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Pre-harvest factors affecting postharvest quality



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a) **Genetic Factors related to plants (Plant factors)**

The cultivar and species is the first factor determining the prevalence of different quality parameters of fruit such as colour, shape, size and weight with biochemical composition.

The quality of seed or plant material is an important factor that controls the quality of the fruit and vegetable produced.

Several parameters of quality are controlled genetically.



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The quality parameters of fruits varieties differs from one another, which are supposed to be due to different genetic makeup of the variety and also because of the difference in their total fruit development and ripening period.

e.g. jackfruit, bael, potato, onion, pumpkin, garlic etc. have good quality in relation to shelf life, while apple, mango, cherry, strawberry, tomato, capsicum, okra, brussels sprout, chinese cabbage, carrot, radish attract more to consumers due to their attractive appearance.



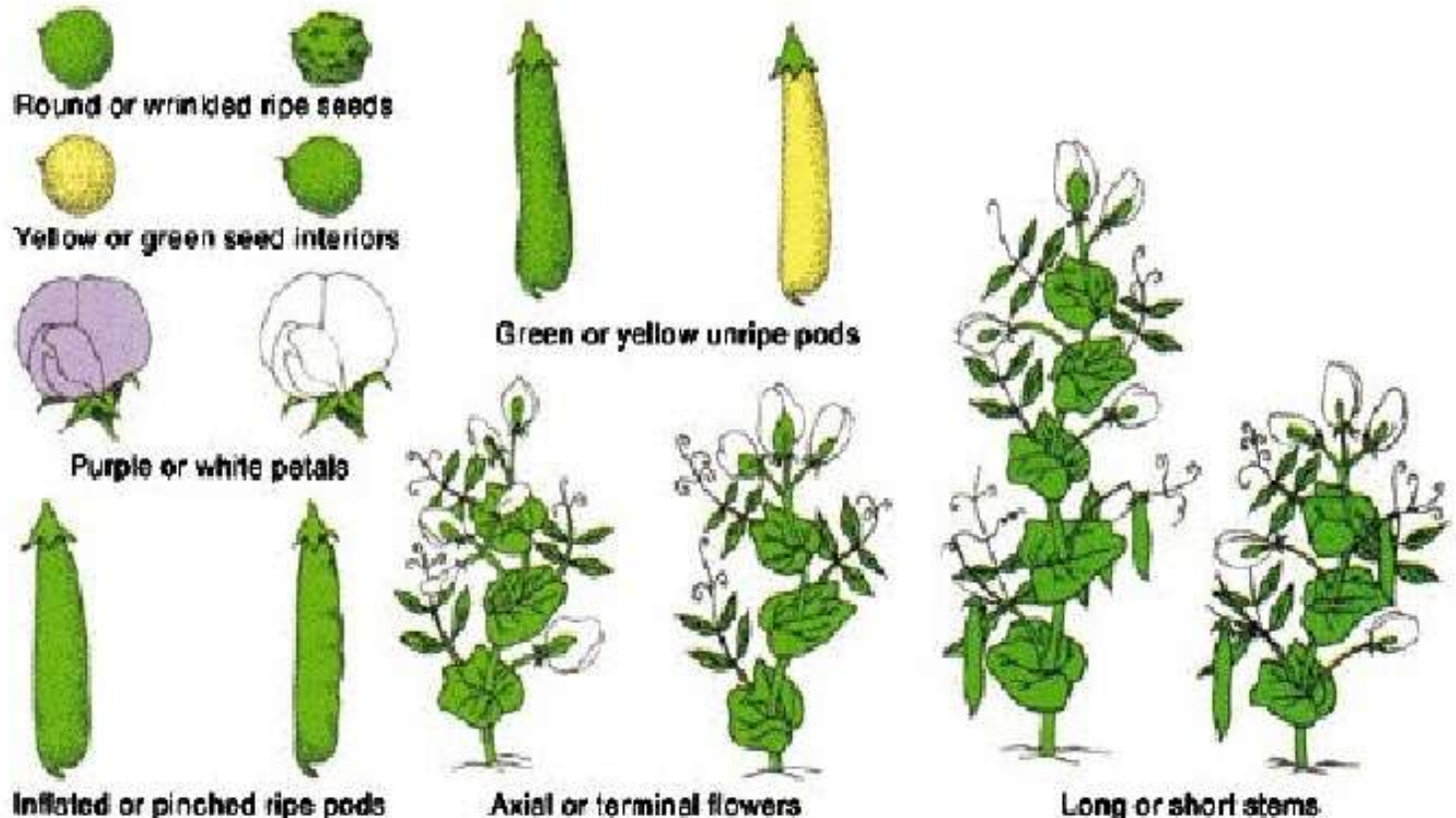
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Example: Genetic factor determining quality traits

Traits Mendel studied in Pea Plants

- Mendel also studied 7 traits of pea plants: They were : Seed shape, seed color, seed coat color, pod shape, flower position, flower color, and stem height.





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b) Related to environments (Climatic factors)

•Radiation

In many cases, modifications in the level of nutritional composition and antioxidant capacity of fruit have been associated with changes in the radiation interception in the field. Sun-exposed sides of fruits have higher levels of phenolic and vitamin C than shaded regions.

•Temperature

Very low or very high temperature may injure sensitive crops. Adequate high intensity and quality is important for the formation of some colour. Temperature influences the uptake and metabolism of mineral and nutrition by plant. Increasing temperature increase the transpiration, while lower temperature influences the flower sex and fruit setting. Fruits like grapes and apple contain higher sugar and lower acid content when grown under high temperature.



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•Rainfall

Rainfall affect the water supply to the plant resulting influences the composition of harvested fruits. Fruits are more susceptible to mechanical damage during shipment. High rainfall and the consequences on fruit growth also increase incidence of skin cracking disorders.

•Harvesting season and time

Quality of produce are greatly influenced by harvesting season e.g. Winter season harvest having more shelf life as compared to other season. When produce are harvested in off season it gives more remunerative price to the grower. Harvesting during or immediately after rains should not be carried out since it creates most favorable conditions for multiplication of microorganisms. Fruits should be harvested when temperature is mild because, higher temperature leads to faster respiration.



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Sow under cover (Yellow)
Sow outside (Orange)

Transplant/ plant (Green)
Harvest (Blue)

Crop	Spring		Summer		Autumn		Winter	
	Early	Late	Early	Late	Early	Late	Early	Late
Asparagus		Green			Blue			
Artichoke	Yellow				Blue			
Beans, broad	Yellow	Orange			Blue		Orange	Yellow
Beans, climbing		Orange			Blue			
Beans, dwarf		Orange	Orange		Blue			
Beetroot	Yellow	Orange	Orange		Blue			
Broccoli, calabrese		Orange	Green		Blue			
Broccoli, sprouting	Blue		Green					Blue
Brussels sprout	Blue	Yellow	Green					Blue
Cabbage, spring			Blue	Orange	Green			
Cabbage, summer	Yellow	Orange	Green		Blue			Yellow
Cabbage, winter	Blue	Orange	Orange	Green			Blue	
Carrots, early		Yellow	Orange		Blue			
Carrots, main			Orange		Blue			
Cauliflower	Yellow	Orange	Green	Green			Blue	
Celeriac	Yellow						Blue	
Celery	Yellow	Green					Blue	
Chard	Blue	Orange		Orange			Blue	
Courgette/marrow		Yellow	Orange	Green			Blue	
Cucumber					Blue			
Kale	Blue		Green				Blue	
Leeks	Blue	Yellow	Orange	Green			Blue	
Lettuce		Yellow	Orange	Orange	Blue	Orange	Blue	
Melons		Yellow		Green			Blue	
Onion, bulb		Green			Blue			
Parsnips	Blue	Orange	Orange				Blue	
Peas	Yellow	Orange	Orange		Blue			
Peppers		Yellow	Orange	Green			Blue	
Potatoes, 1 st early	Green				Blue			
Potatoes, 2 nd early		Green			Blue			
Potato, main crop		Green			Blue			
Radish	Yellow	Orange	Orange	Orange	Blue			
Salsify	Blue		Orange				Blue	
Shallots	Green				Blue			Green
Spinach, summer	Orange	Orange	Blue				Blue	
Spinach, winter	Blue				Orange		Blue	
Squash		Yellow	Orange	Green			Blue	
Sweet corn		Yellow	Orange	Green			Blue	
Tomatoes		Yellow	Green				Blue	
Turnips	Yellow	Orange		Orange			Blue	



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c) Cultural practices (Field Management factors)

•**Planting period:** Many plants are very sensitive to environmental conditions, and thus quality will not be optimized when crop is produced under adverse conditions. Producing summer plants during the winter or vice-versa will not be appropriate, unless protection practices are implemented.

•**Planting density:** It affects both the quantity and quality of the produce. High density planting increases competition between plants, reduces light availability, and thus may decrease quantity. Low density planting lead to large size, better colored fruit or vegetable which may have shorter shelf life. Larger fruits are commonly more sensitive to physiological disorders.

•**Irrigation:** Irregular watering usually reduces fruit size, increases splitting, physiological disorders, reduces water content in the plant or plant part, etc.



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Four Seasons of FRESHNESS

Florida Produce Availability *at a glance*

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
AVOCADOS												
BLUEBERRIES												
CABBAGE												
CANTALOUPE												
CARAMBOLA												
CARROTS												
CAULIFLOWER												
CELERY												
CHINESE CABBAGE												
CUCUMBERS												
EGGPLANT												
GRAPEFRUIT												
GREEN BEANS												
GREEN PEPPERS												
LETTUCE												
MANGOES												
ORANGES												
RADISHES												
SQUASH												
STRAWBERRIES												
SWEET CORN												
TANGERINES												
TOMATOES												
WATERMELON												

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Fruit cracking

Symptoms:

- Radial cracking is more severe than concentric cracking
- Cracking start from stem end in ripe fruits
- Concentric crack around the shoulders of green fruit

Causes:

- Rain after a long dry spell



FRUIT CRACKING

- Uneven regular supply of water.
- Lack of well proper irrigation management.
- Less availability of nitrogenous fertilizer.
- CONTROL
- Well irrigation management.





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- **Fertilization:** Poor management of fertilizers will increase physiological disorders due to deficiencies of some minerals or increase of other leading to toxicity. In both cases, quality will be negatively affected.
- **Pruning:** It reduces the load and increases the growth of fruit and chemical use after harvest. This operation reduces the competition between fruits or plants and thus promotes a good balance between the vegetative and fruit parts and improves quality.
- **Protection:** Pathogens and insects have a very negative effect on quality. Poor management of plant protection programme can lead to very poor quality and reduced yield.



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•**Plant growth regulators:** Application of PGRs can provide significant economic advantage to the growers when used in appropriate concentration, as these have proven effective in stimulating a number of yield and quality parameters. Application of synthetic gibberellins is widely known to improve fruit set in apple and pear. Auxins increase fruit size in citrus, it simulates cell expansion, especially of juice vesicles and cell expansion increase beside capacity for juice accumulation and finally fruit grow faster.

•**Pre-harvest packaging:** Pre-harvest packaging in fruit crops protects the fruit from the attack of pest such as fruit fly and guava weevil. Different types of bagging material are used like Kraft type paper, baking paper, polyethylene, poly propylene spun bond fabrics(PSF), Bio degraded films.



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Pre-harvest packaging/bagging





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OTHERS

•**Season:** Quality of produce are greatly influenced by season e.g. Winter season harvest having more shelf life as compared to other season, while off season fruits and vegetables give more remunerative price. Harvesting during or immediately after rains should not be carried out since it creates most favorable conditions for multiplication of micro-organisms. Citrus fruits become susceptible to damage if harvested during rains as their rind becomes turgid and prone to easy bruising, sun-scald etc.

•**Time:** Fruits and vegetables should always be harvested when temperature is mild. Higher temperature leads to faster respiration. Morning harvest of horticultural crop prefer for local market because they are fully fresh and turgid and having dew drop in this time. Evening harvesting



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is preferred for distant market due to higher accumulation of reserved carbohydrates and less amount of moisture which give the better quality of the produce to consumer. Leafy vegetables harvested in the latter part of the morning or late in the afternoon, the petioles of these vegetables break less easily and their leaves are more resistant to tearing, since they have lost water through transpiration and therefore are less brittle. Cucumber is harvested in the late morning when it to be transported under less than ideal condition because it is less prone to injury when it contains less water.

•**Method of harvesting:** Selection of suitable method for harvesting of the produce is necessary otherwise bruises or injuries during harvesting may later manifest as black or brown patches making them unattractive. Latex coming out of stem in mango should not be allowed to fall on fruits as it creates a black spot. Injury to peel may become an entry



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point for microorganisms, causing rotting. Some harvesting gadgets have been developed, e.g. mango harvester in Lucknow (CISH).

- **Stage of harvesting:** Fruits and vegetables must be harvested at right stage of maturity. A very common cause of poor product quality at harvest and rapid deterioration thereafter is harvesting immature vegetables. Vegetables harvested immature or over mature usually do not keep long. Fruit vegetables harvested too early lose water fast and are more susceptible to mechanical damage and microbial attack. An over mature vegetable is more susceptible to decay, has passed its best eating quality, and deteriorates fast.

- **Consumer demand:** Harvesting time and harvest maturity can be altered by the requirement of the consumer's demand which may affect the quality of the produce at some extent.



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Proper harvesting equipment and technique reduces loss



Hitting fruits with sticks or shaking causes injury to fruits





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