CHAPTER 1 : INTRODUCTION

1.1 Principles, rationale and hypothesis

The ripening of fleshy fruit is a coordinated series of biochemical change that renders the fruit attractive to eat. The ripening process itself generally involves alterations in colour, texture, flavour and aroma although there are occasional exceptions. These attributes make the fruit attractive and tasty to eat. In addition, a wide range of other metabolites is generated from amino acids, carotenoids or lipids that contribute a more unique and subtle quality to the flavour and aroma. Many ripening changes are dependent on the transcription of a set of ripening genes encoding specific enzyme catalyze the alterations in colour, flavour and texture. Because of the variety of ways in which these quality attributes are generated, there are significant differences in the enzymes involved in ripening in various types of fruits. These means different genes have been recruited to the ripening programme of particular fruits during the course of evolution. Because ripening is a precisely controlled and metabolically regulated process, the deterioration of fruit can be retarded by picking early, refrigerating and storing in controlled atmospheres. This often compensates the quality because there are specific requirements for fruit to reach peak condition that are often best met while attached to the parent plant. Quality may be adversely affected by the very technological innovations designed to delay deterioration.

Plant molecular biology and genetic modification (GM) have allowed the ripening programme to be dissected genetically. The development of methods for over-expressing or silencing specific genes in transgenic plants has made it possible to modify ripening genetically to achieve desired objectives. These innovations have provided the means to reduce undesirable characteristics selectively and enhance the

The quality changes flavour and aromas that occur in different fruits are particularly important to render them attractive to consumers. GM fruits offer the potential to improve shelf life and quality. In order to produce fruits that qualities are more suitable for our needs, the qualities of flavour and aroma of transgenic fruit need to be studied in detail. Moreover, the development of new techniques in the flavour area and most recently with the novel APCI-MS (Atmospheric Pressure Chemical Ionization-Mass Spectrometry), a new approach to measure and understand tomato flavour, can now be considered.

1.2 Research objectives

- To study lipid oxidation pathway for volatile generation and identification of main volatiles in model of cucumber.
- To study flavour and aroma components in transgenic tomato fruits
  i. expressing 1-aminocyclopropane-1-carboxylic acid oxidase (*ACO1*) antisense gene
  ii. expressing polygalacturonase (*PG*) sense suppression gene

  and compare with regular varieties *(Lycopersicon esculentum* Mill. cv. Ailsa Craig*)*.
- To study some enzymatic changes in known transgenic tomato fruits.
- To study the molecular biology and analyze the expression of some ripening related genes involved in volatile generation in tomato fruit.

1.3 Research scope

- The use of direct Mass Spectrometric technique (APCI-MS) for analyzing the release of flavour volatile compounds in the expired air during maceration

1.4 Usefulness of the research

- The differences in the maximum intensity and a unique ratio of the various volatiles may be used to build up a type-specific volatile or volatile fingerprint that is a unique for each type of tomato fruit including other fruits.
- The rapid technique, APCI-MS couple with MS-Nose analysis may provide a screening tool to judge the main volatile component not only in fruits, but also in food products.

1.5 Research location

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