



Greenhouse Production of Exotic Vegetables: A Review

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Greenhouse cultivation is an advanced agricultural technique that involves growing crops within a protected structure covered with transparent materials such as polyethylene, glass, or polycarbonate sheets. The greenhouse creates a controlled environment where temperature, humidity, light, and ventilation can be regulated according to crop requirements. This technology has become increasingly important for the cultivation of exotic vegetables, which often require specific climatic conditions that are difficult to maintain under open-field conditions. Exotic vegetables refer to vegetables that are not traditionally grown or consumed in a particular region but have gained popularity due to changing food habits, increasing urbanization, globalization, and growing awareness of nutrition and health. These vegetables are widely used in hotels, restaurants, supermarkets, food processing industries, and households. Common exotic vegetables include colored capsicum, cherry tomato, lettuce, broccoli, red cabbage, zucchini, asparagus, celery, parsley, and English cucumber.

Concept of Greenhouse Cultivation

A greenhouse is designed to provide a favorable microclimate for plant growth. Solar radiation enters through the transparent covering material and is absorbed by plants and the soil surface. The heat generated inside the structure is trapped, creating a warmer environment than the outside atmosphere. This phenomenon is known as the greenhouse effect. The controlled environment of a greenhouse protects crops from adverse weather conditions such as excessive rainfall, frost, strong winds, hailstorms, and extreme temperatures. It also reduces the incidence of pests and diseases and facilitates efficient use of resources.

Importance of Greenhouse Production of Exotic Vegetables

The cultivation of exotic vegetables under greenhouse conditions has become increasingly significant due to several reasons:

1. Growing Market Demand

Consumer preferences are shifting towards healthy and nutritious foods. Exotic vegetables are rich sources of vitamins, minerals, antioxidants, and dietary fiber. The increasing demand from hotels, restaurants, supermarkets, and urban consumers has created lucrative market opportunities for growers.

2. Year-Round Production

Greenhouses enable the cultivation of vegetables throughout the year irrespective of seasonal limitations. This ensures a continuous supply of fresh produce and stable income for farmers.

3. Higher Productivity

The favorable growing environment inside the greenhouse promotes better plant growth, flowering, fruiting, and overall productivity. Crop yields are generally much higher than those obtained under open-field cultivation.

4. Improved Quality Produce

Greenhouse-grown vegetables are usually superior in size, color, appearance, uniformity, and shelf life. Such produce often commands premium prices in the market.

5. Efficient Resource Utilization

Modern greenhouse systems utilize drip irrigation and fertigation techniques that improve water and nutrient use efficiency while reducing wastage.

Characteristics of Exotic Vegetables

Exotic vegetables possess several distinctive characteristics that make them attractive to consumers and growers:

- High nutritional value.
- Attractive appearance and unique flavor.
- Greater market demand in urban areas.
- High economic returns.
- Suitability for protected cultivation.
- Potential for export and processing industries.

Many exotic vegetables require moderate temperatures, controlled humidity, and protection from environmental stresses, making greenhouse cultivation particularly suitable.

Types of Greenhouses

Greenhouses can be classified based on structure, covering material, and environmental control systems.

Based on Environmental Control

Naturally Ventilated Greenhouse

These greenhouses rely on natural airflow through side and roof vents for temperature and humidity regulation. They are economical and widely adopted in developing countries.

Climate-Controlled Greenhouse

These structures utilize advanced equipment such as cooling pads, exhaust fans, heaters, humidifiers, and automated systems to maintain optimum environmental conditions.

Based on Covering Material

- Polyhouse (Polyethylene-covered)
- Glasshouse
- Polycarbonate Greenhouse

Among these, polyhouses are most commonly used in India because of their lower construction cost and ease of maintenance.

Environmental Requirements for Exotic Vegetables

Successful greenhouse production depends on maintaining suitable environmental conditions.

Temperature

Temperature influences germination, growth, flowering, and fruit development. Most exotic vegetables perform well between 18°C and 28°C.

Light

Adequate sunlight is essential for photosynthesis and plant growth. Greenhouses should be located in areas receiving maximum solar radiation.

Humidity

Relative humidity affects transpiration, nutrient uptake, and disease development. Excessively high humidity may encourage fungal diseases.

Carbon Dioxide

Carbon dioxide is a key component of photosynthesis. Proper ventilation ensures adequate CO₂ availability inside the greenhouse.

Major Exotic Vegetables Cultivated Under Greenhouse

Coloured Capsicum

Coloured capsicums are among the most profitable greenhouse crops. They are rich in vitamins A and C and are highly demanded in domestic and export markets.

Cherry Tomato

Cherry tomatoes are small-sized tomatoes known for their sweetness, attractive appearance, and high nutritional value.

Lettuce

Lettuce is a leafy vegetable widely used in salads and sandwiches. Greenhouse cultivation ensures year-round production and better leaf quality.

Broccoli

Broccoli is a nutrient-rich vegetable containing vitamins, minerals, and antioxidants. Protected cultivation enhances head quality and marketability.

English Cucumber

English cucumbers are seedless, tender, and preferred by consumers for fresh consumption and salad preparation.

Zucchini

Zucchini is a summer squash valued for its versatility in cooking and processing industries.

Advantages of Greenhouse Production

Greenhouse cultivation offers numerous advantages:

1. Protection against adverse weather conditions.
2. Increased crop productivity.
3. Production of off-season vegetables.
4. Improved quality and uniformity of produce.
5. Reduced pest and disease incidence.
6. Efficient use of water and fertilizers.
7. Higher economic returns.
8. Better export opportunities.
9. Reduced environmental stress on crops.
10. Enhanced land-use efficiency.

Limitations of Greenhouse Cultivation

Despite its benefits, greenhouse cultivation has certain limitations:

High Initial Investment

Construction of greenhouse structures requires substantial capital investment.

Technical Expertise

Successful greenhouse management demands specialized knowledge regarding crop production and environmental control.

Skilled Labor Requirement

Operations such as pruning, training, fertigation, and pest management require trained workers.

Maintenance Costs

Regular maintenance of covering materials, irrigation systems, and environmental control equipment adds to production costs.

Market Risks

Price fluctuations and market uncertainties may affect profitability.

Economic Significance

Greenhouse cultivation of exotic vegetables has emerged as a profitable enterprise due to increasing market demand and premium prices. It generates higher income per unit area compared to conventional farming. It also creates employment opportunities in nursery management, crop production, packaging, transportation, and marketing. Government initiatives promoting protected cultivation through subsidies and training programs have further encouraged the adoption of greenhouse technology among farmers and entrepreneurs.

Future Scope

The future of greenhouse production of exotic vegetables is highly promising. Rapid urbanization, changing dietary preferences, growth of the hospitality industry, and increasing

awareness of healthy lifestyles are driving demand. Technological advancements such as hydroponics, precision agriculture, automation, and climate-smart greenhouse systems are expected to enhance productivity and sustainability. Greenhouse cultivation will play a crucial role in meeting the growing demand for high-quality vegetables while ensuring efficient use of natural resources.

Conclusion

Greenhouse production of exotic vegetables is an innovative and sustainable approach to modern agriculture. It provides a controlled environment that enables year-round cultivation, higher productivity, superior quality produce, and better economic returns. With increasing consumer demand and technological advancements, greenhouse cultivation offers immense potential for enhancing farm income, improving nutritional security, and promoting sustainable horticultural development. Proper management, technical knowledge, and market access are essential for realizing the full benefits of this promising agricultural technology.

References

1. ICAR-IARI, New Delhi. Protected Cultivation of Vegetable Crops.
2. National Horticulture Board (NHB), Government of India.
3. Choudhary, B. Protected Cultivation and Greenhouse Management.
4. Singh, B. Horticultural Crop Production under Protected Structures.
5. Ministry of Agriculture and Farmers Welfare, Government of India. Protected Cultivation Guidelines.