Physicochemical characterization of agro-industrial waste from 'BRS Magna' grape cultivar

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1. Introduction

The food industry produces large amounts of waste per year. Some of these by-products are used to feed animals and as fertilizer, however, this material is composed of biodegradable and organic substances that can generate environmental problems, since most do not have an adequate treatment for decomposition or disposal [1, 2]. In this context, the wineries stand out as one of the main producers of agro-industrial waste, due to its processing characteristics [3].
In 2011 grape production in Brazil was 1,463,481 tons, where only 52.13% was used for the preparation of wines, juices and other products, while the rest was discarded as waste [4]. The bagasse of the grape represents 30% of the by-product, while peels represent 58%, stem 20% and seeds represent 22% [5, 6, 7]. The destination given to these agro-industrial wastes can cause economic losses in the productivity chain, since they are rich in phenolics, tannins, flavonoids, among others.
These compounds have a high commercial value and could be used in different industries such as; pharmaceutical, chemical and food primarily for the manufacture of more natural products, thus contributing to the replacement of some synthetic antioxidants, in addition to the reduction in pollution caused to the environment [8, 9, 10]. The water content of the grape by-product can vary from 55 to 72%, which is considered as highly perishable, therefore the drying process is an alternative to reduce moisture, potentiating the shelf-life and integral use of these residues, creating great economic benefits [1, 9].
Another factor to be considered is that grape bagasse is a significant source of dietary fibers, some authors have investigated the use of these in the production of flours and powders [11]. In the period from 2008 to 2011, the production of grape juices in Brazil had an increase of 32%, with the purpose of enhancing the competitiveness and sustainability of the wine sector, with creation of grape crops through genetic improvements [12].
The "BRS Magna" is a grape mainly used for juices, whose characteristic is a broad climatic adaptation and harvest cycle in two seasons during the year in tropical regions, in addition to its specific color, sweetness and flavor [13].
The objective of this work was to characterize the agro-industrial residue of the “BRS Magna” grape in order to evaluate its industrial potential.

Materials and Methods

The samples of agro-industrial residues of the ´BRS Magna´ grapes were donated by EMBRAPA (Brazilian Company of Agricultural Research). These were pressed and dried in an oven at 40 ° C for 24 hours, then ground, in a grain grinder, subsequently stored in an ultra-freezer at -80 ° C and then analyzed.
According to AOAC [14], physicochemical assays were performed such as: Moisture, water activity, ashes, fibers and reducing sugars. A conversion factor of 6.25 was used to determine the total protein for the Kjeldahl method. Total lipid extraction was carried out according to Bligh & Dyer [15].
All these assays were performed in triplicate and the results shown as means with standard deviation.

Results and Discussion

The grape residue presented a moisture of 10.28% in accordance with Table 1. Bampi et al. (2010) [16] found in Japanese grape flour a value of 19.08% of moisture, it is estimated that it may be due to several factors such as: crops, storage conditions and technological processing.

Table 1. The results found in the proximate composition of agro-industrial residues of the ‘BRS Magna’ grape.

Analysis	Results (%)
Moisture	10.28 ± 0.01
Ashes	3.27 ± 0.03
Total Proteins	7.67 ± 0.04
Carbohydrates	74.24 ± 0.02
Lipids	4.54 ± 0.02

Triplicate analysis. Mean test and standard deviation.

The amount of ashes found in “BRS Magna” grapes was 3.27%, higher than that discovered by Mota et al. [17] that found values up to 2.17%. It is intuited that it may be due to the processing of the grape and consequently to the origin of the residue. Araujo [18] emphasizes that grape flour has a high fiber content, reaffirming the results found in the present study.
According to Table 1, the 'BRS Magna' grape residue presented 7.67% of total protein and 4.54% of lipids. According to Ishimoto et al. [19], in a study with grape bagasse, even after pressing, 13.6% of protein and 8.9% of lipids were found, higher values than the residue analyzed. It is believed that the result obtained in both by-products could be due to the presence of grape seeds, since these are constituted by high values of these compounds.
While the values found in carbohydrates are 74.24% as expressed in (Table 1), other authors [20] found lower values, not corroborating with those found in the present study. This could have happened because the 'BRS Magna' residue is made up of bagasse, stem, husks, and seeds.
The results presented in Table 2 show that the residues showed a fiber value of 9.52%, 13.34% of reducing sugars and 0.457 of water activity for the. Rockenbach et al. [21] found for grapes seeds a value of 40% of fibers and Ishimoto et al. [19] found 64.1% of fiber for grape bagasse.

Table 2. Results obtained from the analysis of total phenolic compounds, fibers, reducing sugars and water activity.

Analysis	Results %
Fibers	9,502 ± 0,005
Reducing Sugars	13,34 ± 0,023
Water Activity (aW)	0,457 ± 0,01

Triplicate analysis. Mean and standard deviation test. .

The reducing sugars had a value of 13.34 g. 100g-1, similar to those found for husks and grape pulps by Souza et al. [23]. The water activity of the 'BRS Magna´ grape showed low values, thus indicating that its high stability potential could be due to the occurrence of the treatment carried out in the by-product.

Conclusion

It can be concluded that the composition of the 'BRS Magna' grape residue compared to other studies showed significant results, with high protein, lipid, carbohydrates, water activity and reducing sugars content. This shows that the use of agro-industrial wastes can be useful to produce high quality products. It is important to highlight that certain parameters such as the origin and the technological processes applied for obtaining, interfere with the result of their chemical composition. Suggesting that new research could contribute positively to the use of the different bioactive compounds present in this residue.

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