

# **Kharif tomato cultivation**

## for doubling farmers' income in plateau ecosystems

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*Tomato is the second most important vegetable of the world after potato. Though it is popularly known as a winter crop in India, it can be cultivated in the well drained soils of plateau ecosystems in kharif season. Tribal farmers of Deogarh district, coming under North-western plateau agro-climatic zone of Odisha, with the scientific know-how of local Krishi Vigyan Kendra are able to produce kharif tomato in about hundred acres. The production was market oriented and helped to increase their income satisfactorily.*

**Keywords:** Cultivation, Income, Kharif, Plateau, Tomato, Yield

**T**OMATO (*Solanum lycopersicum*) is regarded as one of the most important vegetables of the world. India is the second largest producer of tomato contributing 11.5% of global production after China (23%). Its palatability and consumption in all forms has made it one of the most demanding vegetable. Ripened tomatoes are full of nutrients. It contains enough vitamin A and C and also rich in minerals like iron and phosphorous, dietary fibres and beta-carotene. The antioxidant lycopene present in tomato plays an important role in prevention of cancer and other diseases.

Usually tomato is a winter crop in Indian condition. During the peak production season, it faces distress sale but as an off-season crop, it has a good market demand with better remunerative price. Cultivation of crops outside the regular cropping calendar when supply is low and prices are high, can give farmers better profit. Tomato production during *kharif* and summer is generally less due to a number of biotic and abiotic factors. Atmospheric temperature and intensity of rainfall limits its production around the year. Now-a-days tomato is cultivated throughout the year in open field

condition or in green house conditions. But it cannot be produced everywhere in all the seasons.

Odisha has 10 agro climatic zones which creates lots of opportunities for production of different types of crops in each season. The plateau area of northern and western Odisha is an extension of Chhotanagpur plateau region. Its well drained soil and undulated topography with mild temperature creates a platform for production of various cole crops and tomato like vegetables in off season. Deogarh district, present in North-Western plateau agro-climatic zone of Odisha is endowed with forest and hilly areas (53% of total area). About 52% of total cultivated area is uplands with less water retention capacity and 66% of the total cultivated area also remains under unirrigated zone limiting the scope of double cropping. Out of 6,000 ha of vegetable cultivation, tomato has the coverage of 12.5% of total area. However, most of the tomatoes produced are during *rabi* season which normally gives farmer low price and sometimes they also face distress sale.

Krishi Vigyan Kendra, Deogarh introduced *kharif* tomato cultivation

in the district. Most of the scientific interventions were tested and demonstrated in the subsequent years in one of the interior most Soto gram panchayat. It has now a horizontal spread of about 100 acre which supplies tomatoes in late *kharif* season to the markets of its 3 neighbouring districts. Most of the technologies on scientific tomato cultivation were demonstrated and skills of different practices were shown to the farmers.

### **Site selection and soil reclamation**

The soils of plateau areas are mostly acidic. Red and lateritic soils are predominant in this agro ecosystem causing deficiency of major plant nutrients as well as major micro nutrients like calcium and boron. It can be observed from various nutrient deficiency and physiological disorders symptoms in the plant. Due to deficiency of these micro nutrients, cracking of fruits and deshaping is observed in fruits. Soil application of lime or paper mill sludge @ 5 q per ha reclaims the soil acidity and make the plant nutrients available to plants.

### **Varietal selection**

Variety selection is one of the most

**Table 1.** Yield contributing characters of different varieties of *kharif* tomato

| Variety      | Plant height (cm) | No of branches | Fruits/plant | Average fruit weight (g) | Yield (q/ha) | Net return (₹/ha) | BC ratio |
|--------------|-------------------|----------------|--------------|--------------------------|--------------|-------------------|----------|
| Laxmi        | 58.6              | 6.7            | 57.8         | 51.6                     | 174.6        | 232280            | 3.83     |
| Sakhyam      | 56.8              | 6.2            | 46.2         | 43.0                     | 128.0        | 146900            | 2.75     |
| Arka Rakshak | 70.2              | 7.2            | 35.8         | 36.6                     | 114.6        | 119820            | 2.60     |

### The KVK Experience...

Krishi Vigyan Kendra, Deogarh selected Sodo panchayat of the district which has less than 20% net irrigated area and the soil is red lateritic. More than 70% population are tribals living in hilly terrains mainly depending on forest resources, goater and poultry for their livelihood. Though rice is the pre-dominant crop in the area, its productivity is about 22 q/ha. With such socio-economic background, Krishi Vigyan Kendra started on farm testing of *kharif* tomato. All the technologies were introduced in that area in the subsequent periods. F1 hybrid variety Laxmi which was very popular in the neighbouring districts was introduced for cultivation. Now this variety has covered about 90% of total cultivated 97.5 acres of tomato area giving an average of 174.6 q/ha. Sakhyam and Arka Rakshyak are also cultivated since last couple of years.

important parameter for *kharif* tomato cultivation. As *kharif* season contributes about 80% of total rainfall, many varieties cannot withstand high moisture in soil and atmosphere. Water stagnation is the major drawback in popularisation of tomato cultivation in rainy season. Presence of high degree of moisture causes a number of diseases. Skin thickness is a factor while choosing suitable variety in *kharif* season. Photo-sensitivity also determines the suitability and productivity of the variety to a particular season.

### Nursery raising

Low cost poly tunnels are best for poor farmers to raise healthy seedlings by checking nursery from rain. Seed and soil treatment is an important activity for seedling raising. Soil solarisation should be done to disinfect the soil. Captan, Thiram, Carbendazim or Mancozeb like fungicides @ 2 g per kg and antibiotic like plantomycin @ 1 g per kg may be used for 1 kg seed treatment. Before planting, root dipping of seedlings should be done with these chemicals. Well pulverised soil with six inch height bed in certain rectangular shape like 3 m × 1 m is the appropriate one for a nursery.

### Land preparation

Rainy season tomato cultivation requires sloppy lands with low water retention capacity. Hence clayey soil must be avoided. High moisture content at root zone increases *Fusarium* wilt as well as root rot diseases. Therefore drainage channels must be created in each plot to drain out excess water from the main field.

### Nutrient management

Most of soils of plateau ecosystem are acidic with pH less than 6.0. They are mostly red and lateritic type of soil. The available NPK status is low

to medium. Phosphatic fertiliser gets fixed, thus making unavailable to plants. These soils are also deficient in Ca, S like nutrients and B, Zn like micronutrients. Ca and B are mostly required for better and quality production. The fruit cracking, discolouration, deshaping problems occur due to absence of boron. Application of sufficient organic matter to soil in form of humus, FYM etc. help in balancing soil status. However application of paper mill sludge @ 5 q/ha during land preparation reduces soil acidity. After reclamation of soil, application of gypsum @ 2.5 q/ha also provides calcium and sulphur to the deficit soil. Spraying of water soluble fertiliser (NPK) as well as Ca and B gives better productivity in such type of soils.

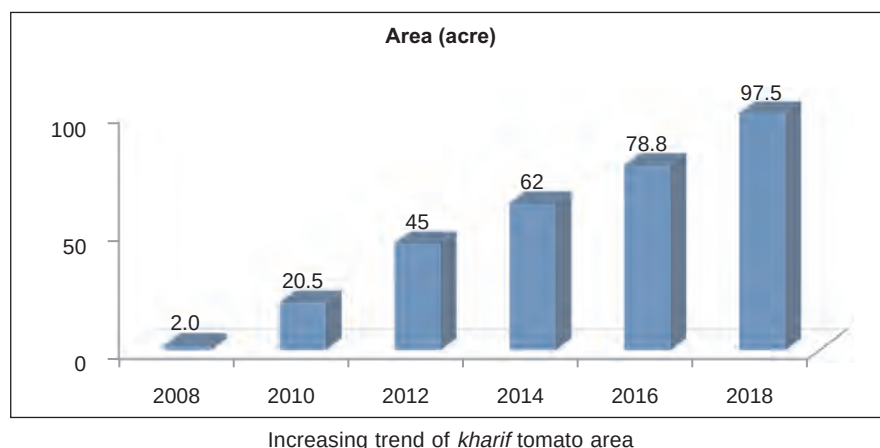
### Pest and disease management

*Kharif* tomato plants harbour a good number of pathogens and insect pests. Different types of pathogens cause severe loss to tomato plants as well as tomato production. In bacterial wilting there is instance of about 90% plants getting wilted. Hence different fungicides and bactericides should be applied with appropriate doses to check the menace. Tomato fruit borer is a major insect pest causing lots of damage. Appropriate insecticide like

Indoxacarb @ 1 g per litre or Spinosad @ 0.3 ml per litre controls the pest virulence to a greater extent. Planting of yellow marigold plants around the main field as trap crop reduces fruit borer infestation.

### Post-harvest management

Post-harvest management of produce is directly associated with its price. Sorting the tomatoes and subsequent segregation according to size, shape, weight and quality draws



**Table 2.** Incidence of Insect pest and diseases in different varieties of *kharif* tomato

| Variety       | Bacterial wilt (%) | Fungal wilt (%) | Leaf blight (%) | Fruit borer infested (%) | Fruit rot (%) |
|---------------|--------------------|-----------------|-----------------|--------------------------|---------------|
| Laxmi         | 7.5                | 6.2             | 4.4             | 8.4                      | 4.8           |
| Sakhyam       | 13.2               | 7.1             | 3.5             | 10.2                     | 6.2           |
| Arka Rakshyak | 0.8                | 4.2             | 6.8             | 7.5                      | 5.8           |

**Table 3.** Effect of nutrient management in *kharif* tomato

| Treatment                                                              | Shape of the fruit | Size | Colour/lustre | Blossom end rot (%) |
|------------------------------------------------------------------------|--------------------|------|---------------|---------------------|
| CaCO <sub>3</sub> (0.5%) + Borax (0.2%) with SHC recommendation on NPK | ***                | ***  | ***           | 3.4                 |
| AMC powder (10 g/l) + 100% RDF                                         | **                 | **   | **            | 5.4                 |
| SHC recommendation on NPK                                              | *                  | *    | **            | 8.3                 |
| 100% RDF (120:50:50)                                                   | *                  | *    | *             | 8.8                 |

\*, \*\*, \*\*\* indicates growing symptoms of different characters.

customers' preference and higher price. Packaging and transporting in plastic crates instead of plastic or gunny bags also reduces loss during transportation.

Tomato cultivation in *kharif* season in open field requires much attention. Sufficient moisture and humidity in atmosphere and in soil make the crop prone to fungal infestations. *Fusarium* wilt, leaf blight and bacterial wilts are common problems in *kharif* tomato cultivation. To minimise the losses from such diseases, *kharif* tomato cultivation requires staking and

support to limit the fruit contact with soil. Such type of cultural practices reduces pest incidence and thereby increases the yield. The net return as well as the BC ratio indicates substantial gain by the farmers adopting proper variety in *kharif* season. It reflects the income gained by farmer in an undulated, unirrigated land which helps in doubling of income.

Most of soils of plateau ecosystems are acidic with pH less than 6. In some areas, it goes upto less than 5. These are mostly red and lateritic type of soil. The available NPK status

is low to medium. Ca and B deficiency symptoms are easily visualised in such types of soils. By the application of Arka microbial consortium (AMC) powder (0.1%), all the yield contributing characters are increased and blossom end rot reduced to 5.4%. In case of application of CaCO<sub>3</sub> (0.5%) and borax (0.2%) with soil health card recommended fertiliser dose, the yield contributing characters as well as blossom end rot reduced to 3.4% where pH is 5.6. Though SHC based recommended NPK gave a better result but Ca and B were found eminent in such soils.

The introduction of *kharif* tomato proved as a profitable enterprise for the farmers of plateau ecosystem. In the degraded, less fertile soil, they are now able to produce tomatoes when there is scarcity and demand of this commodity. The better marketability and pricing are instrumental in increasing the area and adoption of the practices by the fellow farmers. This practice can be replicated with similar agro-eco systems of India for doubling of farmers income.

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## Innovative Agri-Solutions During COVID-19

### Marketing Tomato with i-TEAMS Platform: Innovative Way

#### Intervention

- KVK Ri-Bhoi took the initiative to guide the farmers during this difficult situation and linked group of farmers i-TEAMS
- Through Integrated Technology Enabled Agri Management System (i-TEAMS-1917), a govt. of Meghalaya initiative, farmers were able to sell their harvested produce.
- Around 30-40 farmers of the district could sell 100-200 quintals of their products to the market through i-TEAMS.
- KVK Ri-Bhoi also advised and assisted the farmers / 2 SHGs (40 members) through ICT tools to go for value addition of their produce to Ketchup, puree etc.
- 2 SHGs produced around 160 bottles of Tomato ketchup during the lockdown period.

Contribution: KVK, Ri-Bhoi, Meghalaya

Source: www.icar.org.in