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The study of antioxidant compounds in grape seeds

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Abstract



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This paper uses spectrometric as well as chromatographic techniques to investigate the antioxidant properties of extracts from vine seeds (*Vitis vinifera* L.). For the study, ten vine varieties from the years 2015, 2016, along with 2017 were chosen. Four essentially distinct spectrophotometric methods were used to measure the antioxidant activity, whereas the Folin-Ciocalteu procedures were used to determine the level of total polyphenolic compounds. The composition of fourteen antioxidants was investigated in 2015. The study's findings indicate that grape seeds have a high level of antioxidant components, with variations in content between types and years. Grape seed extracts have potential applications in nutraceuticals, health supplements, as well as food product preservation.

Keywords:

Grape seeds,
Antioxidant activity,
Poly phenolic compounds

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INTRODUCTION

While wine is a significant source of phenolic compounds, numerous research have examined

the polyphenol content of grapevine debris such grape seeds or stems as well as wine and alcohol. Polyphenolic compounds (20–55%) found in wine seeds are useful mostly in the making of red wines. Phenolic compounds are characterised as molecules that have an aromatic nucleus (benzene ring) and a hydroxyl function group (-OH) immediately linked [1]. Berries include both flavonoids and non-flavonoids as phenolic chemicals. Berries and wine contain non-flavonoid phenols. Two hydroxylated benzene rings, A and B, are connected by a tricarbon chain that is a component of the heterocyclic ring C in these C6-C3-C6 polyphenolic compounds [2]. These molecules fall into three structural classes: flavonols, flavan-3-ols, and anthocyanins,

depending on the oxidation state of ring C. Grape marc makes up the majority of the solid waste produced by the wine industry, which accounts for around 30% of the overall weight [3].

The marc contains the majority of the beneficial ingredients, which include phenolic compounds, seed oil, anthocyanins, as well as nutritional fibre. Because they are strong antioxidants, phenolic compounds have considerable promise for improving health and preventing a number of diseases and ailments, including cancer, diabetes, heart disease, and neurological disorders. Since antioxidants are a broad category of compounds with varying modes of action, determining them might involve complicated methods as well as opportunities [4].

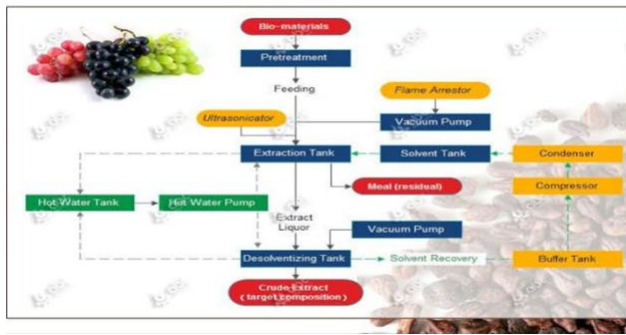


Figure 1: Grape Wine Varieties

Anti Oxidant Activity 1

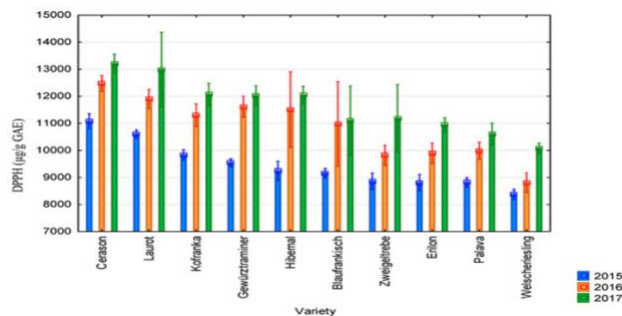


Figure 2: Antioxidant Activity Determination Using DPPH, FRAP, ABTS, as well as CHFR Methods

For this reason, the study's objective was to use chromatography as well as various spectrometric techniques to more thoroughly ascertain the polyphenol and antioxidant profiles of particular grape wine varieties. The comparison of interspecific variations with popular grape wine varieties over a three-year period is what makes this study novel [5].

The results of antioxidant activity and polyphenolic component composition for 10 different wine varieties from 2015 to 2017 are displayed in the graphs above. These represent the three measures' average values. Using the DPPH technique, the average antioxidant activity was 9432 µg/g GAE in 2015, 10,828 µg/g GAE in 2016, and 11,624 µg/g GAE in 2017 [6]. In all monitored years, the Cerason variety recorded the highest values of antioxidant activity (11,079 µg/g GAE in 2015; 12,473 µg/g GAE in 2016; and 13,208 µg/g GAE in 2017) as determined by the DPPH technique [7]. In contrast, the Riesling variety had the lowest values across all monitored years (8374 µg/g GAE in 2015; 8805 µg/g GAE in 2016; and 10,081 µg/g GAE in 2017). Additionally, the year 2017 had the greatest antioxidant activity values, while the year 2015 had the lowest. Compared to seeds from white varieties, blue varieties' seeds displayed better values [8].

Antioxidant Activity 2

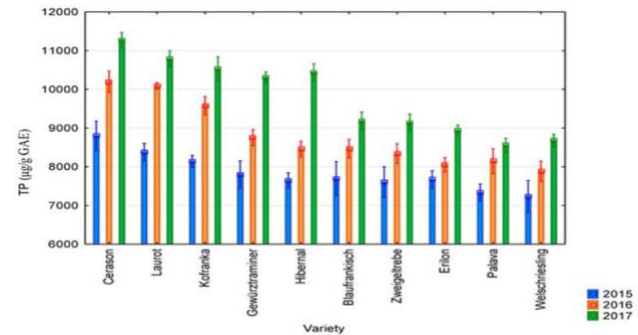


Figure 3: Determining the Concentration of Total Polyphenol

The average concentration of total polyphenolic compounds was 7831 µg/g GAE in 2015 and 8796 µg/g GAE in 2016. Moreover, in 2017 it was 9782 µg/g GAE. In all the years that were observed, the Cerason variety had the highest values of total polyphenolic compound content (GAE levels were 8799 µg/g in 2015, 10,196 µg/g in 2016, and 11,272 µg/g in 2017) [9]. In 2015, the Welschriesling variety had the lowest GAE value of 7236 µg/g, the Riesling variety had the lowest GAE value of 7882 µg/g, while in 2017, the Palava variety had the lowest GAE value of 8558 µg/g [10]. The year 2017 saw the highest levels of total polyphenolic compound content, while 2015 saw the lowest levels. Compared to seeds from white varieties, blue variety seeds displayed better values. Each sample underwent triplicate analysis,

and the average of these data yielded the final result. Following a thorough shaking of the mixture, 300 μL of a 20% Na_2CO_3 decahydrate solution were added after three minutes. For 120 minutes, the reaction mixture was mixed and incubated at 22°C. Following this, a blank was used to measure the absorbance at $\lambda = 750 \text{ nm}$ using the SPECORD 210, Carl-Zeiss, Jena, Germany. Gallic acid equivalent was used to express the results [11].

Sample Preparation

The *Vitis vinifera* L. seeds were separated from the pulp using a separation machine, as well as subsequently washed, dried, and crushed. [12] After the seeds were separated, any empty ones were eliminated by washing them. After the seeds were cleaned, they were dried for 12 hours at 50°C in an oven, and then they were ground in a coffee grinder (BOSCH MKM6003). The ground seeds were extracted in 75 percent ethanol for 120 hours, using a weight-to-ethanol ratio of one part ground seeds to ten parts ethanol (w/w). Following that, the extract was placed in 2 mL microtubes (Eppendorf, Hamburg, Germany) and centrifuged (MiniSpin Centrifuge, Eppendorf, Hamburg, Germany).

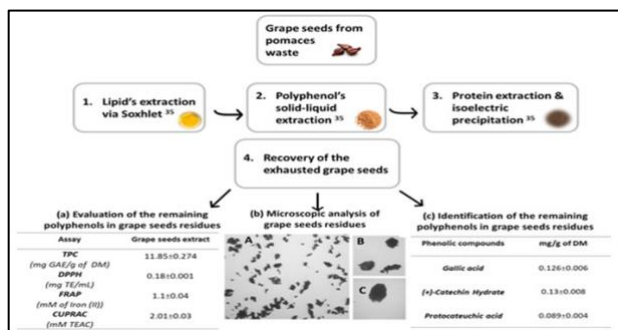


Figure 4: Grape Seeds From Pomaces Waste

After the sample was centrifuged, the supernatant was sorted into a different microtube and ready for spectrometric along with chromatographic analysis.

CONCLUSION

Grape seeds are high in antioxidants. Many scientific investigations have shown that they have antioxidant properties, which supports this idea. Grapevine seeds had an average antioxidant activity of 10,628 $\mu\text{g/g}$ GAE, as measured by the DPPH technique. The FRAP method yielded 13,583 $\mu\text{g/g}$ GAE, while the ABTS and FR methods

yielded 4972 and 2574 $\mu\text{g/g}$ GAE, respectively. The average amount of total polyphenolic compounds was 8803 $\mu\text{g/g}$ GAE. The Cerason variety achieved the highest antioxidant activity levels, while the Riesling variety had the lowest. In 2017, the highest levels of antioxidant activity as well as total polyphenolic compound content were achieved. The year 2015 saw the lowest readings. Values were higher in blue variety seeds than in white variety seeds. The amount of 14 phenolic compounds, including rutin, trans-piceid, trans-piceatannol, caffeic acid, quercetin-3- β -D-glucoside, myricetin, epicatechin, coumaric acid, coutaric acid, ferulic acid, and fertaric acid, was determined using HPLC/UV-VIS. With an average amount of 225.4 $\mu\text{g/g}$ across all kinds under observation, gallic acid was the most prevalent component. It was lowest in the Palava variety (160 $\mu\text{g/g}$) and highest in the Cerason variety (298 $\mu\text{g/g}$). Trans-piceatannol, on the other hand, was the least represented chemical, with an average level of 0.326 $\mu\text{g/g}$. It was highest in the Kofranka variety (0.51 $\mu\text{g/g}$); the Palava variety had the lowest concentration (0.22 $\mu\text{g/g}$). The results of this investigation provide valuable insight into the waste material's future economic and nutraceutical uses. These findings, among other things, offer helpful data that could be applied in the many food industry sectors.

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Conflict of Interest

The authors declare no conflict of interest, financial or otherwise.

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