HortScience 15(6):756. 1980.

Airborne Pollen above a Cranberry Bog[1]

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Additional index words. Vaccinium macrocapron

Abstract. **Pollen traps placed at different levels above a cranberry (*Vaccinium macrocarpon* Ait.) bog in full bloom yielded a mean of 27.5 grains $cm^{-2}da^{-1}$ at the bog surface to 3.5 grains $cm^{-2}da^{-1}$ at 80 cm above the bog. The amount of airborne pollen settling on receptive stigmas could significantly affect fruit set.**

Studies are not in agreement as to the factors responsible for pollination in cranberry. Two pollen transfer agents have been reviewed (6): wind acting over short distances (8) and bees (2, 4). There is strong evidence that bees are the primary pollinating agent while wind and mechanical jarring have been considered ineffective (1, 3, 10). In wind pollination, pollen must be carried in the air to the stigma from an anther of the same or a different flower. The present study was undertaken to determine the relative numbers of cranberry pollen grains in the air at different heights above the bog.

A commercial 'McFarlin' cranberry bog of about 1 ha was chosen. Ten sampling stakes were placed in the bog at intervals of about 7 m. Slides were positioned on the stakes 10, 20, 40 and 80 cm above the bog. An additional slide at the bog surface was protected from debris by a roll of 6 mm hardware cloth. Fifty 75 x 25 mm glass slides were prepared. Each was wrapped in Parafilm M laboratory film with a square of film removed to expose 4 cm^2 of glass. This area was coated with a thin layer of glycerin jelly containing an aqueous basic fuschin stain.

At the peak of cranberry blossom, the slides were placed in the bog at noon on a sunny day with the temperature 10°C and the windspeed 16 km hr^{-1}. When they were retrieved 24 hr later the temperature was 14°C and the windspeed 9 km hr^{-1}. The film was removed, a drop of glycerin jelly added and each slide covered and sealed. A reference collection of pollen from flowering weeds in the vicinity of the bog was also made (11) at the time of trapping. Using a magnification of 250 × the pollen grains were identified, counted and classified as cranberry tetrads or other pollen.

Groups of large numbers of pollen grains on a few of the slides caused a correlation in the raw data between the means and the standard deviations. This correlation was removed by a logarithmic transformation of all counts before further analysis. Slides may have varied in their ability to trap available pollen from the air due to variations in wind currents and slide orientation. The count of pollen grains other than tetrads was used to take into account this source of variance. Covariance analysis, using the number of other pollen grains as the covariate, tested the effect of height upon tetrad count (Table 1).

The regression of cranberry tetrads upon other pollen was significant. Therefore the number of other pollen grains was a useful covariate to take into account random variablilty due to such uncontrolled factors as wind currents and orientation of the slides. The adjusted cranberry tetrad count decreased from a mean of 27.5 tetrads per cm^2 at the bog surface to 3.5 at a height of 80 cm above the bog (Table 1). A regression fitted through the logarithms of the tetrad counts indicated an excellent fit (r^2 = .98) to the following relationship. The effect of doubling height was to decrease the number of cranberry tetrads by 34.3% in the range from 10 to 80 cm above the bog.

It is impossible to know the distance travelled by each pollen grain found on the bog surface. The mean of 3.5 tetrads $cm^{-2}da^{-1}$ found at 80 cm above the bog indicates that cranberry pollen can be carried greater distances than were previously believed. Pollen settling on flower stigmas was expected to be at the same concentration as that found on the bog surface. A mean number of 27.5 tetrads $cm^{-2}da^{-1}$ is substantial considering that the stigma is receptive for at least 6 days (7). During this time, 165 tetrads or 660 viable pollen grains could fall per cm^2 of bog surface. Fruit can set with few seeds maturing (8) and it has been reported that a single pollen grain can initiate fruit formation (5). Bee activity has been widely accepted as essential for cranberry pollination. Bees mainly jar the flowers while collecting nectar and cause direct pollen transfer from anther to stigma (9). Actual numbers of pollen grains transferred and flowers affected by bee visits is unknown, making a comparison of the effectiveness of wind and bee pollination difficult. Under the conditions prevailing in this study wind may transfer enough pollen from flower to flower to be responsible for a significant portion of the fruit set. The effectiveness of wind on pollen transfer within a flower remains unknown.

Table 1. Cranberry pollen tetrads in the air above a bog, British Columia, 1979.

Height above the bog (cm)	Tetrad mean (logarithm)	SE (adjusted)	Tetrad mean (geometric)
0	1.439	0.138	27.5
10	1.065	0.132	11.6
20	0.914	0.132	8.2
40	0.663	0.131	4.6
80	0.540	0.131	3.5

[1]Received for publication December 22, 1979.
The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper must therefore be hereby marked *advertisement* solely to indicate this fact.

[2]The authors wish to thank Daryl C. Parsons for his technical assistance. Financial support was provided by the Natural, Applied and Health Sciences Grants Committee of The University of British Columbia. The Columbia Cranberry Company Ltd. of Richmond, B.C. provided access to the plant materials.

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