

A Modern Approach in Cultivation of Capsicum in the Green Houses (Poly Houses)

Puppala Upender

Lecturer, Department of Biology, Sreemaatae Manikeshwari Independent PU College, Bidar, karnataka, India

ABSTRACT

Capsicum, otherwise called sweet pepper, ringer pepper or Shimla Mirch is one of the well known vegetables developed all through India. It is rich in Vitamin A (8493 IU), Vitamin C (283 mg) and minerals like Calcium (13.4 mg), Magnesium (14.9 mg) Phosphorus (28.3 mg) Potassium, (263.7 mg) per 100 g new weight. In this paper we examine that Capsicum is a cool season trim, yet it can be become round the year utilizing protected structures where temperature and relative humidity (RH) can be controlled. This yield requires day temperature of 25⁰-30⁰C and night temperature of 18⁰-20⁰C with relative humidity of 50-60%. On the off chance that temperature surpasses 35⁰C or falls beneath 12⁰C, natural product setting is influenced.

Keywords: Green Houses, Poly Houses, Cultivation of Capsicum, cultivation, Transplanting

I. INTRODUCTION

Hued capsicums are in extraordinary request in urban markets. The request is for the most part determined by inn and cooking industry. The generally developed green capsicum, contingent on assortment and season, typically yields 20-40 tons for every hectare in around 4-5 months. In greenhouse, the product span of green and shaded capsicums is around 7 - 10 months and yields around 80-100 t for each hectare. The advantages of protected cultivation are;

- ✓ Higher profitability bringing about expanded yield Provides better developing condition to plants
- ✓ Protects from rain, twist, high temperatures and limits the harm of creepy crawly nuisances and sicknesses in this way enhancing the quality and yield
- ✓ Facilitates year round creation combined with yield improvement by 2-3 times contrasted with open cultivation.

1. Selection of Site

Selection of site for taking up of protected cultivation is a basic advance and this must be finished with most extreme care. Spots having high precipitation and humidity are not reasonable for its cultivation, since this empowers numerous foliar sicknesses. Additionally the regions with high breeze speed are not reasonable since they are probably going to harm the structure and the polyethylene sheet as often as possible, in this way upgrading the support cost of the structure. Stay away from the area or territory where overwhelming downpours went with windy breezes are predominant to maintain a strategic distance from harm to the protected structure. Very much depleted sandy topsoil soils having great permeation is most appropriate to develop capsicum. The dirt pH of 6 to 7 and EC < 1 mm hos/cm is perfect for developing capsicums.

2. Cultural and Nursery practices

a. Selection of cultivars

Developing of capsicum half breeds in green house is valuable to acquire nonstop and standard bloom and natural product setting relatively for a long stretch of 8 to 10 months. The vast majority of the capsicum mixtures deliver green natural products that develop to red, orange or yellow contingent upon the half and half. The natural products ought to have characters, for example, uniform size and shape ideally four flaps, organic product weight of >150g, uniform shading in the wake of achieving complete development, with a superior time span of usability of over 5 days under surrounding conditions. Chosen half breed ought to be high yielding, with potential yield of >40t/section of land. Cross breeds ought to have shorter multi-purpose lengths (7 to 10 cm), accomplishing most extreme tallness of 10 feet in a product time of 10 months. Prevalently developed business half and halves in India incorporate Indra, Yamuna (Green); Bomby, Triple star, Natasha, Inspiration, Pasarella (Red); Sunnycz, Swarna, Orobelle, Bachata (Yellow). Capsicum cross breeds with high return potential (>100 t/ha) and having uniform size and shape should be chosen. Mixtures ideally ought to have long developing time of 8-10 months. Organic products ought to have 6 characters, for example, four flaps, uniform shading and maturing with better timeframe of realistic usability.



b. Nursery raising

- Great quality seeds are required for creating better seedlings. The seedlings are brought up in star plate of 98 cells or depressions. Around 16,000 to 20,000 seedlings are required to plant one section of land for which 160-200 gm of

seeds is required.

- The expert plate are loaded with sanitized cocopeat and seeds are sown, one seed for every cell to a profundity of ½ cm and secured with similar media.
- The filled plate are staked one over the other and secured with plastic sheets till germination of seeds.
- Seeds develop in about seven days in the wake of sowing. The plate are moved to net house/polyhouse and daintily watered. Following 15 days of sowing, Mono ammonium phosphate (12:61:0) (3g/L) and 22 days subsequent to sowing 19:19:19 (3g/L) arrangement must be splashed. The seedlings in protrays are soaked with COC 3g/L before transplanting. The seedlings will be prepared for transplanting in 30-35 days.
- Shower imidacloprid @ 0.2 ml/L and chlorothalonil @ 1gm/L before transplanting of seedlings. Continuously include around 0.3 ml/L of wetting specialist per liter of water with each splash of pesticide.



3. Land preparation

The land ought to be completely furrowed and soil ought to be conveyed to fine tilth. All around deteriorated natural excrement at the rate of 20-25 kg for each sq mtr is blended with soil. One application is adequate to grow three capsicum trims progressively. Raised beds are shaped subsequent to conveying soil to fine tilth. The bed size ought to be 90-100 cms wide and 15-22 cms stature. Between the beds strolling space of 45 cms to 50 cm should be given.



4. Fumigation

The crop beds are splashed utilizing 4 for each penny formaldehyde (@4 L/m² of bed) and secured with dark polyethylene mulch sheet. While treating with formalin, care ought to be taken to wear veil, gloves and overskirt. Four days after formalin treatment, the polyethylene cover is expelled; the beds are raked over and again ordinary to evacuate the caught formalin exhaust totally, preceding transplanting. Formalin treatment can be rehashed after three yield cycles or at whatever point essential. Fumigation with formaldehyde limits the dirt borne ailments. Basamid can likewise be utilized for soil disinfection.



5. Fertilizer application

A basal compost dosage of 20:25:20 NPK is required per section of land and is connected to the beds consistently before transplanting as 80 kg calcium ammonium nitrate, 125 kg super phosphate and 32 kg murate of potash or 40 kg sulfate of potash.

6. Application of neem cake and Microbial Bio-control Agents

Fifteen days before transplanting, neem cake must be advanced with bio specialists like *Trichoderma harzianum* and *Pseudomonas lilacinous*. Neem cake of around 200 Kg is powdered and somewhat dampened. *Trichoderma harzianum*, *Pseudomonas lilacinous* and *Paecilomyces chilmidosporia* every one of two kg are blended altogether to the neem

cake. The blend is secured with wet gunny sacks or dry grass and left for 8-10 days. Maintain a strategic distance from guide introduction to daylight and precipitation. Following 10 days, this improved blend of neem cake and bio-operator alongside 600 kg of neem cake must be connected consistently to the beds for a territory of one section of land. This is profoundly helpful to diminish the issue of soil borne pathogens and nematodes. *Azospirillum* or *Azotobacter* or VAM which is a nitrogen settling microscopic organisms can likewise be connected to the developing bed.

7. Laying of drip line

Place one 16mm inline trickle parallel at the focal point of the bed having radiating focuses at each 30 cm interim with release rate of 2 ltr/hr or 4 ltr/hr. Run the dribble framework to check each transmitting point for uniform release before covering the beds with polythene mulch.



8. Mulching and Spacing

Dark polyethylene non-reused mulch film of 30-100 micron thick, 1.2 m wide, is utilized to cover the planting beds. Openings of 5 cm measurement are made on the polyethylene film according to the suggested separating (45cm x 30cm). The planting beds are secured with the film by securing the edges of the sheet immovably in the dirt. Mulching practice moderates water, controls weeds, lessens pervasion of bugs and ailments and results in higher yield and great quality deliver.



9. Transplanting

The planting beds are watered to handle limit before transplanting. Seedlings of 30-35 days old are utilized for transplanting. Care ought to be taken to see that no harm is jumped out at roots, while taking out the seedlings from singular cells of depict. Seedlings are transplanted into gaps made in polyethylene mulch film at a profundity of 5 cm. Subsequent to transplanting, seedlings are doused with 3 g/L copper oxy chloride or 3 g/L captan or 2 g/L copper hydroxide answer for the base of seedlings at the rate of 25-30 ml for every plant. Watering 10 the mulched beds every day amid evening by utilizing hose pipe for seven days ceaselessly is fundamental to stay away from mortality because of warmth caught by mulch sheet.



10. Pruning

Capsicum plants are pruned to hold four stems. The tip of the plant parts into two at fifth or sixth hub and are left to develop. These two branches again split in to two offering ascend to four branches. At each hub the tip parts into two offering ascend to one in number branch and one week branch. The pruning is done following 30 days of transplanting at an interim of 8 to 10 days, bringing about greater natural products with better quality and high efficiency. The capsicum plants can likewise be pruned to two stems and same level of yield can be kept up.

11. Training

The fundamental stem of plant is tied with four plastic twine to prepare along and attached to GI wire network gave on the highest point of the plants. This is rehearsed following a month of transplanting. The new branches and plants are prepared along the plastic twines.

12. Drip irrigation and Fertigation

Trickle water system is given to give 2-4 liters of water for each square meter every day relying upon the season. Water solvent composts are given through fertigation for whole harvest development period, beginning from third week in the wake of transplanting. Fertigation is to be given twice seven days as prescribed in the table underneath.

Sl.No	Required fertilizer	Fertilizer dosage per fertigation (kg/ac)
1	19:19:19	4 kg
2	Potassium Nitrate	1.5 kg
3	Calcium Nitrate	1.5 kg

Capsicum crop is sprayed with water soluble fertilizers like potassium nitrate and calcium nitrate at every 3 week interval after 2 months of transplanting @ 3g/ l as foliar application.

13. Integrated Pests and Diseases Management

Capsicum being relatively long length (9-10 months) edit in polyhouse, the plant parts (vegetative, flower and natural product) are more presented to unfavorable impact on the yield, quality and market estimation of the create. Thus their recognizable proof and administration at right phase of the product ought to be given significance. The real irritations and ailments, their manifestations and their administration in capsicum are given below. The significant spotlight has been given on selection of coordinated approach in overseeing nuisances and illnesses, that assistance to decrease the pesticide stack, cost of chemicals and maintain a strategic distance from the resurgence of bugs and sicknesses.

a. Insect Pest and Management

i. Thrips

Symptoms: Thrips cause upward twisting of leaves, sucks sap and decrease leaf development, plant development, yield and market estimation of deliver. It additionally diminishes leaf zone and obstructs assimilation of supplements and water by the plants.

Expanded invasion prompts darkening and drying of leaves and unpredictable natural product bearing.

Management: Remove influenced plant parts including leaves, blooms and organic products. Keep the plots clean by evacuating all the dropped plant parts. Splash Pongamia oil (5-8 ml/L) or Neem seeds portion extricate (NSKE 4%) or Pongamia/Neem cleanser created by IIHR (7gm/L) or fipronil (1ml/L) or chloropyriphos (2 ml/L) or acephate (1.5g/L) or Imidacloprid (0.5ml/L). Soaking of soil utilizing chloropyriphos (4ml/L) or imidacloprid (0.5ml/L).



ii. Mites

Symptoms: Youthful hatchlings and grown-ups feast upon leaves, bud and organic products, suck sap from plant parts which thusly causes descending twisting of takes off. The measure of leaf, leafy foods gets diminished, products of the soil 13 drop influencing the market estimation of the create. This nuisance pervasion increments with expanded temperature combined with high humidity.

Management: Remove the nuisance harmed plant parts including leaves, blooms and foods grown from the ground Pongamia oil (5-8 ml/L) or Pongamia/Neem cleanser (8-10 g/L) or dicofol (2ml/L) or wettable sulfur (2ml/L) or abamectin (0.5ml/L) or ecomite or propargite or chlorophenapyr (1ml/L) or fenazaquin (1 ml/L).



iii. Aphids

Symptoms: Sprites and grown-up aphids suck sap from leaf veins and more youthful leaves bringing about diminished plant development and reduction in yield. Its pervasion causes twisting of leaves as well as spreads viral infections.

Management: Keep a nearby watch on the plants at standard interims for aphids' pervasion. Splash Pongamia/Neem cleanser (8-10 g/L) or imidacloprid (0.5ml/L) or thiomethoxam (0.5g/L) or dimethoate (2ml/L).



iv. Fruit borer

Symptoms: Natural product borers are exceptionally dynamic amid night. The grown-ups lay eggs on organic products, blossoms and leaves in huge number and the sprites that 14 leave eggs, eat leafy foods causing substantial decimation of harvests and seriously influences the nature of the create. At whatever point night temperature is low, combined with cool furthermore, high humidity the invasion is expanded. Since eggs are laid in gathering, the hatchling additionally nourishes gregariously on leaves at one place, which can be effortlessly recognized and annihilated.

Management: Pick and devastate sprites and grown-up bugs. By and large eggs are laid and bring forth in gatherings, which is anything but difficult to recognize from a separation. Henceforth they ought to be recognized and demolished promptly. Shower thiocarb (1ml/L) or carbaryl (3g/L) or indoxcarb (1ml/L) or rynaxypyr (0.5ml/L) or chlorofenfur (1.5ml/L) or fipronil (1ml/L). Notwithstanding the splashes, adult grown-ups

ought to be subjected to methomyl gaoading, which is a protected, sound and powerful practice.



Methomyl baiting procedure: Set up a blend of 10 kg paddy husk and 1 kg jaggery arrangement and store for 6-8 hrs. Add ½ kg methomyl to the blend. Little measured bundles of blend are made which are spread close to the root zone of the plants and furthermore around poly house/nethouse to keep away from pervasion of organic product borer. It ought to be connected amid night hours, and the household or pet creatures ought not be permitted to move in and around net/polyhouse over night.

v. Nematodes

Symptoms: Nematodes are ordinarily observed in solanaceous products when grown 3-4 times constantly in a similar field. At first yellowing of leaves can be watched trailed by decrease in leaf size, include and 15 extraordinary lessening size of organic products. At the point when contaminated plant is removed and watched, little and huge hubs loaded with huge number of nematodes knobs can be seen on roots relying upon the level of invasion.

Management: Go for edit revolution with non-solanaceous yields like marigold, sweet corn and cabbage to dodge nematode. Bio-pesticides advanced Neem cake (as clarified prior) is to be connected @ 800 kg/section of land 4-5 days prior transplanting to the beds. Apply carbofuran (furadan) granules @ 20kg/section of land at the season of planting. Keep a nearby watch on nematode pervasion of the plants, especially in second and third product. The bug sprays ought to dependably be blended with spreader or sticker while showering. The plants start to finish should interact with shower for better outcome and

care ought to be taken to necessarily cover the whole body with full garments, veil, gloves and smocks while splashing.



b. Diseases and Management

i. Damping off

Symptoms : Contamination happens at the base of the youthful seedlings simply over the ground level which prompts shriveling and 16 later demise of seedlings. Any harm caused to seedlings while transplanting can likewise prompt damping off or seedling shrivel other than new disease in principle field or contamination that is conveyed from nursery.

Management: Drench carbendazim (1g/L) or metalaxyl MZ (2g/L) or copper oxychloride (3g/L) or captan (3g/L) soaked to the base of the plant at around 25-50 ml/plant.



ii. Powdery mildew

Symptoms: The ailment at first shows up as little yellow spots on surface of leaf and powder like material on the lower surface prompting a fine development covering the whole lower surface of leaf which prompts drying and dropping of leaves at later stages. The malady diminishes development of leaves and natural products prompting low quality and amount of the deliver.

Management: Spray Pongamia/Neem oil (7ml/L) + sulfur WDG-80 (2g/L) or wettable sulfur (2g/L) or hexaconazole (0.5ml/L) or myclobutanil (1g/L) or

dinocap (1 ml/L) or azoxystrobin (0.5ml/L) or penconazole (0.5ml/L) or flusilazole (0.5ml/L).



iii. Cercospora leaf spot

Symptoms : Cercospora seems at first as minor yellow spot on leaf surface prompting expanded dim spots which spreads on whole leaf bringing about dropping of leaf.

Management: Spray chlorothalonil (2.5g/L) or mancozeb (2.5g/L) or carbendazim (1g/L)



iv. Phytophthora

Symptoms: This infection shows up amid fruiting and blossoming stage bringing about minor oil like spot on leaf surface bringing about rotting and darkening of plants. Later plant debilitates and bites the dust in 2-3 days. Overwhelming and constant rainfalls combined with high humidity support 18 infection appearance and its brisk spread. Phytophthora infection is relatively more extreme in net houses which may prompt 40-80 for every penny trim harm.

Management: Spray copper hydroxy chloride (3g/L) or bordeaux blend (1%) or metalaxyl MZ (2g/L) or dimethomorph + mancozeb (1 g + 2.5g/L) or fosetyl aluminum (2g/L) or azoxystrobin (0.5ml/L). Seriously contaminated plant parts ought to be wrecked. It is smarter to maintain a strategic distance from capsicum cultivation in extremely influenced net-houses.

c. Viral diseases

Symptoms: Viral maladies are transmitted through aphids and thrips prompting upward and descending twisting of leaves with yellow spot amidst leaf and here and there on natural product too. Overwhelming pervasion prompts dropping up of leaves, hindered plant development and diminishes quality and amount of natural products. Infection influenced natural products are unmarketable.

Management: Grow nursery beds under nylon cover (50 work), legitimate management of aphids, bugs and thrips which goes about as sickness transmitting vectors and transfer of unhealthy/tainted plants, control invasions of viral maladies.

d. Pesticide residues

In poly house cultivation of capsicum, high plant thickness, mono editing of helpless genotypes and expanded work exercises make 20 plants more inclined to vermin and illnesses like parasites, thrips, whiteflies, fine buildup and nematodes. In this way, compound control of irritations end up essential and often a few showers of bug sprays/fungicides are given even at close gather phases of the product. In a polyhouse the volatilization and wind float misfortunes of pesticides are lesser which may bring about higher starting stores of pesticide buildups on the plant and soil, while corruption of pesticide deposits might be higher because of higher normal temperatures. Additionally, a polyhouse for the most part reflects back 43% of the net sun oriented radiation occurrence upon it permitting the transmittance of the "photosynthetically dynamic sun powered radiation" in the scope of 400-700 Nm wave length. Accordingly there will be lesser UV radiation occurrence upon the product in a greenhouse than in open field in a similar territory, particularly if a shade net is likewise utilized. Since most pesticides are UV-degradable there is probability that pesticides will hold on for a more extended time. It is in this way imperative to assess the determination of pesticide buildups in these harvests under polyhouse conditions so protected sitting tight period for essential

pesticides utilized as a part of polyhouse cultivation might be set up.



14. Harvesting and yield

Early morning hours are most appropriate for capsicum collect. Green capsicum can be gathered at 55 to 60 days in the wake of transplanting, yellow capsicum at 70-75 days while red capsicum at 80-90 days. Organic products can be gathered once in 3 to 4 days. Yellow and red organic products can be collected when they have picked up 22 50-80 for each penny of the shading improvement. After collect natural products ought to be kept in cool place and stay away from guide introduction to daylight. The natural products ought to be dealt with deliberately by embracing cut collect strategy and scraping ought to be limited. The normal yield of capsicum per section of land is 30-40 tons.



15. Post Harvest Management

i. Grading

Capsicums are exceedingly perishable in nature and lose water quickly because of wilting, drying and softening of the organic product which quickens disintegration. Great quality natural products are chosen and are cleaned with spotless, dry and soft material to evacuate water drops or wetness or fine buildups of pesticides/fungicides, assuming any, found on the organic products. Great quality organic products with 2-3 flaps measuring < 150 gram are evaluated as B review natural products. Great quality organic products with uniform

development, shading, shape, size and free from surrenders spots, wounds or rot and pesticide deposits ought to be utilized for pressing while natural products hinting at sunscald, mechanical or bug harm, or ailing distorted and harmed natural products ought to be disposed of. For the most part natural products with 3-4 projections weighing 150 gram and more are gathered as A review organic products.



b. Packing and storage

Evaluated natural products ought to be stuffed in CFB containers (5/7 utilize thick) in single or in numerous layers with paper shreds as padding material for long separation transport. The ideal conditions for capacity of capsicum is 7-8°C temperature with high relative humidity (90 to 95 %) where the time span of usability of organic products can be reached out for 2 to 3 weeks. Capsicums are touchy to chilling damage beneath 5° C which prompts softening, setting, and rot of organic products. Capsicum natural products ought not be put away with other aging organic products particularly mangoes, papayas and tomatoes to anticipate speedier maturing and deterioration.



c. Shrink wrapping technology of capsicum

Capsicum organic products are recoil wrapped exclusively. Naturally gathered capsicum organic products are arranged/reviewed, washed altogether with water or disinfectants, surface dried, stalks are trimmed, and singular natural

products are pressed freely in adaptable film before going through therapist burrow (150-170°C) for 8 to 10 24 seconds. Hence shrivel wrapped organic products are gathered, pressed and put away at room temperature or at ideal stockpiling conditions. Film gets contract wrapped firmly around each foods grown from the ground as another layer of defensive cover. This innovation helps in broadening the time span of usability of natural products, which can be utilized to transport for long separation advertise and furthermore for send out. Psychologist wrapping innovation is valuable just when it is combined with low temperature stockpiling, as else it irritates ruining of organic products. It is invaluable over ordinary stockpiling as it diminishes weight reduction, keeps up solidness and decreases chilling damage, imperfections and optional disease of organic products. Under low temperature stockpiling (8-12°C), the time span of usability of therapist wrapped organic products can be broadened upto a month and a half. It likewise defers aging and senescence and accordingly broadens capacity life of organic products. It gives enhanced sanitation where ruined ones can be disposed of effectively and furthermore encourages for purchaser offer assortment and brand recognizable proof.



16. Special Tips to Achieve Higher and Quality Yield

- ✓ The natural excrement/compost connected to the dirt ought to be enhanced with Microbial Bio-control Agents like *Pseudomonas fluorescens*, *Paecilomyces lillacinus*, *Trichoderma harzianum* and so on and biofertilizers like, PSB, *Azospirillum Azotobacter*, and so forth. to upgrade soil wellbeing.
- ✓ Any harm of net or polysheet in the structure ought to be promptly repaired to anticipate passage of vermin and infections.
- ✓ The polyhouse/nethouse ought to have twofold entryway framework which is 25 the most secure approach to keep the section of irritations and illnesses. The entryways ought to be built ideally far from roadside.
- ✓ Seedlings brought up in protrays must be transplanted inside 30-35 days in the wake of sowing on the fundamental raised planting beds (1/2 ft over the ground level).
- ✓ Normal pruning must be taken after to hold two-third solid branches and hold one organic product with great shape and size in each branch and expel disfigured natural products, assuming any, at a beginning period.
- ✓ Branches are legitimately tied with plastic twine and opposite end fixing to the supporting GI framework to give solid help and to maintain a strategic distance from breakage of branches/organic products.
- ✓ Dribble water system and fertigation calendars ought to be taken after routinely.
- ✓ Keep away from nuisances and infection occurrence for receiving prophylactic measures. Utilize appropriate and prescribed amount and measurement of pesticides and bug sprays to control the occurrence.
- ✓ Keep up cleanliness condition in green house and arrange off the spoiled, fallen and tainted plant flotsam and jetsam/products of the soil, ideally regular amid night hours, subsequent to finishing every one of the activities of the day. Utilize clean plastic sacks to gather and convey these materials to the place of transfer, to evade the spread of contamination.
- ✓ Care ought to be taken not to squeeze the apical bud and shield it from the vermin invasion.
- ✓ Botanicals, Microbial Bio-control Agents,

natural specialists and biofertilizers ought to be utilized as an incorporated bug, malady and supplement management rehearse.

- ✓ Yield ought to constitute 85-90 percent of A review natural products (3-4 flaps, 150-180 gms). Disfigured and unpredictable formed organic products are squeezed out at more youthful stage and natural products with 50-70 for each penny shading ought to be reaped, reviewed and stuffed appropriately.

II. CONCLUSION

The present study concluded that in comparative production analysis in case of polyhouse farming(protective farming) the production is 4 times more than open field farming. It also emphasised to the better crop protection practice from weather fluctuations (temperature, light, humidity & precipitation)and also infestation of thrips, aphids, mites, fruit borer, nematodes, damping off, phytophthora and viral diseases Lack of knowledge latest package of vegetables, lack of minimum support price, lack of knowledge regarding marketing information, high cost of transportation, lack of adequate packing material and heavy losses of vegetables in market have been the major marketing constraints

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