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Willow pollen for Spring Hive Vigour

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Introduction

Willows are valuable sources of bee pollen in many parts of the temperate world. Sequential flowering of selectively planted willows (Figure 1) can provide three months of continuous pollen supply in the important period of hive population build-up from late July till late October.

Willows are dioecious. Any individual willow plant is either male or female. Only the catkins (flower bunches) of male plants produce pollen (Figure 2) Both pollen yield per catkin and catkin production per clone are highly variable for willow species.

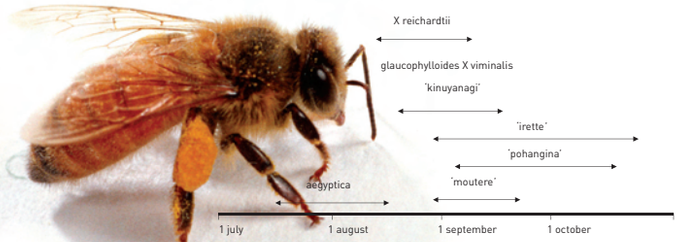


Figure 1 Flowering Sequence for selected Willow species at Aokautere, Palmerston North

Figure 2 Male willow catkin ripe with pollen

Methods

Pollen Production

Pollen was collected from 1-2 m cuttings maintained in water culture in a greenhouse (Figure 3). This was to maintain the catkins in a relatively undisturbed state for retention and collection of pollen.

Figure 3 Bagged catkins with ripening pollen (*S. x reichardtii*)

Pollen collection and extraction

From each clone, 25-50 ripe catkins were collected by snipping off the catkin into a container using scissors. Any disturbed pollen fell into the container with the catkin.

Pollen was removed from the catkins by agitating in 100% ethanol vigorously for 60 seconds, then filtering the solvent. The pollen on the filter paper was dried at 4ºC for 10 minutes, then weighed.

Pollen mass per catkin was found by dividing pollen mass by the number of contributing catkins.

Estimation of pollen production by each species

Catkin numbers were measured on 3-year trees

The pollen production (Y_s) for each species was calculated by applying the following formula.

$Y_s = N_t * P_s$

N_t = mean number of catkins per tree

P_s = mean mass of pollen per catkin

Results

1. Pollen production per catkin

Pollen production is quite variable between willow species (Table 1). Catkin size is one variable that influences pollen yield. Catkins of *S. candida* 'Furry Ness', for instance, are 3-5x the size of those of *S. purpurea* 'Pohangina' which are very small

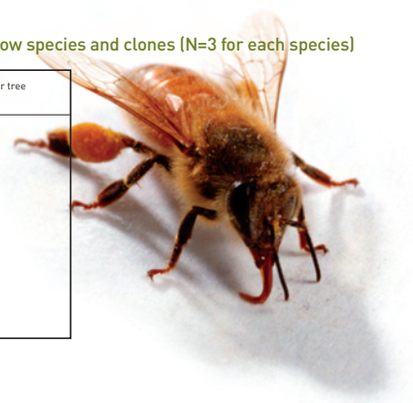
Table 1 Pollen mass per catkin of selected willow species and clones

Salix species	No. of catkins sampled	Pollen mass per catkin (mg)
S. viminalis 'Gigantea'	50	5.2
S. X reichardtii	25	7.2
S. purpurea 'Pohangina'	50	2.8
S. purpurea 'Irette'	50	2
S aegyptica	25	10.6
S. opaca	50	3
S. triandra 'Semperflorens'	25	2.8
S. candida 'Furry Ness'	15	11
S. schwerinii 'Kinuyanagi'	25	4.3
S. lasiolepis	50	10.5

2. Assessment of pollen production at the tree level

Table 2 Pollen mass per plant of selected willow species and clones (N=3 for each species)

Salix species	Pollen mass per 3-year tree (mg)
S. viminalis 'Gigantea'	12.4
S. X reichardtii	74.2
S. purpurea 'Pohangina'	9.1
S. purpurea 'Irette'	8.4
S aegyptica	107.0
S. opaca	No data
S. triandra 'Semperflorens'	18.2
S. candida 'Furry Ness'	No data
S. schwerinii 'Kinuyanagi'	74.3
S. lasiolepis	No data



Discussion

It is not easy to capture all the pollen from a catkin since the florets mature sequentially from the base to the tip. The pollen mass data in this study are likely to be an underestimate of the total pollen production.

Values for pollen mass per catkin from the only other published study (from Poland in the 1970's) of pollen production in willows, range from 4.9 to 34.7 mg. For the two species common to both studies *Salix triandra* averaged 4.9 mg in the Polish study and 2.8 mg in this current study, and *S. purpurea* averaged 12 mg in the Polish study and 2-2.8 mg in this study. The two sets of data are of the same order of magnitude.

Two of the higher pollen producers in the Polish study were *S. caprea* (31.2 mg per catkin) and *S. daphnoides* (34.7 mg per catkin). The males of these two species flower over a similar period to the two *S. purpurea* clones at Aokautere.

The bees probably capitalise on the supply of wax produced by the willow leaves too (Figure 4).

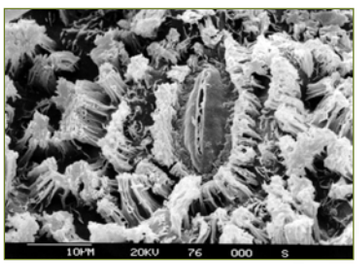


Figure 4 Willow leaves have a lot of wax coating the undersurface which bees may utilise (*S. lasolepis* leaf x 2000)

Reference:
Koter, M. 1987. Nectar secretion and pollen productiveness of several species and hybrids of willow (Salix L.). *Pszcelnicze Zeszyty Naukowe* 31: 131-152