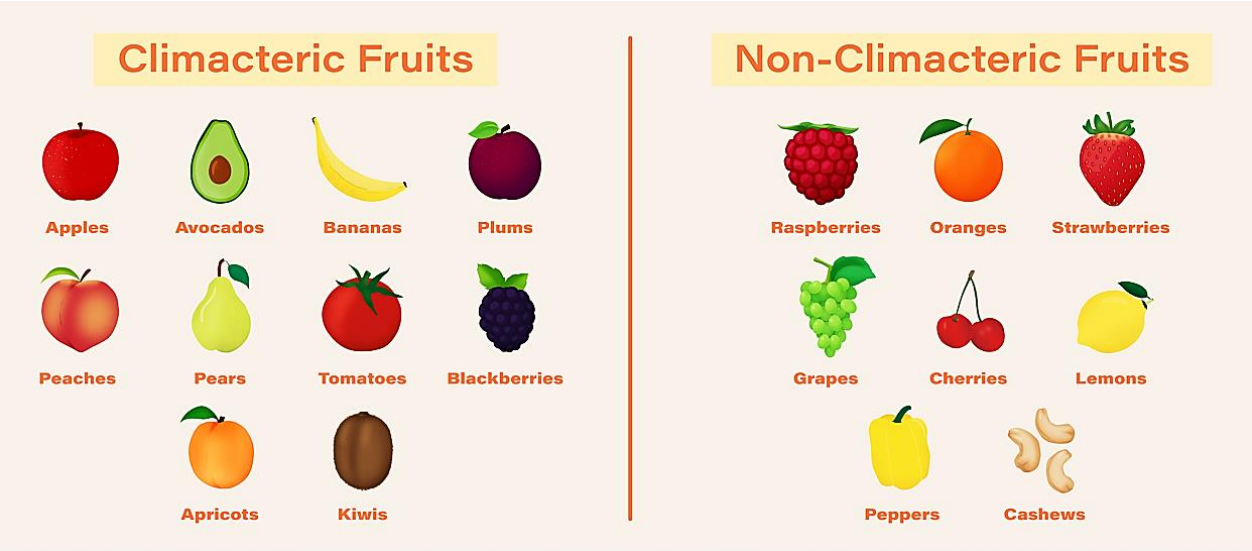
Stay Fresh: Ways to Control Fruit Ripening

The fruit ripening process

Fruit ripening is the final stage of fruit development where it becomes one of the most important determinants of fruit quality and consumer acceptability[5]. Ripeness brings out the best flavours and texture as the fruit becomes sweet, coloured, soft, and develops an appetizing aroma[7]. Fruit ripening is also associated with ethylene, a phytohormone that can lead to the initiation of the ripening and senescence process[3]. Fruit ripening can be divided into two groups: climacteric and non-climacteric fruits. In climacteric, the fruit continues to ripen after harvesting while in non-climacteric, the fruit does not continue to ripen once it's been picked[5,10]. However, if these fruits are exposed to an external ethylene source, such as a ripening climacteric fruit, they can still ripen[13].



Source: *Apeel, 2020*

Why control fruit ripening?

- Extends the storage and shelf life of fresh fruits, especially during shipping and handling.
- Prevent fruit deterioration and maintain visual appeal, as the fruit ripens or enters senescence, it becomes susceptible to fungal and fruit-pathogen resulting in spoilage.
- Dramatically reduce wastage in transit to maximize the yield from the crop.
- Reduce the inherent risk of damaged fruit adversely affecting an entire batch.
- Maximise returns by accessing the markets that most value your fruit.
- Enhance reputation as a supplier of high-quality produce.

Source: *Figueroa, 2021; Its Fresh, 2022; Payasi & Sanwal, 2010*

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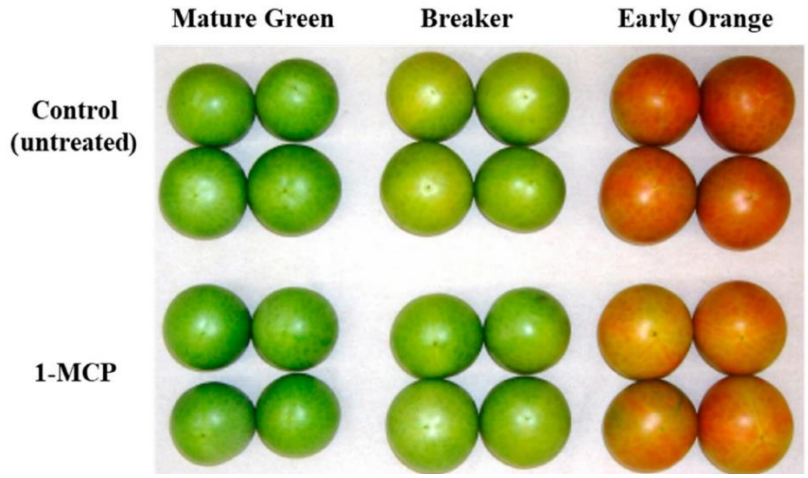
How do we control fruit ripening?

a) Controlling the level of ethylene

As fruits and vegetables mature, they produce increasing amounts of ethylene. This ethylene initiates ripening-associated activities such as increased respiration and softening of the fruits even when the fruit is packaged[8]. By controlling the level of ethylene, the ripening process is slowed down and fruits can be transported or stored for a longer period without becoming overripe or spoiled. Hence, delivering it to the customer in the best possible condition[3,10]. Ethylene inhibitors are used to extend storage life in fruits by using synthetic compounds such as 1-methylcyclopropene (1-MCP)[8].



Source: *Gamrasni et al., 2020*

b) Lowering the temperature

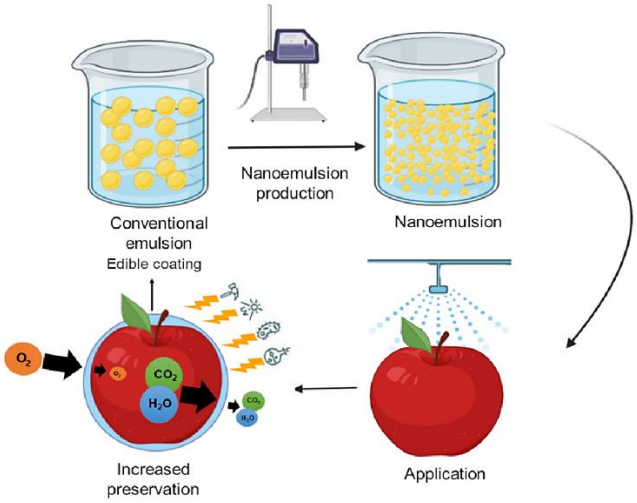
Storage temperature plays a pivotal role in fruit metabolism during long-term storage, causing changes in physical and chemical attributes and in the aroma composition of various fruits[8,11]. The fruit industry utilizes a cold storage temperature of 0–4°C to slow down the ripening process and extend fruit life[8]. Low temperatures generally inhibit microbial growth and slow down respiration, thus maintaining fruit quality during storage[1]. This is important because it allows the product to be shipped further distances and arrive in better condition[6].

c) Modified atmosphere packaging (MAP)

Another way to slow down ripening is by controlling or modifying the atmosphere around the fruit in the packages, primarily by increasing carbon dioxide (CO_2) and reducing oxygen (O_2) levels, thereby extending the shelf-life[9]. Consequently, exposure of fruits to high CO_2 affects respiratory metabolism. This is because fruit needs oxygen to ripen, so if there is less oxygen in the atmosphere, the fruit will ripen more slowly. Furthermore, the combination of N_2O with low O_2 in a controlled atmosphere also gives a synergic effect in delaying the ripening process due to its anti-ethylene activity[10].

d) Edible surface coating

The edible surface coating has also been used as a strategy to delay fruit ripening. Sucrose esters, hydroxypropyl methylcellulose (HPMC), nanoemulsions, and chitosan-based coating have been effective in prolonging the shelf life and quality of fruits[10]. This is due to the layer from the coating agent will reduce the respiration rate and improve the water barrier in fruits[2,12]. According to a study, the shelf life of coated fruit was extended by 12 days when compared to untreated controls which ripened within seven days and lost marketability after day 6[12].



Source: *de Oliveira Filho et al., 2021*[2]

Conclusion

Consumers tend to choose their fruits based on its ripeness at the supermarket. However, once the fruits are ripe, they tend to spoil quickly. Thus, by controlling the ripeness of fruit not only helps the grower to save on postharvest losses, but also brings benefits in terms of retained fruit freshness for a longer period and results in value addition to the fruit[10].

References

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