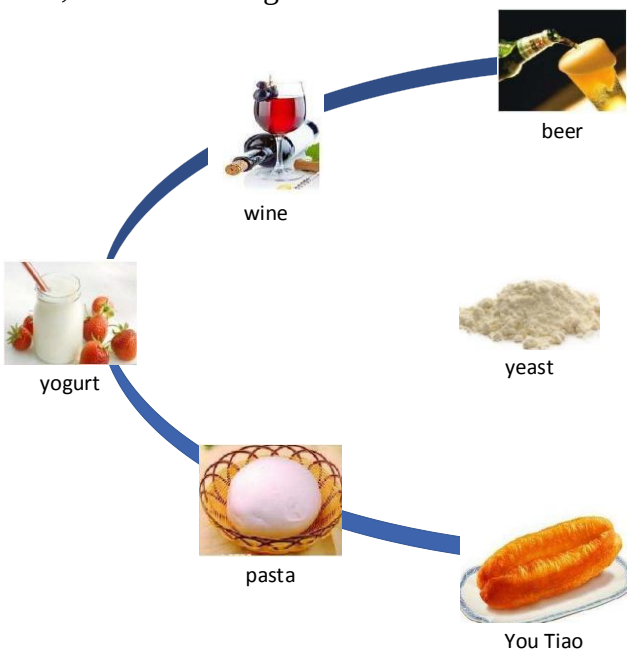

Figure 6. Application of yeast

2.6. Determination of Blueberry Wine Content

In this study, a total of 6 blueberries from 6 production areas were used as raw materials, and commercial RED FRUIT was used as a dry wine process in the laboratory for fermentation. A total of 6 blueberry wines were brewed and the materials were used as The experimental materials yielded the following information.

The regression equation of total phenol content is

$$y = 0.0014x + 0.0025, R^2 = 0.9908 \quad (1)$$

The total phenol in the sample is expressed by the content of gallic acid, and the unit is mg/L

The regression equation of total flavonoid content is

$$y = 0.0011x - 0.0175, R_2 = 0.9961 \quad (2)$$

The total flavonoids in the sample are expressed by the content of rutin, and the unit is mg/L

The regression equation of proanthocyanidin content is

$$y = 0.0007x + 0.1812, R2 = 0.9934 \quad (3)$$

The total phenols in the sample are expressed in units of catechin content mg/L

Total anthocyanin content

The content of total anthocyanins in blueberry wine was determined by pH value differential method. Calculation formula of total anthocyanin content:

$$A = pH_{10}\left(A_{510nm} - A_{700nm}\right) - pH_{4.5}\left(A_{510nm} - A_{700nm}\right) \quad (4)$$

$$\text{content}\left(\text{mg}/L\right) = \frac{A * M_w * DF * 1000}{\varepsilon * 1} \quad (5)$$

2.7. Detection Method

Titrate with glucose standard solution. When the blue color of the solution will disappear and turn red, add 2 drops of methine blue indicator solution, continue titrating until the blue disappears, and record the total volume of the glucose standard solution consumed, repeat several times, until there are three groups No difference in data.

$$F = \frac{m}{1000} \times V \quad (6)$$

In the formula: F. Fehlin A and B solution each 5InL is equivalent to the number of grams of glucose, the unit is grams; V-the total volume of the consumed glucose standard solution, the unit is milliliters (mL); m-weigh the anhydrous glucose Mass, the unit is grams (g).

Accurately draw a certain amount of sample V1 in a 100mL volumetric flask, so that the amount of reducing sugar contained in it is 0.2~0.4g, and add distilled water to the mark. Use this sample solution to titrate according to the first step, and record the volume V3 of the sample consumed.

$$X = \frac{F}{\left(V_1 / V_2\right) \times V_3} \times 1000 \quad (7)$$

In the formula: X-the content of reducing sugar in blueberry juice or blueberry wine fermented mash, the unit is grams per liter (g/L); each 5II of F-feline A and B is equivalent to the number of grams of glucose, the unit Is grams; Vl- the volume of the sample drawn, in milliliter (mL); V2- the

volume of the sample diluted to a constant volume, in milliliter (mL); V3- the volume of the consumed sample, in milliliter (mL).

Determine dry blueberry wine or semi-dry blueberry wine with low sugar content. Titrate, record the volume of consumed glucose standard solution V2.

$$X = \frac{F - cV_1}{V_2} \times 1000 \tag{8}$$

In the formula: the content of reducing sugar in X-dry blueberry wine and semi-dry blueberry wine, in grams per liter (g/L); each 5mL of F-feelin A and B is equivalent to the number of grams of glucose, The unit is grams (g); Vl-the volume of the consumed sample, in milliliters (ml); V-the total volume of the consumed glucose standard solution, in milliliter (ml).

Slow down the titration speed until the solution turns red as the end point of the titration, and record the volume Vl of the NaOH standard titration solution consumed.

$$X = \frac{c \times (V_1 - V_0) \times 75}{V_2} \tag{9}$$

After the distillate turns pink, it is the end point of the titration, and the volume V1 of the standard sodium hydroxide solution consumed is recorded.

$$X = \frac{c \times V_1 \times 60.0}{V} \tag{10}$$

The detection of free sulfur dioxide and bound sulfur dioxide is as follows:

$$X_1 = \frac{c \times V_1 \times 32 \times 1.875}{V} \tag{11}$$

$$X_2 = \frac{c \times V_2 \times 32 \times 0.9375}{V} \tag{12}$$

$$X_3 = X_1 + X_2 \tag{13}$$

The anthocyanin calculation formula is as follows:

$$A = \left[(A_{510} - A_{700})_{pH1.0} - (A_{510} - A_{700})_{pH4.5} \right] \tag{14}$$

$$T_{Acy} = \frac{A \times M \times DF}{\varepsilon \times l} \times 1000 \tag{15}$$

If the absorbance value exceeds 6.00 mg/L tannic acid concentration, dilute the sample solution and re-measure.

$$X = c \times V \tag{16}$$

In the formula: X-tannin content in the sample solution, the unit is mg/L; c-the concentration of tannin in the test sample solution calculated by the standard curve, the unit is mg/L; D-the multiple of the sample dilution.

3. Experiment

The raw materials of wine-making blueberries collected in this study are fresh blueberries produced in June 2019. The origins and varieties of 14 blueberry samples. After sorting, quickly

washing and draining blueberries, the blueberries are quickly frozen into frozen fruit and stored at -20 ℃.

3.1. Blueberry Wine Processing Process

Frozen blueberry fruit-Defrosting-Screw juicer-Blueberry juice-Enzymatic hydrolysis-Adjusting sugar content-Temperature-Controlled fermentation-Pressing and extracting wine-Filtering and separating-Finished wine. The actual processing picture of blueberry wine is shown in Figure 7:

Figure 7. The actual process of blueberry wine processing

Temperature controlled fermentation: Starter-Expanded culture-Activation-Strain QD-1 or Strain QD-2

3.2. Operation Points

Raw material pretreatment: Take 10 kilograms of quick-frozen wild blueberries and 10 kilograms of quick-frozen planted blueberries, remove the leaves and other debris, and then crush them with a screw juicer to obtain two kinds of blueberry juice for future use. Figure 8 shows several types of juicers on the market.

Enzymatic hydrolysis: The blueberry fruit is repeatedly washed three times to remove impurities, and after crushing, enzymes are added to the two types of blueberry juice to hydrolyze the original blueberry juice. The hydrolytic enzyme conditions of the original wild blueberry juice and the original blueberry juice are different. The optimal enzymatic hydrolysis conditions of wild blueberries were optimized through rectangular experiments.

Fermentation: Put blueberries into 500mL glass bottles, 200g each bottle, mash the tissue, and then add pectinase 40mg/L (according to GB 2760-2014 Food Additive Use Standard), and put it in a 55℃ water bath , Enzymatic hydrolysis for 60 minutes, during which time, the bottle mouth should be sealed. Weigh the weight of the blueberry juice after enzymatic hydrolysis, then put it into a centrifuge tube, centrifuge at 3000r/min for 10min, Weigh the weight of the juice and

calculate the juice rate.

Figure 8. Two commonly used juicers on the market

Squeezed wine: When the sugar content in the fermented wine is basically the same, the specific gravity is reduced, and there is almost no or no carbon dioxide release, and the taste of the wine has no obvious sweetness. At this time, the temperature of the wine begins to drop, which means that the alcohol Fermentation. Finally, use gauze to separate the blueberry residue residue from the blueberry wine, discard the blueberry residue, and call the resulting fermented wine the blueberry original wine.

3.3. Analysis of Different Varieties of Blueberries

Table 1. Blueberry content analysis

Ingredient	Frozen Wild Blueberries	Frozen Growing Blueberries
Soluble solid content	9.42%	11.21%
PH	2.43	3.08
Acid value	6.69%	5.14%
Tannin	$0.03g*100g^{-1}$	$0.031g*100g^{-1}$
Total sugar	4.78%	11.36%
Reducing sugar	5.85%	6.66%

It can be seen from Table 1 that the main components of fast-frozen wild blueberries and fast-grown blueberries are very different. The soluble content of solid frozen blueberries is 1.63% higher than that of quick-frozen wild blueberries, which indicates that the moisture content of quick-frozen wild blueberries is higher than that of blueberries. The total sugar and sugar content of quick-frozen wild blueberries is lower than that of quick-frozen blackberries, especially the total

sugar content is lower than 6.28% of quick-frozen raspberries. The total acid content of quick-frozen wild blueberries is 1.47% higher than that of quick-frozen blackberries, and the pH value is also lower than 0.69, indicating that the sourness of quick-frozen wild blackberries is much more sour, and the tannin content of the two is almost the same. The specific changes are shown in Figure 9:

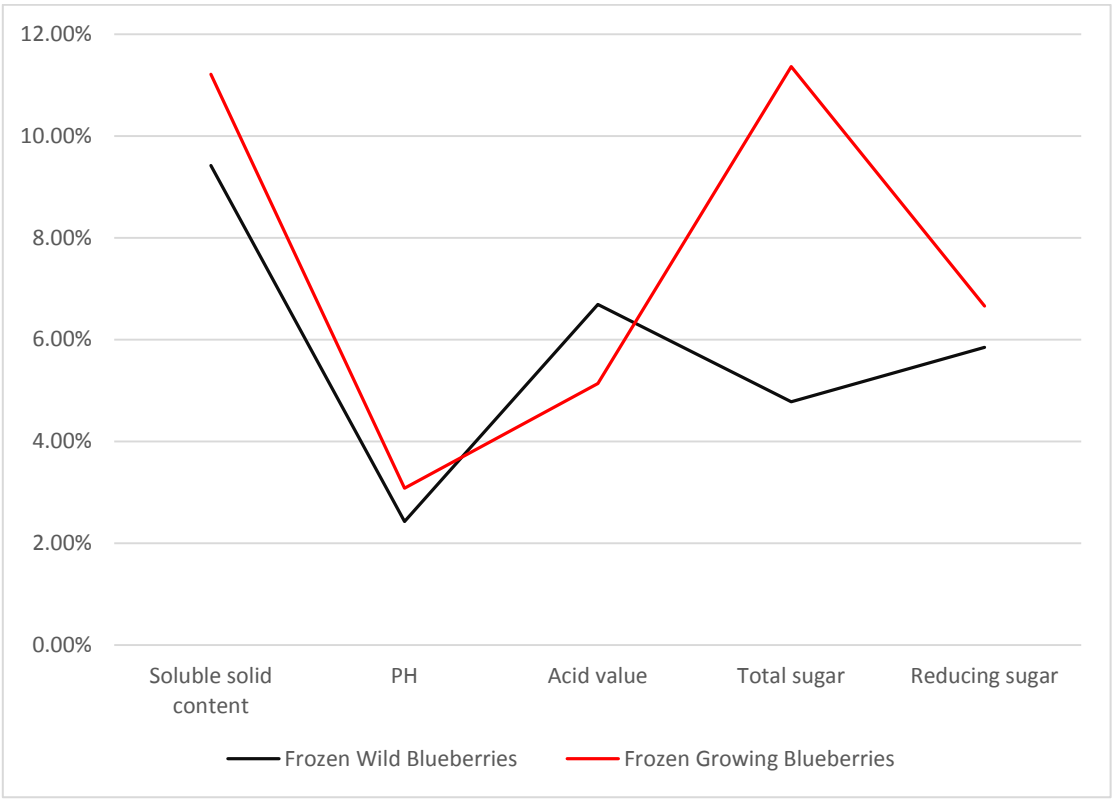

Figure 9. Analysis and changes of blueberry content

4. Functional analysis

4.1. Antioxidant Capacity

Because blueberry wine contains rich polyphenols such as anthocyanins and proanthocyanidins, it has strong antioxidant capacity and has a variety of physiologically active functions in the body. Therefore, this article discusses 6 blueberry wines of different varieties and origins. The antioxidant capacity and the content of total phenols, total flavonoids, proanthocyanidins and total anthocyanins were tested and analyzed to scientifically evaluate the antioxidant function of blueberry wine and provide a theoretical basis for further development and utilization of blueberry resources. The antioxidant capacity of 6 varieties of blueberry wine is in the range of 2247.32 $\left(\mu mol*L^{-1}\right)$-4502.41 $\left(\mu mol*L^{-1}\right)$, among which the strongest antioxidant capacity is Black Pearl and Xilai, which are $(4502.41\pm139.23)\left(\mu mol*L^{-1}\right)$和$(4472.78\pm99.62)\left(\mu mol*L^{-1}\right)$ respectively. There is no significant difference in the antioxidant capacity of wine in this study; however, the antioxidant capacity of the two blueberry wines, Black Pearl and Xilai, is significantly higher than that of the other four varieties of blueberry wine ($p<0.05$). The lowest capacity is $(2247.32\pm54.78)\left(\mu mol*L^{-1}\right)$.As shown in table 2.

Table 2. Antioxidant ability of 6 kinds of blueberry wine

Numbering	Blueberry varieties	Antioxidant capacity Trolox content / $(\mu mol * L^{-1})$
1	Anna	2769.15 ± 65.46^{b}
2	Lanfeng	3763.17 ± 218.05^{c}
3	Happy	4472.78 ± 99.62^{d}
4	Duke	2247.32 ± 54.78^{a}
5	Black Pearl	4502.41 ± 139.23^{d}
6	Brilliant	3351.54 ± 72.36^{c}

4.2. The Influence of Aging Temperature on the Functional Components of Blueberry Wine During Aging

The antioxidant power (DPPH free radical scavenging rate, FRAP antioxidant reducing power) of blueberry wine aged at different temperatures (12, 18 and 25 ℃) varies with the aging period as shown in the figure. It can be seen from the figure that the antioxidant capacity of blueberry wine shows a downward trend with the extension of aging time, and the decrease is obvious in the first 3 months, and it tends to ease from April to May; (12, 18 and 25 ℃) 3 aging temperatures, 10 ℃ Blueberry wine aged under aging has the least reduction in antioxidant capacity. Studies have found that low temperature will inhibit the production rate of O_2- and the content of H_2O_2; blueberry wine aged at 22 ℃ has the greatest reduction in antioxidant capacity, while blueberry wine aged at 16 ℃ has the most The oxidation reduction value is close to the blueberry wine aged at 10 ℃; in consideration of factors such as maximizing the protection of blueberry wine's antioxidant capacity, reducing energy consumption and the ease of aging conditions, when blueberry wine is aged for a long time, the aging temperature is preferably 18 ℃.As shown in Figure 10,11.

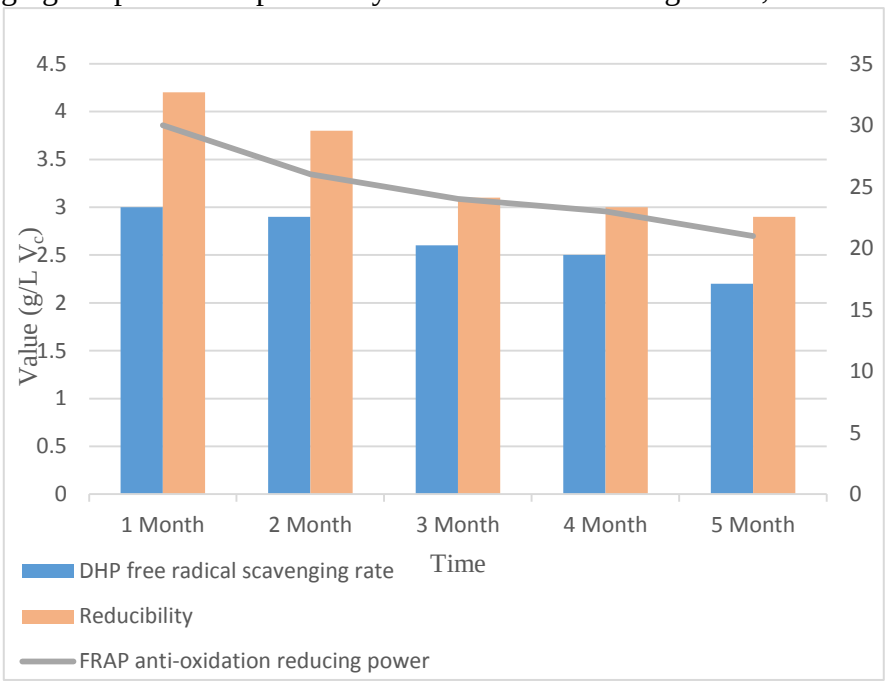

Figure 10. The change of blueberry wine's antioxidant capacity at 12 ℃

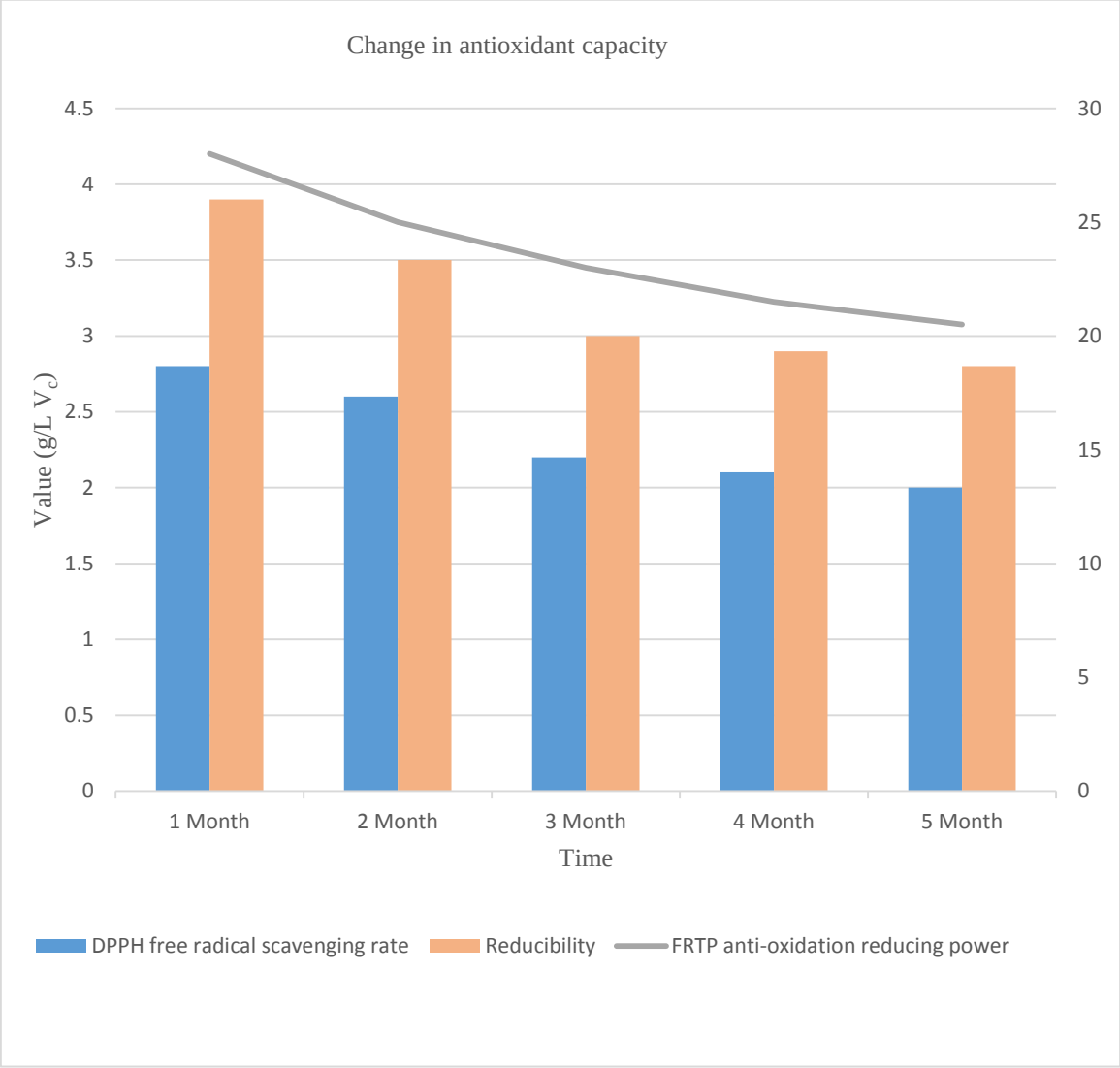

Figure 11. The change of blueberry wine's antioxidant capacity at 18 ℃

4.3. The Effect of Monochromatic Light on the Antioxidant Capacity of Blueberry Wine During Aging

The antioxidant power (reducibility) of blueberry wine under different monochromatic light (shielding, white light, red light, green light and blue light) varies with the aging period as shown in the figure. It can be seen from the figure that during the aging period, the antioxidant power of blueberry wine aged under different monochromatic light shows a downward trend. Among them, blueberry wine aged under dark light has higher antioxidant power than other blueberry wine aged under monochromatic light, blueberry wine aged under white light has the lowest antioxidant power, and blueberry wine aged under blue and green monochromatic light has the lowest antioxidant capacity. The antioxidant power is closest to the antioxidant power of blueberry wine aged in the dark. Since the commonly used wine storage bottle color for fruit wine is dark green, and the green color is consistent with the transmission characteristics of the dark color allowing partial ultraviolet transmission, dark green is preferred as the color of the glass bottle wall when the blueberry wine is bottled.As shown in Figure 12.

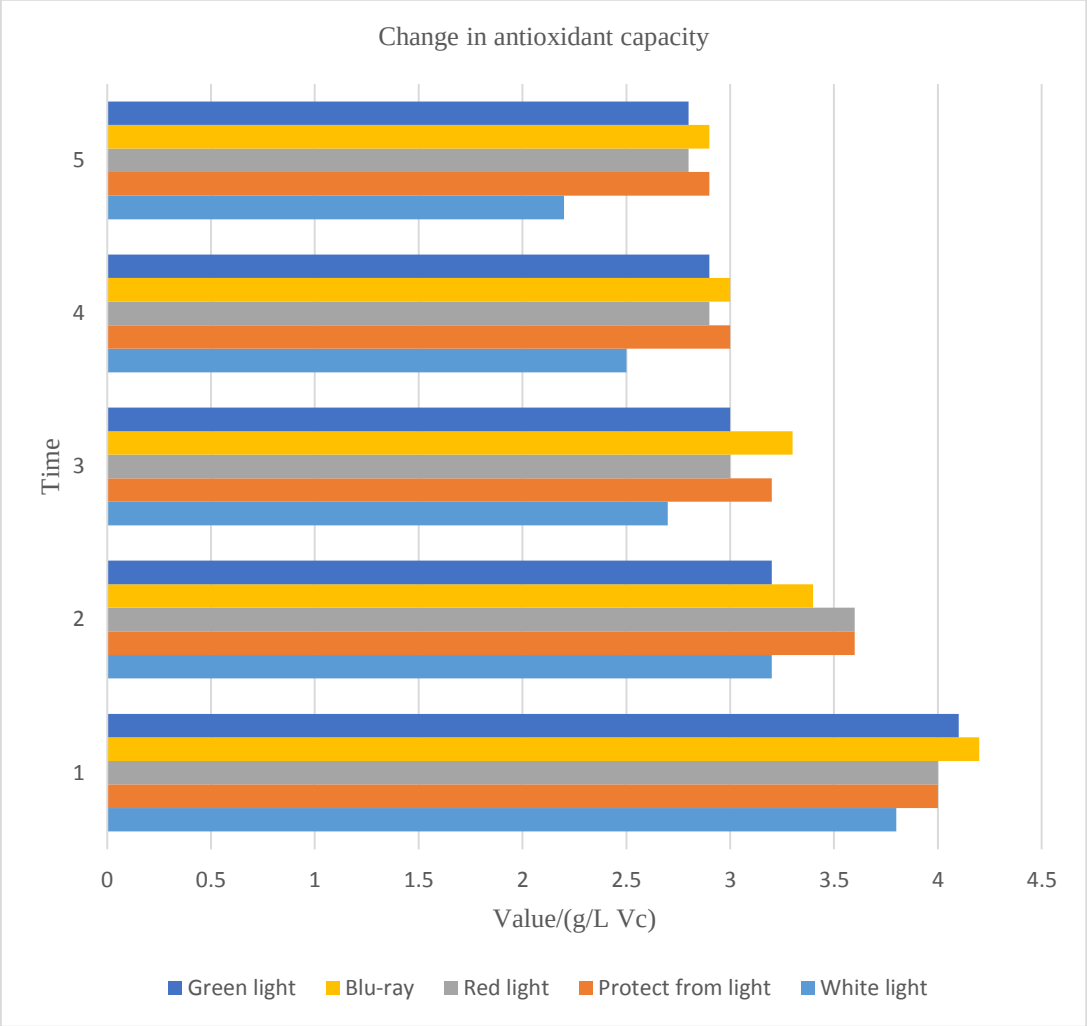

Figure 12. Changes in antioxidant capacity of blueberry wine during aging under different monochromatic light

4.4. Study on the Correlation Between Total Phenols of Blueberry Wine and Antioxidant Capacity

The correlation between total phenols of blueberry wine and antioxidant power is shown in the figure. It can be seen from the figure that the correlation coefficient between the total phenol content of blueberry wine and the reducibility is 0.9439 ($R^2 = 0.8910$, $P < 0.05$), and the correlation coefficient with the DPPH free radical scavenging rate is 0.9708 ($R^2 = 0.942$, $P < 0.05$), The correlation coefficient with FRAP antioxidant capacity is 0.9453 ($R^2 = 0.8936$, $P < 0.05$), indicating that there is a good positive correlation between the total phenol content of blueberry wine and the antioxidant capacity. The study found that the correlation coefficient between red wine total phenols and DPPH antioxidant clearance rate was 0.8727 ($R^2 = 0.7617$, $P < 0.05$); the correlation between blueberry total phenols and DPPH antioxidant clearance rate was 0.9860.As shown in Figure 13.

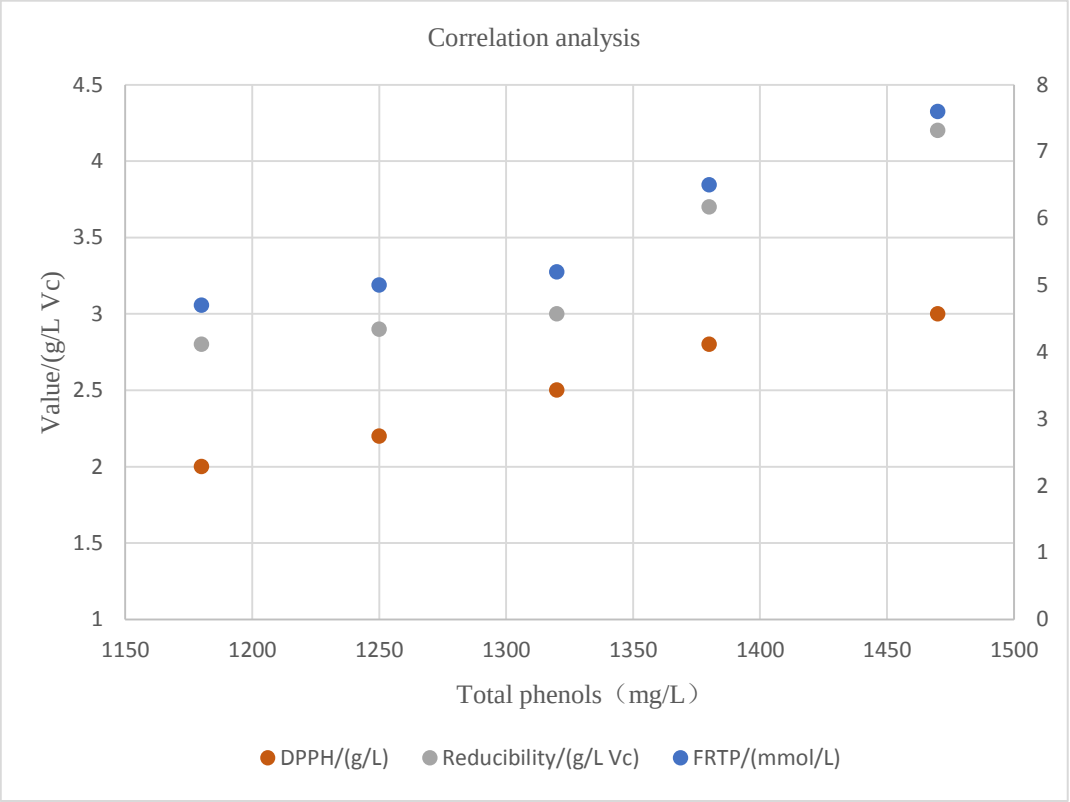

Figure 13. Correlation analysis between total phenol content and antioxidant capacity

5. Conclusion

As research progresses, in some data, berries labeled with blueberries generally seem to be effective antioxidant polyphenols, and they also have the effect of preventing cardiovascular disease. When the body is in a sub-healthy state, it can also be used for improvement and improvement. It can also be used as a medicine to disinfect, reduce inflammation and fight cancer and promote a new generation of brain nerves. As a health product, it can lower cholesterol and has a good regulatory effect on the human body's endocrine system (especially organs). By rationally regulating metabolism, it can give full play to the role of blueberries in disease resistance, and is safer and more reliable. In order to explore its anti-oxidation and anti-aging properties, this article explores its medical impact.

Through the implementation and promotion of the results of the experiment in production, it will increase the consumption of blueberries and promote the further growth of blueberry cultivation; it can also speed up business turnover and reduce production costs. To lay the foundation for making full use of blueberry resources and achieving sustainable economic growth, the development of blueberry can not only meet the needs of consumers at home and abroad, but also effectively promote domestic expansion, increase farmers' income, and increase the competition of blueberry wine in the international market. Strength has important practical significance.

In this article, blueberries were used as experimental materials to study their storage performance under low and normal temperature conditions through processing. The fermentation process of blueberry wine was optimized. Based on this, the influence of organic acids and volatile flavor substances on the fermentation of blueberry wine was studied. This change aims to explore the preservation and deep processing technology of raspberries and provide a theoretical basis for the healthy development of the blueberry industry. And through the medical influence technology to

explore its anti-aging and oxidation ability, and at the same time determine the content of its functional ingredients, the final result shows that the anti-aging and anti-oxidation ability of blueberry wine exists, and at the same time has a certain degree Anti-cancer ability.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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