

Woodhead Publishing in Food Science and Technology

Antioxidants in food

Practical applications

Edited by

Jan Pokorny, Nedyalka Yanishlieva and Michael Gordon



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CRC Press

Boca Raton Boston New York Washington, DC

WOODHEAD PUBLISHING LIMITED

Cambridge England

Published by Woodhead Publishing Limited, Abington Hall, Abington
Cambridge CB1 6AH, England
www.woodhead-publishing.com

Published in North and South America by CRC Press LLC, 2000 Corporate Blvd, NW
Boca Raton FL 33431, USA

First published 2001, Woodhead Publishing Ltd and CRC Press LLC

© 2001, Woodhead Publishing Ltd

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British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library.

Library of Congress Cataloging in Publication Data

A catalog record for this book is available from the Library of Congress.

Woodhead Publishing ISBN 1 85573 463 X

CRC Press ISBN 0-8493-1222-1

CRC Press order number: WP1222

Cover design by The ColourStudio

Typeset by Best-set Typesetter Ltd., Hong Kong

Printed by TJ International, Cornwall, England

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1

Introduction

Professor Jan Pokorný, Prague Institute of Chemical Technology

Fats, oils and lipid-based foods deteriorate through several degradation reactions both on heating and on long term storage. The main deterioration processes are oxidation reactions and the decomposition of oxidation products which result in decreased nutritional value and sensory quality. The retardation of these oxidation processes is important for the food producer and, indeed, for all persons involved in the entire food chain from the factory to the consumer. Oxidation may be inhibited by various methods including prevention of oxygen access, use of lower temperature, inactivation of enzymes catalysing oxidation, reduction of oxygen pressure, and the use of suitable packaging.

Another method of protection against oxidation is to use specific additives which inhibit oxidation. These are correctly called oxidation inhibitors, but nowadays are mostly called antioxidants. These inhibitors represent a class of substances that vary widely in chemical structure, and have diverse mechanisms of action (Table 1.1). The most important mechanism is their reaction with lipid free radicals, forming inactive products. Additives with this mechanism are antioxidants in the proper sense. Usually, they react with peroxy or alkoxy free radicals, formed by decomposition of lipid hydroperoxides. Other inhibitors stabilise lipid hydroperoxides, preventing their decomposition into free radicals. Decomposition of hydroperoxides is catalysed by heavy metals, and consequently metal chelating agents also inhibit oxidation. Some substances called synergists demonstrate no antioxidant activity in themselves, but they may increase the activity of true antioxidants. Another group of substances decompose lipid hydroperoxides by a non-radical pathway, thereby reducing free-radical content. Finally, singlet oxygen oxidises lipids many times faster than