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EXTRACTION OF SWEETENING SUBSTANCES FROM IRIS GERMANICA WHITE AND ANTIOXIDANT EFFECTS

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ABSTRACT. The experimental research aimed to extract some sweeteners from Iris Germanica White and establish the sweetening power of the extracts obtained. The extraction was done in water and alcohol, then the extracts were obtained in powder form. The soluble dry matter was determined, as well as the level of antioxidants. As a result of the experiment, 6 liquid and solid extracts were obtained with a significant sweetening power, with a glucose level ranging between 23-40 mg/100 g glucose and 23-42.7 mg/100 g invert sugar. The importance of the experiment is major for testing the extracts for the glycemic index in the case of food products intended for diabetic diets. Another nutritional aspect is related to the cumulative digestive effect between sugar that is slowly assimilated and the antioxidant substances by the human metabolism.

Keywords: innovation of sweeteners from Iris Germanica White

Introduction

- **Phytochemical investigations of Iris species** have resulted in the identification of various bioactive compounds belonging to different classes, including alkaloids [9], flavonoids and their derivatives [10,11,12], quinones, terpenes, steroids and simple phenolics [13]. Modern pharmacological studies have reported that these compounds exhibit significant effects on human health, such as cancer chemopreventive properties [14] and anticancer [15], antioxidant [16], antiplasmodial[17], immunomodulatory and anti-inflammatory activities [18].

- **Potential Application in the Food Industry.** In recent decades, because of the drawbacks linked to synthetic additives, the demand for new natural food additives with less harmful effects on human health has been intensified [32]. One such strong natural-source candidate with a broad spectrum of applications in the traditional cuisine of different countries worldwide is the genius, Iris. Due to its pleasant, sweet flavour, it is used to aromatize soft beverages, candies, chewing gum and bread flour in several countries [6]. Recent studies have revealed that the isolated compounds and crude extracts of this plant possess significant antioxidant and antimicrobial properties, especially against food-poisoning bacteria and fungi [11,20]. All these properties support the potential use of Iris-based extracts to expand the shelf life of foodstuffs and as flavouring agents. **Antioxidant effects**. Phenolic Acids. In the genus Iris, in total, 12 phenolic acids have successfully been isolated and identified, including 7 trans-cinnamic derivatives and 5 hydroxybenzoic acid derivatives.

Material and methods

The material used in this experiment was Iris Germanica White flowers, harvested from the North-East Region of Romania, Iasy County, Ciurea area. The flowers were separated from the stem and bulb, weighed, and hot water and ethyl alcohol were added as a solvent in a ratio of 1:2.

- Thus, 8 solid-liquid samples were established to perform the extraction of the sweetening solution..
- The extraction was carried out for 24 h at 18-20ºC, after which filtration was performed, resulting in a greenish yellow liquid. The extract solutions were analysed physic and chemically, determining acidity, pH, reducing sugar, glucose, soluble dry matter and antioxidant substances. [26]

- PH index of the samples to be analysed was determined with the PH Testo meter.

- Subsequently, the extracts were dried in an oven according to the method 5 ml sample introduced into glass capsules with lids were dried by infrared drying at 100ºC ±3ºC until constant mass, for 3 to 4 hours. Cooling of the powder samples obtained from the extracts was done in a desiccator, subsequently weighing the capsules with lids on an analytical balance.
- Determination of glucose and invert sugar. Schoorl method**.** Purified aqueous extract of the test sample was filtered and sucrose was hydrolysed (inverted) to reducing sugars, which reduced cupric Cu^{2}+ ions in alkaline boiling solution to cuprous Cu+ oxide. The surplus of Cu^{2}+ was determinate by iodometry using Na2S2O3.

- **The degree of sweetness. The extracts** were compared to the sweetening power of glucose in the control samples with dilutions of 1:3, 1:4, 1:5, 1:6, 1:7, :8, 1:9, 1:10, the degree of sweetness of the extracts from Iris Germanica White is much lower, approximately 7-8 times. As a result, the extracts or powder can be used for sweetening by adding a larger liquid extract and a medium-dose powder.

Results and disscusion

- The trend of the obtained liquid or dry extracts, as well as the extraction yield, indicates an increasing dynamic and a linear variation in the extraction yield between 11.05-30%. (fig.2) The confidence level of the obtained results was very high R^2 = 0.9367 for both the liquid extracts and R^2 = 0.7245 for the extraction yields. (fig.2)

- The glucose index in the case of the experimentally obtained extracts from sample 1 to sample 8 ranged from 23 to 40 mg/100 g, and the invert sugar ranged from 23.2 to 42.7 mg/100 g. From a statistical point of view, the variation of the experimental results is linear with a very important confidence level R^2 = 0.9464 for glucose and R^2 = 0.966 for invert sugar. (fig.3)

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• Results and discussions

Fig.1 Iris Germanica White[33]

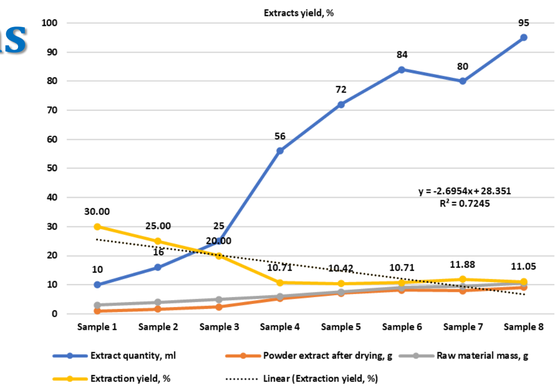

Figure 2 Dynamics of extraction yield from Iris Germanica White

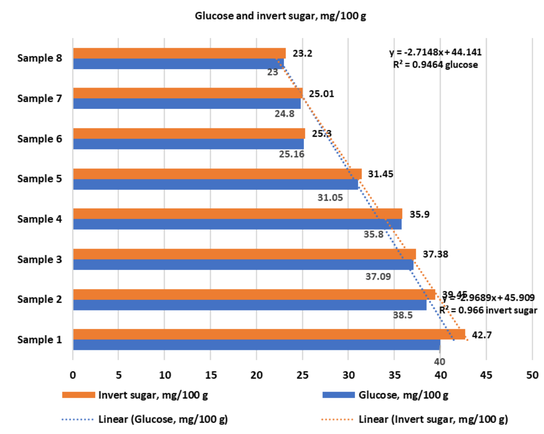

Figure 3 Evolution of glucose and invert sugar in the extracts of Iris Germanica White

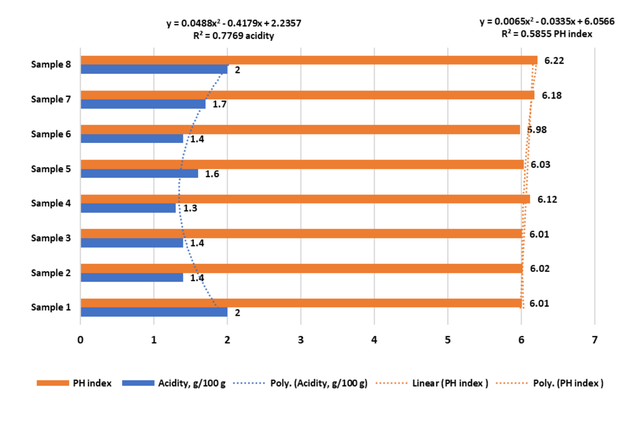

Figure 4 Dynamics of acidity and PH index at the extracts

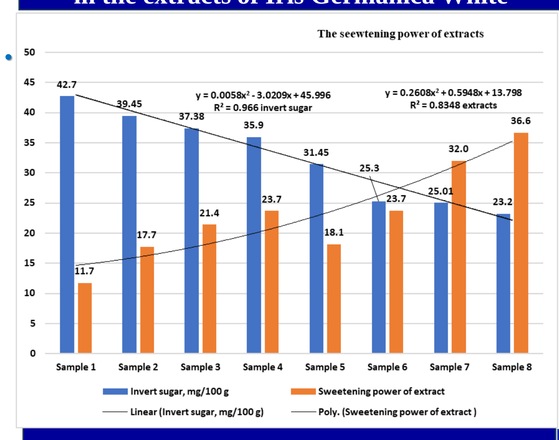

Figure 5 Influence of the sugars from types of flour & the dough fermentation

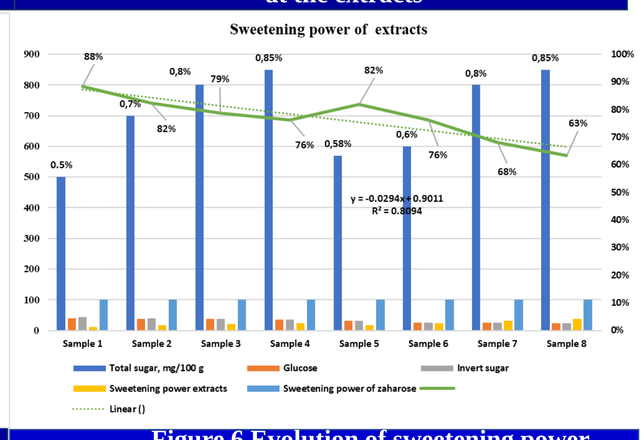

Figure 6 Evolution of sweetening power extracts compared with sweetening power of glucose and fructose

Conclusions

1. The hydroalcoholic extracts of Iris germanica White show a constant evolution of acidity (1.3-2 g/100 g) and PH 5.98-6.22, 2. The extracts obtained had a variation of 23-40 mg/100 g glucose and 23-42.7 mg /100 g invert sugar.

2.There are a lot of research experiments which studied the hypoglycaemic effect of the hydroalcoholic extract of I. germanica L. Rhizomes on streptozotocin-induced diabetic rats. The researchers have lent credence to their ethnomedicinal uses and identified many bioactive compounds endowed with substantial antidiabetic activity, primarily flavonoids and phenolic acids [31].

Figure 7 Samples of Iris germanica White and the extracts

3. In addition, the sweetening power of the extracts obtained is also significant at 11.7-36.6%, lower than the sweetening power of sucrose, but technologically it can be solved by increasing the amount of liquid extract added in the manufacturing recipes or using powder with a high fructose concentration.

4.The powerful antioxidant and antimicrobial potencies of various extracts of this plant could support their potential use as natural antioxidants and antimicrobials agents against multiple pathogenic bacterial and fungal strains in foodstuffs and as good alternatives to synthetic additives.[32]

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