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Cultivation of Cherry Tomatoes Crops in Grow Bags without Soil

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Cherry tomatoes (*Solanum lycopersicum*) are a different group of tomato. This tomato is mostly used raw in salad. The fruit bearing habit is in bunches i.e. called truss and fruit shape varies from pear shape, round and oblong. Fruit size varies from 2-15 g and 3 to 4 cm long. Fruits are of different colours varying from dark red, red, pink, yellow, golden yellow to orange. Golden yellow cherry tomatoes look very fascinating. Cherry tomato is a highly priced culinary as well as ornamental vegetable. One of the most popular high value exotics, it is a favourite among chef's who cook for high profile restaurants and hotels. Nevertheless, it is becoming increasingly popular among common people, who are now interested in garnishing their dishes and diversifying their nutritional intake. Cherry tomatoes look not only attractive in kitchen gardens but are commercially valuable horticultural commodity and have impressive nutritional and pharmaceutical properties.

Cherry tomatoes are a rich source of vitamins, especially vitamin A and C. According to the United States Department of Agriculture (USDA) nutritional information, one cup of cherry tomatoes (149 g) provides 26.8 calories, 1.3 g protein, 4.5 mg omega-3 fatty acids, 119 mg omega-6 fatty acids, 1241 IU of vitamin A, 18.9 mg vitamin C, 22.3 mcg folic acid, 11.8 mcg vitamin C, 353 mg potassium, 35.8 mg phosphorus and 14.9 mg calcium.

There are many benefits of yellow cherry tomatoes used in many dishes and are good for health. It is used in place of regular cherry tomatoes in most recipes. They can be used in salads, sandwiches, salsas, chili, stews, and casseroles. It eaten fresh and are great for snacking. The sweetness of yellow cherry tomatoes makes them ideal for making jams and preserves. For health yellow cherry tomatoes are a good source of iron and vitamin C. They also contain lutein, which can help prevent macular degeneration. Tomatoes are rich in antioxidants, which may help protect against cancer, heart disease, and skin damage. And for weight loss, Cherry tomatoes are low in calories and high in fiber, which can help you feel full and reduce your overall calorie intake.

Traditional farming of cherry tomatoes

For cherry tomatoes., it is required fertile soil, the seeds directly sowing into the soil during spring or autumn. Before planting compost manure should be mixed to a depth of 1 inch and 3 feet apart in a row. The soil must be moist and well-drained, not soggy and compacted. Soil should be neutral or slightly acidic with a pH of around 6.2 to 6.8. Before sowing it is always essential to use soil insecticides such as counter, Basudin or Galition. Prepare a shallow

seedbed of 3-5 cm height and keep it wet. Carefully, sow the seed on the wet soil and cover with a thin soil layer. In the case of drying out, the soil should be irrigated again. The recommended dose of fertilizers (100:60:100 kg/ha of N:P:K) must be used to fertigate on every third day after sowing. Fertilizer is one of the important determining factors of intensive cherry tomatoes production. If amount of nutrient is insufficient, yield and income will be lower. The crop is ready for harvest within around 50 to 65 days after planting. It yields about 70-100 tonnes/ha. Cherry tomatoes is harmed to several diseases that attack the fungal, Fusarium wilt, Verticillium wilt and corky root. The diseases and pests can more attack in traditional farming.

To avoid these problems now-a-days, a soilless culture techniques have been developed and commercially introduced for intensive production of horticultural crops, particularly vegetables under polyhouse condition. However, in almost all the systems, soil as growing media are replaced with other media mostly due to plant protection concerns regarding soil borne pathogens as well as environmental regulations against ground water pollution with nitrate and pesticides. Removing soil from production system can provide number of advantages in the management of both plant nutrition and protection compare to conventional soil-based production systems. It helps to avoid problems related to monoculture of plants in the same land for years.

Case Study

In the present case study, we describe the cultivation of cherry tomatoes in hydroponic farming system i.e. without soil, using grow bags. The study was conducted at Dr. NTR College of Agricultural Engineering, Bapatla, Bapatla District, Andhra Pradesh. To replace soil with other growing media in grow bags, especially for gherkins, peppers, and cherry tomatoes, substrates such as cocopeat, perlite, and vermiculite are used in mixtures in the ratio of 60:20:20 (Fig.1, a, b, c). These grow medias are commercially available in the market.

The use of these substrates supports the roots of the plants, providing optimal aeration and water holding capacity, as well as oxygen levels. This ensures sufficient growth and development of plants, as a good growing media provides support to the plant, acts as a reservoir for nutrients and water, allows oxygen diffusion to the roots, and permits gaseous exchange between the roots and the atmosphere outside the root substrate.

For hydroponic farming of cherry tomatoes, it is important to consider factors such as pH levels between 5.5 to 6.5, EC within the range of 2-5 (TDS = 1400-3500 ppm). For accelerated growth of cherry tomatoes, the ideal temperature range is between 20°C and 25°C during the day and 18°C and 20°C at night. Optimum relative humidity for cherry tomatoes is 60-70% during the day and 80% at night.

Cherry tomatoes can be grown by direct sowing or by transplanting. In this study, both methods were followed. For the growing of the nursery, a proper proportion of 60% cocopeat, 20% perlite, and 20% vermiculite were mixed. The plug trays used to grow the nursery were filled with the premixed cocopeat substrate up to 1½ inches. The seeds were placed carefully in trays and covered with cocopeat as a layer. A plastic sheet was covered on the trays and left for 3 days for the germination of seeds. After 3 days, the plastic cover was removed and water was sprayed with spray cans in the morning and evening daily without disturbing the seeds. After 10 days, the Cherry tomatoes seedlings were transplanted into grow bags with premixed cocopeat. The Cherry tomatoes seedlings in plug trays are shown in Fig. 2.

In a polyethylene grow bag filled with growing medium, such as a premixed cocopeat blend consisting of cocopeat (60%), perlite (20%), and vermiculite (20%), the bag was tightly closed (Fig.3). Three square-shaped holes are cut at the top of the bags (Fig.4). The bottom of

the bags is punched to allow excess water to drain. Cherry tomato seedlings are placed in each bag, with the bags spaced 16 to 18 inches apart in the row. For direct seeding, seeds are placed in the same grow bags, covered with a layer of substrate, and lightly sprinkled with water. Initially, for up to one week, only water is sprayed in the early morning daily. Later, nutrient solution is given to the plants. Plants require all 17 essential nutrients for proper growth, which can be broadly categorized as macronutrients and micronutrients. Both macronutrients and micronutrients are essential for plant growth and development. Macronutrients include carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, sulfur, calcium, and magnesium. Micronutrients include iron, manganese, zinc, boron, molybdenum, chlorine, copper, and nickel.

To prepare nutrient solution, 1 kg of nutrient powder was mixed with 5 lit of water. The solution was thoroughly stirred and stored at room temperature in an air tight container. The nutrient solution diluted with water was applied to plants on alternate days throughout the cropping season. Initially, 10 ml of nutrient solution was diluted with 1lit of water and applied to 3 plants at the rate of 330 ml per plant. At full growth stage (flowering stage), the nutrient solution was increased to 15 ml to 1.0 lit of water. At fruiting stage, the nutrient solution was increased to 25 ml to 1.0 lit of water as high nutrition is required. In natural ventilated polyhouse, crop should be vertically trained and regularly pruned for better growth and yield. The trained plants at full growth stage are shown in Fig.6.

The advantages of hydroponic growing of cherry tomatoes were observed as rapid growth, exceptionally high yield, good fruit quality, low insect pest damage and the growth of plant height, etc. are more compared to the conventional soil system. In hydroponic system cultivation of cherry tomatoes is possible in all the seasons. Absolutely no weed problem. The water requirement was very low and facilitates a micro-climate.

Fig. 1: (a) Cocopeat

b) Perlite

c) Vermiculite

Fig. 2: Cherry tomatoes seedlings

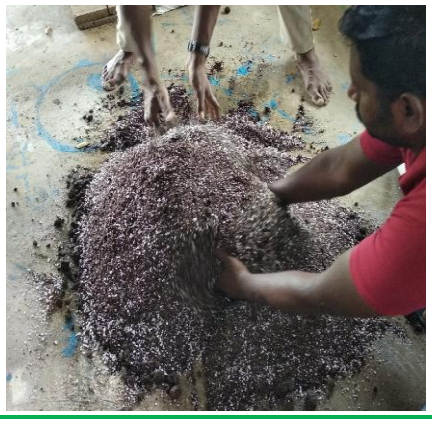

Fig. 3: Premixed cocopeat filling in grow bags

Fig. 4: After transplantation of cherry tomatoes in Growbags

Fig. 5: Cherry tomatoes seedlings at different stages

Fig. 6: Cherry tomatoes at full growth stage

Fig. 7: Cherry tomatoes ready to harvest and harvested Cherry tomatoes