Cornell University Cooperative Extension

# BEST MANAGEMENT PRACTICES
# IN HIGH TUNNEL PRODUCTION

## Cucumbers

Cucumbers are an excellent high tunnel crop for spring, summer and fall production in New York State. Grown vertically, cucumbers take advantage of the space and light offered by a high tunnel. Cucumbers grown in this environment are of higher quality with higher yields. Very fast growing and yielding, they fit into crop plans that include winter greens easier than tomatoes, peppers or eggplants.

High tunnel cucumbers include pickles, slicers, cocktail, English or Asian varieties. Selection of type must meet both market demands and the horticultural demands of tunnel production. Cucumbers grown inside do present additional labor and pest management challenges, but can be grown at a profit when properly marketed.

### Types of Cucumbers

The most important decision in growing high tunnel cucumbers is choosing an appropriate variety. There are numerous cucumber varieties suitable for high tunnel production from pickles, to slicers to seedless to Asian types. The type of cucumber grown depends on market demand; some ethnic populations may have preferences for European, Middle Eastern or Asian varieties. American slicing cucumbers have a broad appeal, but are not as easy to differentiate from field grown crops. Pickling types can be popular, and will require additional labor. Since high tunnel cucumbers are a heavy yielding crop, it is important to know the market will receive the product prior to planting.

Within any one of the many subcategories of cucumbers that can be grown we strongly recommend parthenocarpic varieties for high tunnels, which do not require pollination. Gynoecious varieties produce (nearly) all female flowers, increasing total fruit set and are the most appropriate for high tunnel production. Beit Alpha cucumbers are thin skinned varieties originating in Israel and perform very well in tunnels.

We suggest caution with longer greenhouse cucumbers (sometimes called English or Dutch) in high tunnels. As this is a passively ventilated structure, there is considerably more wind and pollinator visitation than in controlled environment greenhouses. These factors lead to misshapen fruit. Longer cucumbers may require additional fruit thinning to balance shoot/fruit growth. Powdery Mildew resistance is as important as parthenocarpy for tunnel production. Powdery Mildew is a disease that is particularly severe within the tunnel growing environment, and varietal resistance is an essential management tool. Varieties with Powdery Mildew resistance may be listed as PMR or PMT in catalogs.

**Varieties best suited to high tunnels are:**

- Parthenocarpic
- Gynoecious
- Powdery Mildew resistant

*(see page 4 for some suggested varieties)*

# Managing Cucumbers in Tunnels

## Provide Adequate Space

Cucumbers produce prolifically in high tunnels. For the greatest yield and efficient management provide plenty of space. Set the rows at least 4 feet apart, up to 6 feet. The plants can either be set 12" apart in a single row or 24" apart in a double, staggered row.

Set out young transplants, using care to not disturb the roots. Covering the beds with black plastic 1-2 weeks before planting will warm the soil, slow moisture loss and suppress weeds.

## Provide Support

To make the best use of the valuable space In a tunnel or greenhouse cucumbers are given a mesh trellis to climb up or are trained to a single leader, similar to the way indeterminate tomatoes are trained.

Pruning to a single leader works only on parthenocarpic varieties because they produce a flower, a leaf and a shoot all at the same node, making it simple to prune out the shoots and leave the flowers. Regular field type cucumbers (Marketmore 76, Dasher, etc) produce their flowers along the runner shoots. Training field cucumbers to a single leader results in pruning off their flowering shoots, so no fruiting is possible.

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It may seem as though training cucumbers to a single leader wouldn't be worth the time and effort. But in a recent study comparing yield and labor between the two methods of support, the single leader plants yielded 20% more fruit than the trellised plants of the same variety. And the overall labor including planting, trellising and harvesting differed by only 5% between the two methods, with the single leader plants actually taking less labor.

**Comparative research study 2014**

(3 replications of each treatment, same variety)

| | Single Leader | Mesh Trellis |
|---|---|---|
| **Total labor** | 14.48 hrs | 15.23 hrs |
| **Yield** | 1275 fruits | 1014 fruits |
| | (38.6 per plant) | (30.7 per plant) |

*Trial comparing two methods of training cucumbers*

# Water and Fertility

Cucumbers are a water intensive crop. In order to achieve maximum yield and uniform fruit quality, daily watering is recommended. An automatic timer helps ensure consistent soil moisture which leads to properly filled cucumbers. Many growers use two drip tapes beneath plastic mulch to ensure uniform and complete soil moisture.

As a fast growing and heavy yielding crop, tunnel cucumbers have a high fertility requirement. Soil testing prior to planting is important to assess phosphorus, potassium, calcium and pH levels. These can then be adjusted prior to planting with either organic or conventional amendments. Nitrogen requirements will likely exceed 100 lbs per acre. The delivery of this nitrogen can be spaced out over the life of the crop with fertilizer injection in the irrigation system. Slightly acid soil and water pH of 6.0-6.5 is optimum for nutrient uptake. In-season foliar testing allows for further adjustments and can reveal deficiencies before visual symptoms or yield loss occurs.

# Pests and Problems of Cucumbers in High Tunnels

High Tunnel cucumbers experience more pest pressure than other tunnel crops. The primary pests are two-spotted spider mite, thrips, squash bug and striped cucumber beetle. Excellent biological control options exist for spider mites and thrips. In Cornell research, predatory mites including *Amblyseius cucumeris* and *californicus* have been successful at managing these pests when released early in crop cycle.

Spider Mites and Thrips are so common in high tunnel cucumbers that releasing prior to observable damage is advised. There are no commercial biological controls for squash bug and striped cucumber beetle. Screening of side walls can reduce cucumber beetle infestations. There are insecticides available for the management of these pests, but study labels closely to be sure their use is not prohibited in greenhouses. For example, carbaryl (Sevin) is widely used in field production but is prohibited in greenhouse/tunnel production. New products are released each year so check current recommends and labels for the latest information.

Bacterial wilt is spread by the feeding of cucumber beetles so controlling these insects is essential to slow this disease. Powdery mildew (PM) thrives under the more humid conditions in a tunnel. Choose PM resistant varieties whenever possible but realize that resistance can be variable. Effective control with fungicides is challenging in a tunnel, focus on resistant varieties and check for new releases from seed suppliers each year. See page 4 for a partial list of PM resistant varieties suitable for high tunnels.

*Cucumber beetle*


*Bacterial Wilt*


*Powdery Mildew*

# Some Varieties Suited to High Tunnels

**Note:** Good air circulation from adequate spacing and ventilation will help reduce PM pressure. When choosing varieties for high tunnel production look for all three qualities when possible: parthenocarpic, gynoecious and PM resistant.

Key to abbreviations in the list below: G--gynoecious, P-parthenocarpic, PM-powdery mildew resistant

**Pickling**
Excelsior (G, P, PM)
Vertina (P, PM)

**Snack or Cocktail (less than 4" long)**
Iznik (G, P, PM)
Piccolino (P, PM)
Unistars (G, P, PM)

**Beit Alpha**
Manar (P, PM)
Manny (P, PM)
Socrates (P, PM)

**Slicing or medium, 4-8" long**
Corinto (G, P, PM)
Diva (G, P, PM)
Katrina (P, PM)
Lisboa (P)

**Extra long types (more than 8" long)**
(this group may develop misshapen fruit if pollinated)
Sweet Success 12" long (G, P)
Taurus 8-9" long (P, PM)
Tyria 14" long (G, P, PM)

## Useful Websites:

**Cornell High Tunnels:** http://www.hort.cornell.edu/hightunnel
**Team High Tunnel Websites:** http://cvp.cce.cornell.edu/greenhouse_tunnels.php
And http://enych.cce.cornell.edu/greenhouse_tunnels.php

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