

TREES FOR BEES CORNER

STAR PERFORMERS PART 10: THE MAGNIFICENT TULIP TREE FLOWERS IN SPRING



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Trees for Bees has produced a series of fact sheets showcasing the 'best of the best' bee plants that will maximise nutritional benefits for your bees. In this issue of the journal, the team explains why the tulip tree is a 'star performer'. For more information, see www.treesforbeesnz.org.



Figure 1. Fully opened solitary flowers dispersed on a branch of a tulip tree (*Liriodendron tulipifera*).

The tulip tree has huge bowl-shaped flowers filled with pollen and nectar for spring-time bee nutrition.

The tulip tree, *Liriodendron tulipifera*, is a star performer because of the plentiful pollen and nectar produced in each flower. Although the

flower looks a bit like a tulip, it is more like a *Magnolia* flower. In fact, tulip tree is a member of the plant family, Magnoliaceae.

The tulip tree is a tall, deciduous tree that grows up to 50 to 60 metres in its native habitat in eastern North America (Merkle &

Sommer, 1991). The only other species in the genus is a much smaller tree, *Liriodendron chinense*, oddly enough native to central mainland China.

The tulip tree is an important honey production plant in United States where it



Figure 2. Mature tulip tree flower showing green petals with an orange splash on the inside and a ring of stamens surrounding the central cone of female parts (stigmas and ovaries).

is widely distributed, but beekeepers need to make bee colonies strong early enough to harvest the honey in mid-spring (Crane, Walker & Day, 1984). In the United States, the tulip tree is also called yellow-poplar or tulip poplar because of the wood. It is one of the three most important commercial hardwood timber species, along with oaks and maples, in the USA (Merkle & Sommer, 1991). It is also a highly desirable ornamental with many cultivars grown all over the world in gardens, parks and along streets (Merkle & Sommer, 1991; Lindtner, 2014).

Flowers

In New Zealand, the tulip tree flowers in mid-to late spring—usually around October. The flowers are highly attractive to bees because each flower is like a huge bowl full of pollen and nectar, so multiple bees can forage in one flower at the same time. We call these types of blossoms ‘super-bowl’ flowers—other examples are peonies and camellias. Although each tulip tree is not so densely covered with many flowers (Figure 1), the solitary flowers do make up for their low number per tree because each flower is large and has a huge quantity of pollen and nectar. The flowers are bisexual with female parts in the central column and male parts, the stamens, standing in a ring around the centre (Figure

2). Fully open flowers have green petals with a mysterious splash of bright orange in the middle of each petal.

Pollen

Bees can forage efficiently with ready access to the abundant pollen because the flower is an open-dish blossom. The numerous stamens have very large, elongated pale-cream anthers providing a lot of pollen per stamen, as shown in the cut-away section in

Figure 3. The pollen is not yet mature when the flower bud is starting to open but once the petals are open the pollen is ready for the bees. The pollen has good protein content of 20% (Trees for Bees, unpublished data).

Nectar

When we first observed bees in tulip tree flowers at the Eastwoodhill National Arboretum, we were puzzled because we saw bees crawling around on the orange strips of

Figure 3. Cut-away section of young tulip tree flower showing the ring of stamens with elongated anthers full of pollen.





Figure 4. Bee collecting nectar on the ring of orange-coloured nectar guides that show the honey bee the location of nectar secretion in a young tulip tree flower.

the petals. This was strange because we could not see nectar or pollen on the petals (Figure 4). Usually, in most flowering species, the nectar secretion area is in a ring at the base of the ovary or stamens. It turns out that tulip tree nectar is produced on the petals, which is not very common among flowering plants.

Zhou et al. (2016) made a comprehensive study of nectar production in *Liriodendron tulipifera* flowers. The orange colour on the petals are the nectar guides showing the bees where nectar secretion is located. The petals start out green but in the nectary area, the colour turns to light green 10 days before secretion starts; changes to light yellow three days before secretion starts; and then to fully yellow when secretion starts and the bud starts opening. Finally, about 20 hours later, as the bud is further opening, the nectary area becomes bright orange (Figure 4). About two to four hours later, the volume of nectar production reaches its maximum.

Each flower can accumulate ~ 1600 to 2100 µl of raw nectar when nectar feeding insects are excluded (Zhou et al., 2016). The nectar exudes through tiny specialised holes (called 'nectarostoma') in the orange nectar area of the petals. The nectar is so productive that it accumulates into bigger and bigger droplets, which run down the petal and collect at



Figure 5. Nectar secretions accumulating into large droplets and running down the petals to the base of the tulip tree flower.

the base of the petals (Figure 5). This is why multiple bees can be seen feasting on nectar in a partially opened bud (Figure 6).

Each tulip tree flower can produce thousands of microlitres of nectar—an extraordinary production of nectar compared to most flowers, which only

produce under 10 microlitres (Zhou et al., 1991). The enormous quantity of nectar is produced if there is enough soil moisture, cool nights and sunny days (Lindtner, 2014), so in certain regions the nectar production is diminished. In some countries nectar production is usually not high; for example, in the UK (Kirk & Howes, 2012).

As tulip trees are so densely populated and abundant over wide areas of the USA, the tulip tree is a valuable nectar source for honey production (Zhou et al., 2016). Based on our observation of bees in New Zealand, if you have the right place and the right cultivar, tulip tree is excellent for both pollen and nectar during the 'October crash' period after the willows and before the clover flowers.

Planting advice

While the tulip tree is one of the most important hardwood timber species in the USA (Merkle & Sommer 1991), its main use in New Zealand is ornamental. Tulip tree has been used on Trees for Bees Demonstration farms for paddock shade and shelter, as an ornamental tree, and in avenues (including the upright 'fastigate' form). The tulip tree grows well throughout New Zealand. It is a shade-intolerant species and will grow on a variety of soil types, but prefers moist, well-drained fertile soils (Vick, 1985, pp 1–7).

Because the tulip tree grows to a large size (in excess of 30m in height), trees need to be given plenty of space to grow into—the suggested spacing is 20m+ between trees.

Choose a site in a sunny or semi-shade location and sheltered from strong winds if possible. While it is a hardy tree, it is not well suited to very exposed sites as the wood is brittle and branches can be shed in strong winds.

If you are in a lower rainfall area, identify sites where there is more likely to be ground

moisture during dry periods and irrigation may be required to get the plants established. If the soils are wet, then plant the tree on a mound to support drainage. Small trees may only require a single stake and a tree guard if there are pests or stock around, whereas larger-grade trees may require larger stakes.

References

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Figure 6. Multiple bees collecting nectar that has accumulated at the base of the young tulip tree flower just starting to open up. All photos by Valentine Tourneau © Trees for Bees.

