Agri Articles
(e-Magazine for Agricultural Articles)
Volume: 06, Issue: 02 (MAR-APR, 2026)
Available online at http://www.agriarticles.com
©Agri Articles, ISSN: 2582-9882

Modern Techniques in Chilli and Capsicum Cultivation

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Chilli and capsicum are important vegetable crops widely cultivated for their economic and nutritional value. With increasing population and market demand, farmers must adopt modern cultivation practices to increase productivity and maintain quality. Modern agricultural technologies such as hybrid varieties, protected cultivation, drip irrigation, fertigation, mulching, integrated nutrient management, and integrated pest management help farmers improve crop performance and profitability. These techniques not only enhance yield but also reduce production costs and environmental impact. The adoption of scientific farming practices is essential for sustainable chilli and capsicum production.

Keywords: Chilli, Capsicum, Modern farming techniques, Drip irrigation, Protected cultivation, Integrated pest management.

Introduction

Chilli (*Capsicum annuum L.*) and capsicum (sweet pepper or bell pepper) are among the most important vegetable crops cultivated worldwide. These crops belong to the Solanaceae family and are widely used as spices, vegetables, and processed food ingredients. Chilli is valued for its pungency and flavor, while capsicum is known for its sweet taste and high vitamin content. India is one of the largest producers of chilli in the world. Capsicum cultivation is also expanding due to its high market demand and export potential. However, traditional cultivation practices often result in low productivity because of poor soil management, pest and disease incidence, and climatic stress. Modern agricultural technologies provide solutions to these problems by improving crop management, increasing efficiency, and ensuring sustainable production. Farmers can significantly increase their yield and income by adopting advanced cultivation techniques.

Use of Hybrid and Improved Varieties

The use of hybrid varieties is one of the most important modern techniques in vegetable cultivation. Hybrid seeds are developed through scientific breeding programs to provide superior characteristics such as high yield, uniform fruit size, and resistance to pests and diseases. Hybrid chilli and capsicum varieties generally produce vigorous plants with better fruit quality and longer shelf life. These varieties are also more adaptable to different climatic conditions.

Some improved varieties and hybrids commonly cultivated include:

Chilli varieties

- Tejaswini
- LCA-625
- Arka Lohit
- Pusa Jwala

Capsicum varieties

- Indra
- Orobelle
- Bomby
- California Wonder

The selection of suitable varieties based on climate and soil conditions plays a crucial role in achieving high productivity.

Protected Cultivation

Protected cultivation involves growing crops under controlled environmental conditions using structures such as polyhouses, greenhouses, or shade nets. This technique helps protect crops from unfavorable weather conditions such as heavy rainfall, high temperature, and strong winds. Capsicum cultivation under polyhouse conditions is becoming increasingly popular because it produces higher yield and better quality fruits compared to open field cultivation.

Advantages of protected cultivation include:

- Year-round production
- Higher yield per unit area
- Improved fruit quality
- Reduced pest and disease incidence
- Efficient use of water and fertilizers

Protected cultivation also allows farmers to produce vegetables during off-season periods, which increases market prices and profitability.

Scientific Nursery Management

Healthy seedlings are essential for successful crop production. Modern nursery techniques involve raising seedlings in **pro-trays filled with sterile growing media such as cocopeat**.

This method provides proper aeration, moisture retention, and nutrient availability for seed germination. Seedlings grown in pro-trays develop strong root systems and are easier to transplant.

Benefits of pro-tray nursery technique include:

- Uniform germination
- Healthy and vigorous seedlings
- Reduced disease incidence
- Efficient use of seeds

The application of biofertilizers such as **Azospirillum and phosphate-solubilizing bacteria** in the nursery stage further improves seedling growth.

Drip Irrigation and Fertigation

Water management plays a crucial role in chilli and capsicum cultivation. Drip irrigation is a modern irrigation system that delivers water directly to the root zone of plants through pipes and emitters.

Advantages of drip irrigation include:

- Saving water up to 40–60%
- Reduced weed growth
- Improved water use efficiency
- Better plant growth and yield

Fertigation is the application of fertilizers through the drip irrigation system. In this method, water-soluble fertilizers are dissolved in irrigation water and supplied directly to the plant roots.

Benefits of fertigation include:

- Efficient nutrient utilization
- Uniform distribution of nutrients
- Reduced fertilizer wastage

- Improved crop productivity

Mulching Technology

Mulching is a practice of covering the soil surface with materials such as plastic sheets, straw, or dry leaves. Plastic mulching using black polyethylene sheets is widely used in chilli and capsicum cultivation.

Mulching provides several benefits:

- Conserves soil moisture
- Controls weed growth
- Maintains soil temperature
- Improves fruit quality
- Reduces soil-borne diseases

Plastic mulch also prevents fruits from direct contact with soil, thereby reducing rotting and improving market quality.

Integrated Nutrient Management

Integrated Nutrient Management (INM) is a sustainable approach that combines organic and inorganic fertilizers to maintain soil fertility and crop productivity.

Major components of INM include:

- Farmyard manure (FYM)
- Compost and vermicompost
- Chemical fertilizers (NPK)
- Biofertilizers

Organic manures improve soil structure and microbial activity, while chemical fertilizers provide essential nutrients required for plant growth. The combined use of organic and inorganic fertilizers ensures balanced nutrient supply and enhances long-term soil fertility.

Integrated Pest and Disease Management

Pests and diseases are major constraints in chilli and capsicum production. Integrated Pest Management (IPM) is an eco-friendly approach that uses multiple strategies to control pests while minimizing the use of chemical pesticides.

Important IPM practices include:

- Use of resistant varieties
- Crop rotation
- Biological control agents
- Sticky traps and pheromone traps
- Botanical pesticides such as neem oil

Common pests affecting chilli and capsicum include thrips, aphids, mites, and fruit borers. Regular field monitoring helps detect pest infestations early and allows farmers to take timely control measures.

High Density Planting

High density planting is a modern technique that aims to increase productivity by planting more plants per unit area. In this system, spacing between plants is reduced while maintaining proper crop management practices.

Advantages include:

- Higher yield per unit area
- Better utilization of sunlight and nutrients
- Increased profitability

Proper irrigation, nutrient management, and pest control are essential to achieve success in high density planting systems.

Precision Farming

Precision farming is an advanced agricultural approach that uses modern technologies to manage crops efficiently. This technique involves the use of sensors, GPS technology, weather forecasting systems, and digital advisory services.

Precision farming helps farmers:

- Monitor soil moisture and nutrient levels
- Optimize irrigation and fertilizer application
- Reduce input costs
- Improve crop productivity

Mobile applications and digital platforms also provide farmers with real-time information on crop management and weather conditions.

Post-Harvest Management

Proper post-harvest handling is essential to maintain fruit quality and reduce losses. Chilli and capsicum should be harvested at the correct maturity stage to ensure better shelf life and market value.

Important post-harvest practices include:

- Careful harvesting
- Cleaning and grading
- Proper packaging
- Storage in cool conditions

Using ventilated plastic crates instead of traditional sacks reduces mechanical damage and maintains fruit freshness during transportation.

Conclusion

Modern techniques in chilli and capsicum cultivation play a vital role in increasing productivity, improving fruit quality, and enhancing farmer income. Technologies such as hybrid varieties, protected cultivation, drip irrigation, fertigation, mulching, and integrated crop management provide sustainable solutions for vegetable production. The adoption of these scientific practices enables farmers to overcome challenges related to climate change, pest attacks, and resource scarcity. With proper training and awareness, modern agricultural technologies can significantly improve the future of chilli and capsicum cultivation.