JUST AGRICULTURE
multidisciplinary e-Newsletter

No Soil Cultivation of Gherkin Crops in Grow Bags -A Case Study

K. Krupavathi[1], R. Sudha Rani[2], R. Ganesh Babu[3] and K.N Raj Kumar[4]

[1,3]Assistant Professor, Department of Irrigation and Drainage Engineering,

Dr. NTR College of Agricultural Engineering, Bapatla

[2]Ph.D Scholar, Department of Soil and Water Engineering,

Dr. NTR College of Agricultural Engineering, Bapatla

[4]Assistant Professor, Department of Soil and Water Engineering, Dr. NTR College of Agricultural Engineering, Bapatla

ARTICLE ID: 025

India is the world's largest exporter of gherkins, transporting approximately 200,000 metric tonnes, which accounts for 20% of total global gherkin exports. Cultivation of gherkin, processing and exports started in India during the early 1990s with a modest beginning in Karnataka state became a hub for gherkin cultivation in soon India and later extended to neighbouring states of Tamil Nadu and Andhra Pradesh. For a good production, a temperature ranges of 24-27˚C during the day is desirable. Night temperature not lower than 20˚C will allow a rapid growth rate and earliest fruit production. The climatic conditions which are prevalent throughout the year, render this region ideal to take up three crops of gherkins annually. Now, India has emerged as the origin of the finest gherkin cultivation, processing and exporters to the ever-growing world requirement. Currently, there are more than 1 lakh small and marginal farmers who are engaged in the production of gherkins in Karnataka. The contract farmers with companies receive technical support as well as guaranteed buy back of crop from the companies at pre-declared prices. The gherkin industry in Karnataka was massive, with exports reaching 2,25,000 metric tonnes per annum prior to 2014. Gherkins cultivated across 20 districts in Karnataka. Gherkins, commercial cucumbers belong to the same species (Cucumis sativus), but are from different cultivar groups. Gherkin is edible and high quality with a high nutritional value generally used to refer to a savoury pickled in jars or cans. In India, Gherkins are added to soups, salads and vegetable stir fry.

JUST AGRICULTURE
multidisciplinary e-Newsletter

Gherkins popular in Europe and North America, USA, France, Germany, Australia, Spain, South Korea, Canada, Japan, Belgium, Russia, China, Sri Lanka, Israel and Estonia.

There are many health benefits of gherkins like they are good for weight loss. Gherkins are low in saturated fat, and cholesterol, and provides ample of potassium which is required to maintain healthy blood pressure. Gherkins rich in vitamin K and vitamin A but also high in sodium. Body needs vitamin K for many purposes like clotting of the blood and to deal with mal-absorption issues. This vitamin also helps in bone development and in reducing the risk of osteoporosis. Gherkins contain Vitamin A, B, C and minerals like manganese, potassium, magnesium and calcium. Most of this vegetable is nothing but water. It helps to our body stay hydrated and also throwing out toxins. Eating it during summer can help beat the heat. Gherkins contain ascorbic acid. It good for skin, like even applying it externally on skin can treat skin issues. Like most of the other vegetables, gherkins are fibre-rich. They are good for digestive system and soothe our stomach. Body needs silica to maintain healthy ligaments, tendons and connective tissues. USA is the largest market for Gherkins export from India. Major export destinations (2020-21): USA, Russia, France, Germany and Belgium during the period. In 2020-2021 (Apr-Nov), USA imported 33.52 USD million worth Gherkins from India. Among the top countries, USA market share of the total Gherkins export shipments from India is 23.66%. Followed by France with the Gherkins shipment value being 12.0 USD Million. The top 10 countries in total shared the share of 79.84% of the Gherkins export value from India. The country has exported 223,515.51MT of cucumber and gherkin to the world for the worth of Rs. 1,651.83crores/ 223.05 USD Millions during the year 2020-21. The above points are attracting the Indian farmers to grow gherkins at massive scale.

Traditional farming of gherkins:

For growing gherkins, it is required fertile soil, the seeds directly sowing into the soil during spring. Before planting compost manure should be mixed to a depth of 1 inch and 2 to 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 6.5 to 7.0. 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

JUST AGRICULTURE
multidisciplinary e-Newsletter

with a thin soil layer. In the case of drying out, the soil should be irrigated again. The recommended dose of fertilizers (150:75:100 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 gherkin production. If amount of nutrient is insufficient, yield and income will be lower. Drip irrigation system with 3.5 to 4 Lph discharge capacity with 60 cm spacing will be ideal for growing gherkins crop. The crop is ready for harvest in 60-70 days. It yields about 10 - 12 tonnes/ha in 90 days. Gherkins is harmed to several diseases that attack the roots, foliage, and fruit. The diseases and pests can more attack in traditional farming.

To overcome 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, described about cultivation of gherkins in hydroponics system without soil in grow bags. The study was done at Dr. NTR College of Agricultural Engineering, Bapatla. For replacing soil with other growing media in grow bags especially for gherkins, pepper, tomatoes etc., the substrates are used alone are the mixtures of cocopeat, perlite and vermiculite in the ratio of 60:20:20 (Fig.1, a, b, c). These materials available commercially also and are procured from Infinity Hydroponics green farms Kompally, Hyderabad.

The use of these substrates supports the roots of the plants and allows best aeration with optimum levels of water holding and oxygen. This ensured the sufficient growth and development of plants because a good growing media would provide sufficient support to the plant, serves as reservoir for nutrients and water, allow oxygen diffusion to the roots and permit gaseous exchange between the roots and atmosphere outside the root substrate.

JUST AGRICULTURE
multidisciplinary e-Newsletter

For hydroponic farming of gherkins, the factors must keep in mind are pH in the range of 5.5 to 6.0, EC within the range of 1.7-2.5 (TDS = 1190-1750 ppm). For accelerated growth of gherkin crop, maximum temperature of 26˚C is best. Night temperatures should be no less than 18˚C. For gherkins, optimum relative humidity during the day is 60-70% and at night between 70-90%.

Gherkins can be grown by direct sowing or by transplanting. In this study both methods were followed. For growing of nursery proper proportion of 60% cocopeat, 20 % perlite and 20% vermiculite were mixed. The plug trays used to grow 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. The plastic sheet is covered on the trays and left for 3 days for germination of seeds. After 3 days the plastic cover was removed and water is sprayed with spray cans in the morning and evening daily without disturbing the seed. After 10 days the gherkins seedlings were transplanted into grow bags with premixed cocopeat. Gherkin seedlings in plug trays is shown in Fig. 2.

In a polyethylene grow bag filled with growing medium i.e., premixed cocopeat like cocopeat (60%), perlite (20%) and vermiculite (20%) mixtures and closed tightly (Fig 3). At the top of bags cut the 3 square shaped holes. The bottom of bags is punched to drain excess water. Gherkin seedlings are placed in each bag, with bags spaced 16 to 18 inches apart in the row. For direct seeding, In the same grow bags, the seeds were placed and covered with a layer of substrate and water was sprinkled lightly (Fig 4). Initially up to one week, only water was sprayed in early morning daily. Later the nutrient solution was given to the plants. Plants need all 17 essential nutrients for proper growth. Essential nutrients can be broadly categorized as macronutrients and micronutrients. Macro and micronutrients are both essential for plant growth and development. Macronutrients include carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, sulphur, 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 a 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

JUST AGRICULTURE
multidisciplinary e-Newsletter

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 1lit of water. At fruiting stage, the nutrient solution was increased to 25 ml nutrient solution to 1lit of water as it is required high nutrition.

Plants were trained vertically. Picked two best stems and tied them down to the horizontal frame. Removed extra growth from the middle of the plant so that the energy is going to the main lateral stems (Fig 5). Based on the possibility, when the buds along the first lateral stems start to grow, train them horizontally as well. The trained plants at full growth stage are shown in Fig.6.

Gherkins was picked when no longer than 4cm (1.5 in) long, otherwise it becomes bitter and spiny if allowed to grow larger (Fig 7). When fruits have reached the proper size for the variety, used a sharp pair of pruning shears to cut the gherkins from the stem. Gherkins mature quickly, so harvested every two days to keep fruits from getting overripe. Once gherkins plants begin to grow and produce, they need to be picked on a regular basis to continue to produce.

The advantages of hydroponic growing of gherkins were observed as rapid growth, exceptionally high yield, good fruit quality, low insect pest damage and the growth of plant height, Leaf Area Index (LAI) etc. are more compared to the conventional soil system. In hydroponic system cultivation of gherkins is possible in all the seasons. Absolutely no weed problem. The water requirement was very low.

Fig.1(a) Cocopeat (60%) b) Perlite (20%) c) Vermiculite (20%) Fig.2 Gherkins seedlings

JUST AGRICULTURE
multidisciplinary e-Newsletter

Fig.3 Premixed cocopeat filling in grow bags Fig.4 Growbags ready for transplantation

Fig.5 Gherkins seedlings at different stages

Fig.6 Gherkins at full growth stage

JUST AGRICULTURE
multidisciplinary e-Newsletter

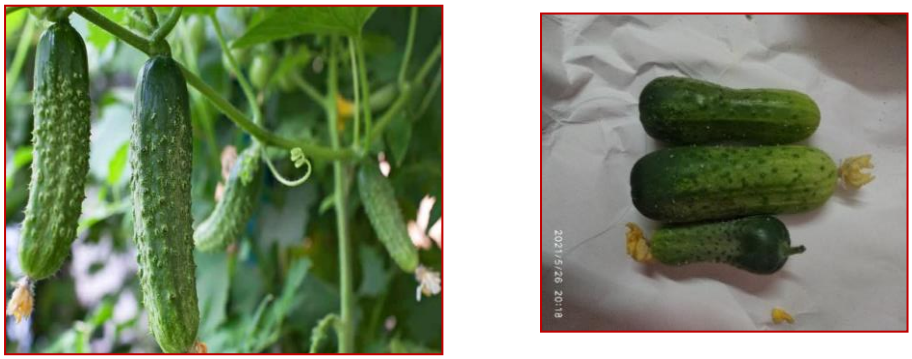

Fig. 7 Gherkins ready to harvest and harvested gherkins