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ANTIOXIDANT ACTIVITY IN FIVE GRAPE CULTIVARS

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ABSTRACT

Pulp extracts from five grape cultivars (Black Globe, Black Magic, Muscat Hamburg, Muscat Ottonel, Red Globe) locally grown in Buzău county were evaluated for antioxidant activity by using the DPPH method.
Muscat Hamburg (63.94 %) had the highest average radical scavenging percentage, while Muscat Ottonel (22.99 %) had the lowest one. In terms of IC50, this equates to 26.07 mg/mL for Muscat Hamburg and 72.49 mg/mL for Muscat Hamburg.
Results are comparable to data on other known grape cultivars. According to known classifications, Black Magic, Muscat Hamburg and Red Globe extracts can be considered as very strongly antioxidant, while Black Globe and Muscat Ottonel were strongly antioxidant.

INTRODUCTION

Viticulture is one of the main agricultural fields in Romania. In 2020, 177,387 vineyards were functioning across the country, with a total annual production of 938,244 tons of grapes.

While the major purpose of grapevine cultivation for most Romanian producers is winemaking (with over 94 % of the national production), there is also a significant share of table grapes (Dracea 2021).

Grapes are one of the most popular fruits worldwide. They are mostly used for fresh consumption, but also for producing a wide variety of derivate products, including as jams, beverages etc. (Cichi et al. 2019).

Grape consumption is beneficial not only due to taste, but also to the presence of various biochemical compounds, many having strong antioxidant properties. The various classes of phenolic compounds, carotenoids, terpenoids, ascorbic acid etc. limit the damaging action of reactive chemical species, helping fight various cardiovascular, kidney and liver diseases, hyperglycemia, diabetes, anemia, thrombosis, hyperacidity, neurodegeneration etc.

Such compounds include flavonoids (among these, anthocyanins, pigments found in red and black varieties), phenolic acids, tannins (mostly found in berry peel and seeds) and the well-known anti-aging compound resveratrol (Xia et al. 2010).

The purpose of this paper was to assess the antioxidant activity in extracts from five grape cultivars commonly grown in Southeastern Romania.

MATERIAL AND METHODS

Fresh grapes. were collected from local vineyards in Pietroasele area, Buzău County, Southeastern Romania. Grape clusters were kept frozen at -5°C prior to laboratory analysis.

Black Globe is a black table grape variety, developed in Argentina as a hybrid of Red Globe and Fantasy cultivars. Fruits are large, obovate, black, sweet, mildly flavored. It is used for fresh consumption and sometimes winemaking (Owens 2008, Röckel et al. 2026).

Black Magic (Codreanca) is a Vitis interspecipic crossing developed in the Republic of Moldova from Moldova and Marshalskii cultivars. Widely grown in Southeastern Europe and the Middle East, Black Magic is a very early variety, medium to large, elongated, blue-black, with rather neutral flavor. Mostly a table grape variety, it is sometimes used in winemaking (Godoroja et al. 2020, Röckel et al. 2026).

Muscat Hamburg (Black Muscat, or Muskat Trollinger) was developed in the United Kingdom, as a hybrid of Schiava Grossa and Muscat of Alexandria. Medium-ripening, with medium-sized, violet-blue, elliptical, seeded, Muscat Hamburg is known as resistant to grey rot, though somewhat sensitive to other diseases and drought. It is mostly used as a low-sugar dessert grape (Korounoska et al. 2022, (Röckel et al. 2026).

Muscat Ottonel is one of the most widely grown cultivars worldwide. Developed in France, as a hybrid of Muscat D'Eisenstadt and Chasselas, it has large, round, seeded, greenish-yellow, sweet and aromatic grapes. Used for fresh consumption and sweet, fruited wines, Muscat Ottonel is among the most popular cultivars in Romania. (Călin et al. 2019, Röckel et al. 2026).

Red Globe is a table variety developed in the USA, as a hybrid of L 12-80 and S 45-48 cultivars. It has large, violet-red-pinkish skin, spheric-ellipsoidal, juicy, seeded berries, with a medium-late ripening period. This cultivare is known to possess a good transport and storage capacity, while also being highly productive. However, it is also sensitive to desiccation, and diseases (Chironi et al. 2017, Röckel et al. 2026).

Berries were separated from their clusters and seeds and subsequently manually homogenized at room temperature in order to obtain a juice. The juice was diluted in 70 % ethanol solution, at a final concentration of 10 % fresh grape tissue per extract.

Three samples from each cultivar were processes and triplicate analysis was performed for each sample.

Antioxidant activity of these extracts was determined through the DPPH method. After 10-fold dilution, 0.1 mL aliquotes were incubated for 60 minutes (with 2.9 mL 2,2-diphenyl-1-picrylhydrazyl (DPPH; incubation ocurred in the dark). Spectrophotometric absorbance was read at 517 nm using a Cecil 2021 spectrophotometer.

A calibration curve was made by using gallic acid. Results were expressed as percentages of DPPH radical scavenging (Brand-Williams et al. 1995). IC50 was derived by linear regression.

RESULTS AND DISCUSSIONS

The percentual radical scavenging activity of grape pulp extracts is shown in Figure 1. Table 1 shows the average half maximal inhibitory concentrations (IC50) of extracts from the five grape varieties against free radicals.

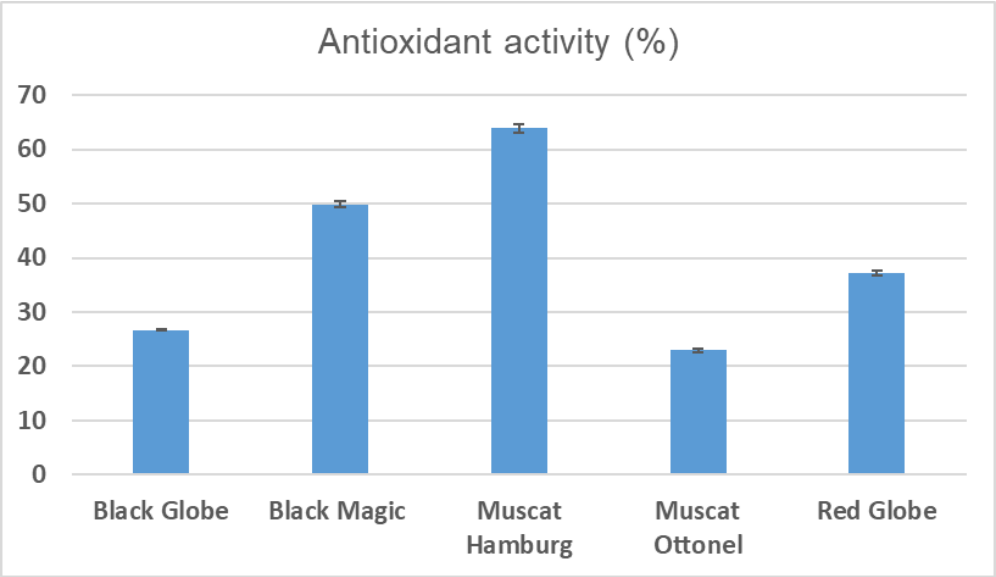


Figure 1. Radical scavenging activity in 10 % ethanolic extracts of selected grape cultivars (%).

Table 1.
Average IC50 in 10% ethanolic extracts of selected grape cultivars against free radicals (mg/mL)

Cultivar	Black Globe	Black Magic	Muscat Hamburg	Muscat Ottonel	Red Globe
IC50 (mg/mL)	62.38	33.42	26.07	72.49	44.87

Results show that antioxidant activity varied from 22.99 % (Muscat Ottonel) to 63.94 % Muscat Hamburg). Black Magic and Red Globe also had high high radical scavenging percentages, of 49.87 %. Considering the IC50, the lowest value, for 10 % Muscat Hamburg extracts it was 26.07 mg/mL.

These values are comparable to other data found in literature. Grapes are known to possess noteworthy, though variable antioxidant capacities.

A study on a Taiwanese *Vitis labrusca* cultivar, for instance, has found up to 57.78 % inhibition percentage in 10 % pulp extracts and IC50 close to 200 mg/mL (Sridhar & Charles 2019).

38.29-50.23 % DPPH inhibition was found in 4 % extracts of four Indian cultivars (Bhat et al. 2025). 28.67-44.67 % were found in 5 % extracts of other four cultivars (with 38.67 % in Red Globe) grown in India (Singha & Das 2015). 40-80 % were found in 20 Korean cultivar extracts (unspecified concentration; Nile et al. 2013).

A study on seven Romanian cultivars found IC50 values of 20.59-44.04 mg/mL in 28.5 % extracts (Luchian et al. 2019). Generally, red and black varieties have higher antioxidant potential than green ones and grape peel higher than pulp.

A useful direction of interpretation is relating antioxidant activity with the concentrations of various phytochemicals, which are available for the five cultivars. Unpublished data show a correlation to total phenolic compounds, flavonoid and phenolic acid levels, also with a maximum in Muscat Hamburg.

Three are the main classes of antioxidant compounds found in fruits.

Phenolic compounds are known as the most potent of antioxidants. This is an extremely variate group of bioactive compounds, serving as plant pigments, but also as antimicrobials and antifungals.

The main subclasses of phenols are flavonoids (including, among others, catechins and anthocyanins), phenolic acids, tannins and stilbenes (resveratrol being the most important), all known to possess important free radical scavenging properties (Kivrak & Kivrak 2014, Zymonė et al. 2018).

Besides phenols, carotenoids are another key class of antioxidants found in all fruits (both peel and pulp), that include carotenes, lutein, lycopene and xanthins. Although usually found in lower amounts than phenolic compounds, they are known to have a noteworthy contribution to the overall antioxidant potential, with various health-promoting applications (antiproliferative, anticarcinogenic; Eldahshan & Singab 2013).

Finally, like all fruits, grapes contain some amounts of ascorbic acid (vitamin C), which is one of the key antioxidant compounds, common to all organism and effective in countering lipid oxidation at cell level (Riscahyani et al. 2019)

Generally, any extract with IC50 below 50 mg/mL can be classified as very strongly antioxidant (the case of Black Magic, Muscat Hamburg and Red Globe) and as strongly antioxidant at 50-100 mg/mL (Black Globe and Muscat Ottonel; Sinay et al. 2022).

It should be noted that, while cultivar is known to be the most important factor in determining antioxidant properties of grapes, geographical setting, soil properties, climate conditions and phytotechnical practices also have significant impacts on this parameter (Stroe et al. 2026).

CONCLUSIONS

Among the five cultivars, Muscat Hamburg had the highest average radical scavenging percentage (63.94 %, 26.07 mg/mL IC50), while Muscat Ottonel had the lowest one (22.99 %, 26.07 mg/mL IC50).

Results are comparable to data on other known grape cultivars.

According to known classifications, Black Magic, Muscat Hamburg and Red Globe extracts can be considered as very strongly antioxidant, while Black Globe and Muscat Ottonel were strongly antioxidant.

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