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Windbreaks, an investment in quality and profitability

An effective series of windbreaks doing their bit for quality plants at TGA Australia in Victoria

Reducing the impact of wind

Few people involved in the nursery industry would need to be persuaded of the benefits in protecting their stock and buildings from wind. Even moderate wind causes loss in productivity and quality through:-

1. high transpiration rates (plant stress)
2. physical damage to plants
3. disruption of sprinkler distribution patterns
4. time taken to rearrange knocked over plants

The ideal windbreak should filter the wind, reducing the velocity in the protected area by pushing the bulk of fast moving air above that zone. Dense barriers perform in a similar manner to a solid fence and in many cases will create a worse problem because of excessive turbulence. *(see Diagram 1).*

In intensive horticulture situations, artificial windbreaks have distinct advantages over natural trees.

- Artificial windreaks are instant
- The windbreak can be designed to give predictable performance
- They don't harbour pests and diseases
- Minimum maintenance and long life
- Minimal shading of the productive area

Design considerations

Height and width

Ideally, a windbreak should be at right angles to the prevailing wind. Note that there will be areas of high wind speed and turbulence around the ends of a windbreak fence, so the fence should always be longer than the area requiring protection or it should have sides. It's recommended that windbreaks be not less than 11 times as long as they are high for best effect. eg 5m high windbreak should be at least (5 x 11) 55m long.

The zone of protection on the down wind side of the windbreak will be 6 to 8 times the fence height. This distance of protection will be less if the ground rises on the down wind side and will be more if the ground drops away. When calculating the required height or distance between windbreak fences, consideration must be given to the crop height.

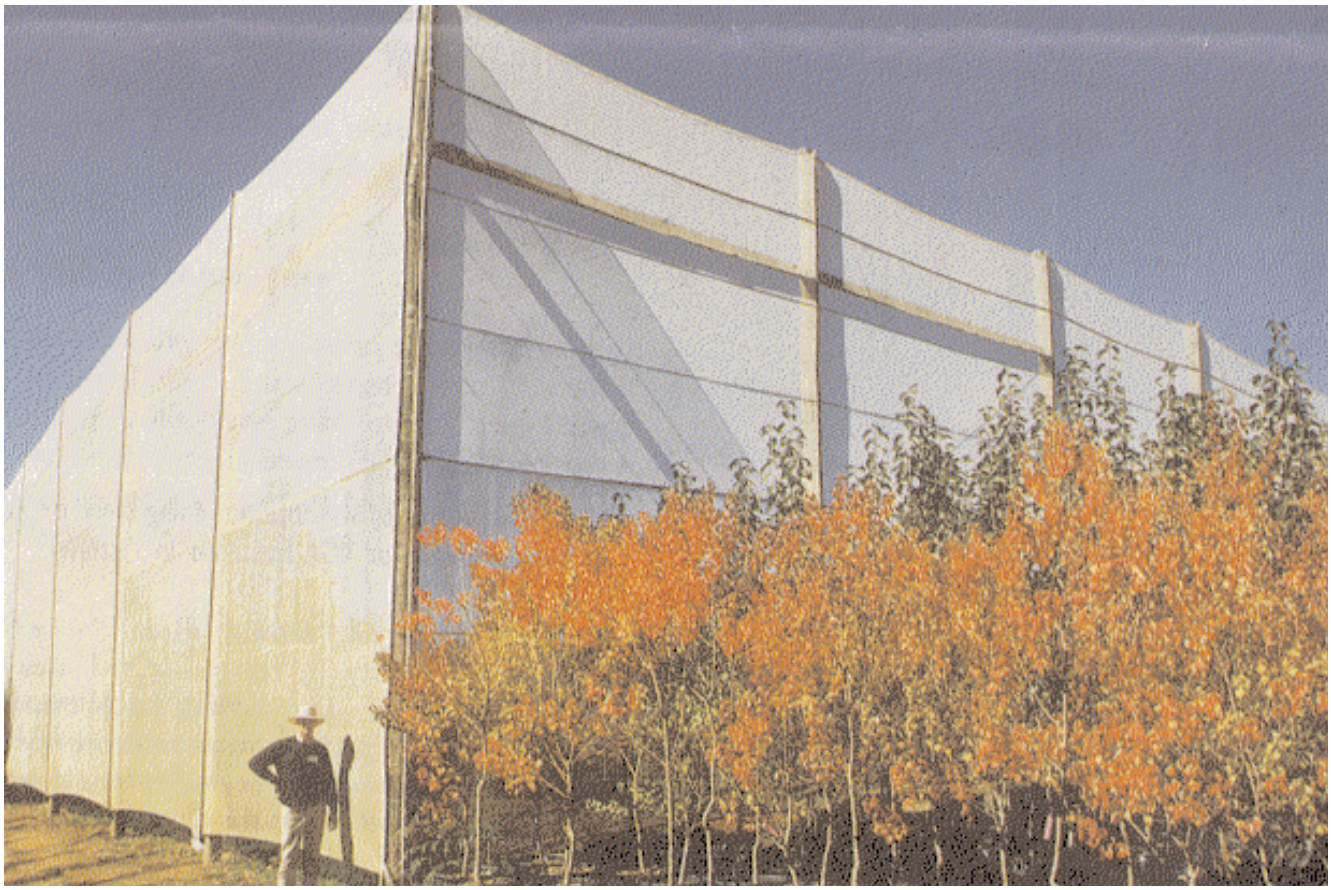
Zone of protection =

(Actual windbreak height - crop height) x 6

e.g. If the proposed windbreak height is 4.5m then subtract the crop height 0.8m to get the effective windbreak height of 3.7m then multiply by 6 to get distance protected. Zone of protection = 22.2 metres. So, in this example we would have an area of crop protection 22m down wind of the structure.

If the distance requiring protection is 30m a 5.5m high windreak would be suitable. Both the 4.5m and 5.5m heights have considerations for available fabric widths. What if the distance needing protection is 50m? Unless expert help is available then around 6m is probably the maximum windbreak height which

Winter Hill Tree Farm in NSW grow many tall lines in pots, so a very tall, guyed windbreak was required.



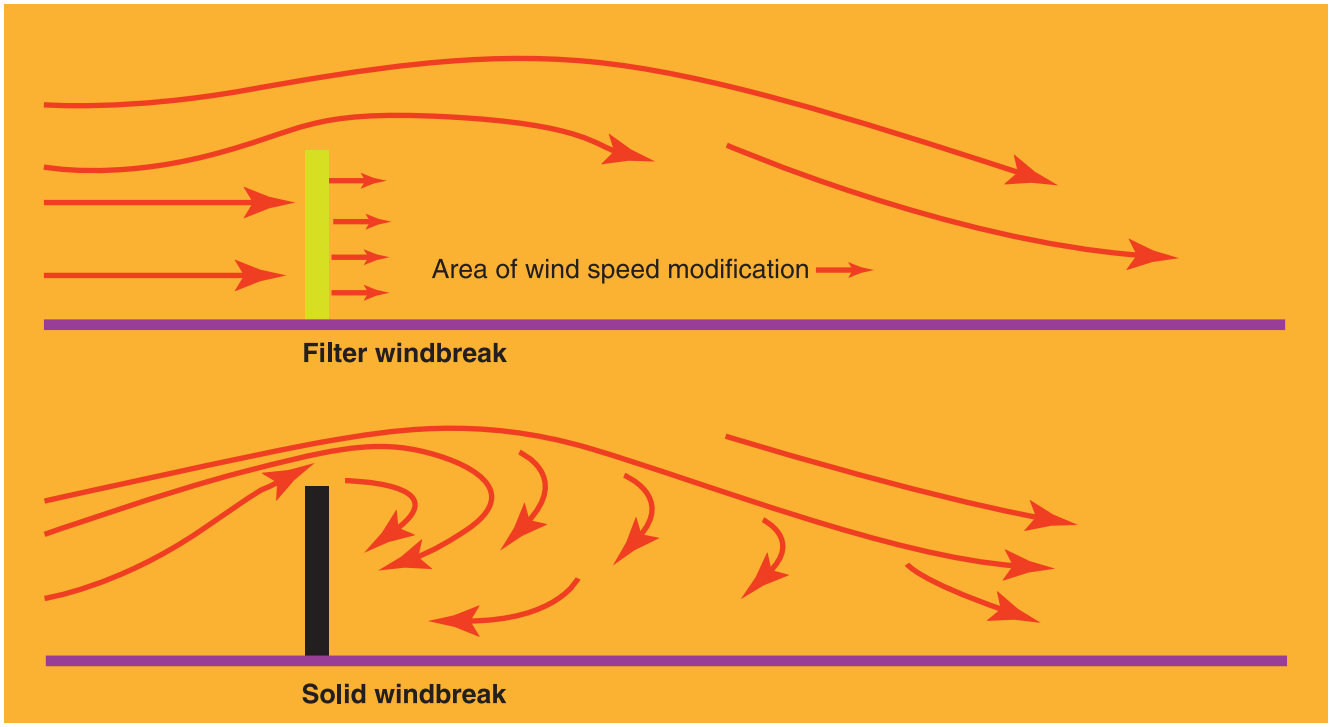


Diagram 1. *Solid barriers are less effective than porous ones which allow some wind through*

should be attempted. So in this case the best option would be the construction of another 4.5m high fence parallel to and 25m from the first.

Buildings, large trees and other natural features can change air flow directions and speed, so it's a good idea to put up some flags and find out from which direction the wind is coming from before you start.

Frost considerations

Colder dense air flows downhill and can be trapped behind windbreaks and other obstructions. Careful design can direct this air away from your sensitive crops. Think of cold air as a slow moving liquid and make sure it can flow away from the area easily. As the colder air hugs the ground even grass buildup along fence lines can change its direction.

Construction materials

Fabric

There are a number of fabrics specifically produced for windbreaks. The longest lasting and most resilient are knitted from monfilament yarn and have a wind porosity of about 50%. Windbreak material manufactured from knitted or woven flat tape yarn will have a shorter life span but are cheaper, making them the ideal choice where the shelter requirement is short term. Other woven and knitted shade cloths of various densities can also be useful.

Support posts

Timber posts are normally used because of availability and ease of use. Tapered hardwood or pine of an appropriate diameter are most suitable. Generally speaking, shaved pine posts or sawn hardwood are not suitable. Steel posts can also be used but present some difficulties in attaching cables and cloth. When selecting posts it is the strength at ground level which is the most important factor.

Wire and cable

Wire or cable is used to support the cloth and transfer the loads to the posts. In the more traditional forms of construction where posts are less than 8 metres apart, single strand wire is used. 3.15 High Tensile (HT Grow wire) is used to support the top and bottom edges and 2.5HT wire is suitable as intermediate wires (anti-billow wires). Ultra Long Span (ULS) construction methods use wider post spacings and fewer wires. Multi strand high tensile cables are used on top and bottom edges of the cloth to support higher wind loadings.

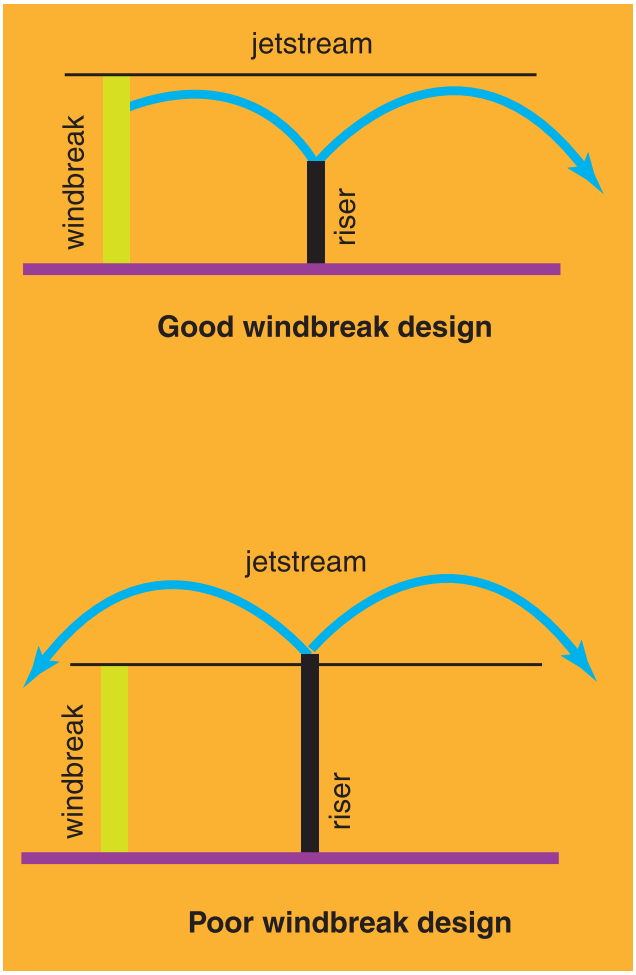


Diagram 2. *Windbreaks should be high enough to protect sprinkler spray patterns*

The bottom line

Windbreaks reduce wind speed and modify the microclimate of sheltered areas. Overall these changes improve plant quality and growth. In vegetable production for instance trials have proven yield increases of between 5 and 50% as well as enhanced quality.

Construction

The distance between posts depends on several factors but is commonly 6 to 8 metres. For catilever pole construction, post embedment depth is a critical factor. In general posts should have 30-40% of their height in the ground. The following situations would require greater depths of post embedment:

- weak, sandy or wet soils
- areas of higher than normal wind speeds
- wider post spacing
- greater windbreak heights
- undulating topography (higher wind speeds)
- lower porosity windbreak cloth

We should not underestimate the wind loading on posts. e.g for a 4.5m high fence with a 6m post spacing, a 20m/sec wind would give each post a loading of 0.54 tonnes. At 30m/sec wind speed the post loading goes up to 1.2 tonnes. If post strength is doubtful or adequate embedment depths cannot be achieved, then an option is to install an anchored guy on each post. i.e brace each post with a cable from the top of the post to an anchor in the ground. Guy wires can restrict access but this system allows the use of smaller poles and shallower embedment.

Windbreaks to protect overhead irrigation systems

Windbreaks are not only required for container plants in the open, but for the sprinklers that provide them with water. Wind over 8 km/hour will badly distort most sprinkler and spray patterns and destroy good irrigation uniformities. Windbreaks must therefore be designed to protect not only the sprinklers but the trajectory of the jet stream. *(see Diagram 2).*

The future?

A number of nurseries in recent years have combined wind and hail protection by using windbreaks around the outside and an overhead canopy of hail net. This provides good wind protection as well as the added protection from devastating hail. The light shading of the hail net (approximately 20-25%) can also improve plant performance.

Acknowledgements

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