

# Hazelnut Breeding and Research at the Grimo Farm



Ernie Grimo &  
Linda Grimo



# JUSTIFICATION FOR BREEDING HAZELNUTS IN ONTARIO

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- Canada imports \$80 million in hazelnuts/yr.
- This requires 26,000 ha
- Ontario has 3.6 million Ha of arable land
- **Current selections have climatic limitations**
- **Difficult to find funding to support breeding**

# Grimo Breeding Objectives

1. Eastern Filbert Blight resistance
2. Hardiness for zone 5, possibly zone 4
3. Precociousness
4. Tree vigor
5. Bud mite resistance
6. Free husking
7. Low blank percentage
8. Nut qualities
9. Flavour profile



# Breeding Parent Selections

**‘Gamma’** was selected as a main parent to pair with each of the others for a number of reasons:

- Hardy for zone 6b
- Vigorous
- Productive in Ontario
- Good blight resistance
- Good bud mite resistance
- Early September ripening
- Nuts are medium size, round and thin shelled
- 47-48% kernel, highest in Ontario for 2018



## **‘Aldara’** is a seedling of the *C. heterophylla* hybrid

- Hardiness for zone 5 or colder
- Blight resistance
- Precocity
- Medium size and round nuts
- Nut drop, late August to early September
- Nut fill in 2018, 43%



## **‘*C. heterophylla* hybrid’**

- Hardiness
- Regular seasonal production
- Drops free from the husk
- Nuts ripen in late August
- Blight & bud mite resistance
- It is the female parent of 4 Grimo selections



**‘Northern Blais’** is a seedling of *C. heterophylla* hybrid.

- The tree was hardy in Quebec, zone 4b
- It is blight resistant
- The tree is productive and vigorous
- Nut size is medium with a round shape



**‘Cheryl’** is a ‘Rush’ x ‘Kentish Cob’ hybrid from Geneva NY breeding project.

- Blight resistance
- Nut size
- Annual high production
- Tree vigor
- The nuts are 40% kernel



**‘Gibson S15’** -thought to be a seedling of *C. heterophylla* hyb.

- It is hardy in Minnesota zone 4b
- It was selected for blight resistance
- Nuts are round and medium size



Lower 'Gamma', Upper Gibson S15 breeding

# METHOD

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- Selected plants were pot grown to flowering stage
- In November pairs were stacked & tied together
- Catkins were not removed
- Self incompatible





Hazelnut matched pair enclosed & sealed

- The pairs were covered with a pallet cover.
- Stretch wrap around the lower pot to seal them.
- Stored in cold but above freezing temperature .



# Tools & Procedure for pollinizing

- Use an air compressor with an air gun
- Fill compressor in pollen-free area.
- Assure females are receptive, and catkins are shedding.
- Make a small hole.
- Gently move air inside plastic to spread pollen both ways.
- Repeat every few days for 2 weeks



Air nozzle gun will move air and pollen to stigmas of both trees.



Portable air compressor

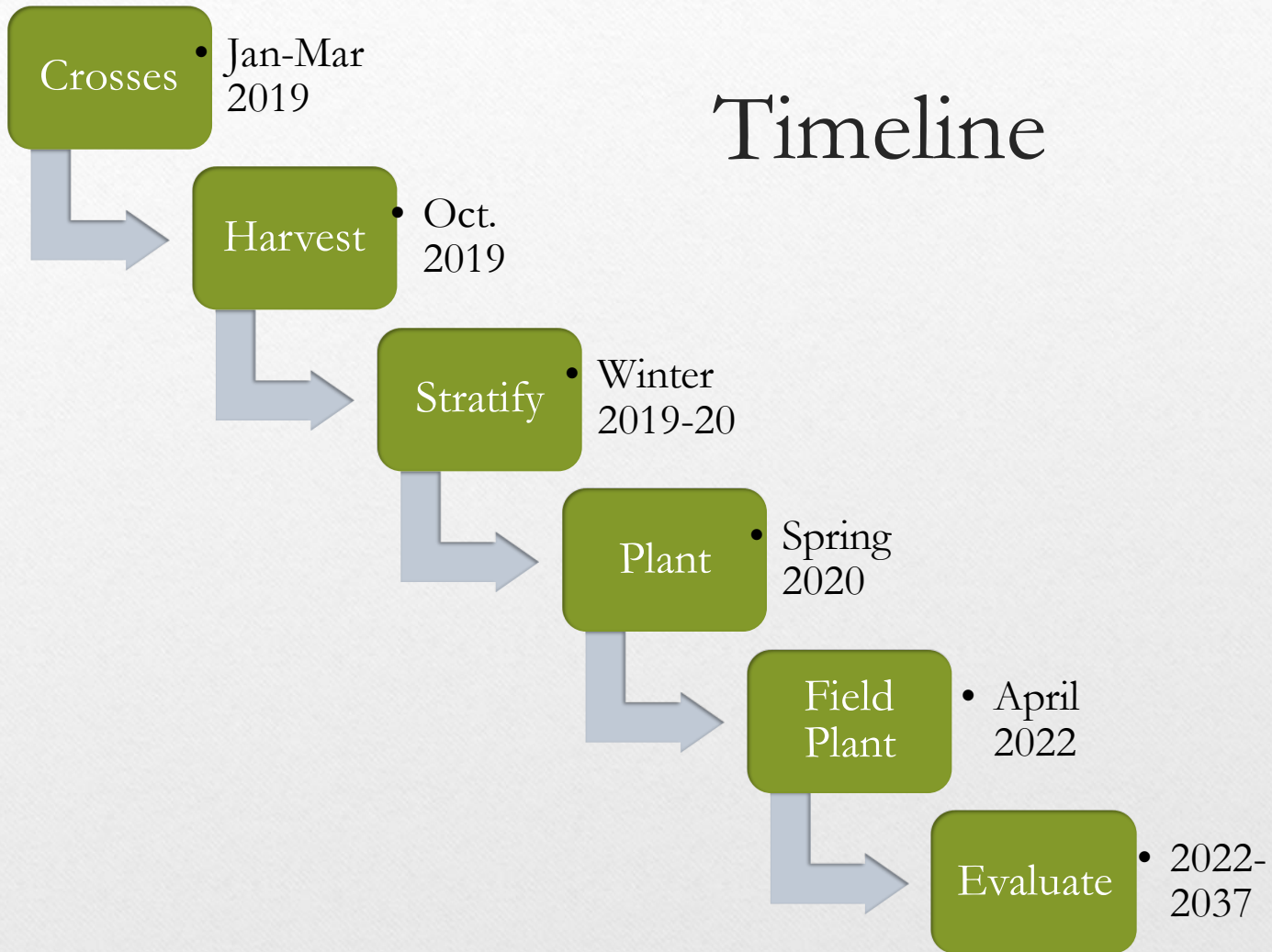
# Bloom & Pollination

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# Timeline



# Grimo Research

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Pollination & Phenology

Alleles

Yields

Percentage Kernel



# Disclaimer

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- It should be noted that these results are found at the Niagara-on-the-Lake Grimo orchard and not replicated elsewhere at this time.
- Results can vary by region based on climate, soil type, fertigation and other factors.
- These findings are to illustrate the importance of continued breeding and selection for Ontario cultivars.
- And... to assist growers in proper tree selection.

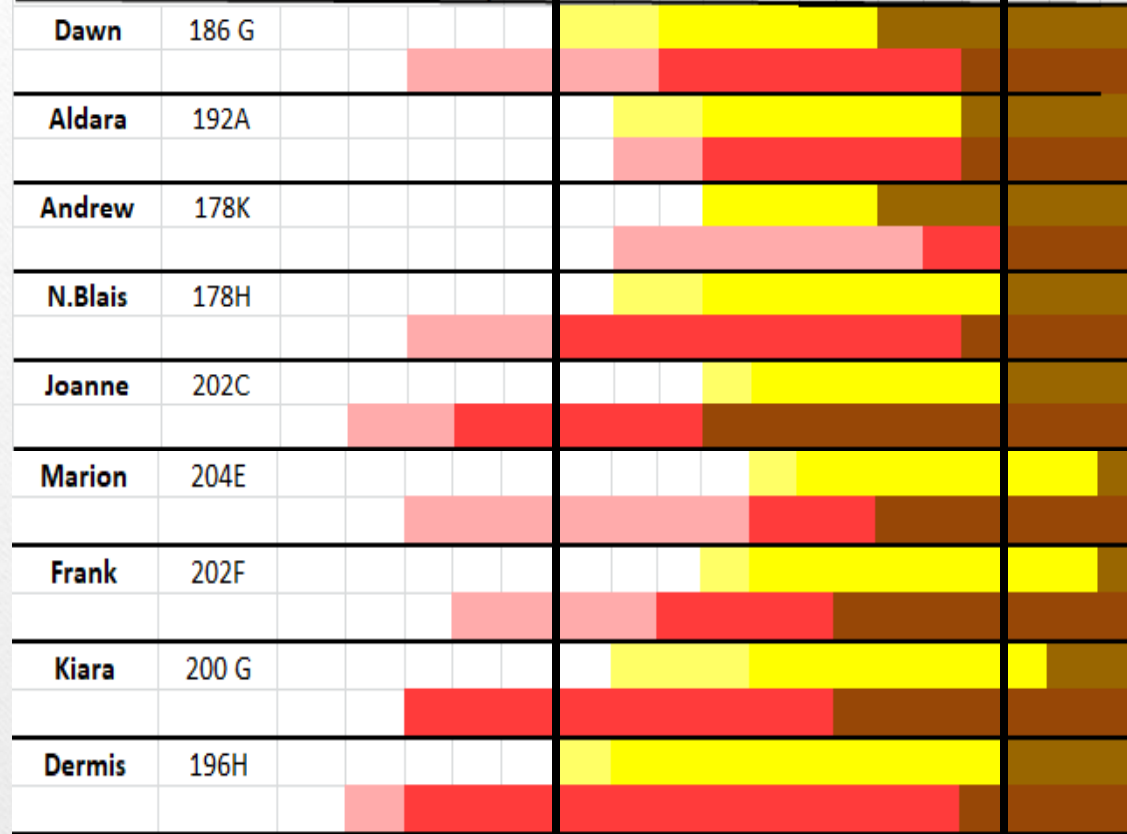
# Pollination & Phenology

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**NORTHERN HAZEL HYBRIDS (ZONE 4b-7)**



Top row (yellow) for each cultivar indicates pollinizing period.

Lower row, pink to red indicates female receptivity period.

Dates when pollinization occurs can vary annually.

In February 2018 we had a warm spell that encouraged the females to begin blooming.

Fortunately the catkins did not elongate until March.

Most pollination took place within a 4 week window.

### Pollination Periods in the Grimo Orchard

Early	Mid-season	Late
Slate	Gamma	Jefferson
Norfolk	Gene	Cheryl
Matt	Alex	Linda
Farris G17	Norfolk	Carmela
Dawn	Farris G17	Aldara
	Aldara	N. Blais
	Dawn	Joanne
	Andrew	Marion
	Kiara	Frank
	Dermis	Kiara
		Dermis

Note that some selections span 2 seasons



# S-Alleles

S-Alleles	Cultivar Name
POL JEFF GENE & SLATE	Alex
<u>23</u> <u>25</u>	Carmela
<u>1</u> 20	Chelsea
<u>10</u> <u>12</u>	Cheryl
<u>2</u> <u>10</u>	Gamma
<u>15</u> 23	Gene
<u>1</u> 3	Jefferson
<u>14</u> 23	Linda
11 13	Matt
<u>12</u> 25	Norfolk
<u>1</u> 23	Slate
<u>8</u> 26	Yamhill
25 27	Aldara
POL SLATE & JEFFERSON	Andrew
15 27	Dawn
	Dermis
14	Frank
	Kiara
<u>14</u> 25	Marion
	N. Blais

# Yields – Northern Hardy

Not accurate yield as trees cut for allele testing

CULTIVAR	YEAR	2018	2017	2016	2015	2014	2013	AVERAGE
<b>ASIAN/QUEBEC SOURCE</b>								
NORTHERN BLAIS	2012	5.75	SEED	1.43	SEED	0.25	0.90	2.69
ANDREW L	2008	1.40	SEED	0.95	SEED	1.60	1.50	1.28
DAWN (HET 2) L	2008	16.30	9.35	8.95	14.00	12.70	5.60	13.38
ALDARA L	2008	7.75	5.47	2.55	SEED	4.40	2.80	4.59
<b>SASKATCHEWAN SOURCE</b>								
MARION ORTET	2001	5.60	5.52	3.50	SEED	1.95	3.60	4.03
KIARA ORTET	2001	11.00	9.70	5.80	SEED	3.45	2.45	6.48
JOANNE ORTET	2001	3.30	2.70	4.40	1.90	0.85	4.80	2.99
FRANK (ORTET)	2001	7.75	2.87	2.95	1.30	1.90	4.65	3.57
JULIA (ORTET)	2001	5.60	5.20	7.35	SEED	8.60	5.20	4.02
<b>SKINNER SEEDLING SOURCE</b>								
DERMIS (ORTET)	1997	20.50	22.25	13.70	8.40	13.70	15.05	15.60
DERMIS L	2013	8.80	3.10					5.95



How should yield be measured...by tree, by acre, or by cubic foot?

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Tree spacing and density vary therefore measuring yield by acre is not accurate.

- Alex type = 18 x 18ft
- Slate type = 18 x 15ft
- Northern types = 15 x 12ft

**THREE YEAR EXTRAPOLATED REPORT ON SELECTED HAZELS IN GRIMO ORCHARD 2016-18**

CULTIVAR	YEAR	3 YR AVER.	RADIUS	LB/FT <sup>2</sup>	LB/70%A	POLLINIZER
	PLANTED	LBS	FEET			RATING 2018
<b>ASIAN/QUEBEC SOURCE</b>						
NORTHERN BLAIS	2012	★ 3.59	4	0.071	2178	FAIR
DAWN (HET 2) L	2008	11.53	6	0.102	3109	FAIR
ALDARA L (3 TREES)	2008	4.77	5	0.061	1852	FAIR
HETEROPHYLLA SDG	2005	8.63	5	0.110	3350	GOOD
<b>SASKATCHEWAN SOURCE</b>						
MARION ORTET	2001	4.87	4.5	0.077	2334	POOR
KIARA ORTET	2001	8.83	4.5	0.139	4232	GOOD
JOANNE ORTET	2001	3.47	4	0.069	2105	POOR
FRANK (ORTET)	2001	4.52	6.5	0.034	1038	GOOD
JULIA (ORTET)	2001	6.05	5	0.077	2349	GOOD
<b>SKINNER SEEDLING SOURCE</b>						
DERMIS (ORTET)	1997	18.82	10	0.060	1827	GOOD
DERMIS L (2 TREES)	2013	5.79	5	0.074	2248	GOOD



# Cultivar Characteristics





# Cold Hardy Cultivars





# Kernel Percentage

CULTIVAR	RATE 1-6	# of nuts	weight	kernel wt	%FILL
NORTHERN BLAIS		10	28.18	9.75	34.59
ANDREW		10	36.36	11.19	30.63
DAWN		10	17.95	8.26	46.01
ALDARA		10	22.46	9.85	43.85
JOANNE		10	22.13	8.08	39.22
MARION		10	33.01	12.21	36.98
DERMIS		10	27.05	10.19	37.67
FRANK		10	26.9	10.73	39.88
KIARA (2017)		8	16.67	6.15	36.89

# Culmination of Data

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- Ernie created a guide to help growers to know how to layout their fields.
  - Phenology – placing trees near each other to maximize pollen timing
  - S-Alleles – placing trees adjacent to each other that are compatible
  - Pollination – ensuring an abundance of pollen sources in each orchard



# What is next at the Grimo farm?

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- New Crosses
  - Repeat in 2019/2020
- Compare phenology across different climate zones in Ontario





Questions?  
[nut.trees@grimonut.com](mailto:nut.trees@grimonut.com)