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Antioxidant of Bulk Cooking Oil from Corn Cob Extract

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Abstract: Bulk cooking oil is cooking oil produced by the people's industry without packaging, with low quality because it has not used additives to resist oxidation reactions. Along with this, the public's need for bulk cooking oil continues to increase. Bulk cooking oil circulating in the market if stored for a long time can cause a decrease in quality. Thus, antioxidants made from natural ingredients need to be developed. The content of natural materials that can be used as antioxidants in bulk cooking oil is corn cobs. corn cobs contain phenolics, tannins and flavonoids. The study aims to see the ability of corn cob extract as an antioxidant and provide an overview of the quality of bulk cooking oil based on SNI 3741:2013 after the addition of antioxidants. This study used laboratory experimental method, namely the preparation of corn cob extract which was then used as the basic ingredient and formulation of bulk cooking oil with different antioxidant concentrations. The weight of extract added to bulk cooking oil is 2 grams with soaking time of 20, 40, 60 minutes. The samples were then measured for acid number, iodine, and peroxide. The best results in this study were obtained in the addition of 2 grams of extract and 60 minutes of soaking time showing an improvement in the quality of bulk cooking oil characterized by a decrease in peroxide number and acid number.

Keywords: Antioxidant; Corn cob; Cooking oil; Iodometry.

Introduction

Oil is a medium for frying food that is widely consumed by the public (Boukid & Rosentrater, 2024; Valle et al., 2024). Approximately 290 million tons of oil are consumed each year. The high demand for fried food is a clear evidence of how much fried food is consumed by people of all ages (Nurrahmah & Putri, 2020). Cooking oil in Indonesia is currently increasingly expensive so that people from the middle to lower classes choose bulk cooking oil, which is conventionally produced cooking oil with quality below the quality standards based on SNI 3741: 2013, because without the addition of additives and without quality packaging, the oil will be easy to oxidize and smell bad (Perwitasari, 2009).

Rancidity in cooking oil can be inhibited by adding antioxidants (Biswal et al., 2021). However, the use of synthetic antioxidants such as BHA and BHT over a long period of time can cause adverse effects on human health, namely impaired liver function, lung, intestinal mucosa, poisoning, and can increase the risk of cancer (Yustinah & Rahayu, 2014). Based on the dangers of the side effects of using these synthetic antioxidants, it is necessary to use other alternatives as antioxidants from natural ingredients (Pisoschi et al., 2021; Uzombah, 2022).

Indonesia has very diverse natural resources and is rich in content that can be used as antioxidants, one of which is corn. Corn is one of the leading commodities in Central Lombok Regency, West Nusa Tenggara Province from year to year has increased. Corn

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production in Jonggat sub-district in 2022 is 84,650 tons. From each corn harvest, it is estimated that the corn (yield) produced is about 65%, while 35% is in the form of waste in the form of stems, leaves, skins, and corn cobs (Selvia, 2022).

One of the waste that has not been utilized is corn cobs (Sinurat, 2011; Subekti et al., 2007). It is known that corn cobs contain chemical compounds such as flavonoids, tannins, and phenols that can be utilized as natural antioxidants or processed into useful and economically valuable products for human life (Swain et al., 2024). The active compounds contained in corn cob extract have a good ability to counteract free radicals and peroxide radicals so that they are effective in inhibiting lipid oxidation (Dantas-Berto et al., 2024; Harlisa et al., 2021; Wang et al., 2024). In addition, product development from corn cobs is still not widely explored, making it one of the alternative natural materials that can be developed as antioxidant ingredients. Therefore, research is needed to see the potential and effect of adding antioxidant corn cob extract to bulk cooking oil.

Method

Sample preparation and processing

The samples used in this study were corn cobs taken in Jonggat village, Central Lombok Regency. Corn cob samples were collected and cleaned by washing using running water. After that, it was drained and dried by air-drying for 2 days and on the third day it was dried using an oven at 40°C. The dried sample was pulverized using a blender until it becomes powder. The powder was sieved using a sieve with a size of 200 mesh.

Extract Production

The extraction process was carried out using the maceration method for 5x24 hours. The first day maceration of 500 grams of corn cob powder was put into a container, then add 2000 ml of 96% ethanol solvent. Then cover with aluminum foil and left for 24 hours while occasionally stirring. After 24 hours of standing, the macerated sample was filtered using filter paper so that filtrate I and residue I were produced. Residue I was then macerated with 96% ethanol solvent as much as 1000 ml, the treatment was the same as the first maceration to produce filtrate II and Residue II. Then residue II was macerated with 96% ethanol as much as 500 ml. after a day, sample II was filtered to produce filtrate III and Residue III. Filtrate I, II, and III were combined, then evaporated to obtain thick corn cob extract.

Bulk Cooking Oil Quality Test

Determination of Acid Numbers

Cooking oil as much as 25 ml was put into 250 ml Erlenmeyer, added 50 ml of absolute ethanol and corn cob extract with variations of 0.50; 0.75; 1.0; 1.50; 1.75; 2.0; and 2.25 grams. Then heated in a water bath at 70°C while stirring with variations in soaking time of 10, 20, 30, 40 and 50 minutes, then titrated with KOH solution with 1% phenolptialin indicator until a pink color change occurs and the acid number is calculated. Each titration was repeated three times (triplo).

Determination of Peroxide Numbers

The bulk cooking oil was put as much as 25 ml into a 250 ml Erlenmeyer and added corn cob extract which was varied by 0.50; 0.75; 1.0; 1.50; 1.75; 2.0; and 2.25 grams, added 30 ml of a mixture of acetic acid and chloroform, then homogenized until all the ingredients dissolved, then added 0.5 ml of saturated KI solution, left for 2 minutes in a dark room while shaking. Then soaked with time variations of 10, 20, 30, 40 and 50 minutes. Then add 2 ml of boiling water and amylum indicator, then titrate with sodium thiosulfate solution, then calculate the peroxide number. Each titration was repeated three times (triplo).

Determination of Iod Numbers

In a 250 ml Erlenmeyer, put 25 ml of cooking oil and add corn cob extract which varies from 0.50; 0.75; 1.0; 1.50; 1.75; 2.0; and 2.25 grams, then add CCl4 solution, add 25 ml of Wijs solution and leave for 30 minutes in the dark room, then add 10 ml of 30% KI solution added with 100 ml of water, immediately close the Erlenmeyer. Then soaked the cooking oil with a time variation of 10, 20, 30, 40 and 50 minutes. Then titrate with 0.1N sodium thiosulfate solution and add starch solution as an indicator. Then calculate the iodine number. Each titration was repeated three times (triplo).

Data Analysis

Data analysis was used with descriptive method through the test results of the effect of the addition of corn cob antioxidants and also the results of bulk cooking oil quality tests with the addition of antioxidants adjusted to SNI 3741: 2013.

Result and Discussion

The use of corn cob extract as a natural antioxidant in bulk cooking oil was carried out by testing bulk cooking oil for peroxide number, acid number and iodine number in bulk cooking oil.

Effect of Corn Cob Extract Addition and Soaking Time on Peroxide Numbers

Peroxide number is the most important value in determining the degree of damage to oil or fat, where unsaturated fatty acids can bind oxygen in their double bonds so that they can form peroxides (Holman, 1954; Mizulni et al., 2023; Rodriguez-Amaya & Shahidi, 2021). The relationship between the weight of corn cob extract and the variation of soaking time can be seen in Figure 1. It is obtained that the best result of using corn cob extract is at the soaking time for 60 minutes and the addition of corn cob extract as much as 2 grams. The addition of corn cob extract also resulted in a decrease in peroxide number. Based on the overall research results obtained that the peroxide number with the immersion time of bulk cooking oil with corn cob extract samples within 20, 40 and 60 minutes can show the results of the more corn cob extract added to bulk cooking oil, the more the ability of corn cobs to inhibit the increase in peroxide number and the more antioxidants contained in corn cobs that will be absorbed by free fatty acids (Colombo et al., 2021; Guillen Sanchez & Siche, 2024; Hernández-García et al., 2024).

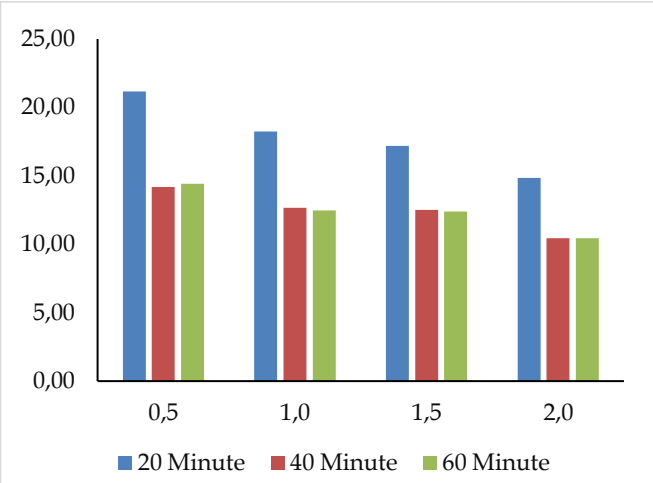

Figure 1. Relationship between corn cob extract weight and peroxide number with various immersion time variations

Effect of Corn Cob Extract Addition and Soaking Time on Free Fatty Acid Numbers

Free fatty acids are closely related in measuring the quality of cooking oil. Free fatty acids are the result of decomposition that occurs in fatty acids caused by complex reactions in oil (Ding et al., 2022; Jiang et al., 2022; Mamtani et al., 2021). The higher the free fatty acid content in the oil, the lower the quality of the cooking oil. Free fatty acids in cooking oil are determined using the titration method using basic reagents (Uçar et al., 2024). The function of adding ethanol in this test is to dissolve the fat or oil in the sample so that it can react with alkaline bases and the function of heating at the time of analysis is so that the oil dissolves completely in ethanol and the reaction takes place faster (Mahmud et al., 2023).

The results of the study on the effect of the amount of corn cob extract and soaking time on the acid number in bulk cooking oil can be seen in Figure 2. Based on Figure 2, it can be seen that the longer the soaking time, the lower the free fatty acid number. This is because during soaking, there is contact between the corn cob extract and bulk cooking oil, causing diffusion between the two, which causes the antioxidant content contained in the corn cob to spread into the oil (Silva et al., 2024). The increasing amount of corn cob extract can also cause a decrease in acid number, it is caused by the more corn cob extract used, the more antioxidants are dispersed into bulk cooking oil. Based on the graph in figure 2, the optimum result is obtained at soaking time for 60 minutes and with the addition of corn cob extract as much as 2 grams.

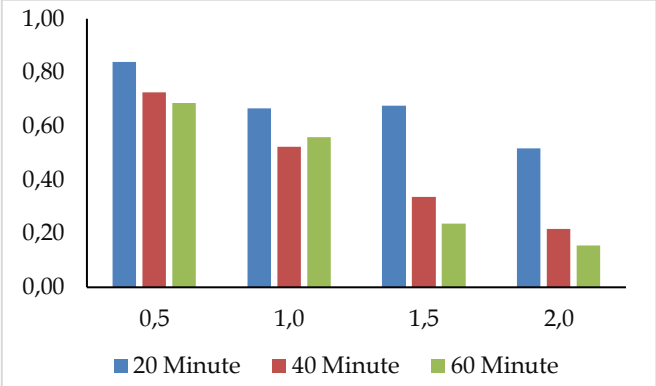

Figure 2. Relationship between corn cob extract weight and free fatty acid number with various soaking times.

Bivariate Analysis

Based on the results of the One Way Anova test in Table 1, the significant value for free fatty acid numbers is 0.000 and the significant value of peroxide numbers is 0.000. These results are still below the value of the possible error allowed, which is 0.05 so that the results of this research can be stated that there is an effect of soaking time on the addition of corn cob extract on reducing free fatty acid numbers and peroxide numbers in bulk cooking oil.

Conclusion

The addition of corn cob extract to bulk cooking oil can improve the quality of bulk cooking oil by decreasing the peroxide number and acid number. The best results obtained are in the addition of corn cob extract as much as 2 gr and soaking time for 60 minutes. There is an effect on the addition of corn cob extract to bulk cooking oil so that it can improve the quality of bulk cooking oil.

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Conflicts of Interest
The authors declare no conflict of interest.

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