One of the most important considerations in the world today is increasing the production of healthy and nutritious food to feed the burgeoning population on the planet. Although India has emerged as the second largest producer of fruits and vegetables, the postharvest losses are still as high as 30 to 40%. Hence, supply of fresh fruits and vegetables can only be increased by using technology to prevent their deterioration after harvest and/or to introduce underutilized fruits for its commercial exploitation. A wide range of underutilized fruits are grown in India, but full potential of these underutilized fruits have not been exploited, which has lead to limited scope for marketing of these fruits outside the local region. Besides, only traditional processing methods are obtained. Also seasonal availability of fruits, non suitable methods of storage and lack of information regarding the nutritional value, limits the use of these underutilized fruits. The potential of underutilized fruits is also hampered because of lack of awareness in the society, as well as by lack of efforts made by the research community in exploring them.

Hence, the current scenario emphasizes the need to improve resource mobilization in support of underutilized plant species research and development, including urgent work to collect baseline information and formulate meaningful indicators to guide future action. Thus, the present study has been undertaken to understand certain physiological and histo-architectural changes associated with the growth and ripening of some underutilized fruits namely *Carissa carandus, Cordia dichotoma, Manilkara hexandra, Mimusops elengi, Physalis minima* and *Syzygium cumini*.

In the presently studied underutilized fruits, a thin layer of cuticle is noted on the epicarp, which comprises single layered outer epidermis with some hypodermal layers. The presence of resin canals is commonly observed in *Carissa carandus, Manilkara hexandra, Mimusops elengi* and *Syzygium cumini*, while sclerified cells are frequently noticed in *Mimusops elengi*. Besides, the tannin deposited cells are also found in the fruits of *Manilkara hexandra, Mimusops elengi* and *Syzygium cumini*. In the fruits of *Carissa carandus, Cordia dichotoma, Manilkara hexandra, Mimusops elengi* and *Syzygium cumini* the mesocarp which appears multilayered possess small, oval to polygonal cells in its stratum and relatively larger cells in the inner mesocarp, while in *Physalis minima* the mesocarp is less differentiated. The endocarps of *Carissa carandus, Manilkara hexandra, Mimusops elengi, Physalis minima* and *Syzygium cumini* are multilayered, while in *Cordia dichotoma* it is parenchymatous with some stony cell.
Fresh as well as processed fruits form an important part of our diet as they are important sources of essential micronutrients, vitamins, phytochemicals and are generally low in protein and fat content. All the presently investigated underutilized fruits during their successive stages of growth and ripening exhibited an increase in their pH and decrease in acidity, except in *Cordia dichotoma*, in which the pH and acidity remained more or less stable at its all successive growth stages. Besides, the decrease in the quantity of chlorophyll pigments was concomitant with the accumulation of carotenoid and anthocyanins in all the presently investigated underutilized fruits. Similarly, the degradation of starch was also simulated with the increase sugar content, while protein and phenolic compounds exhibited inconsistency, but they decreased in all the currently studied fruits when they ripened. In contrast the amount of amino acids increased at all the successive stages of growth and ripening of all the presently worked out fruits.

The role of various enzymes has also been evaluated during the growth and ripening of the fruits. All the fruits worked out under the present study demonstrated high activity of their amylase enzyme during the young stages, but with the advancement of growth and ripening the specific activity of amylase decreases to lower levels. Moreover, invertase exhibited inconsistency in its activity in all the presently studied underutilized fruits. Likewise, the antioxidant enzyme catalase also exhibited inconsistency in the fruits of *Carissa carandus* and *Cordia dichotoma*, while its increased activity is noticed in the fruits of *Mimusops elengi* and *Syzygium cumini*. In contrast, catalase demonstrated a declining trend in the fruits of *Manilkara hexandra* and *Physalis minima*. Furthermore, inconsistency in the activity of peroxidase is measured in the fruits of *Carissa carandus*, *Mimusops elengi* and *Syzygium cumini*, while decreasing trend in its activity is observed in fruits of *Cordia dichotoma* and *Manilkara hexandra*. Although the fruit of *Physalis minima* demonstrated an initial decrease in the activity of its peroxidase activity, while its increasing trend is observed from maturation onwards.

The activity of cell wall degrading enzymes, polygalacturonase (PG) exhibited an overall increase in its activity in the fruits of *Carissa carandus*, *Mimusops elengi* and *Syzygium cumini*, while in the fruit of *Cordia dichotoma* increase of its activity continued until the preripened stage. However, inconsistency in the specific activity of
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PG is observed in the fruits of *Manilkara hexandra* and *Physalis minima*. Similarly, pectinmethylesterase (PME) also exhibits an increase in its activity in the fruits of *Carissa carandus*, *Mimusops elengi*, *Physalis minima* and *Syzygium cumini* until their preripened stage, but it decreased thereafter as these fruits ripen. In contrast, inconsistency has been observed in the PME activity of the fruits of *Cordia dichotoma* and *Manilkara hexandra* at their successive stages of growth and ripening. However, cellulase exhibited an overall decrease in its activity in the fruit of *Carissa carandus* from its young stage until it ripened, but in *Physalis minima* the activity of cellulase increases at successive growth stages. Moreover, inconsistency in the activity of catalase was observed in the fruits of *Cordia dichotoma*, *Manilkara hexandra*, *Mimusops elengi* and *Syzygium cumini* at their successive stages of growth and ripening.

The levels of ethylene and the rate of respiration in most of the underutilized fruits worked out under the present study reveal that these fruits exhibit increased levels of ethylene and respiration, except in *Manilkara hexandra*, where an initial decrease in the levels of ethylene and respiration is observed until preripened stage, but with the onset of ripening the levels of ethylene and respiration increases significantly.

The mineral composition of the presently worked out underutilized fruits revealed that the amount of phosphorus and nitrogen was high in them, while potassium, calcium and sodium tend to remain present in moderate amounts. In contrast copper, manganese and zinc were also present, but in trace amounts. However no particular trend was observed in the accumulation of these minerals in the presently studied underutilized fruits.

The underutilized fruits selected for the present study when used for their antibacterial activity revealed that the methanol extract was more potent than the other extracts used against all the tested bacterial strains. The growth of gram positive bacterial strains was more affected as compared to that of gram negative bacterial strains. Higher inhibition activity was recorded when the fruit extracts of *Physalis minima* and *Syzygium cumini* were used, while less to no activity was observed with the extracts of *Carissa carandus* and *Cordia dichotoma* against most of the tested bacterial strains. Among the various extracts used, lowest MIC value was obtained with the methanol extract of *Physalis minima* fruit against *Micrococcus luteus* and diethyl ether extract of
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Syzygium cumini against Bacillus cereus. Hence, the fruits of Physalis minima and Syzygium cumini possess high medicinal value and can be further used to discover bioactive natural products that may serve and facilitate pharmacological studies leading to synthesis of a more potent drug with reduced toxicity.

Hence, looking into results obtained during the present study it may be concluded that all the currently studied underutilized fruits proved to be highly nutritional, being rich sources of sugars. Besides, the fruits also contain high phenolic content, which is known for its antioxidant property and also provide taste and flavour to the fruits. The presence of high amount of starch and decreased sugar content until mature stage defines the extended postharvest storage life of the commodity. Similarly, the presently studied underutilized fruits are low in their proteins and amino acids content, which denotes the larger shelf life of these fruits until their maturity. Besides, the hydrolytic conversion of the storage product starch and the other metabolic changes that takes place during the growth and ripening of the fruits justifies the role of various hydrolyzing and antioxidant enzymes present in these fruits. Moreover, cell wall degrading enzymes act as an indicator to denote the degree of softening that takes place in the fruits and in turn helps in determining the maturity indices of the fruits. In addition, the role of ethylene and respiration are also helpful in determining the harvest index of the fruits. Likewise, the presence of various macro and micronutrients helps in evaluating their importance as they play a vital role in the humans to put their body in good health. Furthermore, these underutilized fruits, besides being of high nutritional importance, also possess several medicinal properties. Thus they can be highly useful in curing various bacterial diseases.

The maturity indices of the presently investigated fruits have been determined, as maturity is the stage of development at which the fruit has completed its natural growth and is ready for harvest. It is also said to be the stage of development, which ensures proper ripening of the fruits once harvested from the parent plant. The determination of specific indices of maturity for each commodity is also required because of the great differences between commodities (Fallik and Aharoni, 2004), as quality standards are a tool to define and measure quality.
Thus they provide a means to measure the “value” of agricultural products in terms of appearance, texture, flavor, nutritional value etc in determining the maturity indices of the produce. Based on the various compositional, physiological and antibacterial parameters worked out under the present study, the fruits of *Carissa carandus*, *Cordia dichotoma*, *Manilkara hexandra* and *Syzygium cumini* are best to be harvested at their preripened stages. As they further continues to exhibit extensive ripening changes, which leads to their possess poor storage life. In contrast, the fruits of *Mimusops elengi* and *Physalis minima* should be harvested for their optimum nutritional at medicinal properties, when they are full mature. Besides, the ripening changes they exhibit are very less and hence demonstrate better shelf life when compared to the other fruits worked out under the present investigation.

Moreover, this study also opens new vistas by exploring the nutritional value of these underutilized fruits, as they are more or less similar or in some cases are highly nutritional than other commercially available fruits. Besides, this study provides new horizon to explore many more underutilized fruits, as they have never been explored or utilized due to lack of awareness in the research community and hence remained underutilized. Moreover, the use of these underutilized fruits can be a substitute to make human diets more balanced and they may play an important role in increasing the production of fruits by introducing these underutilized fruits into commercial market.