

Hazelnut Fertilization

Part 2

Soil Sampling and Pre-Plant Fertilization

Outline

Part 1 - Why Hazelnuts,

- Site Selection
- Site Layout
- Site Preparation
- Planting

Part 2 - Soil Sampling and pre-plant fertilization

Part 3 - Maintenance and Care

- Watering
- Weed control
- Pest control

Part 4 - Maintenance Fertilization

Part 5 – Harvest and Processing

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- The best hazelnuts grow on fertile soil.
- Unlike with annual crops, for which soil may be tilled annually, once hazelnuts are established it will be very difficult to incorporate fertilizers and other soil amendments.
- Thus it is essential that potential soil deficiencies, especially of nutrients that are immobile in the soil, such as phosphorus and potassium, be identified and corrected before hazelnuts are planted.

Hazelnut Fertilization

- Whereas phosphorus and potassium are immobile in the soil, nitrogen is extremely mobile, and can be lost from the soil very quickly.
- Nitrogen fertilizer should only be applied
 - in quantities that the plant can take up,
 - When the plant is able to take it up
 - In locations where the plant can get to it.
- Otherwise nitrogen becomes a pollutant.

Two Phases for Hazelnut Fertilization

1. Establishment phase:

- Recommendations for immobile nutrients such as P and K are based on soil test results.
- Recommendations for N are based on size of plant and increase as the plant grows.

2. Production phase:

Recommendations are based on:

- Observations of plant growth or vigor
- Leaf analysis
- Yield

Soil Sampling Methods Are Critical!

The soil sample has to represent the field.



Photo Kevin Schoessow UWEX

How to collect a soil sample

- For pre-planting sampling, collect from 10 to 20 spots in your field, in a grid or Z pattern.
- For established perennial plantings, collect from within the hazelnut's rooting zone, near the “drip line” of the bush.
- Sample to 12 inches depth for woody perennials.
- Collect an even column for the full depth.



Photo Kevin Schoessow UWEX

How to collect a soil sample

- Avoid small areas that are not typical of the whole field, such as lime or manure piles, fences or roads, previous fertilizer bands, eroded knolls or low spots.
- Collect separate samples for areas of the field which are different.



How to collect a soil sample

- After collecting, mix the cores from that area well and put a 2-cup composite into the sample bag and label it clearly.
- When you fill out the submissions sheet, be sure to identify the field and sample numbers with names that you will remember, or make a map to remind yourself.



Photo Kevin Schoessow UWEX

Note that no fertilization recommendations have yet been developed for hazelnuts in the Upper Midwest. Therefore, you will have to substitute a similar crop on the submission sheet.

- Apples and grapes are decent approximations.**
- Blueberries may also be used except for pH recommendations.**

Liming

- Hazelnuts can tolerate soil pH from 5.0 to 7.0.
- Apply lime if pH is below 5.6, using rates recommended based on your soil's buffering capacity.
- Use dolomitic lime to supply magnesium if soils test lower than 100 ppm magnesium.
- Incorporate lime into the soil as deeply as possible.
- Apply lime at least several weeks before planting.

Phosphorus for New Hazelnut Plantings

P deficiency has not been observed in hazelnuts in Oregon. Thus these recommendations are based on recommendations for apples, blueberries and grapes in Minnesota. *

| Bray-P (ppm) | Olsen-P (ppm) | | P to apply (lbs/acre) |
|-------------------------|--------------------------|----|----------------------------------|
| 0 – 10 | 0 - 7 | VL | 100 - 150 |
| 11 – 20 | 8 - 15 | L | 75 - 125 |
| 21 – 30 | 16 - 25 | ML | 50 - 100 |
| 31 – 40 | 26 - 33 | M | 25 - 75 |
| 41 – 50 | 34 – 41 | H | 0 - 50 |
| 51 + | 42 + | VH | 0 - 25 |

- Incorporate P before planting.
- To economize, P may be applied in bands to just the planting row, but keep in mind that hazelnuts roots may eventually span the entire row of 10 to 15 feet.

* Rosen and Eliason, Nutrient Management for Commercial Fruit and Vegetable Crops in Minnesota.

Potassium for New Hazelnut Plantings

These recommendations are slightly modified from those for hazelnuts in Oregon. *

They have not been tested in the Midwest, where the recommendations for other woody crops are lower for low soil-test levels, but higher for high soil-test levels.

| Soil test K (ppm) | | K to apply (lbs/acre) |
|-------------------|---|-----------------------|
| 0 - 75 | L | 300 - 400 |
| 75 - 150 | M | 200 - 300 |
| 150 + | H | 0 - 100 |

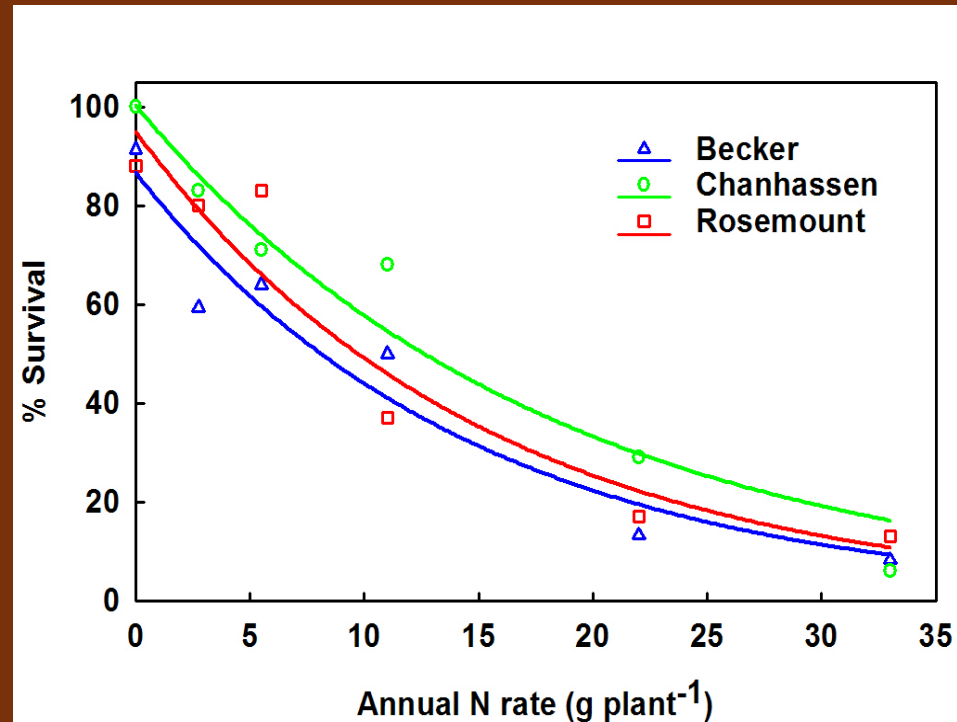
- Incorporate K well before planting, especially if using KCl (muriate of potash) which can burn roots if too concentrated. K_2SO_4 (potassium sulfate) is preferred.
- To economize, K may be applied in bands to just the planting row, but keep in mind that hazelnuts roots may eventually span the entire row of 10 to 15 feet.

*Olsen, 2000. Hazelnut Nutrient Management Guide, Oregon State University Extension Service.

Nitrogen for New Hazelnut Plantings

- Some N fertilizers can burn, or even kill new transplants, so it is best not to apply any at all at planting.

Survival in response to N applications to new transplants. →
Ouch!



Survival was negatively correlated with N rate at all sites at $p < 0.002$, $R^2 > 0.91$.

Nitrogen for New Hazelnut Plantings

- Some N fertilizers can burn, or even kill new transplants, so it is best not to apply any at all at planting.
- N requirements in first year are so low that they can easily be supplied from the soil for the first year after planting, unless soil organic matter is less than 3%.

2 year old seedling →



Nitrogen for New Hazelnut Plantings

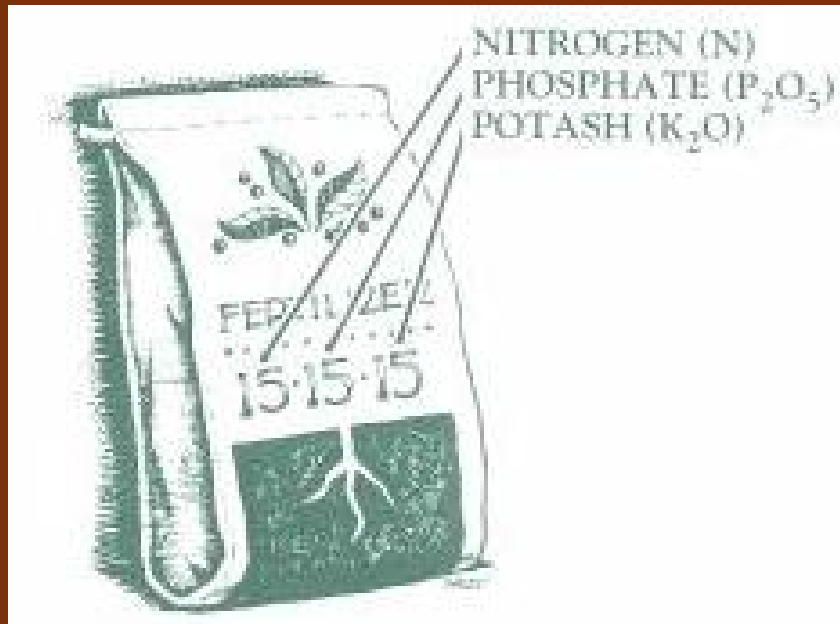
- N requirements in first year are so low that they can easily be supplied from the soil for the first year after planting, unless soil organic matter is less than 3%.
- Some N fertilizers can burn, or even kill new transplants, so it is best not to apply any at all at planting.
- Starting in their second or third year, apply N in proportion to size of bush.

Nitrogen for New Hazelnut Plantings

| Age of plants | N to apply | |
|------------------------|----------------------------------|----------------------------------|
| | oz per cubic yard of bush volume | g per cubic meter of bush volume |
| 1 (establishment year) | 0 | 0 |
| 2 | 0 – 1/8 oz | 0 – 5 g |
| 3 | 0 – ¼ oz | 0 – 9 g |

- For large plantings measure several bushes and average them; multiply the amount needed per bush by number of plants per acre to get N application rate per acre.
- If soil organic matter exceeds 4.5%, no N is needed.

Fertilizer Grade or Analysis



A certified fertilizer will always have three numbers listing its percentage of nutrients

Kevin Schoessow UWEX

Calculation of How much fertilizer to buy and use Example A: Home Landscape Trees

| | N | P | K | Fertilizer to Apply (lbs/100 sq feet) |
|--|---|-------------------------------------|--------------------------------------|---|
| Amount required (lbs/100 sq ft) | 0 | 0.1 lbs | 0.05 lbs | |
| Ratio required | 0 | 2 | 1 | |
| Analysis of P source (rock phosphate) | 0 | 5 % | 0 | |
| Rock phosphate needed | 0 | 2 lbs fertilizer @ 5% P = 0.1 lbs P | | Apply 2 lbs rock phosphate |
| Analysis of K source (K ₂ SO ₄) (potassium sulfate) | 0 | 0 | 50 % | |
| Potassium sulfate needed | 0 | 0 | 0.1 lbs fertilizer @ 50% = 0.05 lb K | Apply 0.1 lb K ₂ SO ₄ |

Note that these recommendations are for landscape trees, not for hazelnuts specifically.

Take-Home Points

- The nutrient requirements of hazelnuts, especially young hazelnuts, are low relative to annual crops.
- New plantings should not need any nitrogen fertilizer for their first year, except on extremely low organic matter soils.
- It is very important to do a soil test before planting and to amend the soil with immobile nutrients , especially phosphorus and potassium, that may be lacking.