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COMPARATIVE STUDY OF PEROXIDE FORMATION IN CANOLA AND SOYBEAN OILS SUBJECTED TO THREE FRYING CYCLES

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INTRODUCTION

The increased consumption of fried foods, especially in fast food and commercial settings, is due to their appealing taste and texture. Vegetable oils are commonly used for frying at high temperatures, but repeated use leads to physicochemical changes, reducing nutritional quality and forming undesirable compounds like peroxides, which signal lipid degradation. This study aimed to evaluate peroxide formation over three frying cycles using two vegetable oils: canola oil (monounsaturated) and soybean oil (polyunsaturated).

MATERIAL AND METHODS

A total of 100 g of polenta was immersed in 500 mL of soybean oil and canola oil, respectively, at 180 °C, with separate frying processes conducted for each type of oil. Each frying cycle lasted approximately 30 minutes and was performed over three consecutive days. At the end of each day (cycle), oil samples were collected and analyzed in duplicate to determine the peroxide value (PV). It is important to note that the initial peroxide concentration for each oil was measured prior to the first frying cycle.

The methodology for peroxide quantification was based on the analytical standards of the Adolfo Lutz Institute.

A 5 g sample was used, to which 30 mL of an acetic acid:chloroform solution (3:2) and 0.5 mL of saturated potassium iodide were added. The mixture was then left to stand, protected from light, for 1 minute. Subsequently, 30 mL of distilled water and 0.5 mL of starch solution were added, and titration was carried out using sodium thiosulfate (0,01 N) until the blue coloration disappeared.

RESULTS

Initially, the PV of soybean oil was 0.46 mEq/kg. After the first frying cycle, it increased to 7.31 mEq/kg; in the second cycle, it reached 12.31 mEq/kg; and in the third cycle, it decreased to 4.92 mEq/kg. For canola oil, the initial PV was 1.74 mEq/kg. After the first frying cycle, it rose to 13.60 mEq/kg; in the second, to 22.78 mEq/kg; and in the third cycle, it decreased to 10.86 mEq/kg.

CONCLUSIONS

The PV increased progressively up to the second frying cycle, nearly doubling at each stage, which reflects the intensification of lipid oxidation with repeated oil use. In the third cycle, however, there was a noticeable decrease, likely due to the breakdown of peroxides into secondary oxidation products such as aldehydes and ketones. Since peroxide formation marks the early stage of lipid oxidation, this reduction does not indicate an improvement in oil quality, but rather a progression to more advanced stages of degradation.

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