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STUDY OF THE CHEMICAL COMPOSITION OF GRAPE POMACE POWDERS PRODUCED FROM CABERNET SAUVIGNON PLANTED IN THE EASTERN PART OF CHINA

Grape pomace is a secondary product of wineries; it becomes an increasingly popular food enrichment additive. It is rich in nutrients, such as dietary fiber, phenols, proteins, vitamins, minerals, grape seed oil, etc. [1]. Polyphenols are one of the most important nutrients in grape pomace. Today, wine grape pomace polyphenols are receiving more and more attention for its potential bioactivities. Grape pomace is used as an enrichment additive in the production of many food products [2].

Wine grape pomace powders can also be added to flour products as a functional food raw material due to its high nutrition and multi-activity characteristics, thereby giving food various physiological functions.

Grape variety, maturity, and growth conditions, such as soil, climate, rainfall, and planting techniques are important factors affecting the composition and content of grape pomace [3].

This study aims to analyze the nutritional contents of wine grape pomace powders produced from Cabernet Sauvignon planted in the eastern part of China.

Fresh grapes were obtained from Huailai city (2019, Hebei, China). Fresh grapes were fermented for seven days, squeezed and washed 4-5 times, the grape skins and grape seeds were separated manually. The fresh grape seeds, grape skin and grape pomace (contains seeds and skin) were dehydrated. The dried samples were grinded using a laboratory-scale pulverizer.

The objects of study were: grape seeds powder (GSP), grape skin powder (GSKP) and grape pomace powder (GPP).

The content of moisture, ash, protein and lipid were tested by the AACCI approved methods 44–15, 08–01, 46–11, 30–10 (AACC International 2000). The total sugar content was determined using a direct titration method. Total dietary fiber, insoluble dietary fiber and soluble dietary fiber were measured by the enzymatic-gravimetric method (AOAC Official Method 991.43, 2000). Mineral elements were tested using inductively coupled plasma atomic emission spectrometry (ICP, Optima 2100DV, PE Co., USA). The content of tannins was determined using Sodium tungstate-Phosphomolybdic acid colorimetric analysis, the content of total polyphenols and proanthocyanidins were measured respectively by Folin & Ciocalteu's phenol reagent and molysite catalytic colorimetry. The content of total flavonoids was determined using aluminum nitrate-sodium nitrite method. The polyphenol composition was analyzed by HPLC-MS/MS.

All experiments were conducted trice, and the results were expressed via ±SD, SPSS version 17.0 software (SPSS Inc, Chicago, IL, USA) was used for statistical evaluations. The Dunnett's T3 with value of 0.05 was applied for multiple comparisons, and when $p < 0.05$, the difference was considered to be significant.

The results of measuring of moisture, ash, protein and crude fat content in powders are shown in Table 1.

Table 1 – Chemical composition contents of grape pomace powders

Component	GSP (%，DW)	GSKP (%，DW)	GPP (%，DW)
Moisture	3.69±0.21	4.51±0.18	5.86±0.25
Crude protein	8.75±0.03	16.31±0.02	13.62±0.01
Crude fat	20.92±0.06	10.66±0.10	17.46±0.04
Ash	2.98±0.11	3.95±0.05	6.02±0.14
Total carbohydrate	57.04±0.48	50.25±0.55	51.66±0.71
Total dietary fiber	29.53±0.29	19.38±0.33	24.20±0.28

The results showed that the grape skin powder contains the largest amount of protein (16.31%) and smallest amount of fat (10.66%) total dietary fiber (19.38%). The grape seeds powder contains smallest amount of protein – 8.75%, but largest amount of total dietary fiber (29.53%), ash (2.98%) and fat (20.92%). Grape pomace powder has intermediate indicators.

Analysis of mineral composition of grape pomace powders shows that the content of K is the highest in GPP powder, followed by the content of Ca, Mg, and Na, and the content of other mineral elements such as Fe, Cu, Zn, Mn, and Se is less.

A study of the polyphenolic composition of powders from grape pomace showed that grape pomace powder is rich with phenols. The content of flavonols (quercetin, morin, myricetin, etc.) and benzoic acid (vanillic acid, syringic acid, gallic acid, etc.) polyphenols in grape skin powder is the highest, followed by flavanol-3-ol polyphenols (catechin, epicatechin, epicatechin gallate, epigallocatechin gallate). The prevalent non-anthocyanin polyphenols in grape seeds powder are flavan-3-ol polyphenols, which occupy about 80% of the total in GSP. Grape seeds powder also contains only trace amount of cinnamic acid, which is very close to existing reports.

However, the content of quercetin in GSP is much less and isoquercitrin is much higher than reported in the literature. This is because the composition of polyphenols in grape pomace depends on many factors such as grape variety, geographical environment, climate, maturity, fermentation time, etc.

Thus, grape pomace powders produced from Cabernet Sauvignon planted in the eastern part of China can be considered as valuable secondary food raw materials, including for the production of flour products. They contain a large amount of protein, fat, carbohydrates, dietary fiber, minerals and polyphenols.

A study of the polyphenolic composition of powders from grape pomace allowed to establish the presence of polyphenol compounds that, according to the literary data, have essential antioxidant properties. The obtained results testify to the good prospects of using powders as a source of natural antioxidants in food products. These data are necessary for estimating a food value of products that powders may be used as a recipe component in.

References

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