BAKING PERFORMANCE OF ASCORBYL-6-PALMITATE IN PUP LOAVES

by

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TABLE OF CONTENTS

INTRODUCTION

In the last century, the food industry has undergone many significant changes in the way food items are formulated, preserved, packaged, and distributed. Products, which were primarily produced and consumed at home earlier in this century, are now being produced commercially in large volume and are being distributed over large geographical regions. The use of food additives has allowed food scientists to improve the texture, flavor, appearance, and shelf life stability of products.

A major segment of the food industry, the baking industry, has been greatly affected in recent years by additives commonly called dough conditioners, dough strengtheners, and crumb softeners. These materials are all surfactants, which means they reduce the surface tension of water. Surfactants are organic molecules containing two distinct functional groups; a hydrocarbon hydrophobic entity and a hydrophilic entity, which can be either ionic or nonionic (Greene, 1975).

Surfactants are used in the baking industry to improve loaf volume of bread doughs, to replace or reduce the amount or type of fat used in a formulation, to improve the shelf life of a product, to improve machine handling performance, and to allow the inclusion of foreign proteins in a bread dough (Pomeranz, Shogren, and Finney, 1969; Tsen, Hoover, and Phillips, 1971; Favor and Johnson, 1947; Tsen and Hoover; 1971; Garti, 1980; Tenney, 1978; Hoseney, Finney, Shogren, 1972; Hoseney, Hsu, and Ling, 1976; Chung, Pomeranz, Goforth, and Shogren, 1976).

Food additives are indispensable in the baking industry's food-delivery system. But additives must be safe to be useful, therefore food

scientists are continually searching for the least innocuous materials to be used in foods. With the advent of changes in food-labeling laws, manufacturers are continually under pressure to remove chemical additives from food.

In the baking industry, one fairly well known oxidizing agent, ascorbic acid (Vitamin C), has been used to provide a maturing action to flour. After baking and at the levels used in bread, however, only a small fraction of the ascorbic acid (AA) survives (Quadri, Liang, Seib, Deyoe, and Hoseney, 1975). Therefore, ascorbic acid used as a maturing agent imparts very little in nutritional gains to a loaf of bread. Mauro et al (1979) reported that 81% of ascorbyl 6-palmitate (AP) was recovered after baking. Inagaki et al (1968) indicated that growth curves of guinea pigs fed AP and those fed AA were comparable. Organ analysis indicated comparable levels of AA in each organ. These data indicate that animals are capable of utilizing AP as a source of vitamin C in their diets. If desired, AP could be used in bread to fortifying it with vitamin C.

The chemical structure of AP is presented in Figure 1. The molecule contains two distinct classes of structural groups. A hydrophobic group, in the form of an esterified fatty acid, is attached to C6. The hydroxyls on C2 and C5 add hydrophilic character to the molecule because they can engage in hydrogen bonding. The C3 hydroxyl adds to the hydrophilic character via ionization (pK_a 4.15). Thus, structurally AP has the potential to act as an anionic surfactant. AP is a GRAS additive with no limit set on its level in food usage except good manufacturing practice (Cort, 1974).

Figure 1. Structure of ascorbyl 6-palmitate.

THIS BOOK CONTAINS NUMEROUS PAGES WITH DIAGRAMS THAT ARE CROOKED COMPARED TO THE REST OF THE INFORMATION ON THE PAGE.

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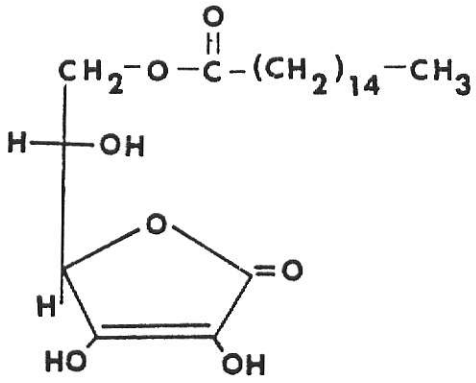
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