



Good Agricultural Practices

CHILLY



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GOOD AGRICULTURAL PRACTICES - CHILLI



Directorate of Arecanut and Spices Development, Kozhikode, Kerala
Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu
Dr.Y.S.R. Horticultural University, Venkataramannagudem, Andhra Pradesh
ICAR-All Indian Coordinated Research Project on Spices, Kozhikode, Kerala
ICAR- Indian Institute of Spices Research, Kozhikode, Kerala

Climate and Soils

- Chilli being a subtropical crop comes up well in warm humid climate and can be grown under varied agro-climatic conditions.
- Excess irrigation/rainfall and moisture stress during flowering/ fruit set is detrimental. Dry climate during fruit maturity and ripening is ideal and facilitates quality harvest.
- Black soils are best suited for chilli cultivation. Irrigation can be taken up in light (red loams/ sandy loams/ chalka soils) and alluvial soils. Soils with poor drainage are not suitable.

Selection of a variety

Variety has to be selected based on climatic conditions, soil type, purpose for which it is cultivated, irrigation facilities, local consumers' preference, and pest and disease incidence in the locality.

Seed rate

- Varieties: 650 g/acre (for transplanted crop); 2.50 kg/acre (for direct sowing)
- Hybrids: 100 g/acre

Seed treatment

- Hybrid and OP seeds marketed by private sector are usually treated with insecticide and fungicide to avoid sucking pests and preventing damping off disease.
- However, in all the other cases, the seed procured must be treated with *Trichoderma viride* @ 4 g / kg or *Pseudomonas fluorescens* @ 10 g/ kg.

Nursery management

Nursery management must ensure healthy seedlings with high initial vigour which helps in faster establishment and a healthy crop. The following points must be taken care of in case of raising the nursery in a traditional way which is widely practiced for open pollinated varieties.

- Raised nursery beds with soil mixed with well pulverized organic matter.
- Apply neem cake powder @1 kg per 40 m² area.
- Avoid application of chemical fertilizers in nursery bed. If necessary use foliar nutrients.
- To protect against damping off, drench the nursery bed with copper oxychloride (3g / L) at 9th day after sowing (DAS) and 15th DAS.
- Wherever possible and in the case of hybrids, seedlings must be raised under shade net or polyhouse in protrays to produce healthy seedlings.

Sowing/ Planting

Direct sowing : July to August
 Nursery : July
 Transplanting : August- September

Integrated nutrient management

Soil problems and micronutrient deficiencies in chilli are mainly due to the excess use of chemical fertilizers and limited or no application of organic fertilizers. Improving the soil health by soil conservation methods, green leaf manuring, crop rotation and application of bulky organic manures will not only improve availability of nutrients to the crop but also improves soil microflora and fauna. To avoid soil nutrient depletion, crop rotation should be incorporated in the cropping pattern.

- Follow crop rotation: Greengram - Chilli rotation is a good example without sacrificing chilli crop.
- Deep ploughing in summer to maintain soil condition as well as to reduce hibernating pest population. Chilli plants in compacted soils experience stress both during wet and dry periods than plants in soils with good tilth.
- Application of diverse organic manures – FYM (25 t/ha) or vermicompost (5 t/ha) enriched with bioagents. Apply liberal doses of diverse organic manures such as crop residues, FYM, compost, vermicompost, green manure, neem cake etc to improve soil organic carbon and physical condition.

- Organic matter should be treated as food for soil microbes and not as food for chilli crop. Soil biota in turn takes care of the soil health and plant nutrition. A healthy soil life is fundamental for balanced uptake of nutrients.
- Application of biofertilizers- & bioagents (Phosphobacteria, *Bacillus subtilis* and Mycorrhiza, *Pseudomonas*, *Trichoderma* etc) to the soil to build up beneficial microbial population.
- Raising green manure crops like Crotalaria. Most green manure crops keep Mycorrhizal counts high and suppress parasitic nematodes. In soils rich in organic matter, nutrient management is easier to satisfy crop needs. Use of green manure reduces the incidence of thrips, aphids and whitefly. Root rots and leaf diseases are reduced with active organic matter.
- Apply neem cake powder @ 250 kg/ha.
- Apply recommended dose nitrogen and potassium fertilizers as per the recommendation of the region (300 kg N and 120 kg K in 4-5 splits for Andhra Pradesh and Telangana)) and as per soil test results.
- Apply entire phosphorus as basal in the form of single super phosphate (SSP) and avoid split and excess doses of P fertilizers.
- Region, soil and farming situation based fertilizer recommendations should be followed for better Fertilizer Use Efficiency.

Weed management

Critical stages are:

- Direct sown crop : 90 DAS
- Transplanted crop : 60 DAP
- Avoid excess use of herbicides.
- Avoid directed spray of herbicides which are not recommended.
- Inter-cultivation must be preferred over the use of herbicides.

Crop management

Crop management practices must integrate nutrient, pest and disease management strategies for raising a healthy crop.

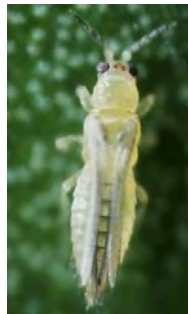
- Transplanting on beds or ridges & furrows method.
- Mulching the field with film – LLDPE 60-70 micron
- Sprinklers during early period of the crop then convert to drip allowing early inter-culture.
- Raise the crop under drip and fertigation
- Keep the field free from weeds by inter-culture and manual weeding.

Integrated Pest and Disease Management

Chilli crop is usually attacked by sucking pests (thrips, white flies, aphids and mites) and borers (*Helicoverpa* and *Spodoptera*). At any stage of the crop, the crop typically experiences pest complex attack leading to panic by the farmers resulting in indiscriminate use of insecticides. Many a times, thrips and mites attack the crop thus making majority of control measures ineffective. Most sucking pests in chilli not only cause direct damage but also transmit viruses. Aphids transmit Cucumber Mosaic virus, whiteflies transmit Leaf Curl Virus (Gemini virus) and thrips transmit Peanut Bud Necrosis Virus. A general guideline is to contain the pest load rather than aiming at absolute control of the pest, as this approach is currently known to cause high pesticide residues in the harvested produce.

Important insect pest of chilly

Thrips



Aphid



Yellow mite



White fly



Fruit borer



Tobacco cutworm



Important diseases in chilly

Damping off



Bacterial leaf spot



Anthracnose



Powdery mildew



Cercospora leaf spot



Fusarium wilt



Leaf curl virus



Leaf mosaic virus



The following are some of the important measures under IPM

- Seedling dip in pesticide/ fungicide solution before planting.
- Planting border crops like sorghum, maize to check sucking pests.
- Planting trap crops like marigold and castor against borers and nematodes.
- Use of pheromone traps for control of borers and sticky traps against sucking pests
Provide poison bait with carbaryl 1.25 kg, rice bran 12.5 kg, jaggery 1.25 kg and water 7.5 L/ha
- Providing bird perches.
- Sprinklers at pre flowering stage to check thrips infestation.
- Avoid fruits touching the soil, and getting infested with fungal diseases.
- Avoid combination of more than two pesticides and avoid repeated use of same pesticide
- Enhance the usage of botanicals viz., Neem and Pongamia oil @ 2mL /L along with recommended pesticides.
- Avoid applying pesticides after flowering to pod formation period, wherever possible.

Insect pest and disease management schedule

Activity	Stage of crop	Management option
Seed treatment	Sowing time	<i>Trichoderma viride</i> @ 4 g / kg or <i>Pseudomonas fluorescens</i> @ 10 g/ kg. Apply neem cake powder in seed bed @1 kg / 40 m ² area.
Management of sucking pests in nursery	Nursery	Spinosad 0.3 mL/L of water
Sowing guard crop	At the time of transplanting	3-4 rows of maize or sorghum as guard crop.
Installation of pheromone traps and live bird perches.	At the time of transplanting	10 traps/ acre, 5 for <i>Helicoverpa</i> sp. and 5 for <i>Spodoptera</i> sp. About 10 maize live perches /acre.
Management of thrips in main crop	Transplant to one month before harvest	Overhead irrigation with sprinklers Spinosad 0.3 ml/L of water or Fipronil @2 mL / L.
Management of mites	In the nursery and main crop	Overhead irrigation with sprinklers, Spray once in the nursery and second time in the main crop with wettable sulphur 3 g / L or vertimic 0.5 mL / L or pegasis 1 g / L
Management of pod borers at initial stage	Flowering Stage	Application of neem cake powder @ 10 kg / acre NPV @ 250 LE / acre, Bt, (dipel 4 mL \ L) <i>Trichogramma pretiosum</i> 3 lakh adults / acre
Management of pod borers at later stage	Fruiting stage	Spray indoxacarb @1 mL/L or Spinosad @ 0.3 mL /L
Arresting immigrating spodoptera	Crop maturity stage	Erecting polythene fence (4 inches above ground). Keep poison baits.
Gall Midge	Flowering / fruiting	Spinosad @ 0.3 mL /L NSKE 2% @5ml/L
Aphids	Vegetative, Flowering stages	Spinosad @ 0.3 mL /L <i>Lecanicillium lecanii</i> 2 g/L
Root grub	Soil application at early stage	<i>Metarhizium anisopliae</i> Soil application with neem powder @1 kg/acre.
Anthracnose	Green fruit stage	Thiophonate methyl 1 g / L Mancozeb 2.5 g / L Tilt 1 ml/L Antrcol 2 g/L
Chaonophora	Flowering and fruiting stage	Copper oxychloride 3 g / l
Powdery mildew	Flowering and fruiting stage	Dinocap 1 ml / L, wettable sulfur 3 g/L
Leaf spots	Flowering and fruiting stage	Propineb 2.5 g / L Chlorothalonil 2.5 g / L

Harvesting and Post-harvest management

Chilli invariably contains high moisture content (60-85%) at the time of harvest, which must be brought down to 8-12%. The majority of Chilli produced is dried in open space. The major change during drying is weight reduction which amounts to a reduction of 20-15% of total weight of the pods. Losses also occur during farm processing. These are spillage in field (1-10%), wastage during farm assembling (5-10%) and wastage during transportation and handling (2-5%). Proper post-harvest management not only helps to reduce the post-harvest losses but also improves quality and shelf life of the final produce. If chillies are not properly dried, 35-50% post-harvest losses may occur when the produce moves along the supply chain.

- Timely pickings improve quality.
- Harvest at right maturity for maximum flavour, oil and colour content.
- Heap the harvested pods over night to get uniform colour
- Avoid insecticide sprays before picking
- Use clean bags and baskets for harvesting.
- Bring moisture level to 10-11% to avoid aflatoxin contamination.
- Use cement platforms and silpaulin sheets to avoid aflatoxin contamination.
- Drying area should be protected by fencing to avoid contact with animals.
- Keep the produce free from dust and other foreign material
- Encourage multipurpose polyhouse solar dryers for quick drying and such closed dryers help to develop high quality produce with minimum contamination and protect from rains.
- Use of polyhouse solar drying for achieving high quality produce. ANGRAU or TNAU model may be used. Bapatla (ANGRAU) model poly house solar dryer is of size 7.5 m × 4 m × 3 m to dry about 10 quintals of ripe chillies. The dryer consists of an arch type poly house to hold chillies in two tiers. The drying time is 5-8 days to reduce moisture from 75 % to 10 % (wb) in comparison with 15-20 days required to dry chillies in traditional open yard sun drying.
- Grading- to sort out damaged and whitened pods
- Grading should be done with proper hygiene.
- Pack in clean, new gunny bags and label with natural colours.
- Store at 4-7°C in cold storage. Cold storage helps to retain colour
- Avoid the use of Rhodamine to label the chilli gunnies.
- Avoid sprinkling water on dry chilli while packing in gunnies.
- Restricting animals, including livestock, poultry or pets, to roam in crop areas, especially near harvest time.
- Excluding rodents, insects and other pests from growing areas.

- Providing appropriate hand-washing instructions and clean toilet facilities for field workers.
- Cleaning and sanitizing harvest containers before use.
- Excluding field debris from packing and storage facilities by cleaning the outsides of harvest bins and requiring workers to wear clean clothes in these areas .
- Using new and unused bags to pack products for further transport and sale.

Types of post-harvest losses in chillies and its prevention

Type of loss	Reason	Prevention
Discolouration	Prolonged sun drying	Mechanical drying
	Harvesting of immature fruits	Harvesting of matured fruits
Mould growth	Improper drying	Proper drying
	Poor storage condition	Proper storage
Loss of seed	Physical injury	Gentle handling
	Improper packing	Careful packing
	Loose stalk	Selection of variety
	Pod borer	
Wrinkling of fruits	Prolonged sun drying	Mechanical drying
	Over drying	optimum drying
	Delayed picking	Correct picking