Post Harvest Management of Cut flowers
Longevity/ vase life/ display life/ shelf life

- The period for which flowers or foliage remain in presentable form without losing its grade and quality is known as longevity, vase life, display life or shelf life.

- Shelf life term is mostly used in case of loose flowers.
Ideal cut flower

- An ideal cut flower should remain fresh with respect to its colour, fragrance and appearance without losing its grade for reasonable length of time.
Post harvest handling of flowers vs fruits, vegetables or seeds

- Most of the fruits, vegetables or seeds are single morphological units.
- Cut flowers or cut inflorescence are composed of many morphological units such as sepals, petals, androecium, gynoecium, stem and often leaves.
- These are different in terms of morphological and physiological traits and interact with each other thus making a cut flower more complex organ.
- This interaction between these components influence water balance, thus, post harvest life of cut flowers is much affected.
Loss due to Ash cloud in Europe during April, 2010

- Hundred of million US$ loss in floriculture industry world wide.
- Kenya- 12m US$
- Ecuador- 5m US$
- Ethiopia- 2m US$
- Israel- 1m US$
Post harvest losses in flowers

- About 20 per cent losses due to improper handling
- About 10 per cent flowers are unmarketable and are not harvested
- Shrinkage losses during marketing
- Over all about 50 per cent losses occur.
Floral quality parameters

- Flower (size, condition, maturity, shape, longevity, colour, texture, grade, fragrance, appearance)
- Stem (size, shape, strength)
- Free from defects and disorders.
Evaluating post harvest quality of cut flowers

- Final shape and size of flowers
- Development of florets in spike inflorescence or lateral florets
- Change in fresh weight of flowers
- Turgidity and freshness of flowers at consumers level
- Objective measurement of changes in petal colour
- Stability or strength of stem or pedicel
- Changes in colour of petals
- Yellowing or browning of foliage or stem
- Water or vase solution up take
Factors influencing longevity of cut flowers

- Genetic or inherent factors (Crop species and cultivar)
- Environmental factors (Light- quality, intensity and photoperiod; Temperature- aerial and growing medium; Relative humidity; air composition; pressure; growing season)
- Management factors (Growing media; nutrition; irrigation- amount and frequency; fertilizers; insecticide-pesticides; insect- pests and diseases; growth regulators)
- Harvest factors (Harvest maturity; time of harvesting; mode of harvesting; distance of market; consumer preference)
- Ethylene
- Post-harvest factors (Handling; precooling; storage environment- light, temperature, relative humidity, air circulation, CO2 and O2; watering; nutrition; preservative solutions; control of diseases; packing and transportation)
Causes of deterioration of cut flowers

- Growing conditions
- Mechanical injury
- Depletion of food reserve
- Infections of microbes
- Plugging of xylem vessels
- Senescence and aging
- Moisture content
- Water quality
- Ethylene gas
- Heat damage
Senescence

- Senescence is the final phase in ontogeny of the organ in which a series of normally irreversible events initiated that leads to cellular breakdown and death of the organ.
Harvest maturity

- It is defined as a point in time when a crop can be harvested and it will continue to grow and develop to reach maximum quality if necessary.
Factors determining the correct harvest maturity of cut flowers

- Crop
- Species
- Cultivar
- Flower market (local or distant)
- Type of handling during marketing process
- Consumer preference
Asiatic Lilium - stage for distant market
Asiatic Lilium- stage for local market
Gladiolus-stage of harvesting for distant market
Local Market
Chrysanthemum - stage of harvesting for distant market
Chrysanthemum - stage of harvesting for local market
Standard carnation- stage of harvesting for local market
Gerbera- stage of harvesting for distant market
Advantages of harvesting cut flowers in bud stage

- Reduction in sensitivity of flowers to drastic climatic conditions and ethylene during handling and shipment/transit
- Saving space during shipment and storage
- Extending vase life of cut flowers
- Reducing the time for which crop remains in the field/greenhouse
- Improving the opening, size, colour and longevity of cut flowers, especially grown under poor light and high temperature
- Minimizing the hazard of damage to field-grown cut flowers by adverse climate and insect-pests.
Detrimental affects of ethylene on cut flowers and pot plants

- Ethylene is a low molecular weight, two carbon compound in gaseous state at room temperature synthesized by most of the higher plants and is 3-5 ppb in air.
- It leads to loss of water in cut flowers
- Decreases water uptake
- Decreases fresh weight of flowers
- Sleeping of carnations, shattering of florets in snapdragon, shelling of calceolaria, dry sepal injury in orchids and yellowing of foliage of pot plants are its detrimental affects.
Flowers most sensitive to ethylene

- Alstroemeria
- Carnation
- Freesia
- Lilium
- Petunia
Flowers and foliage less sensitive to ethylene

- Anthurium
- Gerbera
- Asparagus
Chemical used for inhibiting ethylene ill effects

- Amino-ethoxyvinyl glycine
- Amino-oxy-acetic acid (AOA)
- Methoxyvinyl glycine
- Silver thiosulphate (STS), but now banned
- 1-MCP (1- Methyl Cyclo-Propene)- a non-toxic synthetic gas @ 10-20 ppb for 6-12 hours at 20°C
Hardening

- It is a treatment given immediately after the harvesting of flowers by using water (preferably warm de-ionized water containing some germicide) to restore turgidity.
Pulsing or loading

- It consists of placing the lower portion of cut flower stems in solution containing high percentage of sugar and germicide for a period of few hours to two days. Specific formulations developed vary with the flower species as sucrose 2-20% for 12-48 hours at 20-27°C and relative humidity 80-100% under 2000-2500 lux cool light.
Pre cooling

- It is the removal of field heat from cut flowers, in which temperature is brought down from 25-30°C to 1-2°C in less than an hour time either through hydrocooling or mechanical refrigeration.
Storage of cut flowers

- Cold storage/ refrigeration (wet or dry)
- Controlled atmospheric storage ($\text{CO}_2$: 5-30%, Temperature: 3-10°C, low $\text{O}_2$)
- Modified atmospheric storage
- Hypobaric or low pressure storage (Temperature: 2°C, Relative humidity: 98%, Pressure: 3.2 k Pascal or 24 mm Hg or 0.1 atm.)
Chain of life in cut flowers

- It is the application of improved loss-reduction biotechnology in growing, harvesting, handling, marketing of floral products and educating the consumers for caring these at home. It couples the grower, wholesaler, retailer and the consumer in to single chain.
Steps in chain of life

- Refrigeration
- Use of floral preservatives
  - **Bud opening solution** (high concentration of sucrose plus biocide)
  - **Pulsing solution** (relatively high concentration of sucrose i.e. 5-20% plus biocide)
  - **Vase solution** (low concentration of sucrose plus biocide)
- Use of high quality water
- Sanitation
- Temperature management during transportation
- Re-cutting of stems
- Care of floral products at consumers home.
Mineral solutes used in prolonging flower longevity

- Sucrose
- Sugar
- 8-HQC
- 8-HQS
- Citric acid
- Aluminium nitrate
- Aluminium sulphate
- Borax
- Calcium nitrate
- Cobalt nitrate
- Zinc sulphate
- Nickel chloride
- Silver nitrate
- Silver thiosulphate (STS)
- 1-MCP (1- Methyl Cyclo-Propene)
- Sodium hypochlorite
- Thiobendazole
Commercial preservatives

- Crystal
- Ever bloom
- Flora life
- Oasis
- Petal life
- Rose life
- Seven up
Do’s and Don’ts for improving vase life of cut flowers

- Harvest flowers at right stage
- Remove 1/3rd leaves and all the leaves below water
- Don’t dip more than 3-10 cm stem in vase solution
- Add 1-2 teaspoons of sugar in vase water or use recommended preservatives
- Keep flower vases in red or blue light about 2000 lux or more
- Higher humidity in room is good
- Change vase water every 2-3 days
- Cut the lower stem end by 1-2 cm at alternate day
Do’s and Don’ts for improving longevity of cut flowers

- Don’t keep flower vases under/ near direct sunlight or electric appliances like fans, heaters, blowers, etc.
- Avoid smoking or combustion of gases in room
- Allow clean and fresh air to pass through the room
- Spray water with barber sprayer at least twice a day
- Keep on removing dried or faded flowers/ florets
- Keep stems (2-3 cm) in boiling water for about 60 seconds particularly when stems having milky fluid exuding like poinsettia.