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CONSIDERATIONS ABOUT COMPETITION BETWEEN CITRUS TREES AND WINDBREAKS FOR LIGHT, WATER AND NUTRIENTS

A contribution to the Living and Artificial Windbreaks Short Course by
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Important considerations about locations of windbreaks are related to the direction of prevailing winds, the northerly source of our freezing temperatures, and directional allowances for cold air drainage. Where cold air drainage is a consideration during freeze events, lower branches of living windbreaks or lower portions of artificial windbreaks may need to be removed to allow air flow. Other considerations include potential competition between windbreaks and citrus trees for *water*, *nutrients* and *light*. Windbreaks at the end of perpendicular citrus rows need to be at least 30 ft away to allow for movement of machinery. Windbreaks adjacent to parallel rows of citrus trees can be closer than 30 ft. However, regardless of the distance, competition between the windbreaks and citrus trees is often thought to be an important factor that can negatively affect citrus production.

Water and nutrients. Competition is a negative interaction that can occur whenever a resource is limiting. The amount of water in soil that is available to support plant growth is one of the most important limiting resources for crop production. Living windbreaks can potentially compete with adjacent parallel rows of citrus trees for soil water and fertilizer nutrients. This competition can occur from aggressively feeding roots of windbreak species (e.g., *Eucalyptus* sp.) even at distances greater than 30 ft. Based on observations of stunted citrus trees next to wind breaks in drier climates than Florida, windbreak trees that are planted closer than 25 ft. from citrus trees in Florida can compete with adjacent rows of citrus trees especially during drier parts of the year. If adjacent rows of citrus trees are stunted by say 25%, yields also can be expected to be smaller by about a similar amount. To avoid this root competition for limited soil water and nutrients, wind breaks are often planted further away than the 30 ft between citrus tree rows which diminishes the effectiveness of the windbreak. In flatwoods situations, a good practice would be to plant windbreaks near drainage canals. In addition, it is a good idea to plant living windbreaks with their own irrigation line. Irrigation and fertilization of windbreak trees may be advisable during the first year or so until root systems are established. During the second summer rainy season, root competition should be decreased. Artificial windbreak screens, of course, do not require water and nutrients but that can compete with citrus trees for light.

Light. Another important resource that can limit citrus tree growth is available light. The Sunshine State almost always has more than adequate light to support maximum photosynthesis and citrus tree growth. In fact, our data show that 50% shade at midday can increase tree growth by avoiding excess light and high temperatures. Light only becomes limiting in the early morning and late afternoon hours when the sun is low, when trees become crowded, or when tall weeds out compete trees for light. Both living

and artificial windbreaks can reduce the amount of light available to support tree growth and fruit yield in adjacent citrus rows especially in the early morning and late afternoon hours. The extent to which shade effects from windbreaks limit citrus tree growth depends on row orientation, height and density of the windbreak, and distance between the windbreak and citrus trees. Again, shade limitations would be expected to be greater in parallel rows of windbreaks and citrus trees which could be potentially closer than the 30 ft minimum distance between windbreaks and end rows.

East-west oriented rows. When citrus tree rows are oriented in an east-west direction, parallel windbreaks to the south would tend to shade the adjacent rows to the north throughout the day. To avoid negative shade effects, there would have to be sufficient distance between a dense southern windbreak and citrus trees to the north or the height of the windbreaks would have to be lower than windbreaks to the north of citrus trees. When north-south oriented windbreaks are perpendicular to east-west oriented citrus tree rows, windbreak shade can limit growth of end row citrus trees in the morning if on the east side or in the afternoon if on the west side. Light-limiting photosynthesis in the relatively cool and humid morning hours is probably more negative than in the warmer drier afternoon hours when some shade might even be beneficial. Thus, shorter windbreak heights or greater distances between eastern windbreaks and citrus trees than between western windbreaks and citrus trees may be important considerations. The economic advantage of being able to add more trees per acre by planting a row a trees that will be shaded by a windbreak must be balanced against the yield loss that those shaded trees will suffer. We do not have information about such trade-offs yet.

North-south oriented rows. When citrus tree rows are oriented in a north-south direction, parallel windbreaks to the east would tend to shade the adjacent rows to the west in the morning and windbreaks to the west would tend to shade the adjacent rows to the east in the afternoon. Again, avoiding morning shade may require shorter windbreak heights or a wider separation between eastern windbreaks and citrus trees than that required between western windbreaks and citrus trees. When east-west oriented windbreaks are perpendicular to north-south oriented citrus tree rows, shorter heights or greater distances between southern windbreaks and south end row trees than between northern windbreaks and north end row trees would be required to minimize shade effects. Again, a grower may be economically ahead by planting an extra row of citrus trees close to windbreaks even though yields may be reduced by light competition but we do not yet have the answers to such questions.