TREES FOR BEES CORNER

STAR PERFORMERS PART 11: AUTUMN FLOWERING ALDER TREES

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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 autumn-flowering alders are 'star performers'. For more information, see www.treesforbeesnz.org.

Four species of alder trees regularly flower in autumn and provide excellent pollen to strengthen bee colonies for wintertime.

The autumn-flowering alders *(Alnus spp.)* are important star performers because they provide plentiful pollen when bee colonies are preparing for winter. The diversity of pollen and nectar sources in autumn is very low compared to spring and summer. Our working list of candidate bee plants has only about 15–20 native species and a similar number of exotic species that we are planting for autumn pollen and nectar supply. Hence, we are continually searching for a greater diversity of new autumn-flowering bee plants.

Autumn is a critical time for bee nutrition because without good pollen for protein and nectar for energy at this time of year, the number of new winter bees can become compromised, and the growth and health of individual bees weakened. This means bees, and sometimes whole colonies, will not be able to successfully survive the cold winter months or be robust enough to start rapid colony regeneration in early spring.

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The genus *Alnus* is in the birch family, Betulaceae, and comprises from 29 to 35 species depending on which taxonomic system you wish to follow (Navarro et al., 2003; Chen & Li, 2004; Schrader et al., 2005; Leopold et al., 2012). Most alder species flower in spring but four of them regularly flower in autumn: *Alnus nitida, A. formosana* and *A. nepalensis,* which are native to Asia, and *A. maritima,* native to North America. These four autumn-flowering alders are not common in New Zealand nurseries, but Appletons has often had some of them in stock.

Flowers

Alder trees are deciduous and wind pollinated, which is typical of trees in the birch family. Alders have unisexual male and female flowers on the same tree. The male and female flowers are arranged into male and female catkins. (A catkin is a thin cluster of many flowers arranged closely around a central column.) Catkins usually have tiny unisexual flowers with inconspicuous or no petals that are adapted for wind pollination. In alders, male catkins are long and pendulous to allow the pollen to blow away in the wind, while female catkins are more upright and rigid on the branch to be able to capture wind-blown pollen coming in (Figure 1).

Figure 1. Himalayan alder (Alnus nitida) *branch with male and female catkins.*

Figure 2. Himalayan alder (Alnus nitida) *male catkin with bee collecting pollen in autumn.*

Figure 3. Himalayan alder (Alnus nitida) *male catkin with bee collecting large pollen loads in autumn.*

Figure 4. Himalayan alder (Alnus nitida) *mature tree at Eastwoodhill National Arboretum in Gisborne. All photos by Linda Newstrom-Lloyd © Trees for Bees.*

Pollen

Alder trees are covered with numerous male catkins hanging down on the branches (Figure 1). As alders are wind pollinated, the amount of pollen per tree and per catkin is enormous (Sogo & Tobe, 2005). For example, one species of alder, *A. glutinosa* (which flowers in spring), provided 120 mg pollen per catkin as compared to only 66 mg in hazelnut catkins (Piotrowska, 2008). So, one alder male catkin could be enough to raise one bee from egg to adult, which requires from 120 mg to 145 mg according to Seeley (1995).

The autumn-flowering Himalayan alder *(Alnus nitida)* has pollen with high protein content—we measured 21% to 29.5% crude protein in *Alnus nitida* pollen at Eastwoodhill National Arboretum in April 2013 and 2014 (unpublished Trees for Bees data). This means the winter bees raised on autumn pollen from this alder would be healthy and robust.

On the male catkins, bees have easy access to pollen because the tiny male flowers are open-dish type flowers. In addition, the structure and the arrangement of the flowers on the catkin provide a good landing platform for bees to grasp as they move from flower to flower on the catkin (Figure 2). Consequently, bees can collect large pollen loads quickly because of plentiful pollen on the same catkin and a convenient landing platform allowing them to scramble along the catkin (Figure 3). This gives the bees a good cost/benefit ratio for nutritious foraging.

Nectar

When flowers are highly adapted for wind pollination without the need for any insect or other animal pollinators, they generally do not have mechanisms for producing nectar as a reward. Alders do not produce nectar. Some people mistakenly believe that bees would not visit wind-pollinated plants because there is no nectar; but when bees need pollen, they will take advantage of the copious supply that wind-pollinated plants provide. Some of our most important sources of pollen are wind-pollinated species (e.g., *Coprosma).*

Planting advice

Alders are vigorous and fast-growing pioneer species that establish well on eroded and exposed soils, including stream margins, and have traditionally been used in agroforestry systems for shade, fodder, fuelwood and timber (Devi et al., 2013; Rana et al., 2018). They are nitrogen-fixing species, which together with their vigorous growth on even acidic and damaged sites, help improve land health and give them an important role in forest restoration. Most alders prefer medium-to-heavy damp soils, although Himalayan alder *(A. nitida),* as well as *A. maritima* and *A. nepalense,* can tolerate dry soils (Schrader et al., 2005).

Alders have been used in a variety of situations on Trees for Bees demonstration farms, principally shelterbelts, land stabilisation, paddock shade and shelter, and in riparian planting. Species selection for riparian planting needs to be careful, as some alders (e.g., *Alnus glutinosa)* have been assessed as potentially weedy in New Zealand, although this does not appear to apply to any of the autumn-flowering alders.

The autumn-flowering alders grow to a medium to large size (22 m to 30 m); for example, *Alnus nitida* at Eastwoodhill National Arboretum (Figure 4). They will need to be given enough space to grow into: the suggested spacing is 15 m to 25 m+ between trees, although closer spacing can be used in shelterbelts. While they may tolerate some frost (suggested 5–10°C), the autumn-flowering alders are better suited to the milder parts of New Zealand and to date have been used in the North Island and in more coastal situations.

If you are in a lower rainfall area, identify sites where there is more likely to be ground moisture during dry periods. Irrigation may be required to get the plants established, although as noted above, *Alnus nitida* can tolerate dry soils. Small-grade 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 stake(s). Alders will tolerate some stock browsing once established, but during establishment they will require protection by tree guards or fenced enclosures.

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