

GROUND NUT (*Arachis hypogaea*) (2n = 40)

It is important oil seed crops in India, grown in subtropical and warm temperate zone also called as peanut or monkey nut. It contains 45-55 per cent oil and 25-30 per cent protein.

Origin: Brazil

Distribution:

India, China, USA, Africa, South and South East Asia In India, Gujarat, Andhra Pradesh, Karnataka and Tamil Nadu Maharashtra, Madhya Pradesh, Rajasthan Uttar Pradesh, Punjab.

Progenitor:

Arachis monticola

A – prostrata

A – silvestres

Putative parents and origin of cultivated ground nut.

The cultivated ground nut is a Allotetraploid having A and B genomes. The genus *Arachis* is subdivided into 7 sections. The cultivated ground nut comes under section *Arachis*. This section includes 12 species of which *hypogaea* is the only cultivated species having 2n = 40. The other one is *A. monticola*. The rest ten species are diploids.

Groundnut an unpredictable Crop

Ground nut is popularly known as unpredictable legume. Since the pods are borne below ground positively geotropic we cannot predict its performance before harvest as in the case of other crops. Further Ground nut is highly influenced by environment.

If there is no favourable environment yield alone will not be affected but also the quality characters. **Less boron** means low shelling % and more of immature seeds **moisture stress** leads to lower yield as well as reduction in well developed kernels. Oil percentage is also influenced by environment. **Excess moisture** leads to more vegetative growth and reduction in yield. Compared to any other crop here. G x E interaction is more pronounced.

Besides abiotic stress, biotic stress also play a major role rust and leaf spot in diseases, red hairy caterpillar and leaf minor in pests cause major havoc.

Seed multiplication ratio is 1:5. This is also one of the bottlenecks in the spread of improved varieties.

Breeding objectives:

1. Breeding high yielding bunch ground nut with dormancy suitable for dry land conditions

The dry land bunch type sown during June - July often caught up in early N.E. monsoon rains which results in germination of varieties. So it is necessary to breed varieties having dormancy. Semi spreading varieties are dormant TMV 7 slightly dormant varieties, BSR.1, ALR 2 dormant for 15 days.

2. Breeding varieties for quality

a) High shelling percentage > 75%

Thin shelled varieties have high shelling percentage.

b) High oil content > 50%

TMV 10 the semi spreading variety is having 52% oil. Oil content is highly influenced by environment.

ALR. 2-52% oil

c) High sound mature kernel (SMK)

Which is also influenced by environment. Increased boron application results in high shelling percentage and high SMK %

d) Table purpose varieties

Hand picked kernel for export market. Valencia types are suitable for this.

3. Breeding disease resistance varieties.

Rust and leaf spot are causing major damage. If the onset of rust is in initial stage it results in total failure. Late leaf spot hinders harvest of crop due to foliage loss.

Tomato spotted wilt virus or Bud necrosis of late gaining importance. NCAC 17090 - resistant

4. Breeding for pest resistant varieties

Red hairy caterpillar, leaf miner are major pests.

5. Breeding short duration (85 days) varieties suitable for irrigated conditions

Breeding Methods:

1. Introduction:

All the ground nut lines are introduced ones.

2. Selection :

a) Pure line selection

TMV 2 - Selection from local Gudiyatham bunch.

b) Mass selection

JL 24 from Taiwan variety.

3. Hybridization and Selection

a) Inter varietal

Bunch x Bunch - VRI 2 (Co2 x JL 24)

SSP x Bunch - VRI 3 (R 33- 1 x Ah selection)

b) Inter specific

For transfer of disease resistance.

Arachis sp :

A.hypogaea x *A.batzocoi*

2n = 40 ↓ 2n = 20 (Resistant)

Triploid sterile

doubled

Hexaploid

Reduced to tetraploid.

A. chacoense

$2n = 20$

A. monticola - for thin shelled conditions

Extranervosa sp.

A. illoulicarpa for increased number of pods.

5. Mutation breeding

Gregory in USA extensively adopted and released varieties.

Co2 EMS from POL 1

TMV 10 Natural mutant from Argentina local.

TG 1 to TG 6 (Vikaram) from BARC Trombay.

GNLM - Gujarat Narrow Leaf Mutant.

6. Embryo rescue technique :

A. puscilla x *A. hypogaea* crosses. But not much successful. Cotyledon culture is a success.

7. Transgenic plants

Transgenic plants for disease resistance. Transfer of a particular gene from wild species thro' use of medium of carrier (plasmid) micro projectile bombardment direct transfer. Transfer of disease resistance gene from wild species through plasmid is a success.

B reeding centres:

ICRISAT, Hyderabad

NRCG, (National Research Centre for Ground Nut Junagarh)

Practical Achievements

Varieties: Kadiri-3, JL-24, Tirupathi 1, 2, 3, 4 TMV – 2, J11, Vemanara, Jagtial-88

SESAME (*Sesamum indicum*) (2n=26)

It is an ancient oil seed crop of tropics and warm sub-tropics. It is also called as gingelly.

Origin: India, and Ethiopia (Africa)

Distribution: India, Pakistan, Africa, China, Mexico, Iran, Iraq etc.

Progenitors: *Sesamum angustifolium*

S. radiatum

S. alatum

Wild species utilised in breeding programme

1. *S.alatum* 2n = 26

Resistant to phyllody *S.alatum* x *S.indicum* alatum is having dormancy.

2. *S.malabaricum* (2n = 26) Occurs in Travancore of Kerala. It freely crosses with cultivated gingelly. Oil content is low 32% It is utilised to induce male sterility in cultivated sesame.

3. *S.laciniatum* 2n = 32

Tolerant to phyllody, drought and jassid resistant.

Fertile auto allopolyploid produced by crossing *S.indicum* x *S.laciniatum*

Sterile, Double.

4. *S.prostratum* occurs in S.India (2n = 26)

Tolerant to drought.

Breeding objectives

1. Breeding high yielding varieties tolerant to drought.

2. Breeding white seeded varieties

Finest quality of oil is obtained from white seeded lines.

3. Development of mono stemmed varieties.

By this more population per unit area and yield can be increased. Monostemmed varieties are low yielders.

4. Development of multicapsule / axil and multicarpellary varieties.

5. Rice fallow varieties :

Shorter in duration.

6. Non - shattering varieties

African lines.

7. Resistant to disease

Powdery mildew;

Phyllody - transfer from wild species.

Breeding Methods :

1. **Introduction** : African lines.
2. **Pure line selection.**
TMV6 - Andhra local.
3. **Hybridization and selection.**
 - a) **Inter varietal**
 - b) **Inter specific** : Male sterile lines evolved by crossing with *S.malabaricum*.
4. **Population improvement**
5. **Poly ploidy breeding**
6. **Heterosis breeding**
Epipetalous nature makes emasculation and crossing easier Use of CMS lines is also being attempted.
7. **Embryo rescue technique.**
Varieties Gouri, Madhavi, Rajeshwari, Swetha

CASTOR (*Ricinus communis*)

It is an oil seed crop. It belongs to the family Euphorbiaceae. Its oil is mainly used as lubricant, in industry or as a medicinal purpose. It requires warm climate

Origin: Africa

Distribution: African countries (Egypt), China, India, middle East etc. In India Andhra Pradesh, Karnataka, Maharashtra

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. macrocarpus*
3. *R. microcarpus*

Breeding objectives :

1. **Long duration varieties for dry lands**
2. **Short duration high yielding varieties suitable for irrigated mixed cropping conditions**
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**
 - b) **Mass selection**
3. **Hybridization and selection**
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