

Increasing Summer Stress on Deciduous Trees Using a Highly Efficient Irrigation System[®]

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The nursery is situated at Monbulk in the Dandenong Ranges, 50 km east of Melbourne. The average rainfall is 1200 mm at an altitude of 300 m above sea level. The majority of rain falls between May and October, with October being the wettest month on average followed by May.

The summer period of December to February is the warmest period, but over the last 10 years, the warmer months have been earlier and extending later into autumn. The 2006–7 year saw very warm conditions from early October in late May 2007. The 2007–8 season had very warm temperatures in October to early December, then wet in the middle of December and extreme heat in late December 2007 to middle January 2008. We experienced many days in a row of 35 °C plus, with very low humidity. In the past we would have had 2 days in a row and then a cool change. The warmest part of the day has changed from 2:30 to 4:00 PM to between 4:00 and 5:30 PM. If we are experiencing climate change, I don't think we can truly know for many years to come. The extended warmer periods, with very little cooler periods in between, are changing how we look at growing advanced trees.

The nursery is irrigated by micro-sprays using Netafim spray stakes, and overhead sprinklers are no longer in use. This has led to a dramatic saving in water consumption and very little wastage, and some other challenges have emerged. The cooling effect with increased humidity of using overhead sprinklers doesn't occur with micro-spray stakes. The use of micro-spray stakes has enabled the water to be placed where it should be at the root zone, and extra savings are made by the use of saucers. These saucers catch any water which is not immediately taken up by the plant, and used throughout the day, until the next irrigation cycle.

The effects of high temperature and low humidity are particularly noticeable on a wide range of deciduous trees such as the deciduous *Magnolia* species (*M. sieboldii*) and the cultivars, Star Wars, Caehays Belle, and Felix. The hybrids all have at least one parent from much cooler regions than southern Australia. This certainly plays a large part in being less heat tolerant. The above magnolias all have very large leaves and grow rapidly from November to January, making the plant susceptible to extreme weather conditions.

Our climate dictates that container plants needs to be irrigated at least once a day throughout the warmer months, and possibly twice a day on high-temperature, low-humidity days or with strong winds.

Fagus sylvatica (European beech) and its cultivars are another group of plants showing more signs of summer heat stress. With irrigation the containers will stay moist throughout the day; the leaves are large and tend to absorb a great deal of heat. We have tried to apply a fine mist from a hose, but the humidity tends to be too low.

Acer palmatum (Japanese maple) and its cultivars are showing signs of minor heat stress, and some of the effects on the plants are more long term. The maples have a stronger root system, and burning of the leaves could be result of the micro-

sprays blocking up, or the plant establishing at a greater rate than others. The maples show greater signs than the *Magnolia* and *Fagus*, they tend to wilt first, after another day of either lower irrigation or high temperatures, the first signs are browning of the leaf margins. If irrigation is not applied quickly the leaves will go totally brown, shrivel, and fall off. If this occurs early in the season, the maples will grow another set of leaves prior to autumn. The autumn colour of these leaves will be more vibrant and striking than the rest of the group.

Another major effect of high temperatures on Japanese maples is the potential for sunburnt trunks. The signs may not be noticeable for many days, but have longer lasting effects. The bark which gets burnt goes brown, if the heat is prolonged the bark will peel off. It takes many years for the scar to heal and makes the plant unsaleable. The bark gets burnt as the tree trunk changes the angle it stands towards the sun or the result of many days exposed to the hot westerly sun.

Other deciduous trees are becoming more affected by summer stresses. Ginkgos, *Cornus* (dogwoods), and *Metasequoia* (dawn redwoods) have all been tolerant of our summers in the past but they are now experiencing longer periods of warmer extreme weather patterns. The cooler periods between the warmer periods are less and our rainfall if falling on less days and in greater volumes. The stresses are not just restricted to deciduous trees, *M. grandiflora*, the new leaves are burning, and the larger flatter foliated conifers get sunburnt as they absorb a great amount of heat.

The solution to overcoming summer heat stresses under a micro-spray irrigation system for advanced trees are:

- To become more aware of the weather, its patterns and effects on the environment.
- To continue the use of saucers under the containers for the plants to have a reservoir to draw on between irrigation, this cuts our additional watering, wear and tear on pumps, etc.
- Look at placing the trees which show the most stress, under shade, and utilising the nature boundaries of large established eucalyptus trees which surround the nursery. These give various amount of shade at different times of the day.
- Continue the use of establishing and growing natural windbreaks in the nursery. These create suitable micro-climates, reduces radiant heat, and the effects of wind.

These are the challenges of growing trees outside of their natural environments, with the aim of growing the "perfect tree." What we have done in the past doesn't necessarily apply today, there are new challenge all the time, especially when you grow trees without artificial means of protection.