Int Aquat Res
https://doi.org/10.1007/s40071-019-0224-y

ORIGINAL RESEARCH

Effect of apple peel extract as natural antioxidant on lipid and protein oxidation of rainbow trout (*Oncorhynchus mykiss*) mince

Sedighe Bitalebi · Mehdi Nikoo · Kaveh Rahmanifarah · Farzaneh Noori · Hassan Ahmadi Gavlighi

Received: 15 October 2018 / Accepted: 23 March 2019

Abstract The aim of this study was to use apple peel extract (APE) as antioxidant for inhibition of lipid and protein oxidation in rainbow trout (*Oncorhynchus mykiss*) mince during refrigerated storage. Apple peel extract had high 2,2-diphenyl-1-picrylhydrazyl (DPPH), 2,2′-azinobios-(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) and hydroxyl radical scavenging activity and ferric reducing antioxidant power (FRAP) comparable to ascorbic acid. Lipid oxidation was effectively inhibited in mince during 96 h of refrigerated storage as indicated by significantly lower peroxides and thiobarbituric acid-reactive substances (TBARS) ($P < 0.05$) compared to control. APE could reduce protein oxidation as evidenced by lower protein carbonyls and higher total sulfhydryl group content ($P < 0.05$) compared to control. This was coincidental with higher polyunsaturated fatty acids (PUFA)/saturated fatty acids (SFA) and eicosapentaenoic acid (EPA) + docosahexaenoic acid (DHA)/palmitic acid (C16:0) ratio in mince with added apple peel extract, especially at 20 mg of gallic acid equivalent/kg mince. Apple peel extract retarded fish mince lipid and protein oxidation during refrigerated storage and might be considered as natural antioxidant in rainbow trout mince.

Keywords Apple peel extract · Antioxidant activity · Mince · Oxidation

Introduction

Oxidation of lipids, proteins, and other compounds in muscle foods manifest in the form of undesirable off-flavor or rancidity, discoloration and the formation of potentially toxic compounds as well as peroxyl radicals linked to health risks in addition to the reduction of nutrients (Shahidi and Ambigaipalan 2015). As a result, synthetic antioxidants have been used to prevent food oxidation. Some of the synthetic antioxidants widely used in foods have been shown to attack macromolecules, leading to mutagenic, cancerous and cytotoxic effects (Dolatabadi and Kashanian 2010). Therefore, replacing them with some naturally occurring

S. Bitalebi · M. Nikoo (✉) · K. Rahmanifarah
Department of Pathobiology and Quality Control, Artemia and Aquaculture Research Institute, Urmia University, Urmia, West Azerbaijan 57179-44514, Iran
e-mail: m.nikoo@urmia.ac.ir

F. Noori
Department of Biology and Aquaculture, Artemia and Aquaculture Research Institute, Urmia University, Urmia, West Azerbaijan 57179-44514, Iran

H. Ahmadi Gavlighi
Department of Food Science and Technology, Faculty of Agriculture, Tarbiat Modares University, Tehran 14115-336, Iran

Published online: 30 March 2019