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The effect of different storage methods on hazelnut oil properties

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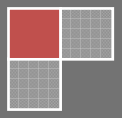
ABSTRACT

Vacuum, filling nitrogen, add anti-oxidants were three ways to deal with hazelnut oil, through high temperature forced oxidation to shorten hazelnut oil experimental observation period, the five indicators which were color, odor, peroxide value, acid value, carbonyl value determined hazelnut oil quality, what tested methods of hazelnut oil storage. The experimental results show that, through the forced oxidation at a temperature of 60 ℃ after 20 days, the blank, vacuum, filling nitrogen, filling nitrogen +0.01%TBHQ、0.02%TBHQ were five ways to deal with hazelnut oil samples, which color were deepened, which smell were added the 0.02%TBHQ unchanged, the other all had rancidity odor; With the extension of forced oxidation time, blank, vacuum, nitrogen hazelnut oil samples of peroxide value, acid value, carbonyl value were significantly increased, filling nitrogen +0.01%TBHQ, 0.02%TBHQ treatment of hazelnut oil samples of peroxide value, acid value, carbonyl value increased slowly, peroxide value increased amplitude of the smallest; adding 0.02%TBHQ could be effective to extend the shelf life of hazelnut oil, and keep the sensory quality.

KEYWORDS

Hazelnut oil; Forced oxidation; Vacuum; Nitrogen; Antioxidants.



INTRODUCTION

Hazelnut oil contains high levels of monunsaturated and polyunsaturated fatty acids[1-3], they are precious and main features. Monounsaturated fatty acids help lower Low Density Lipoprotein and cholesterol in blood, thus Hazelnut oil has a good effect to preventing cardiovascular disease; polyunsaturated fatty acids are beneficial to improve memory, judgment, and optic nerve[4]. Because of hazelnut oil unsaturated fatty acid content is greater than ninety percent[5], easily oxidized or polymerized for contacting with air in long time, they can result in being deeper the oil color and shortening shelf life. If we could make the hazelnut oil to extend the shelf life and the color to be near colorless, hazelnut oil can be long-term storage and widely been used.

Currently, the research related mainly include hazelnut oil extraction Arts[5-7], hazelnut oil physicochemical properties and fatty acid analysis[8], bleaching hazelnut oil[9], hazelnut oil production byproduct-hazelnut protein chara-cteristics and use[10-12]. In this paper, we test result of hazelnut oil storage which is from Three aspects of vacuum, filling nitrogen and adding antioxidants, in order to find ways to maintain the quality of hazelnut oil.

MATERIALS and EQUIPMENT

The hazelnut (Tieling Xifeng County)

PX-150B type biochemical incubator, Shanghai Boxun Industrial Company Limited medical equipment factory; 722N visible spectrophotom-eter, Shanghai Precision Scientific Instrument Co., Ltd.; NMI20-Analyst, Shanghai Electronic Technology Co., Ltd; WSC-S type colorimeter, Shanghai Precision Scientific Instrument Co., Ltd.

EXPERIMENTAL METHODS

Process from hazelnut oil cold pressed method

Hazelnut → shelling → cold pressing→ centrifugation → hazelnut oil

Determination of hazelnut oil color and odor

Color

The sample was placed in a test tube, reservoir height ≥10mm, in natural light, placed in front of a white background observations, described in the following words: colorless, light tan, brown, tan. The colorimeter was preheated in 30 min by electricity, through a self-test and zero, white calibration, the instrument seted program of the measurement substance chroma, and then placed in the sample probe head side, measured chromaticity[13].

Odor

The sample was placed in a small beaker, reservoir height ≥10mm; at 50 ℃ water bath, stirring and sniffing, described in the following words: tasteless, fragrance, scorched, rancidity.

Determination of peroxide value

Using the GB / T 5538-2005 method.

Determination of the acid value

Using the GB / T 5530-2005 method.

Determination of carbonyl value

Using the GB / T 5009.37-2003 method.

Schall oven method accelerates the oxidation of hazelnut oil[14-15]

The hazelnut oil was forced oxidation in incubator of 60 ℃, physicochemical index determination of hazelnut oil every 4 days, 20 days after the sensory evaluation of hazelnut oil.

Storage of hazelnut oil way

Normal storage (blank)

Weighing 100g hazelnut oil into 500mL reagent bottle with stopper.

Adding 0.02% antioxidant

In reference to the relevant provisions of GB2760, we used 0.02% TBHQ as an antioxidant. Adding method: accurate weighing 0.10gTBHQ added to 10.00g hazelnut oil, mixed well spare (female oil). Then, accurate weighing 2.00g female oil added to 98g hazelnuts oil.

Pumping Vacuum

Weighing 100g hazelnut oil into 500mL reagent bottle with stopper, vacuuming until no bubbles.

Filling nitrogen

Weighing 100g hazelnut oil into 500mL reagent bottle with stopper, vacuuming until no bubbles, suck the bottle filled with nitrogen.

Filling nitrogen + 0.01% antioxidants

Referring 2.8,2.10.

RESULTS and DISCUSSION

Color and odor

TABLE 1 : forced oxidation hazelnut oil sensory evaluation

	Forced oxidation 20 days of hazelnut oil		Not forced oxidation of hazelnut oil	
	Color	**Odor**	**Color**	**Odor**
Blank	Dark brown	Rancidity odor	Shallow brown yellow transparent	Hazel fragrance
0.02%TBHQ	Pale brown	Hazel fragrance		
Pumping Vacuum	Deep brown	Rancidity odor		
Filling nitrogen	Dark brown	Rancidity odor		
Filling nitrogen +0.01%TBHQ	Dark brown	A slight rancidity odor		

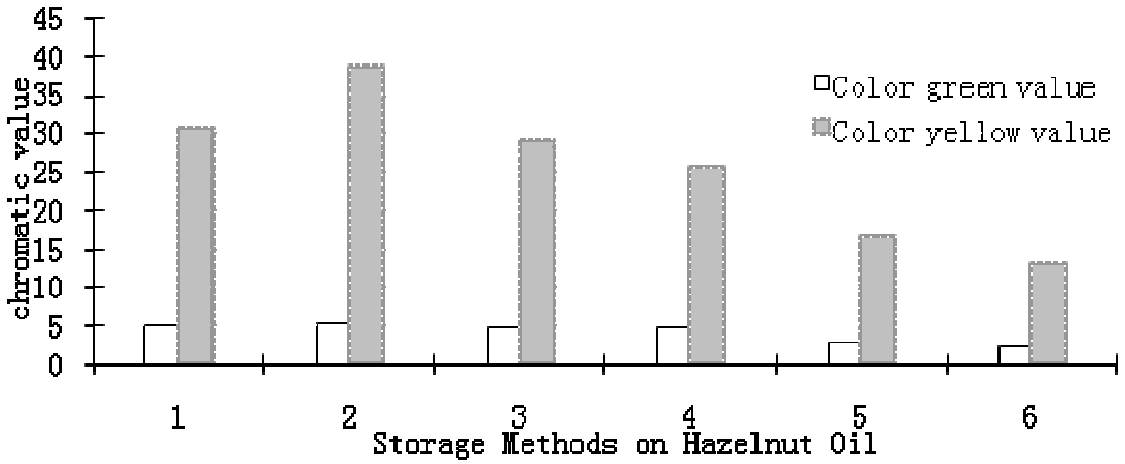


Figure 1 : hazelnut oil color change forced oxidation

In Figure 1, No. 1 is blank, No. 2 is vacuum, No. 3 is filling nitrogen, No. 4 is filling nitrogen+0.01%TBHQ, No.5 is 0.02%TBHQ, No.6 is not forced oxidation of hazelnut oil. Figure 1 shows that, through the forced oxidation at a temperature of 60 ℃ after 20 days, color of hazelnut oil deepened, color of vacuum hazelnut oil was deeper; the adding 0.02% TBHQ of hazelnut oil smell unchanged, the other groups hazelnut oil were rancidity odor, hazelnut oil which filled with nitrogen +0.01%TBHQ of rancidity odor was smaller.

Peroxide value

Figure 2 shows that, after 4 days of forced oxidation, peroxide value of the blank, vacuum, filling nitrogen samples increased quickly, peroxide value added antioxidants samples change scope is very small; after 8 days of forced oxidation, peroxide value of the blank sample had exceeded national standard maximum value (sunflower oil, 7.5mmol/kg)[16]; after 20 days of forced oxidation, peroxide value of the blank, vacuum, filling nitrogen samples had exceeded national standard maximum value,but peroxide value of the added 0.02%TBHQ and filling nitrogen+0.01%TBHQ samples were still lower than national standard maximum value. Therefore, the addition of 0.02%TBHQ or filling nitrogen+0.01%TBHQ to hazelnut oil, has the very good antioxidant effect, can prolong the shelf life of hazelnut oil.

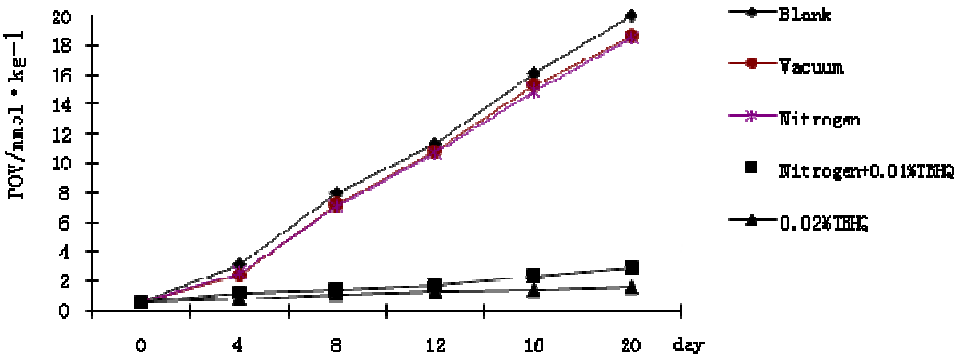


Figure 2 : peroxide value relationship with the oxidation time

Acid value

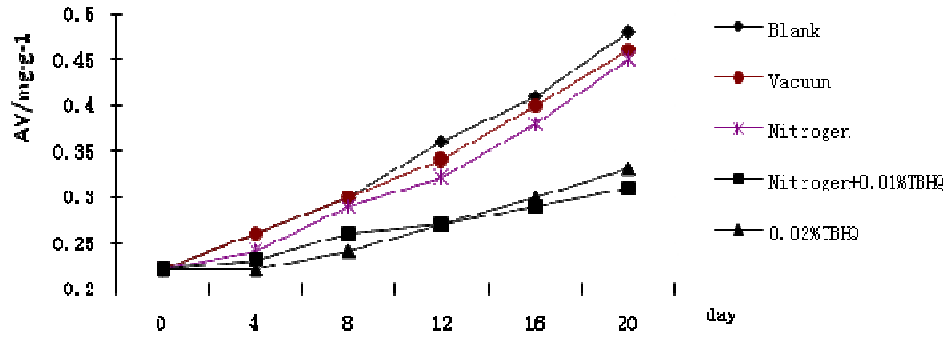


Figure 3 : Relation between the acid value and the oxidation time

Figure 2 shows that, with the extending of forced oxidation time, the acid value of the samples were increased; after 20 days of forced oxidation, acid value of the blank, vacuum, filling nitrogen samples had more than national standard maximum value (sunflower oil, 4.0mg/g)[16]; on 8th day of forced oxidation, the acid value of filling nitrogen+0.01%TBHQ sample was higher than that of the addition of 0.02%TBHQ samples, the later increases were smaller, to 20 days of forced oxidation, the acid value was less than that of the adding 0.02% TBHQ sample, These instruct which inhibits lipase decomposition of hazelnut oil and oxidation reactions of dissolved oxygen.

Carbonyl value

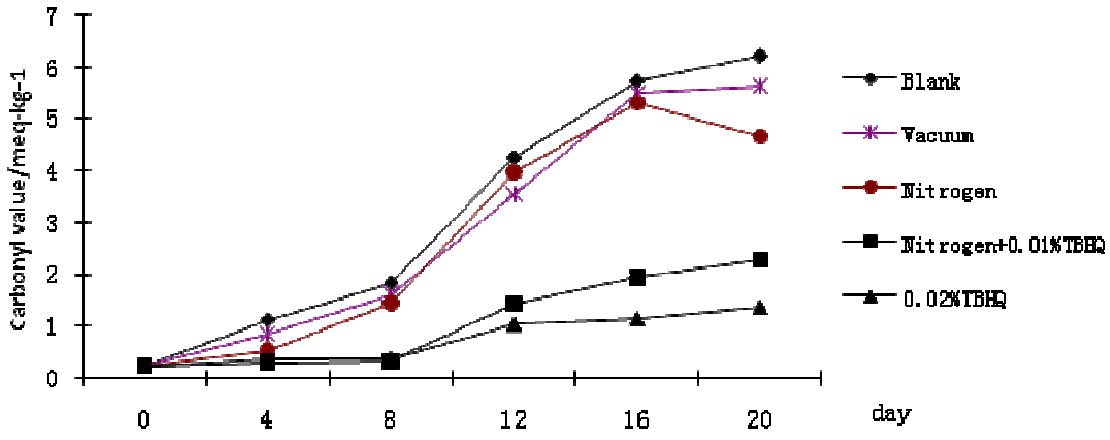


Figure 4 : Relation of carbonyl value and oxidation time

Figure 4 shows that, after 8 days of forced oxidation, carbonyl value of samples began to rise significantly, indicates that the antioxidants can effectively reduce the carbonyl value of hazelnut oil, and which is related to the amount of adding;

after 20 days of forced oxidation, the carbonyl value upward trend of the blank, vacuum, filling nitrogen samples disappeared, but the carbonyl value of the blank sample still increased..

CONCLUSION

1)Through the forced oxidation at a temperature of 60 ℃ after 20 days, the blank, vacuum, filling nitrogen, filling nitrogen+0.01%TBHQ、0.02%TBHQ were five ways to deal with hazelnut oil samples, which color were deepened, which smell were added the 0.02%TBHQ unchanged, the other all had rancidity odor.

2)With the extension of forced oxidation time, blank, vacuum, nitrogen hazelnut oil samples of peroxide value, acid value, carbonyl value were significantly increased, filling nitrogen +0.01%TBHQ, 0.02%TBHQ treatment of hazelnut oil samples of peroxide value, acid value, carbonyl value increased slowly, peroxide value increased amplitude of the smallest;

3)Adding 0.02%TBHQ could be effective to extend the shelf life of hazelnut oil, and keep the sensory quality.

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