

Introduction

- ✓ It is a semi hardy, annual and commercial flower crop
- ✓ Family: *Asteraceae*.
- ✓ $2n = 18$
- ✓ Native : China
- ✓ **Single species** i.e. *C. chinensis* (Huziwara, 1954).
- ✓ Spread to European and other tropical countries during 1731 AD (Desai, 1967).
- ✓ The genus *Callistephus* is derived from **two Greek** words
- ✓ ***Kalistos*** meaning ‘most beautiful’ and ***Stephos***, ‘a crown’ referring to the flower head.

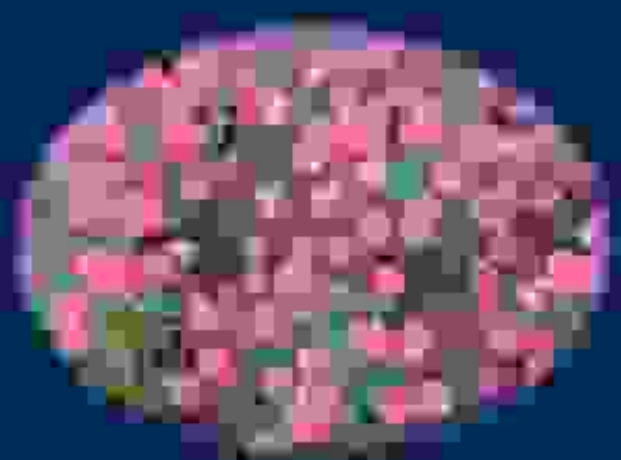
IMPORTANCE OF THE CROP



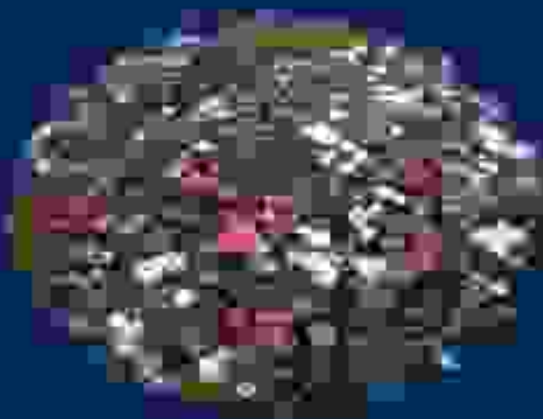
Loose flower



Cut flower



Pot plant



Landscape

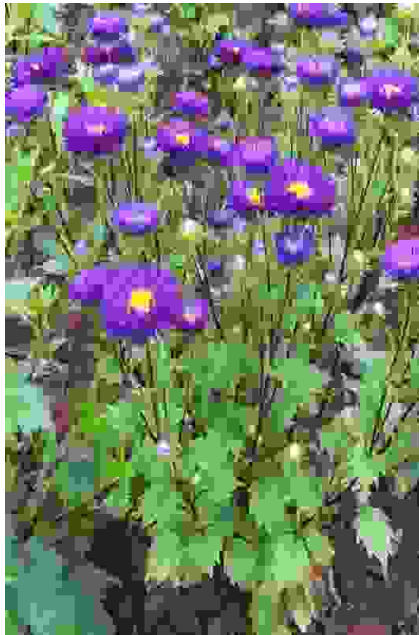


Borders



Commercial

- ✓ **Erect and spreading types**
- ✓ Grown successfully in open conditions for **year round production** in *kharif*, *rabi* and summer
- ✓ Countries : Siberia, Russia, Japan, North America, Switzerland and Europe.
- ✓ India : Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra (Pune and Nasik) and West Bengal.
- ✓ In Karnataka : 2194 ha, with a production of 20646 tonnes and productivity of **9.41 t/ha**. (Anon, 2012).

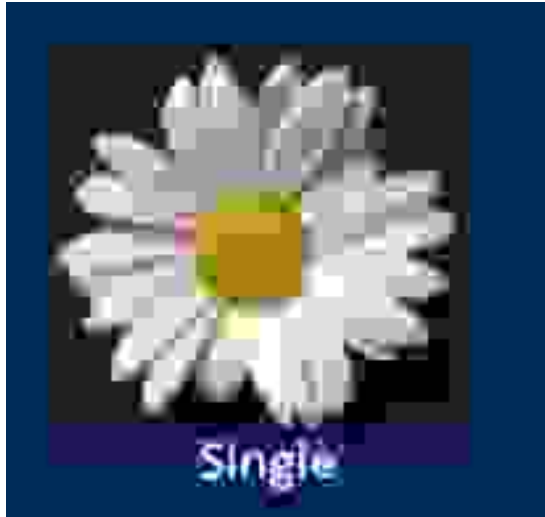


Erect type



Spreading type

Flower types



Commercial Cultivation



- ✓ Present day's asters have been developed from a **single form of wild species** *Callistephus chinensis*. The evolution of China aster was a history of remarkable variations.
- ✓ According to Emsweller et al. (1937), - original plant had **single flowers** with two or four rows of blue, violet or white ray florets.
- ✓ Germans developed **double forms** during 18th century.



Single type



Double type

- ✓ It is a **Self pollinated** crop North (1979) and Watts (1980)
- ✓ Geitanogamous condition – Favors self pollination
- ✓ Fleming (1937) estimated approximately **10 per cent natural out crossing** in China aster.
- ✓ Strube (1965) described **floral biology** of China aster, as its flower head consists of both pistillate ray florets and perfect disc florets
- ✓ Institute : Crop improvement work
 - IIHR, Bangalore
 - Ganesh Khind Botanical Garden, Pune, MPKV, Rahuri
 - UHS, Bagalkot
 - IARI, New Delhi
- ✓ DUS Center for China aster: IIHR, Bangalore

Objectives of breeding

- 1. Compact growth habit**
- 2. Tolerant to different climatic conditions**
- 3. Profuse flowering/abundant flowering**
- 4. Horizontal placement of flowers on the stock**
- 5. Resistant to Fusarium wilt/Alternaria leaf spot**
- 6. Others: size, shape, colour and keeping quality**

Inheritance pattern

Quantitative traits:

Raghava (1984)

- Flower double ness > Singleness: Gene action – Single dominant gene
- Drooping ness > erect ness : Incomplete dominance

Strube (1965)

- Apetalous flowering type < Normal flowers

Qualitative traits: Flower colour

Fleming (1937)

- Purple > Red and Deep pink > White (Recessive to all colours)

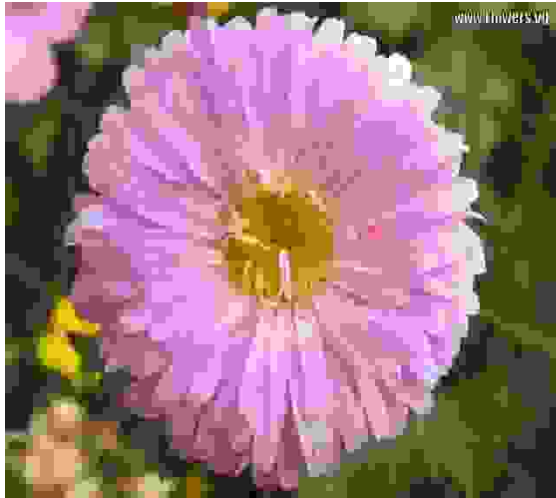
Negi and Raghava (1990)

- Violet > All other colours

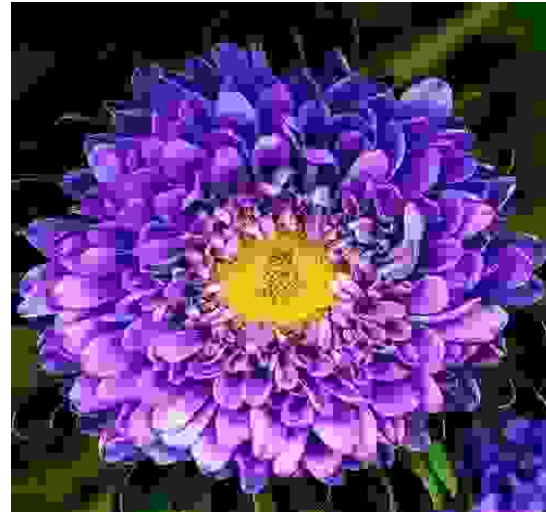
Seyffert Forkmann (1977)

- Multiple alleles govern flower colour in China aster

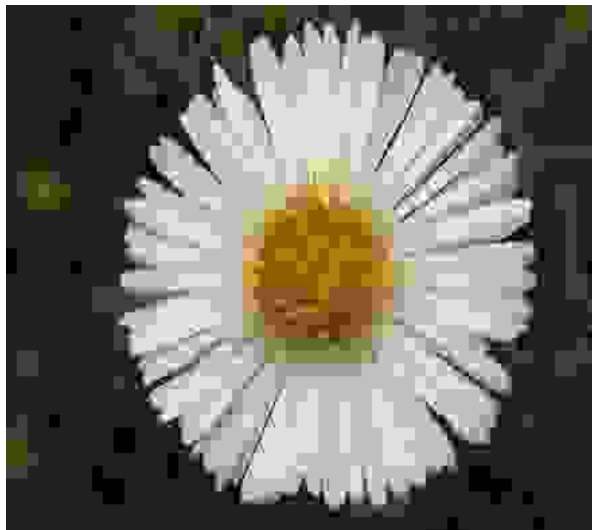
Major colours existing in China aster



PINK



VIOLET/PURPLE



WHITE



RED

Breeding Methods

- **Collection, maintenance and assessment of germplasm**
- **Pure line selection**
- **Hybridization**
- **Mutation breeding**

1. Collection, maintenance and assessment of germplasm

Pedigree of AAC-1 genotype of China aster

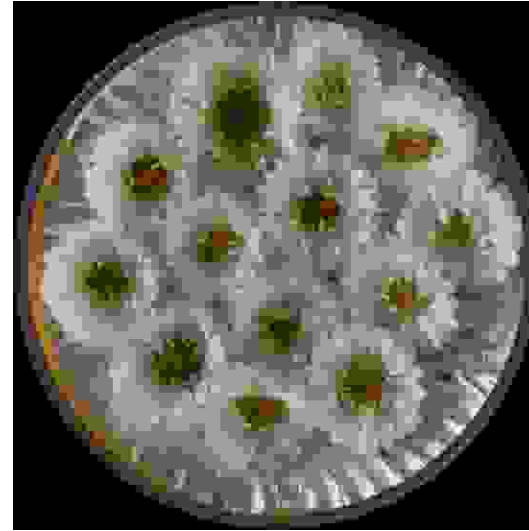
AAC-1 (Arabhavi Aster Collection-1)

It is **OP seedling selection** from germplasm maintained at Department of FLA, KRCCH, Arabhavi.

Flowers are **pink in colour**, flower diameter is 5.5-6.0 cm and flower weigh 4 g, plant height is 55 cm, stalk length of 30 cm and takes about 138 days to flower. The plants produces **50 flowers/plant**.

Selections

**Ganesh Khind Botanical Garden, Pune,
MPKV, Rahuri**



Colour: Snow white (Late type)
Flower type: Double chrysanthemum
Yield: 47.07 lakh flowers/ha
Uses: Cut/loose flower

Cv. PG-White



Colour: Violet (Early type)
Flower type: Double chrysanthemum
Yield: 60.47 lakh flowers/ha
Uses: Cut/loose flower

Cv. PG-Violet



Colour: Rosy Pink (Early type)
Flower type: Double chrysanthemum
Yield: 43.03 lakh flowers/ha
Uses: Cut flower

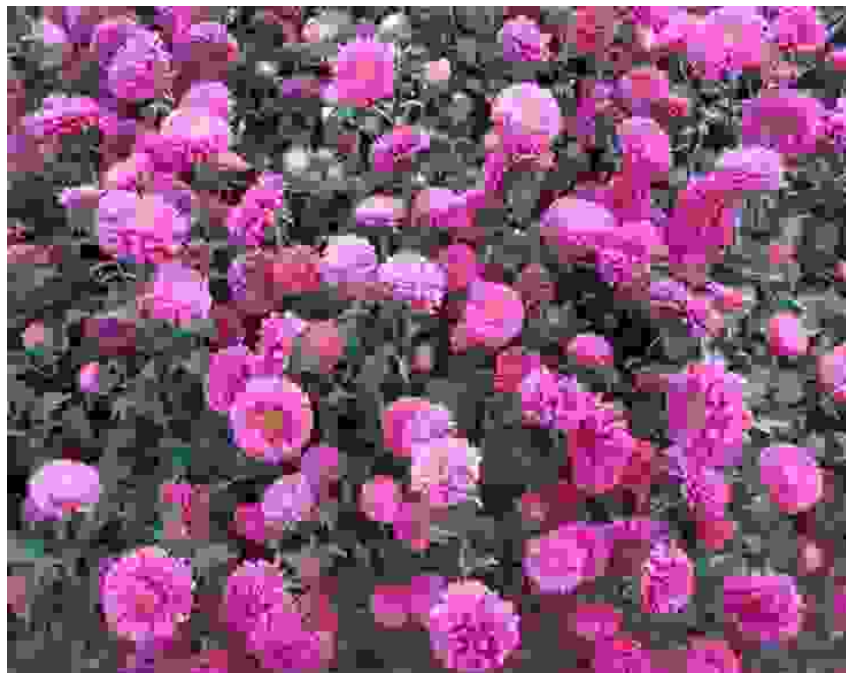
Cv. PG-Pink



Colour: Bright purple
Flower type: Double chrysanthemum
Yield: 46.82 lakh flowers/ha
Uses: Cut/loose flower

Cv. PG-Purple

New Varieties (IIHR, Bangalore)



Arka Aadya

- Individual plant selection from OP population (Line No. 178)
- Colour- Pink
- Early flowering type (66DAYS)
- Loose flower purpose
- No. of flowers / plant- 70
- Yield: 178.5g/plant

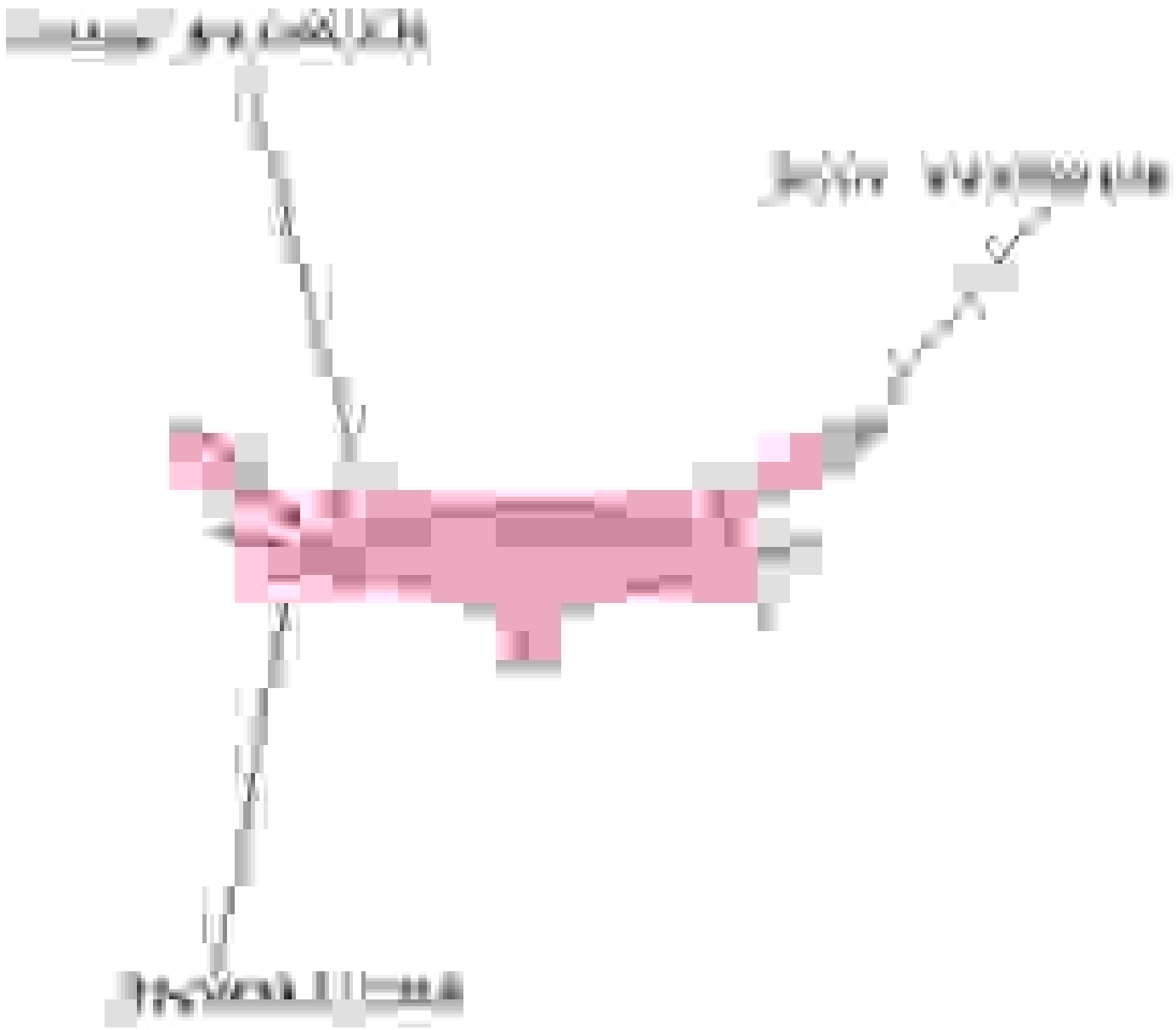


- Selection from segregating population (Line No. 15)
- Colour- white
- Early flowering type(69DAYS)
- Loose flower purpose
- No. of flowers / plant: 85
- Yield: 222.62g/plant

Arka Archana

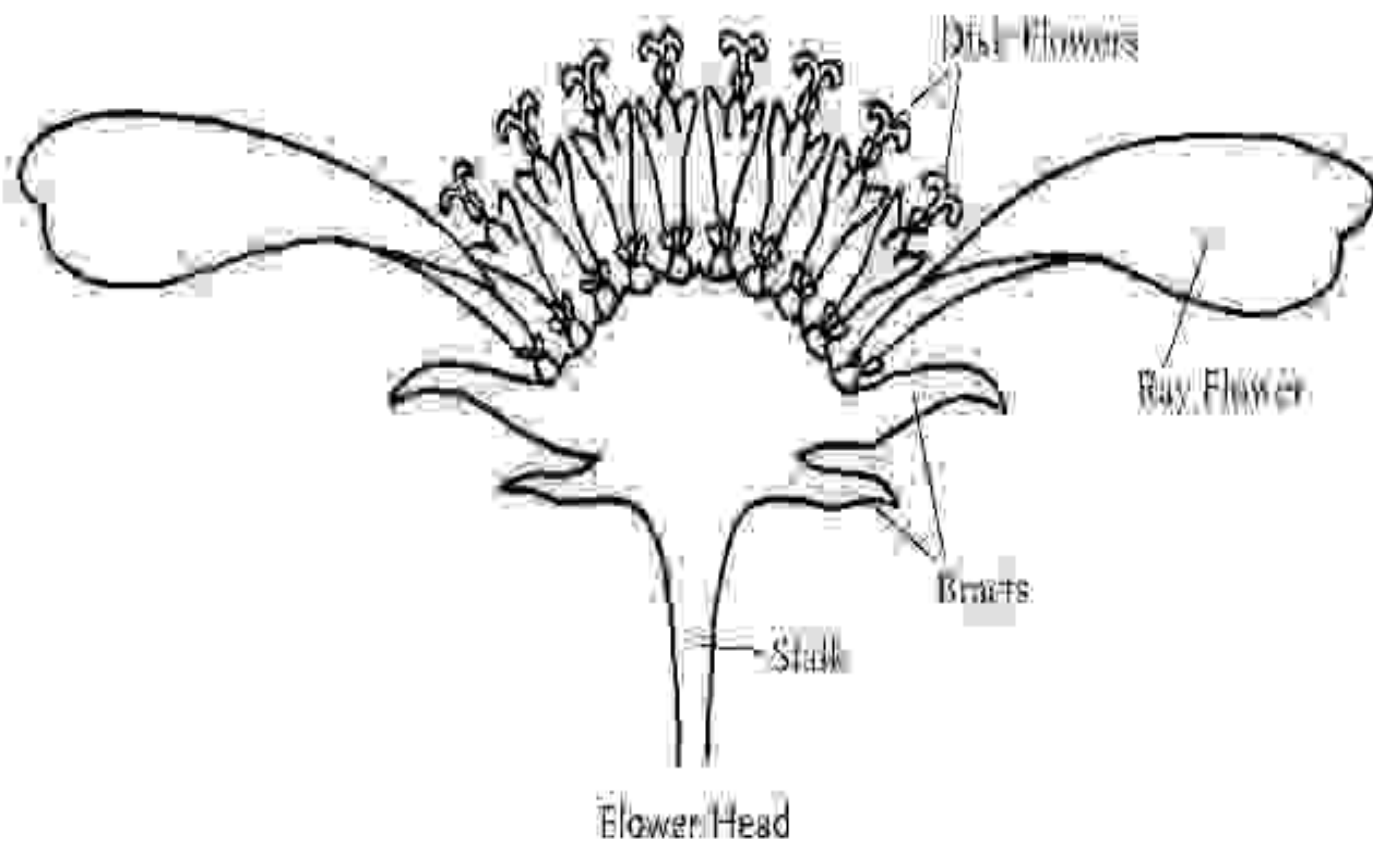
Hybridization

Floral Biology

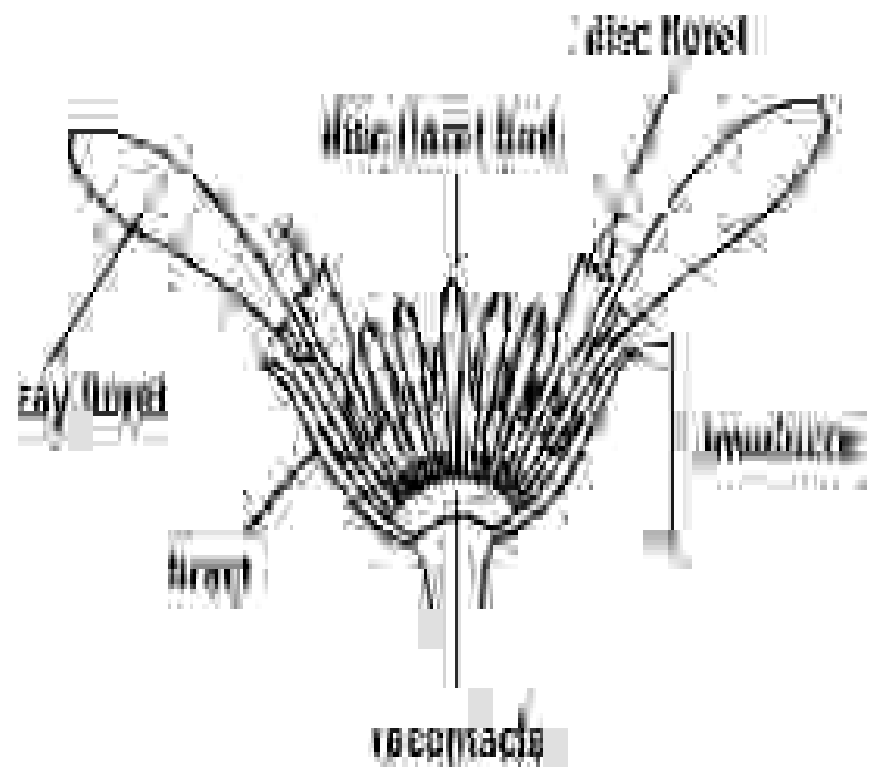
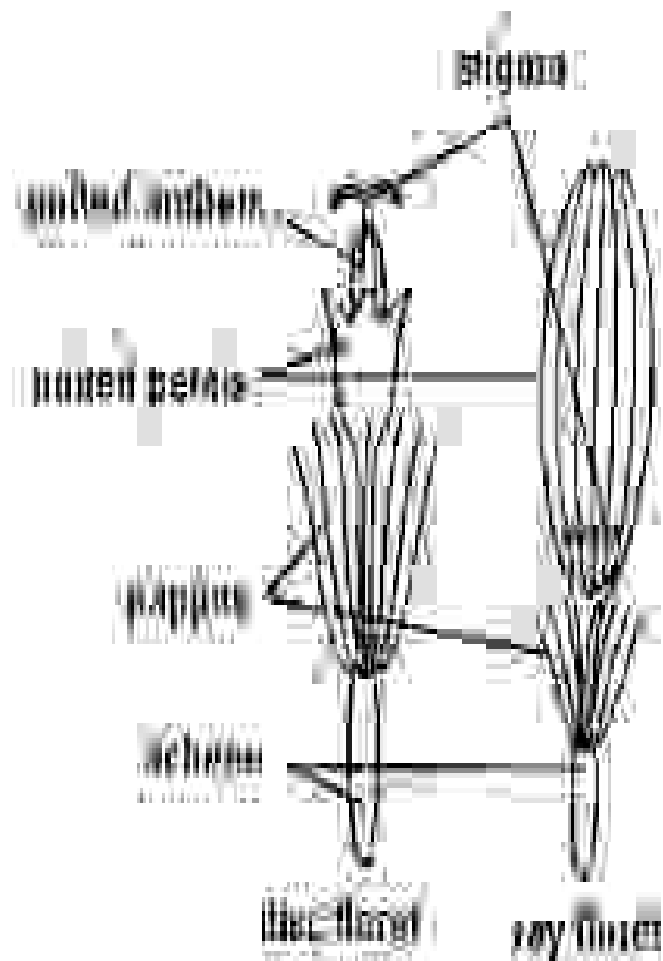


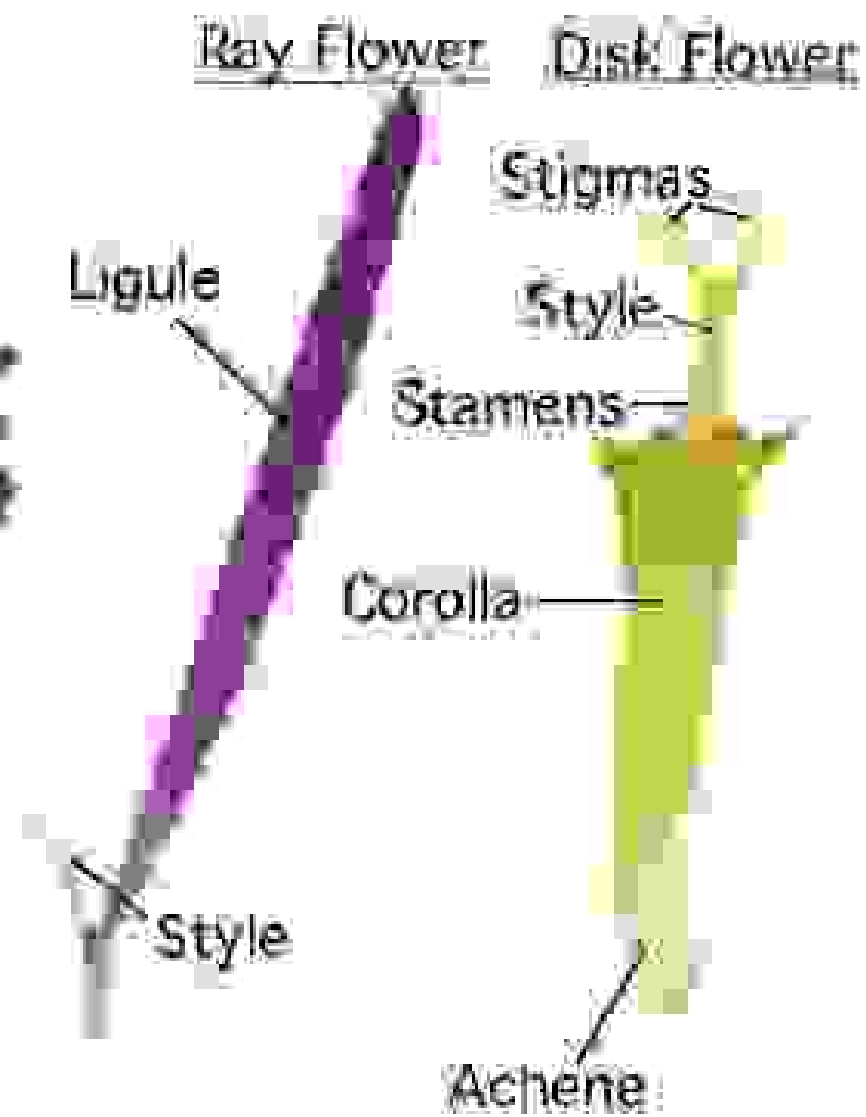


ASTER FAMILY COMPOSITE FLOWER



PARTS OF AN ASTER FLOWERHEAD





Technique of Hybridization



→ **Emasculation**

- Stage: At bud opening stage
- Complete removal of all the disc florets (as they are hermaphrodite)



→ **Emasculated Flower**

Trimming Ray florets



Trimmed Ray florets



Trimming : Trim the ray florets up to the stigmatic surface

Pollination



Direct tapping pollen on the emasculated flower

Pollination:

- Done on the 3rd day of emasculation
- By collecting pollen in petri plate or by dusting pollen directly on the stigma
- Pollen are collected by mature flowers showing the pollen on flower head – harvest such flowers and keep in sun light for 2hr for pollen discharge.



Pollination

- Done by using soft camel hair brush



Bagging and labeling



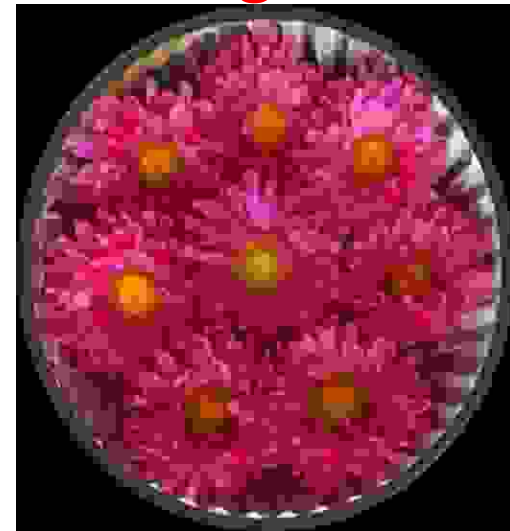
- **Bagging :** After pollination individual flowers are bagged until seed set.
- **Harvesting:** Seeds will mature in 3-4 weeks after pollination
Seeds are cleaved and stored in cold storage (Other wise seeds loose viability)
- **Yield:** 200-300kg/ha (OP seed yield)

IIHR, Bangalore

Methodology: Pedigree breeding



Cv. Kamini



Parents: AST-6 x AST-36

Colour: Pink

Plant height: 60cm

Flower diameter: 6 cm

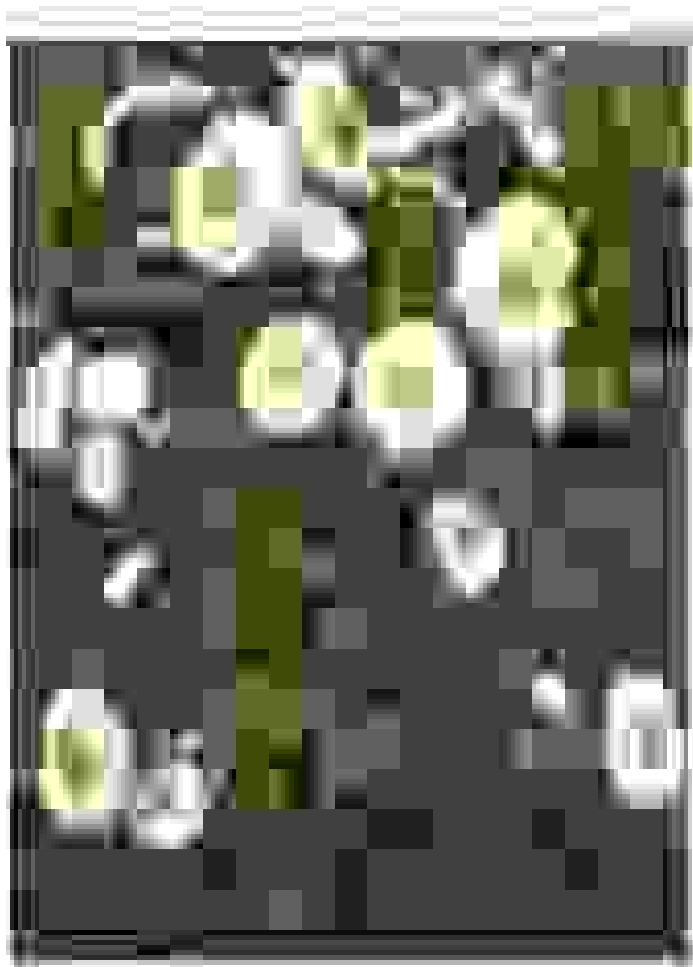
Flower weight: 2 g

Flowering : 138 days

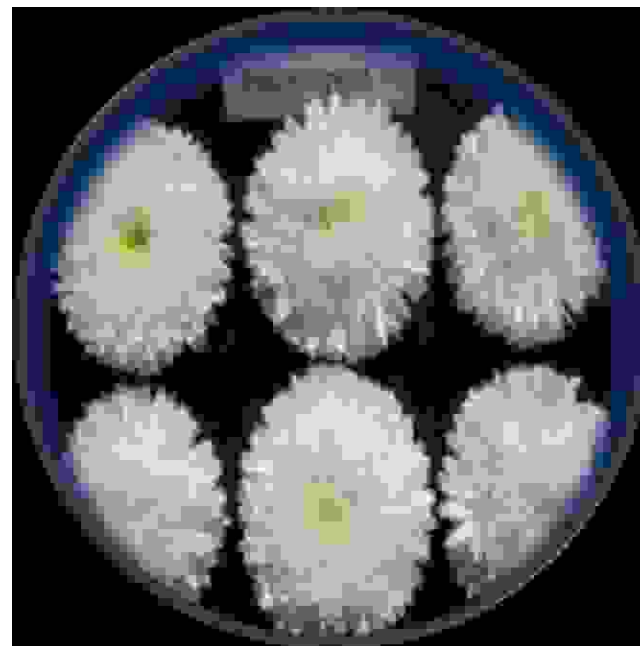
No. of flower: 50 flowers/plant

Stalk length: 30 cm

Vase life: 8 days



Cv. Poornima



Parents: AST- 29 x AST-3

Colour: (Powder puff type)

Plant height: 50cm

Flower diameter: 5 cm

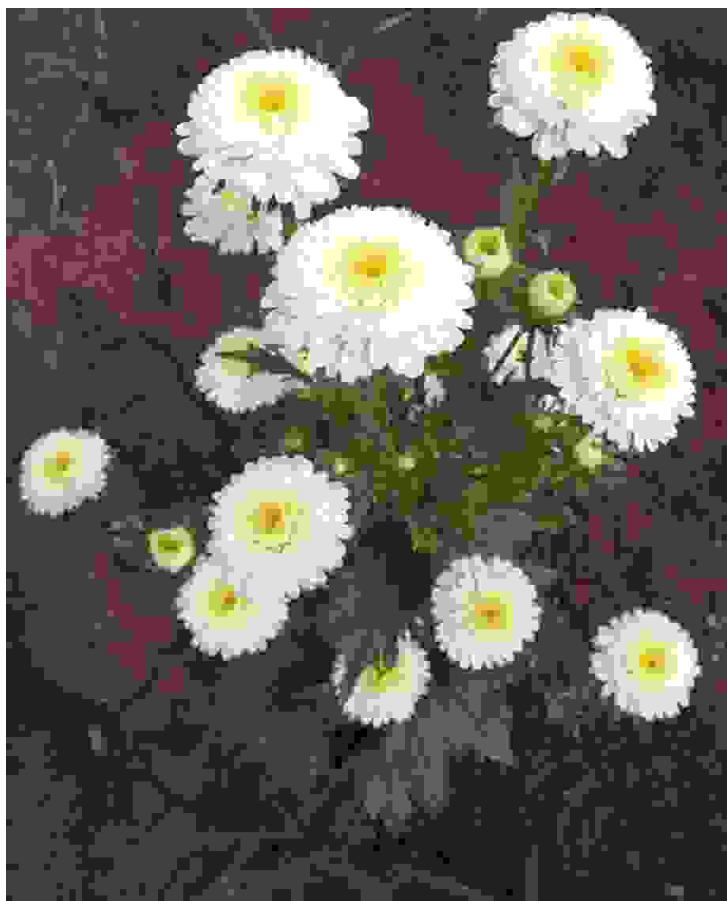
Flower weight: 3.5 g

Flowering : 105 days

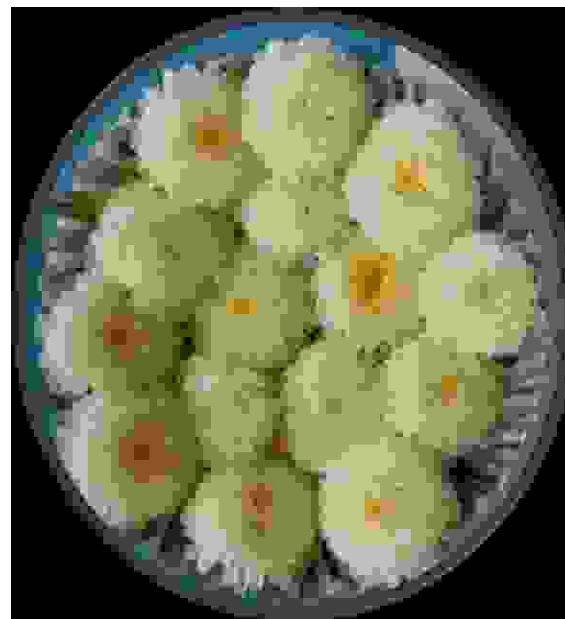
No. of flower: 25 flowers/plant

Stalk length: 25 cm

Vase life: 7 days



Cv. Shashank



Parents: Local pink x AST-2

Colour: White (Powder puff type)

Plant height: 55cm

Flower diameter: 6 cm

Flower weight: 2.5 g

Flowering : 124 days

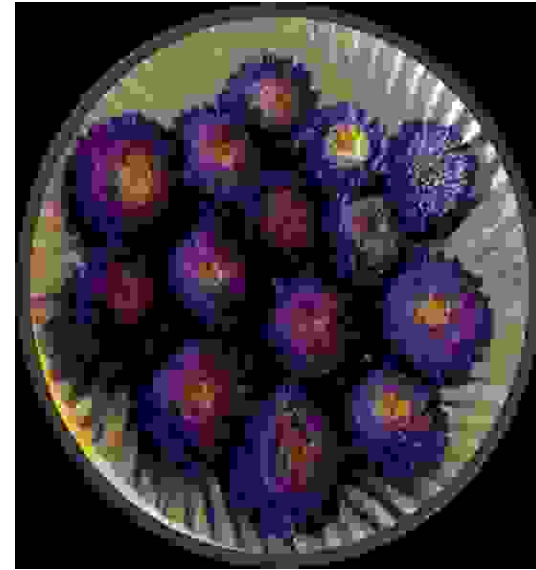
No. of flower: 45 flowers/plant

Stalk length: 25 cm

Vase life: 9 days



Cv. Violet Cushion



Parents: Local pink x AST-2

Colour: **Violet** (Pompon type)

Flower diameter: 4.5 cm

Flower weight: 2 g

Flowering : 130 days

No. of flower: 70 flowers/plant

Stalk length: 20 cm

Vase life: 8 days

Resistance Breeding

Result

- **Resistant:** Matsumoto, Einf. Madeleine and Americka kraska series,
- **Moderately resistant:** Chryzantemokvěte and Standy series, Matsumoto Pink, Princes Armida and Jitka.
- **Sensitive:** Průhonicky trpaslik, Jehlicovite and Pastel series

Exotic cultivars : Wilt Resistant

Beauty, Bouquet Powdery puff, Chrysanthemum dwarf flowering, Dwarf Queen, Giant Princes, Ostrich Plume, Pompone, Super Giant, Super Sinensis