

CASTOR

Ricinus communis (2n = 20)

Place of origin : Ethiopia

Classification : Monotypic, all varieties of castor from giant perennials to short internode dwarf have the same chromosome number.

Zugovosky (1962) has described three species in the genus *Ricinus*

1. *R. communis*
2. *R. macro carpus*
3. *R. micro carpus*

But this is not accepted by Botanists.

There are sub species which are considered to be ecological extreme varieties i.e. poly morphic of cultivated type. They are

- R. communis* subsp *persicus* (Persian)
- ssp. *chinensis* (chinese species)
- ssp. *zanzi barensis* (Zanzibar)
- ssp. *sanguinens* (Crimson species)
- ssp. *africanus* (African)
- ssp. *mexicanus* (Mexican)

Red castor varieties (Popova 1930)

Subsp *gibsoni*

subsp *ambogenisis*

Breeding objectives :

1. Long duration varieties for dry lands

S.A.1, Co1 perennial - Tall - Normal internodal, high node number.

Intermediate - Normal internode, low node no (13 or 10)

2. Short duration high yielding varieties suitable for irrigated mixed cropping conditions

TMV 5

3. Breeding non shattering spineless varieties

Baker variety of USA Non - Shattering.

4. Breeding for insect resistance

Semi looper, jassid. Hopper burn - serious in dry land varieties.

Triple bloom - TMV 5. - Triple bloom condition gives resistance.

5. Breeding varieties with low ricinin content.

Breeding Methods:

1. Introduction.

Hospet varieties.

Russian lines.

2. Selection

a) **Pureline selection** - Co 1 from Anaimalai local

b) **Mass selection**

TMV 3 - from South Arcot local.

3. Hybridization and selection

TMV 5 (SA2 x S 248/2)

TMV 6. (VP 1 x RC 962)

4. Population improvement

By using recurrent selection technique.

5. Mutation breeding Aruna castor

SA2 Natural Mutant from TMV 1.

6. Heterosis breeding

GAUCH - 1

100 % pistillate lines.

Geneic male sterility

Temperature plays a major role.

GCH 4

TMVCH 1 (LRES 17 x TMV 5)

SUN FLOWER *Helianthus annuus*

Place of origin : North America.

Classification : The genus comprises nearly 67 species - all native to America. Of these two are cultivated.

a) *H. annuus* - diploid $2n = 34$

Oil seed crop.

b) *H. tuberosus* - Hexaploid $2n = 102$.

Jerusalem artichoke - cultivated for tuber.

Wild species : *H. hirsutus*, *H. rigidus* moderately resistant to *Alternaria*.

Putative parent : Weed sunflower gave rise to cultivated one. The weed sunflower was modified by introgression with *H. petiolaris*.

Cultivars of sunflower :

a) **Giant types :** 6 - 14 feet tall. Late maturing, Large heads 12 - 30" in diameter, seeds large, white or grey or with black stripes. Oil content is very low. E.g. Mammoth Russian.

b) **Semi dwarf varieties :**

Medium tall - 4 ½ to 6 feet, Early maturing. Heads 7 - 9" in diameter. Seeds smaller, black, grey or striped. High oil content 35%. E.g. Jupiter, Pole star.

c) **Dwarf types**

2 to 4½ feet tall. Early maturing. Head size 5½ - 6½ " diameter. Small seeds, high oil content 37%.

E.g. Sunrise, Morden, Co1, Co2

Breeding objectives

1. **To develop short duration varieties suitable for dry land and irrigated conditions.**

Dryland successful in black soils only. In red soil under rainfed it is not successful.

2. **Breeding varieties with high oil content :**

Ranges 38 to 48%. Complex character yield and oil content are negatively correlated. To increase oil content the shell must be thin.

3. **Breeding for self fertile lines.**

Protoandry and self incompatibility mechanism operates in sunflower. Hence hand pollination is necessary. To avoid this self fertile lines can be evolved.

4. **Breeding for disease resistance.**

Maharashtra hybrid susceptible to powdery mildew. Hence ban is there. Powdery mildew, rust, charcoal rot, *Alternaria*. Wild species like *H. hirsuta* are moderately resistance to *Alternaria*.

5. Resistant to pests

Heliothis , Grass hopper Jassids.

Breeding Methods:

1. **Introduction** : Morden from Canada.

2. **Mass selection:**

Ec 68414 from Russia. Co1 mass selection from Morden. Useful for characters which are highly heritable. E.g. Plant height, disease resistance.

3. **Hybridization and selection**

a) **Intervarietal** : E.g. Co2 Derivative of multiple cross
Co4 - (Dwarf x Surya)

b) **Interspecific** :

Wild species of North American origin and best Soviet varieties were crossed and number of varieties were evolved.

E.g. Progress.

Novelty

Jubilee 60-

They are resistant to *Verticillium* wilt also

4. **Mutation**

Co3 (Mutant from Co2 thro' gamma rays)

5. **Head to row and remnant seed method**

Developed by Pustovoit in Russia. By this method oil content is increased. In this method the following are the steps:

- a) From open pollinated type a large no (10,000 to 12,000) plants are selected based on Head size.
- b) The selected lines are analysed for oil content and high oil content lines are isolated (1000 plants).
- c) Part of the seed reserved and the part is sown in progeny rows along with check to estimate yield.
- d) Second season testing is also done. The best lines are identified.
- e) The remnant seed of elite plants which give high yield were raised in isolation and multiplied for crossing *interse* next season.
- f) The multiplied lines also tested for oil content and high yielding high oil content lines were raised in isolation and crossed *interse*.

6. **Population improvement**

By mass selection, recurrent selection and use of male sterile lines population can be improved and utilised for breeding.

7. Heterosis breeding :

Development of inbred lines and crossing them to harness heterosis was first done as early as 1920 in Russia. During 1970 cytoplasmic geneic male sterility was identified in wild types and obsolete cultivars. Now this system is being extensively used for production of hybrids.

First hybrid

BSH 1 CMS 234 A x RHA 274

BSH 2

BSH 8.

A number of CGMS lines were bred by Government as well as private seed growers and are utilised now.

Male sterility can also be inducted by GA 100 ppm.

Steps

1. Development of inbreds.
2. Evaluation of inbreds for combining ability.
3. Conversion of inbreds into CGMS lines and R lines.
4. Production of hybrids.

Varietal renovation

In sun flower the varieties released are renovated annually to produce super elite (Breeder seed) and Elite Seed (Foundation seed).

SAFFLOWER
Carthamus tinctorius (2n = 24)

Place of origin : Africa

Related species : The wild species *Carthamus oxycanthus* is found in many parts of Punjab. It is a dwarf bushy plant, very spiny, forming small achenes. The oil content is 15 to 16 percent

Classification of safflower :

Safflower can be grouped in to two broad categories.

1. The outer involucre bracts spinose, lanceolate mainly cultivated for oil. Flowers yellow in colour.
2. Involucre bracts moderately spined or spineless which are cultivated mostly for the dye than the spiny types. Flowers orange in colour.

Breeding objectives :

1. Breeding for high oil content :

Normal oil content is 32% of which 72% is linoleic acid, the factor which reduces blood cholesterol. Oil content is negatively correlated with yield. Wild species of *C.oxycanthus* having 28% oil were utilised in hybridization programme to increase yield and oil content but success was not achieved.

2. Breeding for non-spiny varieties with high oil content.

A very limited success was achieved Co1 safflower is an example for this.

3. Breeding varieties having thin shell

Thin shelled varieties have high oil content.

4. Breeding varieties for dry land conditions.

Under dry land conditions the spiny nature will be more pronounced. How ever dry land varieties with less pronounced spines were evolved. E.g. K.I.

5. Breeding varieties resistant to pest and diseases :

Pests like Prodenia and Heliothis are important pests. The wild species *C.oxycanthus* is moderately resistant to pests. This is being utilised in breeding programme.

NIGER

Guizotia abyssinica ($2n = 30$)

It is a cross pollinated crop oil content is 35 to 45 %. The inflorescence is a head or capitulum and heterogamons and florets are similar to that of sun flower.

The breeding objectives and methods are similar to that of sunflower.