GROUNDNUT

1. Varietal recommendations:

Season/ situation	Suitable Varieties
a) Early *kharif* (March - April) (Irrigated)	TAG 24, Greeshma, Rohini, Dheeraj, Dharani, Nitya Haritha, Abhaya, Bheema, Kadiri 7 and Kadiri 8 bold
b) *Kharif*-Scarce Rainfall areas	Kadiri-9, Dharani, ICGV 91114 & Kadiri Anantha
c) *Kharif*-assured rainfall areas with scope for supplemental irrigation during prolonged dry spells	Dheeraj, Kadiri 6, Dharani, Narayani, ICGV 91114, Abhaya, Prasuna, Kadiri 9, Nitya Haritha, Kadiri Amaravathi, Kadiri Harithandra, Kadiri Chitravathi
d) For excess rainfall conditions	Kadiri Chitravathi, Abhaya, Kadiri-9, Kadiri Amaravathi, Kadiri-7 Bold, Kadiri-8 Bold
e) *Kharif*- Irrigated	Dheeraj, Kadiri 6, Dharani, Narayani, ICGV 91114, Abhaya, Prasuna, Kadiri 9, Nitya Haritha, Kadiri Amaravathi, Kadiri Harithandra, Kadiri Chitravathi, Bheema, Kadiri7 and Kadiri 8 bold
f) *Kharif*-delayed monsoon situation (August sowings)	Narayani, Dharani, ICGV 91114, Kadiri Anantha
g) Rabi (November-December sowings)	Dheeraj, Kadiri 6, Dharani, Narayani, ICGV 91114, Abhaya, Prasuna, Nitya Haritha, Kadiri Amaravathi, Kadiri Harithandra, Bheema, Kadiri7 and Kadiri 8 bold, TAG 24, Greeshma and Rohini
h) Rabi-rice fallows (January sowings)	Kadiri 6, Narayani, Dharani,Dheeraj,TAG 24, Rohini and Greeshma
i) Kalahasti malady affected areas	Kalahasti , Prasuna, Kadiri-9
j) Varieties having tolerance to leaf spot and rust	Kadiri Anantha, Abhaya, ICGV 00350
k) Coastal sands	Kadiri-6, Greeshma, TAG-24, Narayani, Dharani

2. **Selection of field/land preparation** : Well drained sandy loamy soils are highly suitab Prepare the land till fine tilth is attained by ploughing and harrowing using primary and secondary tillage implements. It facilitates root growth, peg penetration and pod development. Weeds and clods are to be avoided.

3. **Seed rate, sowing method and spacing – :** Seed rate varies depending on seed size, season and variety.

Seed rate:

Variety	*Kharif (kg/ac) Seed*	*Rabi (kg/ac) Seed*
Narayani, Kadiri-6, Dharani, Greesha, Rohini, Abhaya, ICGV 91114, Kadiri 9, Kadiri Anantha, Prasuna, ICGV 00350	50-55	70-75
Kadiri Amaravathi, Kadiri Harithandra, Dheeraj, Nitya Haritha	60-65	80-85
Kadiri-7Bold, Kadiri-8 Bold	45-50	85-90
Bheema	65-70	80-85

- With traditional method behind the plough or bullock drawn gorru, sowing 2 ha of area can be done in a day while, with tractor drawn seed drill an area of 5-6 ha can be covered. Hence, sowing with tractor drawn seed drill reduces the time and sowing cost and ensures sowing under optimum moisture conditions. Depth of sowing should be 5 cm and not more than 5 cm.

Spacing:

Varieties	Season		
	Early *kharif*	*Kharif*	*Rabi*
Narayani, Kadiri 6, Kadiri 9,Dharani, Kadiri Amaravathi, ICGV 91114, Kadiri Harithandra, Prasuna, Bheema, Dheeraj, Nitya Haritha	-	30cm x 10 cm	22.5cm x 10cm
TAG 24, Greeshma and Rohini	22.5cm x 10cm	-	22.5 cm x 10cm
Kadiri-7Bold, Kadiri-8Bold	30cm x15cm	30 cm x 15 cm	30 cm x 10 cm

- For Bheema, Dheeraj, Dharani and Nitya Haritha varieties, 30 cm x 10 cm should be adopted in early *kharif* season also.

4. Seed treatment:

- Seed should be treated with Imidachloprid 600 FS @ 2 ml + 4ml of water / kg seed followed by Tebuconazole 2%DS @ 1g or Mancozeb @ 3 g / kg seed.
- If the seed possesses dormancy, seed should be soaked in 0.05 % Ethrel solution for 12 hours followed by shade drying.
- *Trichoderma viride* seed treatment @ 8 g/kg seed for soil borne diseases
- *Rhizobium culture* inoculation is necessary for groundnut in non-traditional areas and rice fallows. Seed should be inoculated with Rhizobium culture @ 20-25 g/kg of seed.

5. Sowing time:

Region	**Early *kharif* - Irrigated**	***Kharif* -Rainfed and Irrigated**	**Rabi**
North coastal Andhra	March-April	June-July 2nd FN of June	November to December
Rayalaseema	March-April	2nd fornight of June to up to 1st week of August Best time -1st FN of July	November to December. Best time-1st FN of December

6. Fertilizer recommendations:

- Soil test based fertilizer application should be followed.
- Application of farm yard manure/ compost @ 4 tonnes /ac once in 2 – 3 seasons
- Application of 8N + 16 P_2O_5 + 20 K_2O kg/ac as basal for *Kharif* crop. Phosphorus should be applied through single super phosphate.
- For *Rabi* crop application of 8 N + 16 P_2O_5 + 20 K_2O kg/ac as basal and 4N kg/ac at flowering
- Application of Gypsum @ 200 kg /ac at flowering stage by placement.
- Application of Zinc sulphate @ 20kg/ac once in 3 seasons.
- Wherever Iron deficiency is noticed on crop, spray 0.5 % ferrous sulphate along with 0. 1
  % citric acid two times with one week interval.
- Seed treatment with Rhizobium and soil application of Phosphorous Solubilising Bacteria (2 Kg/ac) will reduce the chemical fertilizers requirement.
- Rhizobium & PSB cultures can be obtained from ARS, Amaravathi, Guntur.
- Application of 4 kg Borax and 4 kg Ferrous sulphate per acre as basal to avoid deficiency
- Spraying @ multi micro nutrient mixture (Available commercial formulations) @ 1Kg
  /ac in 200 litres of water at 30 and 60 DAS to avoid deficiency in the crop.

9. Weed management:

- Crop must be kept weed free up to 45 days after sowing.

- Hand weeding should be done at 20 and 40 DAS.
- The crop should not be disturbed by weeding or intercultivation after 45 DAS.
- Preplanting incorporation of Fluchloralin @ 1litre / ac.
- Pre-emergence application of Butachlor /Alachlor@ 1 litre ac or Pendimethalin @ 1.3 litres – 1.6 litres/ac followed by one intercultivation or one hand weeding at 25 DAS will effectively control the weeds.
- Wherever pre-emergence herbicides could not be applied, post-emergence application of Imazethaphyr @ 300 ml/ac controls broad leaved weeds and grasses. For the control of only grassy weeds application of Quizalofop Ethyl @ 400ml /ac at 20 DAS when the weeds are at 2-5 weed leaf stage of grassy weeds is recommended.

10. Irrigation management:

- Groundnut crop requires on an average 400 to 450 mm.
- Good crop of groundnut requires 8 to 9 irrigations at 10 day interval starting from 25 DAS. Irrigation interval depends on soil type.
- After the crop is established, it is necessary to withhold irrigation for about 25 days to create stress which helps in synchronized flowering.
- The last irrigation is to be at 15 days before harvesting.
- About 25-30 % irrigation water can be saved with sprinkler irrigation.
- Critical stages for water management are flowering**,** peg penetration and pod development.

Soil moisture conservation practices should be followed in rainfed crop.

- Apply 5 tonnes of groundnut shells per acre at 15-20 DAS as mulch to reduce evaporation losses and conserve soil moisture.
- To reduce transpiration losses from crop canopy, spray calcium sulphate solution (50 g/l).
- Spray urea solution (20 g/l) during dry spells in order to make the crop recover from stress.

11. PEST MANAGEMENT:

A. Insect Pest management:

1. Red hairy caterpillar:

Identification:

- Young larvae feed gregariously on the undersurface of leaves.
- Grown up larvae feed individually by devouring leaves, flowers and growing points.
- When the pest is severe only the bare stem points remain resulting in heavy yield loss.
- Early instar larvae are ash brown in colour but when fully grown turn reddish brown with black colour hairs on the body.

Problem areas: Kadapa, Kurnool, Anantapuramu and Chittoor districts.

Remedies:

- Pre-monsoon deep ploughing (two/three times) during summer showers will expose the hibernating pupae to sunlight and predatory birds.

- Removal and destruction of alternate weed hosts which harbour the hairy caterpillars.
- Use trap crops around main crop eg. Cowpea. Avoid coepea in endemic areas for bud & stem necrosis diseases. Avoid cowpea as trap crop in endemic areas of PBND and PSND
- Collect the grown up larva by keeping Calotropis branches between the rows.
- Monitor the emergence of adult moths through light trap.
- Organize bonfires on community basis from 7.30 PM to 11.0 PM to attract the newly
- emerging moths for 3 or 4 succeeding days when good showers are received.
- Collect and destroy egg masses and early instars larvae.
- Dust Quinolphos or Carbaryl @ 10 kg /ac to control early instars of the caterpillar.
- To control grown up larvae, spray Dimethoate @ 2.0 ml or quinolophos 2.0 ml/l of water.
- Trap and kill the migrating larvae in deep cut straight trenches by dusting Methyl parathion 2 % in the trench around the field.

2. Root grub:

Identificatio**n:**

- Young grubs feed on rootlets and nodules.
- Old grubs devour the entire taproot.
- Affected plants wither and die. Such plants when pulled from the soil, the devoured taproot can be clearly seen.
- Damage usually occurs in patches.
- Pest usually occurs in August and

September months. **Distribution:** Anantapuramu, Kadapa, Kurnool, and Chittoor districts.

Remedies:

- Pre-monsoon deep ploughing (two/three times) will expose the hibernating pupae to sunlight and predatory birds.
- Mass collection and destruction of beetles from the branches of neem, bar, drumstick and subabul trees.
- Apply 10 G Phorate granules @ 0.6 kg a.i. /ac at the time of sowing.
- Seed treatment with chlorpyriphos @ 6 ml /kg before sowing in root grub prone area or Imidachloprid 600 FS @ 2 ml + 4 ml water / Kg of seed.

3. Leaf miner: Identification:

- Small blister like mines appear initially on the upper surface of the leaf.
- At severe stages entire leaflet becomes brown and it rolls, shrivels and dries up.
- Severely infected crop may die and give burnt appearance when we see from distance.

Problem areas: Presently it is a major pest in all parts of the state.

Remedies:

- Rotation of groundnut with non-leguminous crops should be followed to reduce the pest incidence.
- Rotation of groundnut with soybean should be avoided.
- Collection and destruction of moths by setting light traps early in the season.
- Keeping pheromone traps in the field @ 10 per acre.
- Spray Quinalphos 25 EC @400 ml or Monocrotophos 36 SL @ 320 ml per ac in 200 litres of water should be followed.

4.Tobacco caterpillar
(*Spodoptera litura*)

Identification

- Larvae long, stout, pale green (or) brown with black half moon shaped spots on the body
- During day time it hides under soil clods and stones..
- Eggs are small and laid in mass covered with copper brown colour tuft of hairs
- In initial stages larvae congregate and scrape, later skeletonise the leaves.
- Leaves become white papery at early stage.
- In severe cases it defoliates.
- Grown up larvae disperse and make irregular holes

Problem Areas

All groundnut areas (Anantapuramu, Cuddapah, Chittoor).

Severe in the months of September, October, November, December, January.

Remedies

- Monitor the pest from September last week onwards by Pheromone traps @ 10 per ha.
- Collection and destruction of eggs masses and damaged leaves along with gregarious larvae.
- Grow the castor plants in the field at the time of sowing act as trap crop.
- For early stages spray neem oil 5 ml or Chlorpyriphos 2.5 ml or Monocrotophos 1.6 ml per liter of water.
- Arrange bird perches @ 10 per ac.
- Spray *SNPV* @ 100 LE/ac.
- Make deep furrow around the field and dust with methyl parathion dust to control migratory caterpillars
- For the control of late instar (3rd onwards) larvae, spray Thiodicarb 1.0 g or Novaluron 1.0 ml or Chlorfenapyr 2.0 ml/l. of water
- Use poison bait to attract and control late instar larvae per acre Rice bran - 5 kg

Jaggery	-	0.5 kg
Carbaryl	-	0.5 kg (or)
Monocrotophos	-	0.5 litres (or)
Methomyl	-	0.3 kg
Water	-	4-5 litres

Mix the above and make small pellets and apply them in one acre during evening hours near base of plants and along bunds .

5. Sucking pests (Jassids, Aphids and Thrips):

Identification:

- Thrips infestation results in curling of leaves and stunting of the crop growth. Thrips transmit bud necrosis and carry PSND virus in groundnut.
- Aphid infestation results in chlorotic plants and curling of leaves.
- Jassid infestation results in yellowing of the leaves at early stage, later which on turn to brick red colour.

Distribution: Present in all groundnut growing areas.

Remedies: Spraying of Monocrotophos 36 SL @ 320 ml or Dimethoate 30 EC@ 400 ml or Imidacloprid17.8 SL@ 60 ml per ac in 200 litres of water

6. Storage Pests:

- Groundnut bruchid and Corcyra occur in storage.
- Moisture content should not be more than 9 % in pods during storage.
- Spray 0. 5% Malathion on pods and gunny bags.
- Fumigation with aluminium phosphide tablets - 3-5 tablets /tonne of groundnut pods.
- Mixing neem oil 5 ml/kg of pods protect from bruchid.
- Spray Deltamethrin 2.5 SC @ 0.5 ml per litres of water on pods and gunny bags.

B. DISEASE MANAGEMENT:

1.Tikka leaf spot

Identification:

- In case of early leaf spot, the lesions are sub -circular and 1-10 mm diameter and dark brown on the upper surface of the leaf
- In case of late leaf spot, the lesions on the leaf are small, more nearly circular and darker than those of early leaf spot.
- Both the lesions may also appear on the stem, petiole and pegs

Problem areas: Both the leaf spots are commonly present in all groundnut-growing areas, but the incidence is relatively more in North coastal and heavy rainfall areas.

Remedies:

- Removal of infected plant debris
- Crop rotation should be followed
- Seed treatment with Tebuconazole 2 % DS @ 1 g or mancozeb @ 3 g/kg of seed
- Growing tolerant varieties *viz*., Abhaya, Kadiri Anantha and ICGV 00350.
- Spraying of Mancozeb 75 WP @ 400 g + Carbendazim 50 WP@ 200 g /ac or Hexaconazole 5 SC @ 400 ml or Chlorothalonil 75 WP @ 400 g or Tebuconazole 25.9 EC @ 200 ml/ac in 200 litres of water at fortnightly intervals from first disease appearance.

2.Rust:

Identification**:**

- Orange coloured pustules appear on the lower surface of the leaflets
- In severe cases, lesions also appear on other plant parts except flowers

Problem areas: Occurs in all groundnut-growing areas

Remedies:

- Removal of infected areas
- Collect seed from disease free areas
- Seed treatment with Tebuconazole 2 % DS @ 1g or 3 g of Mancozeb/kg of seed
- Spraying of Mancozeb @ 400 g or Chlorothalonil @ 400 g or Tridemorph @ 400 g /ac in 200 litres of water at 15 days interval starting from disease appearance.

3.*Collar rot:* **Identification**:

- Rapid desiccation of the affected plant
- Affected tissue is covered with black mass of spores
- In mature plants, lesions develop on the stem just below the soil surface and then spread upward along the branches.
- In mature plants, symptoms generally do not appear until the wilting of the entire plant is apparent

Problem areas: More prevalent in light sandy soils

Remedies:

- Select healthy seed
- Seed treatment with Tebuconazole 2 % DS @ 1g or Mancozeb 3 g/kg.
- Deep sowing of seed should be avoided
- Deep ploughing of fields and destruction of plant debris

4.Dry root rot:

C. Identification:

- Appears at any stage of the crop and severe during drought period
- First water soaked necrotic spots appear on the stem just above the ground level, later develop into blackish when they spread to aerial parts and down into roots.
- If the infection girdles the stem, wilting follows.
- Roots are commonly attacked, tap root become black with abundant sclerotia and rotten and shredded.
- Leaf infection characterized by marginal zonate and irregular spots.

Problem areas: Severe in rain fed groundnut growing areas

Remedies:

- Deep ploughing in summer
- Selection of healthy seed
- Seed treatment with Tebuconazole 2 % DS @ 1 g/kg seed or Mancozeb @ 3 g/kg kernel or seed
- Soil application of *Trichoderma viride* fortified FYM developed by

mixing 90 kg FYM + 10 kg neem cake + 2 kg *Trichoderma viride* and incubating for 15 days under shade per acre

- Timely management of irrigation schedule. Do not allow to wilt during critical stages of crop.

5.Peanut Stem Necrosis Disease (PSND)

Identification:

- Necrotic lesions on terminal leaf lets, death of top growing bud on main stem followed by necrosis of all top buds on primaries. Complete stem necrosis and often-total necrosis of entire plant in early infection
- Infected plants become stunted and showed auxiliary shoot proliferation with small and chlorotic leaflets
- Necrotic spots on pods. Testa also gets discoloured or mottled

Problem Areas: Anantapuramu, Kurnool and Chittoor districts of A.P.

Remedies:

- Growing of tolerant groundnut varieties namely Kadiri 9, Kadiri 7 bold and Kadiri Amaravathi.
- Seed treatment with Imidachloprid 600 FS @ 2 ml + 4 ml water /kg of seed.
- Weeds such as *Parthenium hysterophorus, Tridax procumbence, Ageratum conyzoides, Cleome viscosa, Commelina benghalensis, Vernonia cineraria, Achyranthus aspera, Acanthospermum hispidum* should be removed before flowering in and around the field
- Barrier crops namely bajra, maize and sorghum should be planted in 4-8 rows around the groundnut field. These will prevent thrips and wind borne weed pollen carrying virus
- Spraying of Monocrotophos 36 SL@ 320 ml or Dimethoate 30 EC@ 400 ml or Imidachloprid 17.8 SL@ 60 ml/ac in 200 liters of water at 25-30 days after sowing.

6.Peanut bud necrosis disease:

Identification:

- Initial symptoms appear on young leaflets as chlorotic spots and develop into chlorotic or necrotic ring spots
- Terminal bud necrosis on main stem followed by death of top buds on all primaries
- Stunting growth with reduced size of leaflets and petioles
- Infected plants become dwarf and show axillary shoot proliferation with small leaves having mosaic and distortion of lamina.
- Early infection leads to no flower and pods. In case of late infection very few pods with reduced size and mottled testa.
- **Remedies**:
- Use of tolerant varieties *viz.*, Dharani and Kadiri 9

- Barrier crops namely bajra, maize and sorghum should be planted in 4-8 rows around the groundnut field.
- Spraying of monocrotophos @ 320 ml or Dimethoate @ 400 ml or Imidachloprid @ 60 ml/ac in 200 litres of water at 25-30 days after sowing
- Maintenance of recommended plant population i.e. 33 plants /m^2 in *Kharif* & 44 plants/m^2 in Rabi.

12. Harvesting:

- Should be done at right stage of maturity
- At the time of 70-80% leaves and stems turn yellow
- When the inner side of the shell turn black
- When sufficient moisture is available in the root zone

13. Storage:

- Seed should not contain more than 9 % moisture for storage
- Prefer polypropylene/gunny bags for storage
- Spray Malathion 5 ml / litre of water once in 2-3 weeks on storage bags against storage pests.

14. Tips for increasing production

- Deep summer ploughing using sub-soiler
- Adoption of HYV
- Adoption of recommended seed rate
- Use small seed without shrivelling of improved varieties
- Seed treatment
- Ensure optimum population
- Adopt recommended fertilizer dose
- Adoption of Ferti-cum- seed drill to ensure right placement of seed and fertilizer
- Apply Gypsum and SSP to provide calcium and Sulphur
- Avoid inter cultivation/weeding after 45 DAS.
- Adopt IPM Package
- Practice crop rotation and intercropping
- Use mechanization for sowing, inter cultivation ,harvesting and stripping to reduce cost of cultivation

Salient features of groundnut:

Variety	Duration	Pod yield (q/ha)		Shelling %	100 seed weight (g)	SMK %	Oil content (%)	Special features
		Kharif	Rabi					
Narayani	100	8-9	16-18	76	40-45	90-95	49	Early maturing(100days), drought tolerant, red testa
Kalahasti	105-110	--	18-20	74-76	50-53	85-90	52	kalahasti malady resistant, red testa, suitable for oil purpose
Prasuna	105-110	8-9	16-18	75	40-45	85-90	48	Tolerant to kalahasti malady, medium bold seeds and rose testa
Abhaya	105-110	8-9	16-18	76-79	38-40	85-90	52	Drought tolerant, LLS tolerant with fresh seed dormancy, short compact plant type, suitable for high rainfall areas
Greeshma	95-100	8-9	16-18	76	40-45	85-90	50	Early (95-100days), water use efficient, short compact plant type
Rohini	90-95	8-9	16-18	75	38-42	85-90	49	Ultra-early (90-95days), water use efficient, short compact plant type

Bheema	110-115	9-10	14-20	63-65	65-70	75-80	45	Early bold seeded Spanish bunch variety with low oil and high sucrose
ICGV-00350	105-109	9-10	12-18	75	45	87	48	tolerant to LLS, rust and stem rot
Dharani	100-105	7-8	15-18	75-77	40-43	90	49	Drought tolerant – withstands up to 35 days dry spell, uniform maturity, high SMK%, attractive pods, moderate stature and tolerant to low light conditions
Dheeraj	100-105	8-9	16-18	74-76	50-55	90	50	Water-use efficient, heat and cold tolerant
Nitya Haritha	110-115	9-10	14-16	76	50	89	50	3-seeded pods more, short-statured, 15-20 days fresh seed dormancy
Kadiri 6	100-105	8-8.8	16-17	72	40-45	89	48	Popular among farmers for its quality attributes
Kadiri 7 bold	130-135	8-10	18-20	70	65-70	75	49	Bold seeded Virginia bunch variety
Kadiri 8 bold	120-130	8-10	18-20	70	70-75	75	49	Bold seeded Virginia bunch variety

Kadiri 9	110-120	8-10	14-16	80	35	85	52	Drought tolerant, tolerant to late leaf spot, sucking insects, kalahasti malady, mites, fresh dormancy 30 days

Kadiri Harithandra	110-120	8-10	14-16	70	40-45	75	48	Drought tolerant, tolerant to late leaf spot, thrips ,stays green up to harvest, high haulms yield
Kadiri Anantha	110-120	8-10	14-18	75	40	85	48	Drought tolerant, tolerant to late leaf spot, sucking insects
Kadiri Amaravathi	115-120	8-10	14-18	76	45-50	85	49	Drought tolerant, tolerant to late leaf spot, sucking insects, bud and stem necrosis diseases
Kadiri Chitravathi	110-115	-	12-20	70	40-45	80	49	Tolerant to PBND, PSND, dry root rot, sucking insects