Rosaceae rubus rosifolius smith: nutritional, bioactive and antioxidant potential of unconventional fruit

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ABSTRACT

Rubus is an economically important fruit, highly valued for its taste and medicinal properties. It is estimated that there are between 400 and 700 species, but many of them are still unknown to the general population. There is little information in the literature about the physicochemical and bioactive composition, as well as the antioxidant activity of these fruits, which is why this research was carried out. The fruits showed lipids (7.42%), ash (0.27%), dietary protein (11.54%), fiber (23.72%), carbohydrates (59.18%), low acidity, and good Brix. Regarding bioactive compounds, good concentrations of phenolic compounds (289.4 (mg g\textsuperscript{-1} EAG), flavonoids (155 mg100g\textsuperscript{-1}), anthocyanins (120.11 mg cyanidin-3-glucoside 100 g\textsuperscript{-1}), and phytoene (517.3 mg100g\textsuperscript{-1}) were found. The wild strawberry showed good antioxidant capacity, which was confirmed by different analytical methods. Because of the results of this research, it is concluded that this fruit has nutritional and phytochemical potential that should be included in the human diet, and its consumption should therefore be encouraged.

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1. Introduction

Blackberry belongs to the rose family (*Rosaceae*), genus *Rubus*, and forma diverse and widespread group for which there are an estimated 400–700 species known as berries, the term of which has been commonly used to describe any small fruit with a sweet taste and round shape (Judd et al. 2016).

Fruits play an important role in human health as they are a source of essential nutrients and phytochemicals that help reduce or prevent disease (Cömert et al. 2020). *Rosaceae* is a plant with pharmacological potential, traditionally used to treat diarrhea, and gastric diseases, as well as analgesic, antimicrobial, antihypertensive, and other pharmacological properties (Quadros et al. 2020).

*R. Rubus rosifolius* Smith, popularly known as blackberry, redberry or wild strawberry, is a shrub plant found on several continents and in Brazil, especially in the south and southeast of the country. The genus *Rubus* belongs to the berry plants, which are small, soft, mostly edible, colorful and have a high nutritional content. The blackberry has a thin, round skin that ranges in color from purple to dark red (Campbell et al. 2017). Blackberry is a wild plant, and although its composition contains several bioactive compounds, it has not been the subject of relevant studies and its potential for application has not yet been exploited.

There are a variety of *Rubus* species, many of which have unknown compositions, such as *R. Rubus rosifolius* Smith, leaving a gap in the literature, and for this reason this area has attracted our attention to better investigate the bioactivity and its chemical components. With this in mind, this research aimed to perform the physical-chemical characterization of the fruits, and to evaluate the bioactive composition and antioxidant potential of *R. Rubus rosifolius* Smith from the southern region of Brazil (Figure 1).

2. Results and discussion

The wild strawberry had high moisture content, low lipids and ash content, medium protein content and high fiber and carbohydrates content (Table 1). The fruit had an average TSS/TA ratio of 17.30, which was due to the high soluble solids content in the blackberry (12.70°Brix), indicating that the fruit had a sweet taste. As for the

![Map of Rio Grande do Sul indicating the place where the samples were collected.](image)
dimensions, the fruit is small and tends to have a reddish color. The coloration of these products can be used as an indicator of the quality and even defects of the products. In addition, a colorful diet is recommended to obtain micro and macro nutrients (Cömert et al. 2020).

Anthocyanins, flavonoids, phenols, and carotenoids are the phytochemicals normally found in berries that are known to possess anticancer, anti-inflammatory, antioxidant, antimutagenic, neurodegenerative, antihypertensive and other bioactive properties (Nile and Park 2014). It is well known that the nutritional value and bioactive potential of plants are determined by the production and accumulation of primary and secondary metabolites, which may differ among plants of the same species due to different environmental conditions (Sampaio et al. 2016). Therefore, the occurrence of anthocyanins (120.11 mg of cyanidin-3-glucoside.100 g ⁻¹), flavonoids (155.01 mg 100 g⁻¹), total phenolics (289.04 mg. g⁻¹ EAG) and individual carotenoids in the *Rubus rosaefolius Sm* was investigated (Table 2).

Phytoene, a precursor of carotenoids, was the prominent compound in the analysis with 517.3 mg.100g⁻¹ of fruit, followed by lutein (8.6 mg.100g⁻¹), zeaxanthin (7.3 mg.100g⁻¹) and finally lycopene (6.6 mg.100g⁻¹).
It should be considered that the differences in the content of chemical and bio-active compounds may vary depending on the place where the fruits are grown, due to the different intensity of solar radiation and thermal amplitude, which affect their organoleptic properties (Otero et al. 2020b).

Fruit antioxidant capacity is thought to correlate with presented color (Cömert et al. 2020) and can be measured by different methods (Otero et al. 2020a). The wild strawberry showed a high percentage of inhibition (99.02% ± 0.1%) by DPPH and intermediate antioxidant capacity by FRAP (224.5 ± 59.3 mmol Trolox g⁻¹). This indicates a good antioxidant capacity for wild strawberries, regardless of the method used for the determination. Although the antioxidant capacity than blueberries, wild strawberries is lower than that of blueberries, it exceeds that of fruits such as pitaya and peeled pineapple.

3. Conclusion
The properties of wild strawberries, such as the high content of phenolic compounds, the considerable content of carotenoids and the good antioxidant activity, show the importance of promoting their commercialization and introduction into the diet of the population. In addition, its physical-chemical composition is similar to that of other blackberry varieties, which is why this unconventional food crop is considered to have great potential for fresh consumption and for technological processing. The nutritional composition of this fruit shows that the wild strawberry can help reduce food insecurity so their consumption should be encouraged.

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