Developing natural flavors

Flavour is the utmost important factor for all consumers that undergo various biochemical enzymatic and chemical processes which are active in plants and animals during growth, ripening and maturation. Food flavours can be natural as well as artificial (used to enhanced weak flavours, or replace natural flavour that are lost during food processing), desirable and non desirable (e. g. rotten eggs). Flavours are organic compounds that belong to different chemical classes, such as alcohols, aldehydes, amines, esters, lactones, trepenes, etc. Many volatiles are produced by plants and food during stages of flowering, ripening or maturation but only few are responsible for giving food its unique flavour that helps human recognise appropriate foods and avoid poor or dangerous food choices first by its odour. Many sensory systems (smell, taste, sight, feeling, and sound) are involved in the flavour recognition along with receptive properties of different receptors present in nose and oral cavity. Flavours can be divided into two groups namely, primary (e. g. fruits, vegetables, meat, milk etc) and secondary (e. g. cheese, roasted meat, coffee, etc) aroma compounds that undergo many biochemical and chemical processes to produce flavour which will be discusses further in this study using apple, cheese and meat as main examples.

Apple Flavour formation

Flavour components are stored in exocarp and mesocarp of a fruit which develops during ripening. (R. Miranda-lopez et. al); (J. Dixon et. al; 2000). Apple fruit produces many volatile compounds (approximately 300) many of which are esters that are responsible for the apple aroma (78-92% of total volatiles), alcohols (6-16% of total volatiles), aldehydes, ketones and ethers, which are present in various amounts in different cultivars. (L. P. Christensen et. al). (J. Dixon et. al ; 2000), many of these volatiles give the green note in apples when unripe and only few contribute to give the fruit its unique flavour (e. g. sweet rosy apple), although these flavours can be influenced by many biochemical and environmental factors that may improve or effect fruits flavour and quality (J. Dixon et. al; 2000).

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Volatiles are very important for aroma, and flavours are synthesised from amino acids, lipids and carbohydrates. Many biosynthetic processes are involved in the volatile synthesis such as the Î²- oxidation and lipoxygenease which give rise to aroma compounds; aldehydes, ketones, alcohols, lactones, and esters from lipids (fig 1. 1). Î²- oxidation produce volatiles in intact fruits while lipoxygenase is activated when the fruit tissue is disrupted. Î’-oxidation of fatty acids is a primary biosynthetic prosess that provide alcohols and acyl co-enzymes (coA) for ester formation which give pleasant aromas. Process of flavour formation in apples commences by the degradation of fatty acids which are generated from lipids (triglycerides, phospholipids or glycolipids) present in the cell membrane. These lipids are primarily composed of linoleic and linolenic acids that may be due to the breakdown of chloroplast. Alcohols with an even carbon number (butanol and hexanol) were the most important for flavour development.

According to many experimental studies on apple flavour , it is found that Î²-oxidation is active in ripe apples and the formation of most esters depend on availability of C6-C8 acids and alcohols (C6 and C9 are specifically flavour metabolites observed is most apples)(M. Menzel et. al); (Bartley et al. 1985). In a study of Gala apple fragrances it was found that butyl acetate, hexyl acetate, hexyl propanoate, butyl 2-methylbutanoate, and hexyl 2-methylbutanoate were responsible for the apple-like, fruity aroma and methyl 2-methylbutanoate, ethyl 2-methylbutanoate and propyl 2-methylbutanoate gave sweet and berry-like odours (L. P. Christensen et. al). Fatty acid acyl-CoA derivatives are converted to short chain acyl-CoAs by losing two carbons in every step of oxidation cycle, requiring flavin adenine dinucleotide (FAD), nicotinamide adenine dinucleotide (NAD), and free CoA. Acyl CoAs are reduced by acyl CoA reductase to aldehyde that in turn is reduced by alcohol dehydrogenase (ADH) to alcohol for use by alcohol acyl CoA transferase (AAT) to produce esters (J. Dixon; 2000).

Meat flavour formation

Most of the meat flavour develops during cooking which is influenced by oxidation, amount of lipid, myoglobin, and pH that gives meat its desirable taste. (C. R. Calkins et. al). Meat is packed with numerous amounts of flavour compounds, most of which are distorted during cooking and storage. Meat undergoes so called Maillard reaction (non-enzymatic browning) for flavour formation (Reducing sugar + amine ïƒ brown pigments + flavour). Maillard reaction is the utmost important reaction for quality and flavour of food, and occurs when the denatured proteins on the surface of meat combine with the sugar present which gives “ meaty flavour” and causes change is meat colour which is why it's called the browning reaction. This reaction mostly depends on temperature, ph and nature of the reactants. (i. e. type of the sugars, type of amino acids, or protein).