

Cucumber cultivar susceptibility against twospotted spider mites in high tunnels



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INTRODUCTION

High tunnels (HTs) are a tool used for protected cultivation of food crops. Their popularity falls on the low cost of construction and increased profitability by extending the growing season and protecting crops against adverse weather conditions. Cucumber (*Cucumis sativa* L.) are suitable for HT production because of their vertical growth pattern, which optimizes space, and repeated flowering, offering multiple harvest opportunities (Fig. 1a). However, twospotted spider mite (*Tetranychus urticae* Koch; TSSM; Fig. 1b) is a primary pest of cucumbers in HT systems that decreases production. TSSM suck essential plant nutrients from the leaves, causing yellowed stippling symptoms and eventual leaf death. TSSM often goes unnoticed until the damage is irreversible, and the pest is difficult to control without conventional insecticides, which are limited in high tunnels.

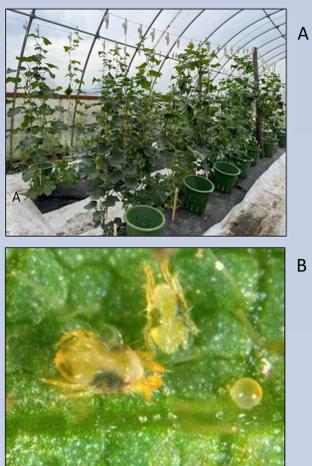


Figure 1. Cucumber plant vertically trellised inside a high tunnel (A); TSSM adult and egg, photo by John Obermeyer (B).

OBJECTIVE

Evaluate the susceptibility of different cucumber cultivars to TSSM in high tunnel production systems.

Reference

- Horsfall, J.G. and Barrat, R.W., 1945. An improved grading system for measuring plant diseases. *Phytopathology*, 25, pp. 655. (Abstr.).

RESULTS

Using the H-B ratings over time we calculated the Area Under the Disease Progression Curve (AUDPC), a quantitative summary of TSSM pressure over time, to compare cultivar susceptibility to TSSM. There were significant differences between cultivar ($F_{9,9} = 5.16$, $p < 0.001$; Fig 2). Overall Poniente and Corinto are more susceptible than Taurus, China Long, and Itachi.

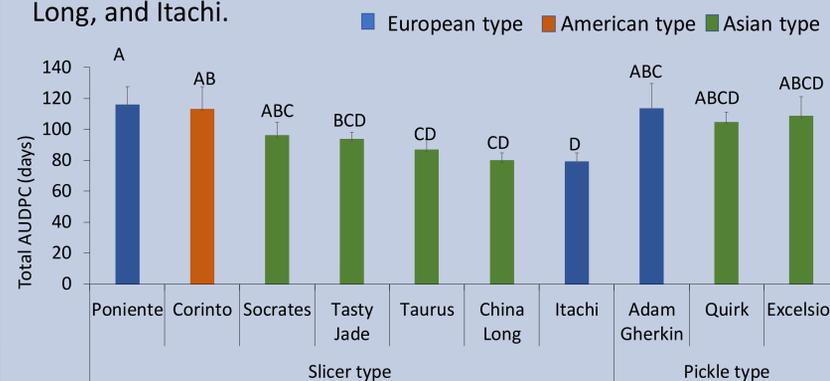


Figure 2. TSSM susceptibility as measured by AUDPC

Total yield per cultivar is an important parameter when selling pickle type cucumbers, which are sold by weight. There were no significant differences between pickle cultivars ($F_{9,9} = 3.22$, $p < 0.0072$; Fig 3A). The number of fruit is more important when selling slicer type cucumbers. There were no significant differences between slicer cultivars ($F_{9,9} = 44.85$, $p < 0.0001$; Fig 3B).

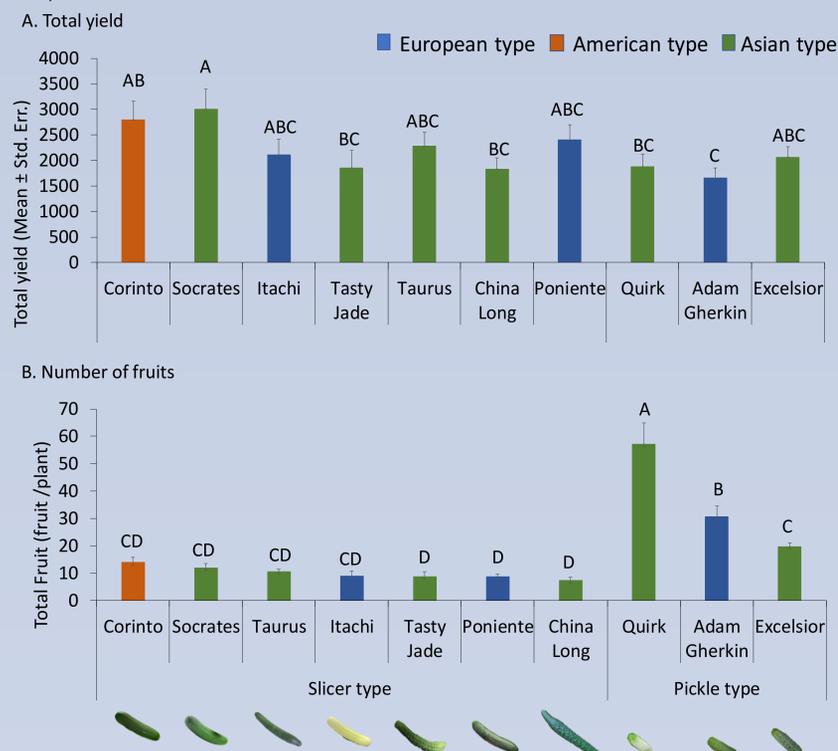


Figure 3. Total yield (A), and total number of fruit (B) per cultivar

METHODOLOGY

Ten different cucumber cultivars were selected based on their origin (European, American, and Asian type) and by their form (pickle and slicer type) (Fig. 4). Cultivars were grown in a RCB design replicated across four tunnels at three different locations (Fig. 5).

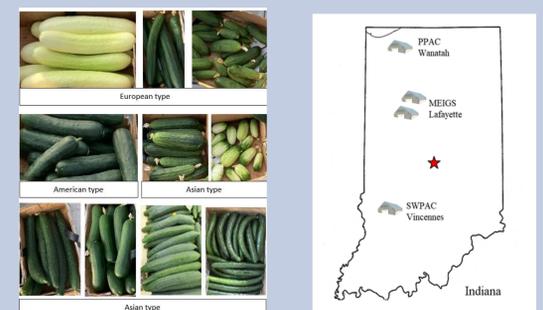


Figure 4. Cucumber cultivars. **Figure 5.** Locations of the study.

Yield and number of fruits were measured by harvesting three times per week. TSSM surveys evaluated symptoms (stippling, webbing) using the Horsfall-Barratt scale (Horsfall and Barratt 1945; Fig. 7). The Area Under the Disease Progression Curve (AUDPC) was calculated to measure mite damage:

$$AUDPC = \sum_{T_0}^{T_1} H - F \text{ rating} [T_1 - T_0] \text{ days}$$

H-B Score	% Affected
1	0
2	>0 to 3
3	3 to 6
4	6 to 12
5	12 to 25
6	25 to 50
7	50 to 75
8	75 to 87
9	87 to 94
10	94 to 97
11	97 to 100
12	100

Figure 7. Severe leaf symptoms of infestation of TSSM (A); Horsfall-Barratt rating scale (B)

CONCLUSION

- We conclude that Itachi, Taurus and China long cultivars are less susceptible to TSSM compared to Poniente and Corinto.
- We detected no difference in marketable yield among cucumber types (slicer and pickles) to TSSM injury.