

# CARNATION

Botanical name: *Dianthus caryophyllus*

Family: *Caryophyllaceae*

Origin: Southern Europe (France) & National flower: Spain

Introduction in India: Around 1980

Area in HP during 2012-13: 65 ha      2011-12: 59 ha

2010-11: 74 ha      2009-10: 52 ha      2008-09: 40 ha



# Why carnation became so popular?

- Excellent vase life
- Wide range of flower colours and forms
- Ability to withstand long distance transportation
- Rehydrate easily
- Lighter weight



# Dr Ravinder Nath with carnation grower Sh. Sudhir Sharma at Dhadhol



# Sh. Inder Singh Thakur, Jukhala



# Dr Mushtaq Mohammad, leading grower cum motivator of flower cultivation in HP



# Different types of carnation

- Border or outdoor carnations
- Greenhouse or florist or perpetual carnations

# Different types of border carnations

- Self (Single colour)
- Fancies (yellow or white background mottled with various colours)
- Picotees (White or yellow with narrow bands)
- Bizarres (2 or 3 colours)
- Flakes (Clear ground flaked with one colour)
- Marmaison (Plants with stiff massive habit, with broad leaves fully double flowers, pink, well filled centre and fragrant flowers)

# Different types of florist carnations

- **Standard:** Ability to produce single large sized bloom if timely disbudding and proper nutrition is applied. Better adapted in cool climate.





# Different types of florist carnations

- **Spray:** Ability to produce small to medium sized numerous flowers and bloom size do not increase irrespective of disbudding and best fertilizer application. Better adapted in warm climate than standards.



# Different types of florist carnations

- **Micro carnations**
- **Mini carnations**



# Different types of florist carnations

- **Standard cultivars:**
- Red: Scania, Tanga, Red William, Granda, Espana, Master, Killer.
- Pink: Pamir, Nora, Lena, Sharina, Pink Sim, candy, Manon, Oriana.
- Yellow: Pallas, Raggio di Sole, Candy, Yellow Dusty, Murcia, Tahiti.
- White: White Sim, Roma, Candy, Calypso, Sonsara.
- Orange: Tangerine Sim, Orange Triumph.
- Others: Charmeur, Aurthor Sim, Toledo, Solar, Laurella, Vanessa.
- Indian cultivars: Arka Flame and Arka Tejas

# Arka Flame



# Different types of florist carnations

- **Spray cultivars:**
- Red: Rony, Karma, Enzo, Etna, Peach Delight, Vermillion Protruding.
- Pink: Annelies, Barbara, Silvery pink, Madea, Karina, Medley.
- Yellow: Yellow Odeon, Alicetta, Lior, Goldilocks.
- White: White Royalette, Tibet, Iceland, Excel, Equisite, White Lilia.
- Others: Twinkle, Exquisite, Kissi, Luna, Mirage, Macarena.
- **Micro carnations:** Eolo, Pink Eolo, Wiko.
- **Mini carnations:** Lima, Orca, Roland.

# Climatic Factors

- Light: Photoperiod (long days over 16 hours) and intensity (100 watts bulb spaced at 10.5m at 1.5m height)
- Temperature: Night ( winter: 10-11° C, spring: 12.7° C and summer: 13-15.4° C) and day ( 18-23° C)
- Ventilation: Free circulation of air
- Relative humidity: 50-60%.
- CO<sub>2</sub>: 500-1500 ppm

# Propagation of carnations

- Seeds (only to develop new cultivars)
- Terminal stem cuttings (8-10 cm long with 4-6 leaf pairs)
- Micro-propagation



# Carnations propagation by terminal stem cuttings

- Terminal cutting of 8-10 cm long is taken.
- Shear off lower most 1-2 leaf pairs.
- Give sharp cut below node.
- Dip the cuttings in a solution of Dithane M. 45 (0.1%) + Bavistin (0.1%) for 5 min.
- Put the lower end of cuttings in a solution of NAA or IBA 500 ppm for 5 sec.
- Plant the cuttings in sterile sand at a spacing of 3 x 3 cm.
- Spray water 4-5 times in a day so that 90% or more humidity is maintained.
- Temperature: 20-30°C is ideal.
- Rooting occur in 3-4 weeks.
- Transfer these rooted cuttings to a hardening chamber in mini portable tunnels (3 x 1.5 x 15 m :: w x h x l) in a sterilized medium (sand: soil: FYM: rice husk one part each) for about 3-4 weeks.







# Management factors affecting growth and flowering of carnations

- Soil or medium condition
- Spacing
- Nutrition
- Pinching
- Disbudding
- De-shooting
- Plant support (staking)

# Ideal soil for growing carnations

- Light texture loam or sandy loam soil which is well drained and aerated.
- Soil pH: 6-7

# Optimum planting time

- N.I. plains: Sep.-Oct.
- Low hills: Sep.-Nov.
- Mid hills: Jan.-Feb.
- High hills: Mar.-April
- Northern hemisphere: April-Sep.
- Southern Hemisphere: Sep.-April
- Staggered planting at 15 days interval ensure regular supply of cut flowers.



# Optimum planting density and spacing

- Ordinary: 25-32 plants/m<sup>2</sup>
- High : 40 plants/m<sup>2</sup>
- Standards: 20 x 20 cm
- Spray: 30 x 30 cm

# Optimum level of major nutrients

- N: 5.4%, P: 0.31%, K: 3.8%
- Standards: FYM: 5 kg, N: 30g, P: 20g, K: 10g/ m<sup>2</sup>
- Spray: FYM: 5 kg, N: 40g, P: 20g, K: 10g/ m<sup>2</sup>



# Fertigation schedule 500 m<sup>2</sup>

- Day 1: 19/19/19 - 800g
- Day 2: plain water
- Day 3: 0/52/34 - 700g
- Day 4: plain water
- Day 5: Ca(NO<sub>3</sub>)<sub>2</sub> - 800g
- Day 6: plain water
- Day 7: 13/0/45 - 400g
- Day 8: plain water
- Day 9: MgSO<sub>4</sub>- 350g + Micronutrient- 300g
- Day 10: plain water

# Optimum level of soil moisture

- Optimum soil moisture is 300-500 cm tension
- Irrigation twice/thrice in a week is optimum

# Pinching in carnations

In pinching terminal growing shoot about 2-3 cm long is removed to overcome apical dominance and to promote side branching when the plants are at 6-8 leaf pair stage.

# Types of pinching in carnations

- Single pinching: In single pinching terminal growing shoot about 2-3 cm long is removed once in all the shoots.
- Pinch and a half: First pinching is done in all the shoots. When the side shoots are 6-8 cm long and this stage occur at 40-50 days after pinching, then half of the shoots are again pinched. This increases the duration of flowering.
- Pinch plus pull pinch: First pinching is done in all the shoots. Later on keep removing the shoots by pulling up to 2 months, so as to get single large peak flowering.

# Types of pinching in carnations

- Double pinching: First pinching is done in all the shoots. When the side shoots are 6-8 cm long and this stage occur at 40-50 days after pinching, then again do the pinching in all the shoots. This delays the flowering and flower quality is also poor.
- In marguerite and annual carnations pinching is done at 40 and 60 days after transplanting.

# De-shooting in carnations

- When the side shoots after pinching are 3-5 cm long then retain 3-5 shoots per plant in standard cultivars.
- When the side shoots after pinching are 3-5 cm long then retain 6-10 shoots per plant in spray cultivars.

# Disbudding in carnations

- Disbudding is the removal of visible (5-10 mm diameter) undesirable buds.
- In standard cultivars terminal bud is retained and all the lateral buds are removed.
- In spray cultivars terminal bud is removed and lateral buds are retained.

# Staking in carnations

- Wire mesh, plastic nets, string or bamboo canes are used to support plants.
- Wire mesh or plastic nets having inner size of 10-15 cm squares are placed on the ground in three layers, which are erected at 20, 35 and 50 cm above the ground level with the growing plants.
- String or rope is erected in three rows at the same distance along the rows.







# Weeding in carnations

- Three-four hand weeding.
- Chemicals viz., oxidiazon and napropamide @ 2.2 and 4.5 kg a.i. per hectare are good in greenhouse.
- In open fluchloralin (basalin) and pendimethalin (stomp) @ 1.0 a.i. per hectare each are effective.

# Optimum stage of harvesting carnation flowers

- Standard cultivars for local market are harvested when flowers are half opened or at painting brush or outer petal is perpendicular to stem, while for distant market cross is developed on buds and colour is visible.
- Spray cultivars are harvested for local market when two flowers have opened and others have shown colour, while for distant market when 50% flowers have shown colour.
- For loose flowers fully open flowers are harvested.

# Qualities the carnation cut flowers

According to Society of American Florists:

- Bright, clean and firm flowers and leaves
- Fairly tight petals near the centre of the flowers.
- Symmetrical flower shape and size representative of the cultivar.
- No calyx splitting.
- No lateral buds or suckers.
- No decay or damage.
- Straight stem and normal growth

## Different grades of carnation cut flowers

Parameter	Grade	Grade	Grade
Bud dia (mm)	Blue/ Fancy	Red/ Standard	Green/ Short
Tight	50	44	None
Fairly tight	62	56	None
Open	75	60	None
Stem length (cm)	55	43	30

# Local grades of carnation cut flowers

- A: over 45 cm
- B: 30-45 cm
- C: less than 30 cm

# Packaging of cut flowers

- In bundles of 10, 12, 20 or 25.
- In corrugated cardboard boxes of 120 x 60 x 30 cm (L x W x H) accommodates about 800-1000 cut flowers of carnation.
- Wrap flower bunches in cellophane sleeves.



# Post Harvest Management

Ideal pulsing solution in carnations:

- STS 0.5 mM + BA 25 ppm + sucrose 5% for 20 minutes

Ideal holding solution in carnations:

- Sucrose 2% + 8-HQC 200 ppm



# Important diseases of carnations

- Wilt (*Fusarium oxysporum f. sp. dianthi*)
- Foot- rot (*Phytophthora*, *Pythium*, *Rhizoctonia solani*, *Sclerotinia sclerotiarum*)
- Stem rot (*Fusarium roseum*)
- Flower bud rot (*Alternaria dianthi*)
- Bacterial wilt (*Pseudomonas caryophylli*)
- Rust (*Uromyces caryophyllinus* or *U. dianthi*)
- Flower blight (*Botrytis cinerea*)
- Fairy ring spot (*Heterosporium echinulatum*)
- Viral diseases

# Important insect-pests of carnations

- Aphids
- Red spider mites
- Heliothis caterpillar
- Nematodes



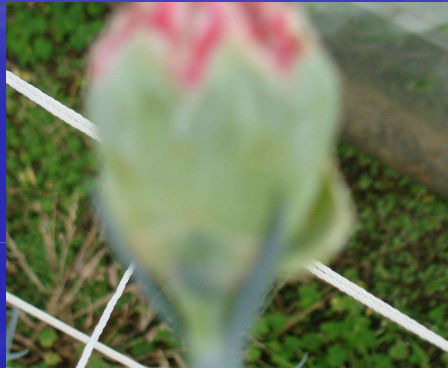
# Red spider mites in carnation





**Nematodes infestation**

# Thrips attack in carnation



# Important disorders of carnations

- Calyx splitting
- Grassiness
- Sleepiness
- Splitting at nodes and bushiness
- Small narrow leaves and tied tips

# Calyx splitting

- Fluctuation of temperature
- Night temperature should not be below 10°C
- Use of more nitrogenous fertilizers
- More during spring than winter
- Vary from cultivar to cultivar.
- Do rubber banding before flower opening.



**Kamachi**



# Grassiness

- No flower production.
- Genetically related disorder.
- Vary from cultivar to cultivar.
- Remove and destroy all such plants

# Sleepiness

- There is temporary or permanent wilting of flowers.
- It is due to exposure to ethylene or water stress or higher temperature.
- Spray STS 0.4mM before harvesting
- As a replacement for STS keep cut flowers in 1-MCP (Methyl Cyclo-Propene) 10-20 ppb for 6-12 hours

# Splitting of nodes

- Poor shoots developed through gaps.
- Poor flower quality.
- Boron deficiency.
- Apply boron @ 2g/m<sup>2</sup>.

# Tinting is done in carnations

- A concentrated liquid or powder colour is mixed in small amount of warm pure water (37°C) and stems are placed in it. The colour develops in different patterns on the petals after 10-24 hours.

# Optimum yield of carnations

- Standard: 4-6 stems/plant
- Spray: 8-12 stems/plant
- Average yield 200-300 flower stems/m<sup>2</sup>/year.