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Influence of processing variables on some characteristics of nocino liqueur

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Abstract

The production of nocino, an after-dinner liqueur of Celtic origin, is connected with ancient superstitions and legend. The date upon which the walnuts should be gathered (the night of 24 June) seems to be one of the few universally accepted features of the production process. The aim of this study was to investigate the influence of the relative ripeness of the walnuts, together with the effect of temperature and the length of steeping on the phenolic composition and the antioxidant power of nocino. Three different batches of unripe walnuts gathered from a single nut tree were used to produce 18 samples of alcoholic infusion. The steeping process was carried out at 20 or 40 °C, for 15, 40 or 90 days. The results revealed that the highest content of phenolic substances – and consequently the highest antioxidant power – was obtained with the least ripe batch of walnuts. On the other hand, temperature and length of steeping have little effect on the phenolic composition of nocino.

Keywords: Antioxidant; DPPH; Nocino liqueur; Phenols; Production process; Walnut

1. Introduction

Nocino is an after-dinner liqueur of Celtic origin, which is very well-known and appreciated in Italy and other countries. Although it is one of Italy's typical products, it has never been the object of scientific research, either as regards its composition or, even less, the production process. The little information available on walnut liqueur concerns its history and associated folklore or the suggested recipes for household preparation (Bergonzini, 1978).

The production of nocino is connected with ancient superstitions and legend. Indeed, tradition has it that the unripe, green walnuts, intended to be used for producing the liqueur, should be collected on the night of 24 June, the day dedicated to Saint John the Baptist, which coincides with the end of the celebrations for the summer solstice. It was held that herbs and nuts gathered during this period were influenced by the change in the sun's ecliptic and the growth cycle in plants, and would thus be particularly purifying.

The date upon which the walnuts should be gathered seems to be one of the few universally accepted features of the production process for nocino. On the other hand, the recipes used and the methods of preparation are many and various. When collected, the walnuts still have a green hull and the endocarp is developed, but has not hardened. The whole nuts are washed, quartered and left to steep in food-grade ethanol in glass or enamelled pottery containers. The ratio of walnuts to alcohol should be about 1:2, so as to obtain an alcohol content of around 60% v/v. In industrial production, the mass is left to brew in silos, protected from the direct light of the sun, for at least 4 months, and constantly stirred. At the end of the brewing period, the steeped mass is pressed to separate the liquid phase from the solid matter and left

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to age between 6 months and 4 years. It must not be pressed too vigorously, otherwise unpleasant-tasting substances may pass into the liquid. After aging, a sugar syrup is added to the brew thus obtained, so the final alcohol content is around 38–43% v/v. Also natural herbs, spices and flavourings could be added, such as, for example, cloves, cinnamon, coriander, coffee beans and lemon zest, which differentiate the various formulations. The liquor thus obtained is filtered prior to bottling (technical document, Il Mallo, Pozza di Maranello, Modena, Italy).

The main variables in the process – apart, naturally, from the formulation used – are temperature, the length of steeping and aging time. Moreover, setting aside popular beliefs, the ripeness of the walnuts can be considered an important variable.

A previous study (Alamprese, Pompei, & Scaramuzzi, 2004) highlighted the fact that nocino is characterized by a significant content of phenolic substances with a high antioxidant power. However, the characteristics of the liqueurs sold under the name of ''nocino'' were found to vary considerably. It was, moreover, observed that aging did not lead to a significant reduction in polyphenol content and thus in the antioxidant power of the liqueur.

The aim of this study was to investigate the influence of the relative ripeness of the walnuts, together with the effect of temperature and the length of steeping, on the phenolic composition and the antioxidant properties of nocino, in order to extract useful information with a view to standardizing the most interesting characteristics of this liqueur.

2. Materials and methods

2.1. Materials

Three batches of unripe walnuts were gathered from a single nut tree (*Juglans regia*, cv. Noce di Sorrento):

- batch 13/06: gathered on 13 June
- batch 24/06: gathered on 24 June
- batch 04/07: gathered on 4 July

Each batch was made up of around 80 walnuts of various sizes; the average weights of nuts belonging to the three different batches were 27.40 ± 0.26, 34.23 ± 0.21 and 38.98 ± 0.49 g, respectively.

The three batches were characterized by analysis of the moisture content, ash and firmness. The phenol composition and the antioxidant properties were evaluated on an ethanolic extract: 100 g of walnuts were washed, chopped and blended for 3 min in a mixture of 96% (v/v) ethanol (BDH Laboratories Supplies, Poole, UK) and distilled water, introduced in such proportions as to obtain around 600 ml of extract in ethanol at 80% v/v. In order to calculate the exact quantities of ethanol and water required, the water content of the walnuts was taken into account. This was determined by means of a moisture content analysis for each batch. The samples were kept in the dark, at 20 °C, for 24 h. The hydro-alcohol phase was then retrieved by means of a filtration using Whatman no. 1 filter papers (Whatman International Ltd., Maidstone, UK) and restored to its initial volume (600 ml) with 80% v/v ethanol. The ethanolic extract aliquot set aside for analyses was poured into 15 ml test tubes, saturated with nitrogen and kept in the dark at 20 °C.

The three batches of unripe walnuts produced 18 samples of alcoholic infusion, combining different temperatures and times of steeping. Approximately 270 g walnuts, cut into quarters, were put in a glass container, together with 500 ml of food-grade ethanol (95% v/v). The steeping process was carried out in the dark, at 20 or 40 °C, for 15, 40 or 90 days. The glass containers were periodically shaken. At the end of this phase, the liquid was separated, by filtering through paper filters, and dispensed into 15 ml tubes, saturated with nitrogen and stored at 20 °C, in the dark. The samples were identified by the gathering date of the corresponding batch of walnuts, followed by the steeping time expressed in days (15 d, 40 d, 90 d).

2.2. Walnut firmness

The firmness of the walnuts was evaluated by means of penetration tests, carried out with an Instron Universal Testing Machine (mod. 4301, Instron Ltd., High Wycombe, UK), connected to a personal computer which manages the instrument by means of dedicated software (Series IX Automated Material Testing System software, version 7.50.00, Instron Corp., 1998). The tests were carried out using a steel probe with a 4-mm diameter and a 45° angle point, at a penetration speed of 20 mm/min, with a 1-kN load cell. Each walnut was positioned on the equipment lengthwise and in such a way that it was not perforated along the seam uniting the two halves of the shell. Results are expressed in terms of load at the 1st and 2nd peak (N) and energy (J) and are the average of 20 determinations.

2.3. Walnut moisture and ash contents

The moisture and ash contents of the unripe walnuts were determined by gravimetric methods, following AOAC Official Method Nos. 925.40 and 950.49, respectively (AOAC, 1995). Samples were previously minced in a Waring Blender (mod. 32B/79, Dinamics Corporation of America, New Hartford, USA), for 3 min, at the minimum frequency. Results are reported as g/100 g.