ISSN - 2250-1991 | IF : 5.215 | IC Value : 79.96

Original Research Paper | Biology

BIOLOGICAL EFFECT ON MANGO DURING RIPENING BY CHEMICAL AGENTS

Asha Sangwan | Lecturer in Biology, Govt Senior Secondary School Mandhana, Bhiwani

ABSTRACT

Mango fruit is germination in panicle and belongs to the subtype in deliquescent drupe. The fruit is major, fleshy and differs in figure, shape, colour, fibre content, aroma, flavour and taste depending on cultivars, and has a specialty conical projection termed as 'beak'. The fruit can be differentiated into three parts, i.e. exocarp, the part that defend the fruit that is primarily green and later changes to yellow or reddish or orangish depending on the cultivar and stage of ripening, and flexible.

KEYWORDS | Biological, Chemical, fruit ripening

INTRODUCTION:

Mango (*Mangifera indica Linn*.), a dicotyledonous fruit of the family Anacardiaceae, is the most vital tropical fruit of India, grown as a business in more than 87 countries. It is famously known as "The King of Fruits". Mango recently ranks fifth in total production among main fruit crops in all over world. The all countries production of mango is approximately to be 23.4 10^6 MT per anum. India stage first in mango growing, accounting for 54.2% of the total mango produced in all countries. In spite of being the moneyed source of quality mango kind in the world, the fruit economy in India is far from good. One of the limiting parts is the relative short ripening period and post-harvest life. In other words, extensive textural softening during ripening leads to adverse effects upon storage. Thus, an in-depth understanding of the biochemical and physiological events eventful during ripening is essential to identify the crucial targets contributing to textural softening. Delaying the ripening-associated changes will lead to greater 'commercial value addition'.

Mango (Mangifera indica L.) is the second biggest fruit being produced in Pakistan and has become an integral part of history and culture of the Pakistan (Asif et al., 2002). With over 1.3 million tons annual production, Pakistan is world's fifth biggest producer of mango after India, China, Thailand and Mexico (FAO, 2006).

Textural softening in between the fruit ripening is of commercial importance as it directly dictates fruit shelf life, its keeping quality and early harvest physiology, which is due to in vivo carbohydrate hydrolysis under ripening by respective carbohydrate hydrolases. The extent of depolymerization of different carbohydrate polymers during ripening is a direct index for their helping towards textural softening. By implication, the corresponding hydrolases would be the targets for controlling the ripening procedure at textural level. Control or modification of fruit texture, and shelf life extension with retention of desirable organoleptic attributes in a ripe fruit is the ultimate aim in modern 'Fruit Biotechnology'. During ripening stony hard unripe mango becomes soft spongy ripe fruit. Ripening involves a series of biochemical procedure including biosynthesis and partial of complete down turn of high molecular weight cell wall carbohydrates.

Tomato is the only fruit system studied for suppressed expression of key ripening specific enzymes related to textural softening where fruit ripening was manipulated at gene stage to get firmer tomatoes with enhanced shelf life by individually suppressing ACC syntheses and EFE at ethylene level, PG and PME at cell wall level, by antisense RNA technique. Suppression of ethylene biosynthesis resulted in overall command of the ripening process, which was triggered by exogenous ethylene-boost. Genetic manipulation at the textural satge resulted specifically in "improved texture" in the transformed tomatoes, where PG suppression yielded firmer fruits, while PME suppression resulted in fruits with super solid content. Pectin regulation at the cell wall stage is the only aspect that is studied thoroughly in the context of textural softening during ripening so far. But, the collaboration of other equally mainly carbohydrates and their degrading enzymes both at cellular as well as at cell wall level in fruit softening during ripening is totally unexplored.

The post studies on mango fruit softening mainly focused on the post harvest physiology, especially, organic acid metabolism, fruit flavors volatiles, overall composition and total changes in total pectin during ripening. However, detailed studied on the quantitative and qualitative changes of cell wall polysaccharides and their in vivo hydrolysis by corresponding hydrolyses in relation to textural softening have not been carried out.

The purpose of the this study is to understand the parts contributing to the textural changes in relation to carbohydrate degradation by respective hydrolyses during ripening of mango and alfo, tissue culture and transformation studies on asunder genotypes of mango. This study was undertaken to pinpoint the new enzyme aim (hitherto not known) responsible for fruit softening, which was studied at both substrate (water soluble and insoluble polysaccharides) as well as enzyme targets (hitherto not known) liable for fruit softening, which was studied at both substrate (water soluble and insoluble polysaccharides) as well as enzyme (respective hydrolyses) stages. Some new hydrolyses other than PG/PME, hitherto unexplored, and were observed in mango fruit, which could serve as important targets for carbohydrate disintegration in vivo. Mango fruit, apart from being untouched for studies on textural regulation, is also a tough system for in vitro culturing and inherited transformation. The study also involves a successful attempt towards. Induction of somatic embryogenesis from nucellar and cotyedonary explants of mango and expression of GUS gene in somatic embryos from apart genotypes of mango via *Agrobaceterium timefaciens* mediated transformation.

Mango "Kings of Fruit"Before we delve into the health advantages of eating mango every day, let's take a look at the nutritional value of the exotic fruit. A advocate dose of mango is one cup, which has around 225 grams.

Here are the nutritional numbers of one cup, with percentages applying to daily values.

- 105 calories
- 76% of the advocate daily dosage of vitamin C
- 25% of the urge daily dosage of vitamin A
- 11% percent vitamin B6 and other B vitamins
- 7% potassium
- 4% magnesium

- 9% copper
- 9% healthy fiber

REVIEW OF LITERATURE

Jain (1961) states that pectin increases from the fifth week of fruit set until the stone is formed, there after the pectin content falls. Tondon and Kalra (1984) describe that dashehari mango cultivar, water-soluble pectin showed a steep rise after 70 days, reaching a maximum size 101 days of fruit growth. Jain (1961) reported the presence of glucose, fructose and maltose, in addition found xylose in ripening mangoes. Stahl (1935) noted the presence of tartaric acid. Citric acid is the major organic acid present in the mango fruit. Tandon and Kalra (1983) reported a decrease in the soluble protein content upto 44 days after fruit set, which increased again until 96 days. Pandey et al., (1974) detected 12 amino acids during fruit growth. At peak stage, only alanine, agrinine, glycine-serine, and leucine-isoleucine were detected, while others were present in treaces. At maturity their levels were predominant, which decreased during ripening with the exception of alanine. Siddappa and Bhatia (1954) reported that vitamin C content was maximum (300 mg/100 g) in Pairi variety in the early stages of growth although the ripe mango is an excellent source of this vitamin.

A worldwide increase in the demand of fresh mango fruit is being observed, increasing the prospect for the producing countries (Amin et al., 2007). However, like all other fresh commodities, its market potential is also linked with the fruit quality and market access (Anwar & Malik, 2007). Whereas certain preharvest factors, like insect pest and disease management (Mahmood & Gill, 2002; Ishaq et al., 2004; Iqbal et al., 2004), are important from production point of view, proper postharvest treatments and packaging are required for maintaining better quality, extended shelf life and having access to international markets (Anwar & Malik, 2007).

OBJECTIVES:

1. To analyze some biochemical components, carbohydrate agents during ripening the mango.
2. To identify the chemical effect on fruits during ripening
3. To define the biological effects on during ripening the fruits
4. Screening for the various enzyme activities during ripening process.

COMPOSITIONAL CHANGES DURING PROGRESS

The chemical composition of mango mush differs with the location of cultivation, variety and phase of maturity. The main constituents of the pulp are water, carbohydrates, organic acids, fats, minerals, pigments, tannins, vitamins and flavor compounds. During maturation of mango, the period of rapid growth is characterized by an increase in alcohol-insoluble solids; principally starch accumulation takes place in the pulp-tissue. The rate of starch accumulation is rapid at the beginning of fruit growth and slows down later, but it continues to increase up to maturity. There is an increase from 1 to 14% in starch content in Alphons mango during development (Laley et al, 1943; Quintana et al, 1984). At initial stages of fruit development no systematic trend was observed in the sugar content, but towards the end of maturity, both reducing and non-reducing sugars were found to be increasing.

The soluble sugars of the fruit pulp consisted mainly of glucose, fructose and sucrose (Tandon and Kalra, 1983; Pandey at al. 1974). The total sugar content of mangoes varies between 11.5 and 25% (fresh weight). Starch increases up to 15% of the fresh pulp of green, mature fruits. In developing mango fruits, acidity increased at early growth phase, reached a peak and then declined gradually until harvest (Wardlaw and Leonard, 1936). In Alphonso mango, the acidity reached maximum (4.2-4.4%) in about 7 weeks and descent slowly to around 2.7-2.8 at the time of harvest (Lakshminarayana et al., 1970). Jain (1961) states that pectin rise from the fifth week of fruit set until the stone is formed after that the pectin content falls. In the study of Dashehari mango cultivar, water-soluble pectins showed a steep rise after 70 days, reaching a maximum at 101 days of fruit growth (Tandon and Karla, 1984). The ammonium oxalate-soluble fraction showed a similar rising during fruit growth. The alkali soluble fraction (protopectin) increased up to 70 days after fruit set but decline thereafter until harvest. During ripening of the fruit, sucrose rose from 5.8 to 14.2% of the fresh weight, while the pH rose from 3.0 to 5.2. In the post-climacteric step, the content of non-reducing sugars fell to 0.6% 10 days after the climacteric peak. Total acidity varied from 0.13 to 0.71% (as citric acid). Jain et al., (1959) reported the presence of oxalic, citric, malic, succinic, pyruvic, adipic, galacturonic, glucuronic ad mucic acids, together with two unidentified acids; Mango fruit contains 0.-1% protein on a fresh weight basis (Lakshminarayan, 1980. A Peruvian variety has an exceptionally high content, 1.57-5.42% of protein (Jain, 1961). The skin of Java grown fruit contains 1-2% protein and the pulp 0.6-1

Pathak and Sarada (1974) reported that lipid content in peel and pulp of five mango kinds ranged from 0.75 to 1.7% and 0.8 to 1.36%, respectively. Selvaraj et al. (1989) reported that total lipid in seven commercial cultivars ranged between 0.26 and 0.67% at harvest. A mainly component of the pulp was reported to be a triglyceride, while mono-and di-glycerides were minor components (Gholap and Bandyopadhyay, 1975). The specialty odor that appeared in the fruits during ripening is due to components of ester and carbonyl types, which are varietal specific. The main volatile components of mango are terpenes although several other hydrocarbons, esters and alcohols were also found to be present in ripe mango fruit (Hunter et al, 1974; MacLeod and Gonzalez, 1982; Phno et al., 1989). Spencer et al. (1956) reported its downward trend from 88 to 22 mg% within 5-10 weeks after fruit set in Mulgoa, Pico, Amini, and Turpentine kinds of mango during growth. Gosh (1960) reported 36 mg of folic acid in 100 g of green fruit and Gopalan et al (1977) found 0.08 mg of thiamine (Vitamin B1) and riboflavin (Vitamin B2) and 0.09 mg of niacin per 100 g of ripe mangoes.

REFERENCES

1. Gosh, S. (1960). The content of folic acid and its conjugates in some common Indian fruits. Science and Culture 26: 287-292.
2. Jain, N.L., Krishnamurthy, G.V. and Lal, G.C. (1959). Non-volatile organic acids in unripe pickling mangoes and salted mango slices by paper chromatography. Food Sci. 3: 115-118.
3. Kalra, S.K., Tandon, D.K. and Singh, B.P. (1995). Mango. In: Handbook of Fruit Science and Technology Production, Composition, Storage and Processing.
4. Lakshminarayana, S. Subhadra, N.V. and Subarmanyam, H. (1970). Some aspects of developmental physiology of mango fruit. J. Hort. Sci. 45: 133-142.
5. Pandey, R.M., Rao, M.M. and Singh, R.N. (1974). Biochemical changes in developing mango fruit (Mangifera indica L.), cv. Dashehari Prog. Hort. 5: 47-53.
6. Selvaraj, Y, Kumar, R. and Pal, D.K. (1989). Changes in sugars, organic acids, amino acids, lipid constituents and aroma characteristics of ripening mango (Mangifera indica L.) fruit. J. Food Sci. Technol. 26: 308 – 313.
7. Tandon, D.K. and Kalra, S.K. (1984). Pectin changes during the development of mango fruit cv Dashehari. J. Hort. Sci. 59: 283 – 286.