CHAPTER 2

LITERATURE SURVEY
2.1 Impact of blanching on tomato and other fruits and vegetables

Thermal methods are extensively used for the preservation and preparation of processed food from fruits and vegetables. Amongst the thermal treatments like conventional boiling water (BW), Steam (ST), microwaved in boilable bags (MWB) and microwaved in a glass container (MV), it has been observed that, MV – blanched tomatoes retained more nutritive value in the finished product, whereas, BW-blanched tomatoes had generally higher flavour, texture and appearance scores by S. Begum, M. S. Brewer, 2001.

Processing of tomatoes into a puree or paste is an added value, as it frees, lycopene from the tomato matrix, thus enhancing its bio availability (Ahmed and Shivhari, 2001). Lycopene content in raw tomato varieties and the processed tomato depend on the function of three different isomers (cis, all trans and 5 cis) as well as the variation in blanching time due to the difference in size, texture and composition of tomatoes. The adequacy of blanching for each variety was tested by the methods described by Ranganna (Raul et al, 2004).

Bright red coloured soft tomatoes are required to make the puree or paste. Blanching is a minimally decontaminant treatment which produced softer tomatoes and their firmness decreased (Akbudak and Akbudak, 2007).

Blanching of vegetables in boiling water was observed most acceptable in terms of rehydration property and nutritional quality by V. D. Mudgal & Vishaka Panda, 2009. It also proved that the colour retention properties of blanched vegetables are more stable and durable than the unblanched ones.

Pesticide residues have been found in both raw and processed vegetables. The vegetables are consumed after passing through various culinary and processing treatments. Reduction of residue level by blanching, canning, peeling and washing of fruits and vegetables was observed and indicated by B. M. Keikotthaile et al 2010 with an average response ratio from 0.10 to 0.82.
Choice and order of processing treatments can have a large impact on both lycopene bioavailability and texture of tomato product. It has been observed that the lycopene was relatively stable during thermal treatment, whereas β Carotene was significantly (p < 0.05) reduced by all heat treatment except for low temperature blanching by Cecilia A. Svelander et al, 2010. They studied that in vitro bio accessibility of lycopene was significantly increased from 5.1 ± 0.2 to 9.2 ± 1.8 and 9.7 ± 0.6 mg kg⁻¹ for low and high temperature blanching respectively.

Enzymatic reactions are not desirable in ripe fruits and vegetables. Enzyme activity may discolour or toughen vegetables during freezing which results in quality loss during transportation, storage and processing. Blanching is a pre-treatment operation whose aim is to inactivate enzymes such as polyphenolase, peroxidase and pectinase and blanching may induce sensory and chemical changes studied by Lidia Dorautes – Alvarez et al, 2011.

Enzyme inactiveness kinetics and colour changes in garlic (Allium Sativum L.) blanched under different conditions were observed by Luciane Fante et al 2012 and concluded that colour parameter L increased with increase in blanching time, the samples becoming lighter in colour and the parameters a and b decreased.

2.2 Influence of Processing on the Lycopene and Physicochemical properties of Tomato and its products.

Sixteen tomato paste samples from four different varieties (with different contents of pectolytic enzymes, polygalacturonase and pectin methylesterase) have been manufactured at different breaking temperatures (65 – 85°C) and screen sizes (0.8 – 2.2 nm) and studied by MaCarmen et al, 2002. It has been observed that with the influence of the some processing variables (sieve pore size and breaking temperature) and tomato variety exert on the linear viscoelastic properties of tomato paste. The liner viscoelastic properties of tomato paste depend dramatically on water-insoluble solids content and particle size, which may be greatly influenced by the processing variables along with the specific action of the proteolytic enzymes present in the tomato varieties.
The lycopene content and its stability in two commonly available tomato cultivars (lycopersicon esculentum var. Roma VF and L. esculentum var. Ibadan local) during processing and in package storage were studied, by C. T. Akanbi and F. O. Oludemi, 2004. The results indicated that Roma VF had more lycopene (5.98 mg./100 gm) compared to the Ibadan local (4.76 mg./100 gm) cultivars. Moreover, at 40°C, lycopene degraded by three to six times faster than that at 29°C and degraded faster in Ibadan local that Roma VF pulp on storage.

Tomatoes constitute the major dietary source of lycopene, a bioactive carotenoid present in many fruits and vegetables. Tomatoes undergo extensive processing and storage before consumption and thus a conductive study was made to evaluate the stability, isomeric form, bioavailability and in vivo antioxidant properties of lycopene by Anita Agarwal and Honglei Sheu et al, 2004. Total lycopene and isomers were measured by spectrophotometry and high performance liquid chromatography and observed that lycopene content of tomatoes remained unchanged during the multistep processing operations for the production of juice or paste and remained stable for up to 12 months of storage at ambient temperature. In the presence of corn oil tomato juice at cooking temperature resulted on the formation of cis-isomers form, which was considered to be more bioavailable lycopene.

With an increasing understanding of the health benefit of lycopene, much attention has necessitated the preservation lycopene during processing and storage. Lycopene, the carotenoid pigment mostly exists in nature as all-trans form. Heat, light, oxygen and different food matrices are factors that have an effect on lycopene isomerization and autooxidation. Lycopene may isomerize to mono or poly-cis-forms with the presence of heat or oil or during dehydration and reisomerization takes place during storage. After oxidation, the lycopene molecule splits which causes loss of colour and flavour. The conditions causing the occurrence of isomerization, the optional moisture and the temperature for storage studied by S. Xianquan, 2005.

Lycopene content in raw tomato varieties and tomato products was studied by Ramses B. Toma et al, 2008 and evaluated that the lycopene content in raw tomato varieties and processed tomato products. The separation of lycopene isomers was conducted by high performance liquid chromatography and lycopene content was determined on dry weight basis (DWB). Data for raw tomato varieties were analyzed and cherry tomatoes ranked the
highest in lycopene content on DWB, while the vine tomatoes ranked the lowest in lycopene content. Among the tomato processed products, tomato paste ranked the highest in lycopene content and canned tomato juice the lowest.

The influence of thermal processing on degradation, isomerization and bio accessibility of lycopene isomers in tomato pulp, without adding any other ingredient was studied by Ines Colle et al, 2010. The results confirmed high thermal stability of lycopene in tomato pulp, but the improvement was only significant upon treatment at temperatures of 130 and 140°C. Such intense process conditions may affect other qualities and nutrient parameters.

Tomato (lycopersicon esculentum) is grown extensively throughout India for raw consumption and commercial processing. The physicochemical properties and nutritional composition of two tomato genotypes (HAS – 7 and ARTH – 3) was studied and indicated that there was no significant difference between the two genotypes in β–carotene content by Aditi Gupta, A. Kawatra and S. Sehgal, 2011.

2.3 Impact on influence of additives for improvement of colour, pH and texture of tomato and other fruits and vegetables.

Since the early 1940s researchers have known about calcium-associated firming and this effect is specific to calcium and not necessarily to other divalent cations. Along with the numerous factors like variety, maturity, genetic modification, environmental conditions, processing conditions, the addition of divalent cation calcium salts (up to 500 mg./ kg) significantly improved the textural properties of dried tomatoes studied by De Giorgi et al, 1994.

Effect of liming materials on soil available nutrients, yield and grade distribution of double-cropped tomato and cucumber growth with plasticulture was studied by Joshua L Mayfield 2001. The objective of this two year field study was to compare the effects of selected liming materials on yield and grade distribution and soil available nutrients of a tomato or cucumber double crop produced with plasticulture.
Throughout the study, agricultural limestone, a high CaO – containing blend and a CaO / MgO, (dolomite blend) resulted in greater fruit weight compared to the control and CaSO₄. Quick lime (CaO) provided higher levels of soil Ca and Mg available for plant growth.

Combined treatments of high hydrostatic pressure and natural additives on quality parameters of tomato puree [citric acid and sodium chloride (NaCl)] was studied by Lucia Plaza et al, 2003 and showed that enzymatic inactivation (polyphenol oxidase, peroxidase and pectin methylesterase) was significantly improved. Also a very significant reduction in total micro count was observed when pressure was increased to 400 MPa.

The new processing and preservation techniques to improve the shelf-life of fruits and vegetables and to minimize the auto breaks have been associated with freshly-cut products studied by Ana Allende et al 2006. The combination of physical treatments like use of ultraviolet C, modified atmosphere, ozone treatments and chemical treatments like use of acidic or alkaline electrolyzed water (AcEW), chlorine oxide have proved useful in controlling microbial growth and maintaining quality during storage of fresh-cut produce.

The influence of various sugar solution concentrations on the characteristics of candied dried tomatoes was studied by Wawan Buntaran, 2010. Soaking in a solution of sugar concentration of 40%, 50%, 60% and 70% with 0.2% and CaCl₂ as preservatives, were used to make candied tomatoes. It was observed that immersion in 40% solution produced candied dried tomatoes with the best characteristics of taste, flavours, colour and texture.

Tomato juice was prepared with three different additives namely potassium meta-bisulphate (KMS), sodium benzoate, sorbic acid and the effect of chemical additives on the shelf-life of tomato juice was studied by Md. Nur Hossain, Md. Fakruddin and Md. Nurul Islam 2011. There were variations in colour and flavour in prepared juice with three different chemical additives. It was found that Na-benzoate is a better preservative than Potassium Meta bisulphate (KMS) and sorbic acid for tomato juice.
2.4 Role of beet root and culinary herbs in the promotion of health and their uses in processed fruits and vegetables.

Numerous nutraceuticals are present in medicinal herbs and their therapeutic activity along with the other nutraceuticals studied by H.Dureja et al, 2003 and reviewed that nutraceuticals can bring the health benefits quicker than would normally be the case through eating conventionally healthy foods alone. Herbs are as old as human civilization and culinary herbs have provided a complete storehouse of remedies to cure and chronic diseases.

The remarkable antioxidant activity of phytochemicals and polyphenols present in beet root and potential health effects of betalains from dietary sources studied by Luisa Tesoriere, 2004. The results suggest that betalain may be involved in the protection of LDL who consumed red beet juice or beetroot.

Anthocyanin accumulation in tomato at concentration comparable to the anthocyanin levels found in blackberries and blueberries studied by Eugenio Buteli et al, 2008. Anthocyanin has been associated with protection against a broad range of human diseases and the enhanced tomato fruit resulted in threelfold antioxidant capacity with intense purple colouration in both peel and flesh. In a pilot test, cancer susceptible mice fed a diet supplemented with the high-anthocyanin showed a significant expansion of life span.

Natural antimicrobials such as cumin, caraway can be used alone or in combination with other herbs to increase the shelf life of unprocessed or processed foods was studied by, Brijesh K.Tiwari et al, 2009. Edible, medicinal and herbal plants and their derived essential oils and isolated compounds contain a large number of secondary metabolites that are known to retard or inhibit the growth of bacteria, yeast and mould.

The antiviral and antimicrobial activities of seven essential oils from coriander, parsley, basil, cumin, garlic were determined by Ranny M. Romeilah et al. 2010, using cytopathicity (CPE) assay and DPPH radical assay. It was found that the essential oils of seven analyzed plant samples showed goods antioxidant capacities compared with vitamin C, the standard antioxidant compound.
The herbs, their active ingredients, biochemical action and herbal formula composition to design anticancer remedy according to the approved pharmaceutical limits for human use was studied by Rakesh Sharma, 2010. Chemically the active components in bioactive herbs are classified as isoprenoid derivatives, phenolic compounds, isoflavones, flavones, carbohydrate derivatives, fatty acids and structural lipids, amino acid derivatives, microbes and minerals. Most of the herbs are biochemical metabolites either by direct intermediary metabolism or regulatory cancer pathways and stimulating immunity.

Neutraceuticals are food product that provides health as well as medical benefits, including the prevention and treatment of disease. Neutraceuticals may range from dietary supplements to genetically engineered foods, herbal products and processed foods. The therapeutic application, adverse effect and interaction of different neutraceuticals were studied by Swati Chaturvedi et al, 2011 and suggested that neutraceutical products are used in prevention of disease but not in cure of disease.

2.5 Effect of thermal processing on the antioxidant activity of beet root, culinary herbs and other vegetables.

N. M. Ansari et al, 2005 studied that the chemical composition of the plant changed during the heating process, leading to an increase in the amount of antioxidant components. These findings confirm the great interest of the nutraceutical sciences, whose phytochemistry and phytopharmacology should be investigated further in order to detect possible phytotherapeutic uses in the prevention of ageing related diseases and Alzheimer disease.

The impact of cooking (simmering, microwaving, stewing, stir frying and grilling) and storage on the antioxidant capacity of common culinary herbs was investigated by Magali Chohan, 2008. Many culinary herbs are cooked or undergo some other form of processing before they are consumed as part of a meal and such factors may affect their significance as a source of dietary antioxidants. Simmering, soup making and stewing significantly increased antioxidant capacity, while grilling and stir frying decreased it. Herbs in cold vinegar macerations for 1 week showed a decrease in antioxidant capacity, therefore the potential of culinary herbs to be significant contributors to dietary antioxidant intake is significantly affected by both cooking and storage.
The influence of home cooking methods like boiling, microwaving, pressure cooking, frying and baking on the antioxidant activity of vegetables like beet root, green bean, garlic have been studied by A. M. Jimenez et al, 2009. The highest losses were observed in cauliflower after boiling and microwaving, peas after boiling, but beet root, green bean and garlic kept their antioxidant activity after most cooking treatments.

Herbs and spices are one of the most important targets to search for natural antioxidants from the point of view of safety.

The effect of thermal processing on the antioxidant activities and protein of Tom-Kha on galangal coconut soup were determined and studied by Sunisa Siripongvutikorn, 2010. An ingredient of Tom-Kha paste has been addressed as natural antimicrobial and antioxidant activities. Moreover, thermal processing and protein nutrient did not reduce antioxidant activity of the Tom-Kha paste extract and therefore in consuming Tom-Kha soup may promote healthy benefit.

2.6 Consumers’ attributes to be considered for processed foods (fruits and vegetables).

To determine the beliefs regarding organically produced food, organic farming and food purchasing practices were studied by Linda du Toit et al, 2003 and suggested that to promote organically produced products, a cohesive marketing strategy is needed which depends on a better and fuller understanding of food consumers. Research on consumer perceptions, beliefs, attitudes and purchasing practices of organically produced food has been done in the United States of America, Great Britain and New Zealand.

The consumer’s decision-making process towards minimally processed vegetables and packaged fruits was studied by Peter Ragaert et al, 2004. The most important motivation for purchasing minimally processed vegetables relates to convenience and speed, especially for consumers who buy this product during weekends. The consumption of minimally processed vegetables depends on the consumer’s high awareness of the relationship between food and health and significant attributes in relation to colour, texture and flavour.
Consumer acceptance of fresh and processed tomato (*Lycopersicon esculentum* Mill.) product is influenced by appearance, flavor, aroma and textural properties. Sensory and objective qualities of beta-carotene and lycopene-rich tomato fruit were studied by John Stommel et al, 2005 and demonstrated that the perception of cherry tomato fruit colour, appearance, flavour, textural attributes were acceptable by the consumers in case of tomato products purchase. The product price and income were more important determinants of purchase pattern than nutrition, freshness and colour.

The consumer’s attitude and behaviour towards tomatoes after 10 years of Flandria quality labeling was studied by Wim Verbeke, 2008. Based on cross-sectional data collected through a self-administered consumer survey (n = 373), it was revealed that buyers, who constitute 26.8% of the sample, perceive Flandria tomatoes as superior to other tomatoes because of their guarantee of origin, better taste and stricter production control. It also reported that consumers had strongest perception of Flandria as an ordinary tomato as compared to non-buyer segments.

The relationships between the various variables relating to the personal characteristics of the consumers were studied by Phang Ing@ Grace et al, 2010. The study showed that consumers’ food habits and consumers’ willingness to pay play a significant role in the food choice. In this study it has proved that peer influence have no significant relationship with the acceptance of the developed product (seaweed).

New process technologies for the processed food can potentially offer superior advantage in the market place, sometimes manufacturers ignore consumers’ needs and value systems during the new product development (NPU) process. Douglas Sorenson et al, 2011 studied that the consumers were generally receptive towards the concept of high pressure processed chilled ready meals and perceived food safety risks related to high pressure processed foods.