
HAZELNUT GROWERS ASSOCIATION OF NEW ZEALAND

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Winter Addition

Pollinizer Management in a Hazelnut Orchard

S.A. Mehlenbacher and A.N. Miller
Oregon State University, 1988

Three factors must be considered in choosing pollinizer cultivars: 1) the amount of viable pollen produced, 2) compatibility, and 3) time of pollen shed.

The amount of viable pollen produced by a hazelnut tree is largely a function of the number of catkins on the tree and the viability of the pollen produced. Some cultivars set pollen in abundance Others typically set very few catkins. Some cultivars drop their catkins prior to pollen shed. Since one good Daviana catkin is estimated to produce 4 million pollen grains, the amount of pollen produced by a single pollinizer tree is tremendous.

Incompatibility occurs when plants having functional pollen and functional female flowers are unable to set seed when self-pollinated or crossed with some of their relatives.

Incompatibility is a physiological between pollination and fertilization. Pollinizers are required in hazelnut orchards because cultivars are self-incompatible. They are also cross-incompatible in certain combinations. Hazelnuts are similar to Brassica species (cabbage, broccoli, and their relatives) in that all have the sporophytic incompatibility system All pollen produced by a tree exhibits the same incompatibility reaction. The reaction is under simple genetic control. There is one locus (one gene), the S-locus (for self-incompatibility) with 22 known alleles. Don't let this terminology scare you. In humans, there is a locus controlling eye color, an allele for brown eyes, and an allele for blue eyes. Humans have a locus controlling hair color, an allele for brown hair, and an allele for blond hair. In hazelnuts, there is one S-locus which controls the incompatibility reaction, and alleles S1, S2, S3,.....S22. Hazelnut trees, like humans, are diploids. Thus at every locus, they

have two alleles. Brown eyed people may have two alleles for brown eyes or one allele for brown eyes and another for blue eyes. The allele for blue eyes is recessive. In hazelnuts, both alleles are always expressed in the female flowers. One or both may be expressed in the pollen. If a given allele expressed in the pollen is met with the same allele in the female flower, the cross is incompatible. In simpler terms, if like meets like, the reaction is incompatible. If a given allele expressed in the pollen is met with different alleles in the female flower, the cross is compatible. Because of the dominance relationships among S-alleles, some crosses are compatible yet the reciprocal cross is incompatible.

A third factor to consider in choosing pollinizer cultivars is time of pollen shed. It is essential that the pollinizer shed pollen when the female flowers of the main crop cultivar are receptive. Pollen which is shed before the female flowers emerge is wasted.

Unpollinated female flowers remain receptive for up to 3 months, so a late pollinizer can be very effective. Although actual dates vary from year to year, relative dates of pollen shed are consistent. Female flowers and catkins respond differently to temperature. In colder winters, female flower development is accelerated relative to catkin elongation. Thus a pollinizer which sheds at the ideal time one year may shed too early or too late the next year. Some cultivars shed their pollen over a very short time while others shed over a much longer time. By planting 2 or 3 rather than a single pollinizer, growers increase the odds of having pollen shed at the optimum time.

Another dehiscence and pollen release from catkins requires lower relative humidity and warmer temperatures. If temperatures are too cold (32°F or less) and humidity is too high (85%+) then pollen will not be shed.

Temperature will also have an effect on pollen viability. If temperatures exceed 73°F then pollen viability decreases. Optimum pollen germination in artificial culture has been obtained at 68-72°F, but will also germinate at 34-39°F.

Once pollen is released from the anther, wind is required for its distribution. The absence of wind could result in pollen dropping to surfaces below the catkins. Theoretically, pollen could travel about 250ft. in 36 seconds and drop 3 feet. if a 15mi/hr wind was blowing. However, hazelnut pollen is moved by eddy diffusion where the air movement rolls and swirls. Pollen concentration drops very quickly to relatively low amounts around 46-72 ft. distance away from the orchard edge. At this time we do not know what the required amount of pollen is to guarantee optimum nut set and development. However, in 2 research articles Schuster (5,6) states, "In observation in the field is shows that trees planted 40-60 ft. from a pollinizer bear good crops though the ones at 60 ft. sometimes appear light." and "In the field it has been noted that trees more than 50ft. from the pollinizer yield smaller crops than closer."

The above article has been abridged to conserve space in our news letter. Data tables showing compatible crosses, compatible cultivars, Cultivar pollen shed compatibility, Pollen concentrations at different distances, and charts showing pollinizer planting options within orchards have been left out. If a full copy of the article is wanted, please contact the Editor.



Interesting Websites

- www.ippc.orst.edu/cicp/fruit/hazelnut
- www.fas.usda.gov/htp2/circular/1997/97-10/hazelnut
- www.hazelnuts.org.au/business%20plan%202001.doc

The HGANZ newsletter is a source of valuable information concerning our organisation and all members should feel comfortable contributing to the growth of our fledgling industry through it. Valuable and important information could take the form of:

- ❑ Important dates or social events
- ❑ Field trips
- ❑ Advice for the orchard
- ❑ New machinery to make our work easier
- ❑ Marketing tips, advice, or theory
- ❑ Hazelnut business opportunities
- ❑ Useful research (old or new...professional or amateur)
- ❑ Hazelnut issues or questions that you have wondered about that someone else might have an answer to.

As you run across items that you think that others of us could also profit from, pass it on to Dave at nutt.ranch@xtra.co.nz so they can be added to the next quarter's newsletter.

Hazelnut Crepes

Makes approximately 12

$\frac{3}{4}$ cup plain flour

$\frac{1}{4}$ cup hazelnut flour

$\frac{1}{6}$ cup milk

1 egg plus 1 yolk

A pinch of salt

1 tspn of hazelnut oil

Put all ingredients in a blender and whiz at high speed. Leave to stand for 1-2 hrs. Heat crepe pan or small fry pan and lightly oil it. Swirl around just enough of the mixture to coat the pan and pour out the excess. Turn over when cooked on one side. Cook lightly and remove to a plate. When they are all cooked, you can add a filling and wrap, fold into quarters and top or stack with greaseproof paper in between and freeze.

- Try filling with fresh fig sliced and lightly sauteed in hazel nut oil then glazed in the pan with honey and top with natural yogurt.
- For something savoury, try chopping together pickled walnuts, morello cherries, celery, and spring onion, filling it in the warm crepes and serving with lamb, venison or chicken.

Hazelnut Growers' Corner

In this issue our growers' corner takes a look at the hazelnut operation at the Nutt Ranch in Blenheim, and we are listening to Bev and Dave Null.

This property was purchased in 1995 as 8ha of pasture land. The land was purchased with the growing of hazelnuts in mind. The land is marginal for horticulture use and is in a dry area of Marlborough.

Hazels are not deep rooted and our soil, although light and stony, is rich and has good PH. Norwesters are a bother in early summer as the hazel leaves are fairly delicate and can sustain some wind damage. We have an excellent water supply for both ourselves and our irrigation.

At present we have 3000 trees with 500 at 7yrs, 500 at 5yrs, 500 at 4yrs, and 1500 at 3 yrs.

Plantings

Our main crop is a New Zealand bred hazel, "Whiteheart". It is an excellent confectionery nut with a fine nutty flavour. It fills the shell exceptionally well and blanches nearly 100%. We have narrowed our pollinator range over 5 years to 4 which work well for us. These are Alexandra (best), Merville de Bowiller (good), Butler (earlyish), and Ennis (earlyish).

Our tree spacings are somewhat different than what most written material suggests. The Whiteheart is not a large tree and it is fairly upright. We have chosen 4 meters between rows with 3 meters between trees in the row.

Fertilising

We are using Nitrofoska as a general fertilizer in late Winter. The amount is based on soil and leaf testing during the previous season. Our plan is to replace what elements are used by our trees and see annual growth of between 150-200mm in the season.

Pruning

We try to keep the centre of the tree open with no crossing limbs. We remove some fruiting wood from most trees to promote new growth. We shorten to an outside bud all extra long growth. We try to leave as large a framework as possible.

Irrigation

Our irrigation consists of 50mm mains with 40mm leaders and 19mm laterals. We are using 4litre/hour drippers which are serving us well. We keep close records on all irrigation during the dry summer. We have found that the Hazels need extra irrigation during nut formation and then again during their final maturing.

Sucker Control

The Whiteheart variety produces large amounts of suckers at the base of each tree in early summer and again in early Autumn. We spray with Buster when the suckers are young and tender but clean up the trees with the secateurs during the Winter.

Harvesting

Our harvest is done by hand as a family affair, but our plan is to eventually operate a vacuum running off the tractor's PTO as the trees become larger. Our nuts are washed carefully and then dried in onion sacks in the sun to about 5% moisture content before cracking, shelling, grading and sorting. We store the shelled nuts in plastic drums until sold.

To The Future

We have just completed a commercial kitchen and a building for the processing, retailing, and storage of nuts. Next year there will be a need for a full time worker in the orchard.....the tractor needs replacing....the harvesting and shelling of the nuts must become more mechanized to speed the processing and save our backs.

We would also like to see more people sharing their experiences and knowledge. Contact with other growers and processors is extremely important for the industry. And, of course, we wish to find the time to just sit on our veranda and enjoy the day!

Marketing

We consider the marketing of our products to be as important as the growing of the nuts. Our marketing strategies are based on the quality and freshness of the products and/or their health giving properties. We sell from the "ranch", from markets, by order, and by e-commerce through our website which has become an exciting part of the business.