

## **SEED PRODUCTION IN SUNFLOWER**

Sunflower is a common oilseed of India with wider utility. It is used as a source of edible oil, and as raw material for agri -based industry. Botanically it is known as *Helianthus annuus* and belongs to the family asteraceae. It is a cross pollinated crop, insects (honey bees) are the pollinating agents. The crop has got two types of flowers viz. ray and disc florets. Seeds set in disc florets which are bisexual but exhibit self incompatibility due to protoandrous nature of the flower.

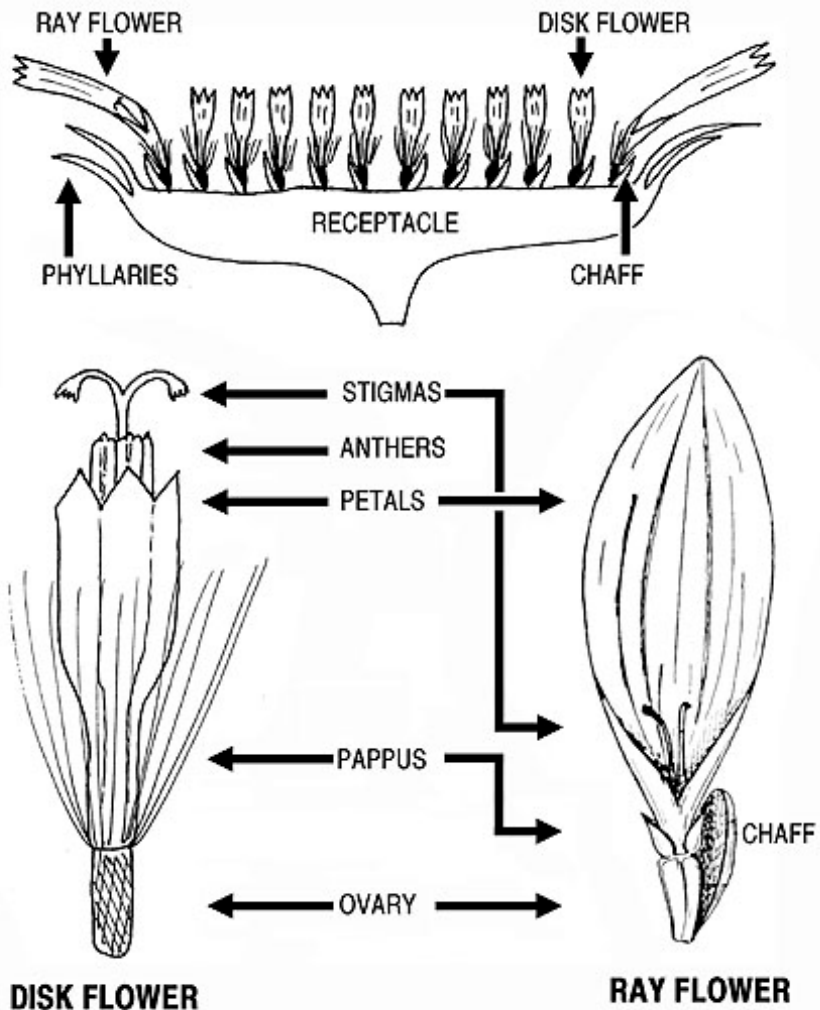
### **Botany of flower**

Inflorescence is a head, consisting of pistillate or sterile ray florets at the periphery and central hermaphrodite, disc florets. The involucre is bract. The pappus is calyx or calyx is modified into two papus scales. The five petals are united to form corolla tube. Stamens are free and attached to the base of corolla. Five anthers unite to form anther tube and style is inside the anther tube and stigma bilobed.

### **Anthesis and pollination**

The disc florets are protandrous. Flower opening starts from outer whorl and proceeds towards centre of head. The head bloom within 5-10 days. The pollen grains are viable for 12 hours. Anthesis take place at 5-8 a.m. Self incompatibility operates leading to cross pollination.

## FLOWER HEAD OF SUNFLOWER FAMILY



### Varietal seed production technique

Open pollination under isolation is the common method of varietal seed production.

### Varieties

CO 1, CO 2, Morden, K1, K 2, EC 68414, EC 68415

### Stages of seed multiplication

In sunflower seed is multiplied adopting three generation system, as breeder seed, foundation seed and certified seed as the crop is often cross pollinated crop where the chances for genetic contamination is high.

### **Varietal renovation method (Pustovit model)**

- ❖ In open pollinated variety, selection of superior plants are made based on the quality characters viz., plant yield, 100 seed weight and oil content.
- ❖ The selected plants are harvested separately
- ❖ Then they are raised in rows individually
- ❖ Seeds from promising plants are collected and this form the super-elite seeds

### **Causes for ill filled seed**

#### **a) Pollination**

It is a cross pollinated crop, normally the insect activity is less. For increasing the insect activity bee hives should be kept in the seed production plot in adequate quantities. The insect activity depends on the pollution and insecticides application. If insect activity is less that leads to poor seed setting and formation of ill filled seeds.

#### **b) Development of axillary flowers**

Normally the axillary flowering takes place during the summer because of the high intensity of light. So these type of axillary buds receive the nutrients and assimilate whereas the main head does not get the required quantity of assimilates for seed set there by ill fillings occurs.

#### **d) Self incompatibility**

Presence of self incompatibility in sunflower also leads to poor seed set and ill filled seeds.

### **Technology for increased seed set**

- a. Pollination behavior: Sunflower is a cross-pollinated crop. Two types of flowers are available. They are ray and disc flowers. Ray flowers are unisexual while disc flowers are bisexual.

b. Pollinating agent : Honey bees

### Popular varieties

In Tamil Nadu, Morden, CO1,CO2,CO3, K1, K2 , CO4 are the popular varieties for commercial purpose .

### Season

April to May is highly suitable for irrigated seed crop. The flowering should not coincide either with rain or high RH as it will wash out the pollen and the maturation should coincide with dry weather.

### Land requirement

The land should be fertile and problem soils will lead to low pollen fertility and will adversely affect the quality and the seed set will be poor. The previous crop should not be the same crop to avoid the occurrence of volunteer plants and if to be the same crop it has to be the same variety and should be certified and has to be accepted for certification. The field should not have any volunteer plants.

### Field Standards (Isolation)

General: 1. Sunflower field should be isolated from contaminants as follows

Contaminants	Minimum distance(meters)	
	Foundation stage	Certified stage
Fields of other varieties and the same variety not confirming to varietal purity requirements for certification and wild sunflower	400	200

In sunflower differential blooming dates for modifying the isolation distance is not permitted

### Seed and sowing

- ✓ For production of foundation seed, breeder seed is used as the base material ,while for certified seed, foundation seed should be used as the base material

- ✓ The seed used should be from authenticated source with tag and bill.
- ✓ The required seed rate will be 8-10kg /ha or 3-4kg/ acre. (Morden 80kg/ha)
- ✓ The seeds are sown at a spacing of 30 x10 cm for the variety morden and at a spacing of 60x20 cm for other varieties and are dibbled at a depth of 2-4cm.
- ✓ In the main field seeds are sown either in ridges and furrows or under beds and channels.

### **Presowing seed treatment**

- ✓ The seeds are given with any one of the seed treatment or in combination
- ✓ Fresh seeds of sunflower exhibit physiological dormancy which could be broken by soaking the seeds in 300ppm ethrel for 8h or 0.5% KNO<sub>3</sub> for 16h. Moist hydration of seed with water for 24h followed by dry dressing with thiram @2g kg<sup>-1</sup> of seed improved the productivity of the seed.
- ✓ Seeds are soaked in 2% ZnSO<sub>4</sub> for 12h with a seed to solution ratio of 1:0.06 and are dried back to their original moisture content of 8-9% .This management could be used both for dryland agriculture as well as gardenland.
- ✓ As an ecofriendly treatment seeds are also fortified or hardened with 1% moringa leaf extract for 16h with a seed to solution ratio of 1:0.06 and are dried back to their original moisture content of 8-9%.
- ✓ Seeds are dry dressed with bavistin @2g/kg of seed to protect against seed borne pathogens and soil borne pathogen. Seeds are also treated with azospirillum @50g/kg of seed to fix atmospheric N.
- ✓ Any one of these treatment or combination of treatment is adopted for better productivity. On adoption of sequence of treatment physiological should be followed with physical seed treatment.

### **Nutrient application**

At last ploughing apply 12.5 tonnes of compost per hectare. The fertilizer requirement of seed crop is 80:40:40 kg of NPK, in which 40kg of N and full dose of P and K is applied as basal, while 40kg of N is applied at the time of earthing up i.e. 40-45 days after crop growth..The seed crop is also sprayed with 2% DAP or

20ppm NAA at 30 and 60 days after sowing. In case of deficient soils the crop is sprayed with 0.5% Borax at button formation stage.

### **Micronutrients deficiency**

Zn and Fe composition is very important for the proper seed set in sunflower. Zn is responsible for the production of IAA. Fe deficiency leads to sterility of the pollen.

### **Weeding**

Apply of fluchloralin @ 2l/ha as pre-emergence herbicide to control the growth of weeds up to 20-25 days. One hand weeding is done at the time of button stage to keep the field free of weeds. Weeding after head formation stage is not economical. On organic production, 2 hand weeding at seedling stage and other at boot leaf formation will keep the field weed free.

### **Supplementary pollination**

- ✓ Due to lack of honey bees, seed setting will be poor. Hence critical or additional pollination is given to the crop for effective seed setting by
- ✓ Rubbing the heads of two neighbouring plants with each other.
- ✓ It is done during mid flowering stage (i.e 58-60 days of planting for long duration varieties and 45-48 days for short duration varieties) at alternate days between 7-11 a.m for 2 weeks.
- ✓ Hand pollination: The heads are rubbed with palm or muslin cloth so that pollination can be enhanced.
- ✓ In hybrids, the palm is first gently rubbed on the male parent flowers and then on the female line to transfer the pollen.



**Hand pollination**

- ✓ Keeping of bee hives 5 ha<sup>-1</sup>

### **Foliar application**

At head opening stage 2 % D.A.P and 20 ppm N.A.A. sprayed 2 times on 30<sup>th</sup> and 60<sup>th</sup> day after sowing for effective seed setting.

### **Irrigation**

The crop should be irrigated once in a week for enhanced seed set and formation of bolder grains. The critical stages of irrigation are primordial initiation stage, vegetative stage, milky and maturation stage. If the irrigation is withheld in these stages seed set will be poor and seed size will be reduced.

### **Pest and Disease management**

<b>Common pests and diseases</b>	<b>Management techniques</b>
Cut worm	Chlorpyrifos (20EC) @ 3.75 l/ha
White fly	Imidacloprid @ 0.1ml/lit
Thrips	Phosphomidon 0.03%

Tobacco caterpillar ( <i>Spodoptera litura</i> )	Endosulphan 0.07% or NSKE 5% or Fenitrothion 0.05%
Capitulum borer ( <i>Helicoverpa armigera</i> )	Endosulphan 0.07% or Helicoverpa NPV @ 250 LE/ha.
Alternaria blight and leaf spot	Mancozeb 0.3%
Rust	Zineb 0.2%
Downy mildew	Metalaxyl 25WP
Head rot	Copperoxychloride@0.4% or mancozeb 0.3% combined with endosulfan (0.05%)

## Roguing

Plants rogued from their vegetative phase to harvesting, based on plant, height, head size, branching habit, number of heads and colour of seeds.



## Field standards

Factor	Maximum permitted (%)	
	FS	CS
Off types at and after flowering	0.10	0.20
Objectionable weed	None	None
Plants affected by downy mildew	0.050	0.50



Plants infested with orabanche	None	None
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### **Seed Certification**

#### **Number of Inspections**

A minimum of three inspections shall be made as follows:

1. The first inspection shall be made before flowering on order to verify isolation, volunteer plants, and other relevant factors,
2. The second inspection shall be made during flowering to check isolation, offtypes and other relevant factors
3. The third inspection shall be made at maturity and prior to harvesting to verify true nature of plant and other relevant factors

#### **Bird scaring**

At the time of maturation birds will create problem due to their feeding habit. Hence, from the time of milky stage of the seed proper protection should be given against birds as it will lead to reduction in seed yield upto 80 per cent.

#### **Harvesting**

Change of thalamus colour from green to yellow is the visual symptom of physiological maturation. Heads are harvested as once over harvest.



#### **Threshing**

The earheads are dried under sun and threshed with flialle stick for extraction of seeds. The moisture content of seed at the time of threshing will be 15-18%. On large scale production sunflower threshers are used, but care should be given to avoid mechanical damage, which in turn will reduce the seed quality and storability.

### **Drying**

The seeds are dried to 8-10 % moisture content either under sun or adopting mechanical driers for long term storage as the seeds is orthodox in nature.

### **Processing**

Mechanical grading can be done with cleaner cum grader, which will remove the undersized immature and chaffy seeds. The middle screen size should be 9/64" round perforated sieves. The size can vary depending on the type of seed. In sunflower the graded seeds also can be upgraded through specific gravity separator for improvement in seed quality characters. Even the quality of seed lots having 5-10% lesser germination than MSCS level can be upgraded through simple specific gravity separation.

### **Seed treatment**

The seeds are infested with several storage pests, to protect against these pests the seeds are given protective treatment with bavistin @2g/kg of seed.

### **Seed packing**

Seeds are packed in gunny bag for short term storage while in HDPE and polylined gunny bag for long term storage.

### **Storage**

The treated seed can be stored up to 10 months provided the seeds are not infected with storage pests. Seed can be stored up to 2 years if the seeds are packed in moisture containers and are stored at low temperature. The godown should be kept clean as the possibility of secondary infestation with *Trifolium* (red flour weevil) is much in these crop.

### **Seed standard**

The processed seed should have the following seed quality characters both for certification and labeling.

### Seed Standard

Factor	Standards for each class	
	FOUNDATION	CERTIFIED
Physical purity (min.) %	98	98
Inert matter (max.) %	2	2
Other crop seed (max.) %	None	None
Germination (min.) %	70	70
Huskless seed (max.) (By number)	2.0%	2.0%
Total weed seeds (max.)	5/kg	10/kg
Objectionable weed seed	None	None
Seed infested with Orabanche (max.)	None	None
Moisture content (%)		
a. Previous container (max.)	9.0	9.0
b. Vapour proof container (max.)	7.0	7.0

### Mid storage correction

The seeds lose their quality during storage due to deterioration and pest infestation, when the germination falls below 5-10 % of the required standard the seeds are imposed with midstorage correction, where the seeds are soaked in double the volume of  $10^{-4}$  M solution of potassium dihydrogen phosphate (3.6mg/lit of water) for 6 hours and the seeds are dried back to original moisture content (8-9%).

## Hybrid seed production in sunflower

- ✓ Hybrids are produced by employing cytoplasmic genetic male sterility.
- ✓ The male sterile female and male parents are raised in BSH 3, 1:6, KBSH 1, 1:4 ratio under 400 m isolation.
- ✓ Seeds are produced by transferring the pollen of male parent to the female parent with the help of honeybees reared at 5 hives / ha.

### Hybrids

BSH -1 = CMS 234 A x RHA 274

KBSH 1 = " x 6 DI

MSFH 1 = MHS 71 x MHR 48

MSFH 8

MSFH -17

TCSH 1 = CMS 234 A x RHA 272

**Season** : June - July, October - November

### Isolation distance

	Foundation seed	Certified seed
Hybrids	600 m	400 m

### Seeds and sowing

Seeds are sown in ridges and furrows

Seed rate : Female 12 kg /ha and Male 4 kg/ha.

### Spacing

60 x 30 cm (hybrids)

Planting ratio : 8:1 or 4:1

Border row : two

### Manures and fertilizers

Compost : 12.5 t/ha  
NPK : 60:45:45 kg /ha

### **Supplementary pollination**

1. As in varieties

In hybrids, the palm is first gently rubbed on the male parent flowers and then on the female line to transfer the pollen.

2. Keeping of bee hives 5 ha<sup>-1</sup>.

### **Roguing**

Plants are rogued based on plant height, head size and colour of seeds during pre-flowering stage upto harvest.

### **Field standards**

	Foundation seeds	Certified seeds
Off types	0.1 %	0.2%

### **Harvesting**

The change of head colour from green to lemon yellow is the indication of physiological maturity. The heads are harvested separately first in male and then in female.

**Drying, processing and others** – as in varieties

### **Seed standards**

The graded seed should possess the following characters for certification and sale as certified/ truthfully labelled seeds

Parameter	FS	CS
Physical purity (min) %	98	98
Inert matter (max) %	2	2
Germination (min)%	60	60
Moisture content (max)%		

(a) Open storage	8	8
(b) Moisture vapour proof Storage	5	5

# GROUNDNUT SEED PRODUCTION

- **Common name-** Groundnut or Peanut or Earth nut or Monkey's nuts or Jack's nut or Manila nuts or Gopher peas or Pinder.
- **Scientific name-** *Arachis hypogea*
- **Origin-** South America or Mexico
- **Distribution-** India, Nigeria, USA, Brazil, Senegal
- **Nutrition-** 44 to 56%- edible oil
  - 22 to 30%- edible protein
  - also has P, Ca, K, Mg, Vitamin E, Vitamin K, Vitamin B2
- **Physiology-** short day plant
  - photoinsensitive
  - well drained soil, light and sandy loam soil
  - pH- 5.8 to 6.2



# CLIMATIC REQUIREMENTS

- Groundnut is a tropical plant and requires a long and warm growing season
- It grows in areas receiving 50 to 125cm of well distributed rainfall.
- The optimum temperature for vegetative growth is ranging between 26 to 30°C depending on the cultivar.
- Reproductive growth is maximum at 24-27°C





## SOIL AND LAND REQUIREMENTS

### ❖ SOIL-

- Groundnut prefers well drained, light textured, loose, friable and sandy , sand loam soils.
- Clay or heavy soils are not suitable
- It is sensitive to soil salinity
- Prefers a soil pH of 6.0 to 7.5 with Ca and a moderate amount of organic matter.

### ❖ LAND-

- A field is selected on which groundnut was not raised in the previous two seasons, unless the variety was same and the crops were certified.
- The field should be well drained.



## SELECTION OF VARIETIES

- Only notified varieties recommended for a state/region should be selected.
  - 3 different types of groundnut are-
    - a. Erect/bunch-** shorter in duration. They don't possess seed dormancy.
    - b. Semi erect or semi spreading-** semi erect are between erect and spreading type in duration.
    - c. Spreading-** spreading types are longer in duration.
- The erect and semi erect types are suitable for all seasons.



## LAND PREPARATION

- Although groundnut is a deep rooted crop, deep ploughing should be avoided, because it encourages development of pods in deeper layers of soil which makes harvesting difficult.
- One ploughing and 3-4 harrowing, followed by levelling .
- Apply FYM or compost @ 5T/ha before final land preparation..
- Adopt ridge and furrow method to drain out excess water in rainy season.



# SEED TREATMENT



- Treat 1kg of seeds with 2gm of thiram before sowing.
- Keep the fungicide treated seed for 24hrs and use for sowing.
- Rhizobium culture treatment should be taken up after 7days of seed treatment.
- To break the seed dormancy of spreading type varieties , give the seed treatment of etharel.
- Use repellents like Pinetar and Kerosene to keep the rodents and crows away.
- The seed treatment should be according to the Indian Minimum Seed Certification Standards and should be followed by proper labelling.

# SOWING

- Usually undertaken with the onset of monsoon
- Heavy rain encourages high vegetative growth of plant and delays penetration of pegs.
- Optimum time for sowing for **kharif**- mid June to first week of July
- **Summer**- last week of Jan to 1<sup>st</sup> week of Feb.
- **Rabi**- September to December
- In Odisha it is mainly taken up in rabi season under irrigated condition.



## SEASONS FOR SOWING

In India, groundnut is generally sown in 4 seasons-----

- a. **Kharif**- About 85% of groundnut in india is sown in kharif
- b. **Rabi**- Groundnut is grown in rabi season in a limited area where winter is not severe and temperature do not go below 15°C. This crop is usually cultivated in rice fallow field and utilizes the residual moisture with minimal irrigation.
- c. **Summer**- Generally in the states like Tamil Nadu, Andhra, Karnataka with 9-12 irrigations.
- d. **Spring**- Spring cultivation of groundnut is taken in the states of UP, Punjab, West Bengal etc (March-May)

# SEED RATE AND SPACING

## ❖ SEED RATE

- Seed rate depends on- spacing, type of seeds and germination percentage.
- Spreading type varieties- 80-100kg/ha acc to size of kernels
- Bunch type varieties- 100-125kg/ha acc to size of kernels

## ❖ SPACING

- Spreading varieties- 60cm x 10cm
- Bunch varieties- 45cm X 10cm



# SOWING METHOD

- Seeds should be sown about 5cm deep with the help of a country seed drill or they are sown behind country plough.
- **Broad Bed And Furrow Method Of Sowing In Groundnut-** Under irrigated conditions
  - Advantageous for shallow water table and saline soils.
- **Cross Method Of Sowing-** helps in maintaining optimum plant population
  - Advantageous where groundnut succeeds rice cultivation.





# ISOLATION

- Isolation distances are essential for maintaining genetic purity.
- Groundnut is a largely self pollinated crop.
- Hence an isolation of 3m from other fields of groundnut is sufficient for certified and foundation seed production.
- In self pollinated crops isolation distance avoids mechanical mixture.



## FERTILISER APPLICATION

- Fertiliser influences pod formation and lime application ensures better nodulation.
- Lime @5q/ha
- Fertiliser dose- 20:40:40 NPK Kg/ha
- Gypsum @250kg/ha 20-25 DAS.



# IRRIGATION

- **Critical stages of irrigation-** flowering, peg formation and pod development
- **Rabi groundnut-** 3-4 irrigations
- **Summer groundnut-**9 irrigations
- Irrigation at 10-15 day intervals in kharif season
- Proper drainage is essential.
- Furrow method is the most effective with maximum WUE.



# INTERCULTURAL OPERATIONS

## A) Weeding

- Critical period of weed competition 28 to 42 days after sowing.
- Hand weeding is preferred at 20,45 and 60days of sowing.
- Chemical weed control fluchloralin @0.9 kg a.i./ha as pre emergence

## B) Earthing up

- Done within 2-3 weeks
- Soil is not disturbed after flowering.



## C) Roguing

- Roguing is done for offtypes, disease and pest infested plants and weeds

**D) Field Inspection-** A minimum of 2 inspections shall be made from the time of flowering to harvesting.

**E) Use of hormones-** Application of MH (Maleic hydrazide) near maturity in inducing dormancy in the pods for about 20-30 days .

- Application of growth hormone like planofix or Vardhak at time of flowering reduces excessive vegetative growth.
- Ideal time for hormonal application is 40 to 80days after sowing and ideal concentration is 20ppm.

## MAJOR WEEDS IN GROUNDNUT



*Amaranthus viridis*



*Boerhavia diffusa*



*Celosia argentea*



*Chloris barbata*



*Cynodon dactylon*



*Cyperus rotundus*

# PLANT PROTECTION



## 1. Early leaf spot or Early tikka:

C.O- *Cercospora arachidicola*

### Symptoms:

- Infection starts about a month after sowing.
- Small chlorotic spots appear on leaflets, with time they enlarge and turn brown to black and become sub circular shape on upper leaf surface.
- On lower surface of leaves light brown colouration is seen.
- Yellow halo is seen around the brown spots.
- Lesions also appear on petioles, stems, stipules.
- In severe cases several lesions coalesce and result in premature senescence.

### Management:

- Spray carbendazim@ 500 g/ha or mancozeb@ 1000 g/ha, if necessary 2<sup>nd</sup> round is given after 15 days.
- Spray 10% Calotropis leaf extract

## 2. Late leaf spot or Late tikka:

C.O- *Cercospora personata*

### Symptoms:



- Infection starts around 55-57 days after sowing in Kharif and 42-46 days after sowing in Rabi.
- Black & nearly circular spots appear on the lower surface of the leaflets and darker than early leafspots.
- Lesions are rough in appearance. In extreme cases many lesions coalesce resulting in premature senescence and shedding of the leaflets.

### Management:

- Intercropping pearl millet or sorghum with groundnut (1 : 3) is useful in reducing the intensity of late leafspot.
- Deep burying of crop residues in the soil, removal of volunteer groundnut plants. Spray Carbendazim@ 0.1% or Mancozeb@ 0.2% or Chlorothalonil@ 0.2%.



### 3. Bud necrosis:

C.O- Peanut bud necrosis virus(PBNV)



#### Symptoms:

- Chlorotic spots appear on young leaflets and necrotic rings and streaks are developed.
- As the plant matures it becomes stunted with short internodes and proliferation of auxiliary shoots.
- At last, the chlorotic spots enlarge to form necrotic patch and affect other plant parts.
- The virus is mainly transmitted by thrips.

#### Management:

- Adopt a close spacing of 15 x 15 cm.
- Remove infected plants up to 6 weeks after sowing.
- Spray Monocrotophos 36 WSC 500 ml/ha, 30 days after sowing either alone or in combination with antiviral principles.

## White grub:

S.N- *Holotrichia serrata*



### Symptoms:

- The grubs feed roots and damage pods.
- Grubs also feed on fine rootlets resulting in pale wilted plants.
- In severe condition the plant may die in patches.

### Management:

- Application of carbofuran @ 33kg/ha.
- Application of chloropyriphos 20EC @ 1125ml/ha.

# HARVESTING

- **Maturity indices-**

- Leaves start yellowing
- Spotting of leaves
- Dropping of old leaves.
- Pods develop blackish streaks on the inside of the shell
- Seeds are separated from the shell of the pod



- **Method-**

- Bunch type: by pulling
- Spreading type: by local plough or blade harrow.
- Hard soils are irrigated before harvesting for easy uprooting

## DRYING, CURING AND STORAGE

- Harvested crop kept in small heaps for 2-3 days or until it produces rattling sound.
- Followed by detaching the pods.
- Dried fodder (hulm) can be used for cattle feed.
- Pods must contain moisture less than 9% and kernels 8%. Best stored as pods.



## YIELD

- 1500 to 2000kg/ha (spreading type)
- 1000 to 1500kg/ha (bunch type)
- Ratio of the kernel to pods is 70:30 (kernels and shell)



## INDIAN MINIMUM SEED CERTIFICATION STANDARDS FOR GROUNDNUT

The General Seed Certification Standards are basic and, together with the following specific standards constitute the standards for certification of groundnut seed.

### **I. Land Requirements:**

Not eligible if crops grown within 2 seasons were of same kinds unless they were of same variety and of an equivalent or higher class of certified seed

### **II. Field Inspection:**

A minimum of two inspections shall be made, the first before flowering and the second at flowering and harvesting.

### III. Field Standards

#### A. General requirements

Contaminants	Minimum distance (meters)	
	Foundation	Certified
Field of other varieties	3	3
Fields of same variety not conforming to varietal purity requirements for certification	3	3

#### B. Specific requirements

Factor	Maximum permitted (%) [At the final inspection]	
	Foundation	Certified
Off-types	0.10	0.20

#### IV. Seed Standards

Factor	Standards for each class	
	Foundation	Certified
Pure seed (minimum)	96.0%	96.0%
Inert matter (maximum)	4.0%	4.0%
Other crop seeds (maximum)	none	none
Weed seeds (maximum)	none	none
Germination (kernels hand shelled)	70%	70%
Moisture (maximum)	9.0%	9.0%
For vapour-proof containers (maximum)	5.0%	5.0%



## FIELD WORK ACTIVITIES

Date	Activities
01/03/2021	<ul style="list-style-type: none"><li>• Land preparation was done.</li><li>• Urea and SSP fertilizer were applied at 1:5 ratio per seed.</li><li>• Sowing was done at 30cm × 10cm distance.</li><li>• The rest of sowing was done on the next day.</li></ul>
03/03/2021	Irrigation was given.
05/03/2021	1 <sup>st</sup> germination date was recorded and plant population was counted.
08/03/2021	Irrigation was given.
10/03/2021	<ul style="list-style-type: none"><li>• Irrigation was given.</li><li>• Chloropyriphos@ 1.5 DP was applied.</li></ul>
15/03/2021	Irrigation was given and 2 <sup>nd</sup> reading of plant population was taken.
(16,17,18)/03/2021	Irrigation was given.
22/03/2021	Weeding was done.
24/03/2021	Irrigation was given and 3 <sup>rd</sup> reading of plant population was taken.
25/03/2021	Weeding was done and 1 <sup>st</sup> flowering was observed.
30/03/2021	Irrigation was done and germination of 50% was observed in plot-3.
07/04/2021	Weeding and hoeing was done.

## FIELD WORK ACTIVITIES

### LAND PREPARATION

- ❖ **DATE:** 01.03.2021
- ❖ **MATERIALS REQUIRED:** Phawda, Garden rake, Trench hoe, Leveller.
- ❖ **PROCEDURE:**
  - Weeds were removed, bunds were trimmed.
  - The land was ploughed to a fine tilth.
  - FYM was added and incorporated in the soil.
  - Land was levelled.
  - Then lines were made 30 cm apart from each other with the help of trench hoe.

## FIELD WORK ACTIVITIES

### FERTILISER APPLICATION

- ❖ **DATE:** 01.03.2021
- ❖ 0.081kg urea and 0.601kg SSP was applied to 38.5m<sup>2</sup> area.
- ❖ **PROCEDURE:**
- ❖ The fertilizers were applied in the rows.
- ❖ Fertilizer was properly mixed with the soil with the help of a stick, so that the fertilizer did not come in contact with the seed.

## FERTILIZER DOSE AND SEED RATE CALCULATION

✓ **Fertilizer required:**

N=12.5kg/ha, P=25kg/ha

- Urea required-  $12.5/46 \times 100 = 21.17\text{kg/ha}$

For 38.5 sq.m.-  $21.17/10,000 \times 38.5 = 0.081\text{kg}$

- SSP required-  $25/16 \times 100 = 156.25\text{kg/ha}$

For 38.5 sq. m.-  $156.25/10,000 \times 38.5 = 0.601\text{kg}$

- ✓ **Seed rate**- 100kg/ha, Test wt- 40gm, wt. of 1 seed-  $40/100 = 0.4\text{gm}$

Total no of seeds required-  $1,00,000/0.4 = 250,000$  seeds/ha

**Amount of fertilizers/seed:**

- Urea-  $21170/250000 = 0.084\text{gm/seed}$
- SSP-  $156250/250000 = 0.625\text{gm/seed}$

## FIELD WORK ACTIVITIES

### SOWING

- ❖ Pre treated seeds were sown in lines.
- ❖ **DATE:** 01.03.2021 (TAG-24, SWARAJ-51)  
02.03.2021 (SWARAJ-44)
- ❖ **SEED RATE:** 100 kg seeds / ha for bunchy type
- ❖ **SOWING TYPE:** Line sowing in east-west direction
- ❖ **DEPTH OF SOWING:** 5cm
- ❖ **SPACING:** 30 cm × 10 cm
- ❖ **IMPLEMENTS USED:** Rope , Trench hoe , Scale

## FIELD WORK ACTIVITIES

### IRRIGATION

- Irrigation is not required in chary groundnut as it is sensitive to water.
- Better drainage should be ensured for a healthy crop stand.
- Rabi groundnut irrigation requirement is more.

❖**DATE:** (03,08,10,15,16,17,18,24,30) . 03. 2021

❖As we sow groundnut in zaid season, the water requirement was high. So frequent irrigation was given.

❖At the initial stage, irrigation was done with the help rose cane and pipe using sprinkler method.

❖In later stage before peg initiation furrow method of irrigation was used.

### PLANT POPULATION COUNT

On 5<sup>th</sup>,10<sup>th</sup> and 15<sup>th</sup> march plant population was counted.

## GERMINATION DATA OF GROUNDNUT

### **1<sup>st</sup> germination data: (05/3/21)**

1. Plot-1= 11
2. Plot-2= 09
3. Plot-3= 11

### **2<sup>nd</sup> germination data: (10/3/21)**

1. Plot-1=37
2. Plot-2= 41
3. Plot-3= 165

### **3<sup>rd</sup> germination data: (15/3/21)**

1. Plot-1=132
2. Plot-2=154
3. Plot-3=325

## FIELD WORK ACTIVITIES

### INTERCULTURAL OPERATION

❖ **DATE:** 22.03.2021

❖ **MATERIALS REQUIRED:** Trench hoe.

❖ Hoeing was done between the rows for proper aeration of soil and to control weed.

❖ Hoeing was done in a proper way, so that the groundnut plant was not affected.



## FIELD WORK ACTIVITIES

### PLANT PROTECTION

- ❖ **Chloropyriphos (deadly) 1.5% DP** was applied for protection against major soil pests like termites, ants and white grubs.
- ❖ **Date of application:** 10.03.2021
- ❖ Chloropyriphos was applied carefully, so that seeds and seedlings did not come in direct contact with the pesticide.

### WEED MANAGEMENT

- ❖ Critical stage of crop weed competition is 30-60 days after sowing.
- ❖ Hand weeding was done (20 DAS,40 DAS appox).

## FIELD WORK ACTIVITIES

**Date: 01/03/2021**



**Land Preparation**



**Fertilizer  
Application**



**Sowing**

## FIELD WORK ACTIVITIES

**Date: 03/03/2021**



Irrigation

## FIELD WORK ACTIVITIES

**Date: 05/03/2021**



**Plant Population Count**

## FIELD WORK ACTIVITIES

**Date: 10/03/2021**



**Irrigation**



**Chloropyrifos  
Application**

## FIELD WORK ACTIVITIES

**Date: 15/03/2021**



Irrigation

## FIELD WORK ACTIVITIES

**Date: 22/03/2021**



**Weeding**



**Intercultural  
Operation**

## FIELD WORK ACTIVITIES

Date: 24/03/2021



Irrigation



# VARIETAL CHARACTERISTICS

## 1. TAG-24:

- TAG stands for Trombay Akola Groundnut.
- Developed by BARC in 1992.
- Average duration is 110 days.
- Average yield is 25q/ha.
- 2 kernels/pod.
- Resistant to leafspot and bud necrosis.
- Oil content is 51%.

## 2. Swaraj-44:

- Bunchy variety
- 2-3 kernels per pod.
- High shelling percentage i.e. 76%.



- Oil content is 45%-48%.
- Seed rate is 40kg/ha
- Duration is 95-100 days

### 3. Swaraj-51:

- Bunch type.
- High yielding variety.
- Used for domestic purpose.
- Good fodder variety.
- Oil content is 50%-51%.
- Maturity is 90-100 days.



# PROCESS FOR SEED CERTIFICATION

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**1**

APPLICATION FOR CERTIFICATION

**2**

SCRUTINY OF THE APPLICATION

**3**

INSPECTION OF SEED FIELD

**4**

APPROVE OR RECOMMEND THE FIELD FOR REJECTION

# PROCESS FOR SEED CERTIFICATION

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5

INSPECTION OF SEED PROCESSING

6

SEED SAMPLING BY REPEATED HALVING AND MIXING

7

TAGGING AND SEALING

8

CONTROL PLOT TESTING

# PROCESS FOR SEED CERTIFICATION

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**9**

**CONDITION FOR INTERCROPPING**

**10**

**EXTENSION OF VALIDITY PERIOD OF TAG**

**11**

**REVOCAION OF CERTIFICATE**

**12**

**APPEAL AGAINST CERTIFICATION AGENCY**

## CONCLUSION

- Total cost of cultivation of groundnut for 115 sq m of area= Rs. 414.286
- Average yield/ha= 20 quintal or 23.1kg/115.5 sq m
- Total income=  $50.90 \times 23.1 =$  Rs. 1175.79
- Profit=  $1175.79 - 414.286 =$  Rs 719.768
- BC Ratio=  $719.768 / 414.286 =$  **1.737**
  
- Since the BC ratio is 1.7, it is a profitable enterprise

## REFERENCES

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2. Practical note of seed technology of 3<sup>rd</sup> semester
3. [https://www.google.com/url?sa=t&source=web&rct=j&url=https://kvk.icar.gov.in/API/Content/PPupload/k0447\\_5.pdf&ved=2ahUKEwjws8nMsuLwAhVIU30KHQczCbMQFjAAegQIBBAC&usg=AOvVaw2kQ2LhUkFBgLwCKN4lGhzW&cshid=1621861983351](https://www.google.com/url?sa=t&source=web&rct=j&url=https://kvk.icar.gov.in/API/Content/PPupload/k0447_5.pdf&ved=2ahUKEwjws8nMsuLwAhVIU30KHQczCbMQFjAAegQIBBAC&usg=AOvVaw2kQ2LhUkFBgLwCKN4lGhzW&cshid=1621861983351)