

1-INTRODUCTION

Nitrates are present naturally in soils, water and plant materials as a consequence of nitrogen fixation. In addition, the wide use of nitrogen-based fertilizer in agriculture contributes to the total nitrate present in the soil and water. Nitrate is therefore likely to be present in most things we eat or drink. The significance of nitrate to human health derives from the fact that nitrate can be converted *in vivo* to nitrite which interacts with haemoglobin to affect the oxygen transport mechanism giving rise to a condition known as methaemoglobinaemia (WHO,1977 and MAFF,1984). Furthermore, NO_2 ion can also react with secondary and tertiary amines to form N-nitroso compounds through a process known as nitrosation. Some N-nitroso compounds have been implicated in the aetiology of cancers in laboratory animals (Preussmann and Stewart, 1984).

Vegetables constitute a major source of nitrate providing more than 85 % of the average daily human dietary intake (Emig, 1989 and Gangolli et al, 1994). Vegetables often contain NO_3 concentrations ranging from mg to grams / kg. Nitrite is present in concentrations corresponding to about one percent of the NO_3 level. Microorganisms in the human saliva reduce NO_3 forming NO_2 .It has been estimated that 75 % of the NO_2 reaching the stomach in man originates from saliva and 25 % from cured meat products which contain NO_2 as an additive (Böstrom and Tammelin,1981).

Nitrate and nitrite concentrations in fresh vegetables rarely exceed 1 mg / kg although they may increase during storage of vegetables. Thus a great efforts were made in recent years to reduce the nitrate content in vegetables and vegetable products. Cooking vegetables reduced their NO₂ contents to less than 0.2 ppm in most cases (Pickston et al, 1980).

Both NO₃ and NO₂ have been used extensively for the traditional curing of meats. Nitrite (mainly sodium nitrite) is an attractive aid in the manufacturing of cured meat products. The most important property of NO₂ is its inhibitory effect on food poisoning bacteria, primarily *Clostridium botulinum* (Hofsten and Snygg, 1981). One of the principal objective of curing is to stabilize the red color and flavor of the final products. The role of NO₂ to stabilize the color and flavor was carried out by many investigators (Mellet et al, 1986; Shahidi, 1991 and Cassens, 1995).

In investigations made in other countries , it has been found that meat products treated with NO₂ have relatively often contained N-nitrosamines. The content of nitrosamines may be influenced by such factors as storage time , storage temperature and the content of substances that may catalyse or inhibite the formation of nitrosamines. In products treated with NO₂ , the nitrosamine content is influenced by the amount of nitrite added, the addition of nitrosation inhibitors , e.g. ascorbic acid and α - tocopherols (Josefsson and Nygren, 1981).

The majority of N-nitroso compounds that have been tested in animal

experiment have been shown carcinogenic properties.

Several compounds related to foodstuffs and food additives have been investigated as inhibitors of N-nitrosamine formation. Ascorbic acid, erythorbic acid and their salts have been permitted in cured meat products (Fiddler et al, 1973 and Herring, 1973). Alpha tocopherol was evaluated as inhibitor of N-nitrosamine formation by many investigators (Reddy et al, 1982 ; Theiler et al, 1984 and Hussein et al, 1990). A wide variety of reducing sugars including glucose, maltose , lactose and sucrose dramatically reduced nitrosamines level (Theiler et al, 1981b and Hussein et al, 1990). Other technological processes such as cooking and frying were also reduced the nitrosamine compounds in some cases.

The determination of NO_3 and NO_2 in foodstuffs has become increasingly important because of concern over excessive human dietary intake of these species. The toxicity of NO_2 especially in relation to nitrosamine production, has been well established and whilst NO_3 not very toxic, their ready to conversion into NO_2 means that levels of NO_3 must be carefully monitored.

Subsequently, this investigation was designed to demonstrate the following points:

- * Effect of location of market on the nitrite, nitrate and nitrosamine compounds of some selected fresh vegetables , fruits, meats and meat products as well as some types of fish and baby foods.

- * Effect of storage conditions (at room temperature , refrigeration and freezing) on NO_2 and NO_3 levels of some vegetables.
 - * Effect of cooking on NO_2 and NO_3 concentration of some selected vegetables.
 - * Effect of soaking in NO_2 and NO_3 solutions with different concentrations for different time on the NO_2 and NO_3 residues of old and young beef meats.
 - * Effect of different cooking methods (blanching, frying and grilling) on the NO_2 and NO_3 residues of meats.
 - * Evaluation of ascorbic acid and α -tocopherol as inhibitors of N-nitrosamine formation in cured meats.
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