Hazelnut Breeding and Research at the Grimo Farm

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Grimo Nut Nursery

JUSTIFICATION FOR BREEDING HAZELNUTS IN ONTARIO

- 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**
- **SASK. & MN sources are untested**
- **Government funding is reluctant to support breeding**

Grimo Breeding Objectives

1. Hardiness for zone 5, possibly zone 4
2. Precociousness
3. Tree vigor
4. Eastern Filbert Blight resistance
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

‘C. heterophylla hybrid’

- Hardy in Quebec, possibly zone 4
- 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

‘**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% kernel

'Northern Blais' is a seedling of C. heterophylla hybrid.

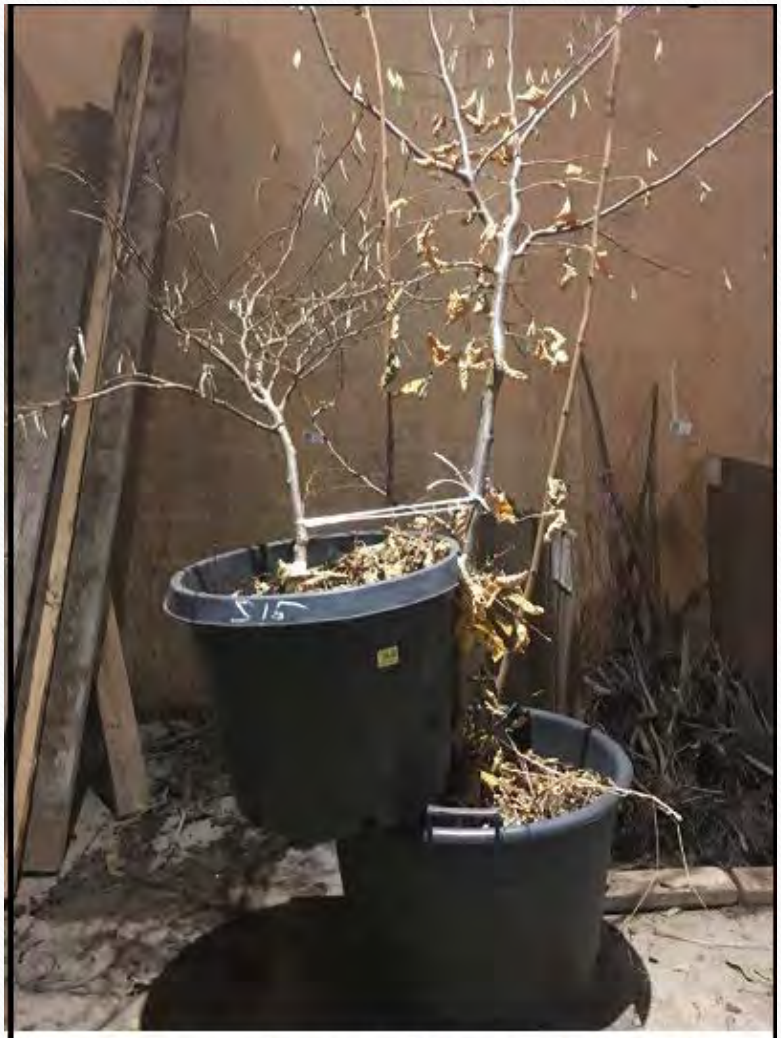
- The tree was hardy in Quebec, zone 4b
- It is blight resistant
- The tree is productive and vigorous
- Nut size is medium with a round shape

'Gibson S15' -thought to be a seedling of C. heterophylla hyb.

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

'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



Lower 'Gamma', Upper Gibson S15 breeding

METHOD

- 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

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

- Use an air compressor with an air gun.
- Assure females are receptive, and catkins are shedding.
- Make a small hole.
- Gently move air inside plastic to spread pollen both ways.
- Repeat every 3-4 days for 3-4 weeks

Portable air compressor

Bloom & Pollination

Spring 2019

- Mid-April 2019, remove plastic.
- Place potted trees on dripline for the season.
- Harvest nuts when they are brown and free.
- Count, bag in plastic & tag.
- Mix fresh hazels with wet peat moss.
- Store in refrigerator at 3-4°C until planted in the following spring.

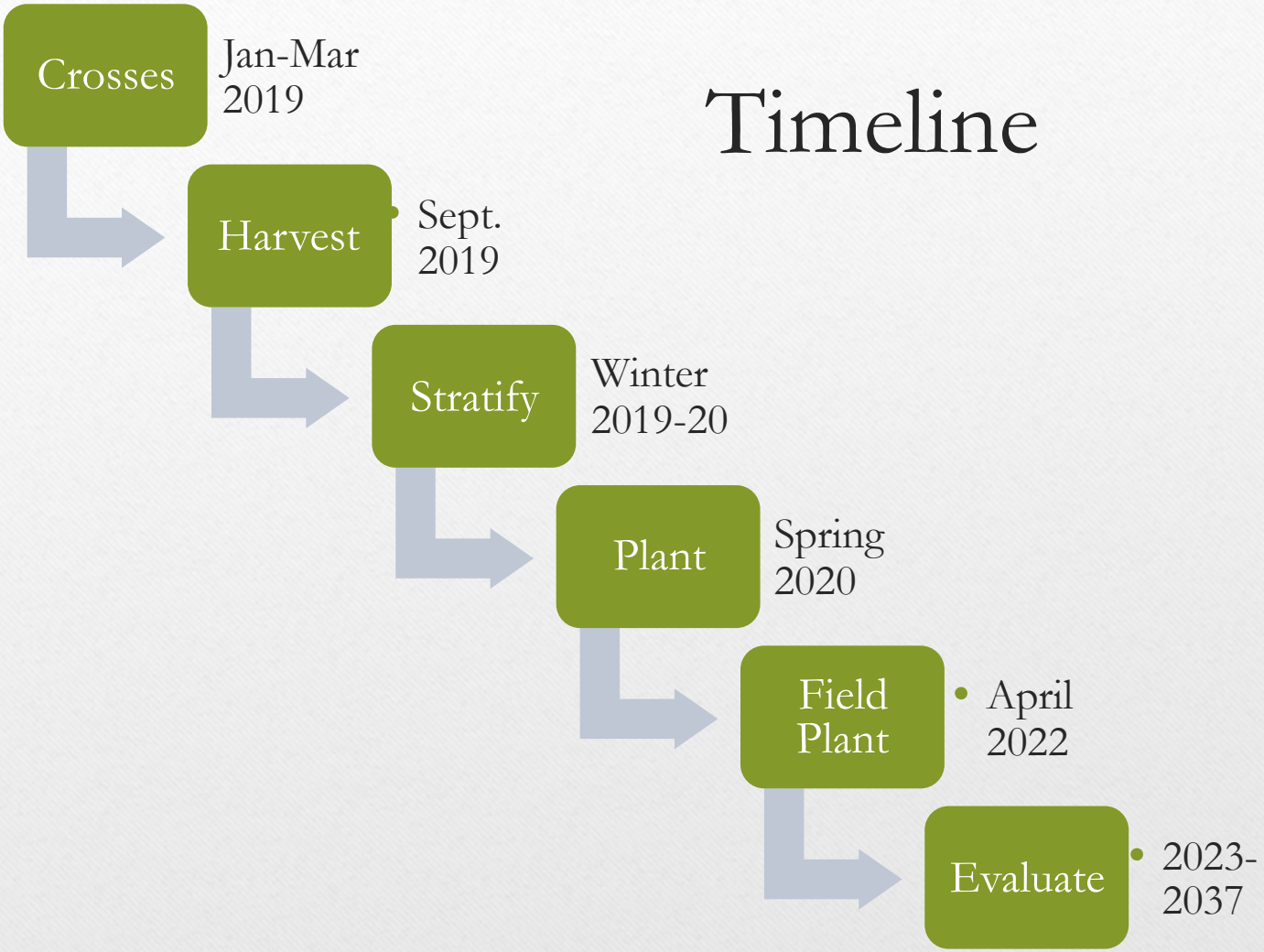
Growing the Seedling Crosses

- Plant seed, May of 2020.
- Cover seed rows with hoops of chicken wire.
- Uncover in July 2020 when all are sprouted.
- Count or estimate numbers of each cross.
- Allow 2 year's growth.
- Solicit and contract potential growers.
- Spring of 2022 dig trees, grade and count.
- Distribute trees to contracted growers at n/c.

Grower Contract Terms

- Plant the trees at the grower's expense.
- Space & manage the trees using good practice.
- Harvest trees individually & evaluate annually.
- Report best tree results & forward to Grimo.
- Grower owns the crop, Grimo owns rights to the best germplasm.
- Grower must supply layers to Grimo when requested for further testing and evaluation.

Timeline

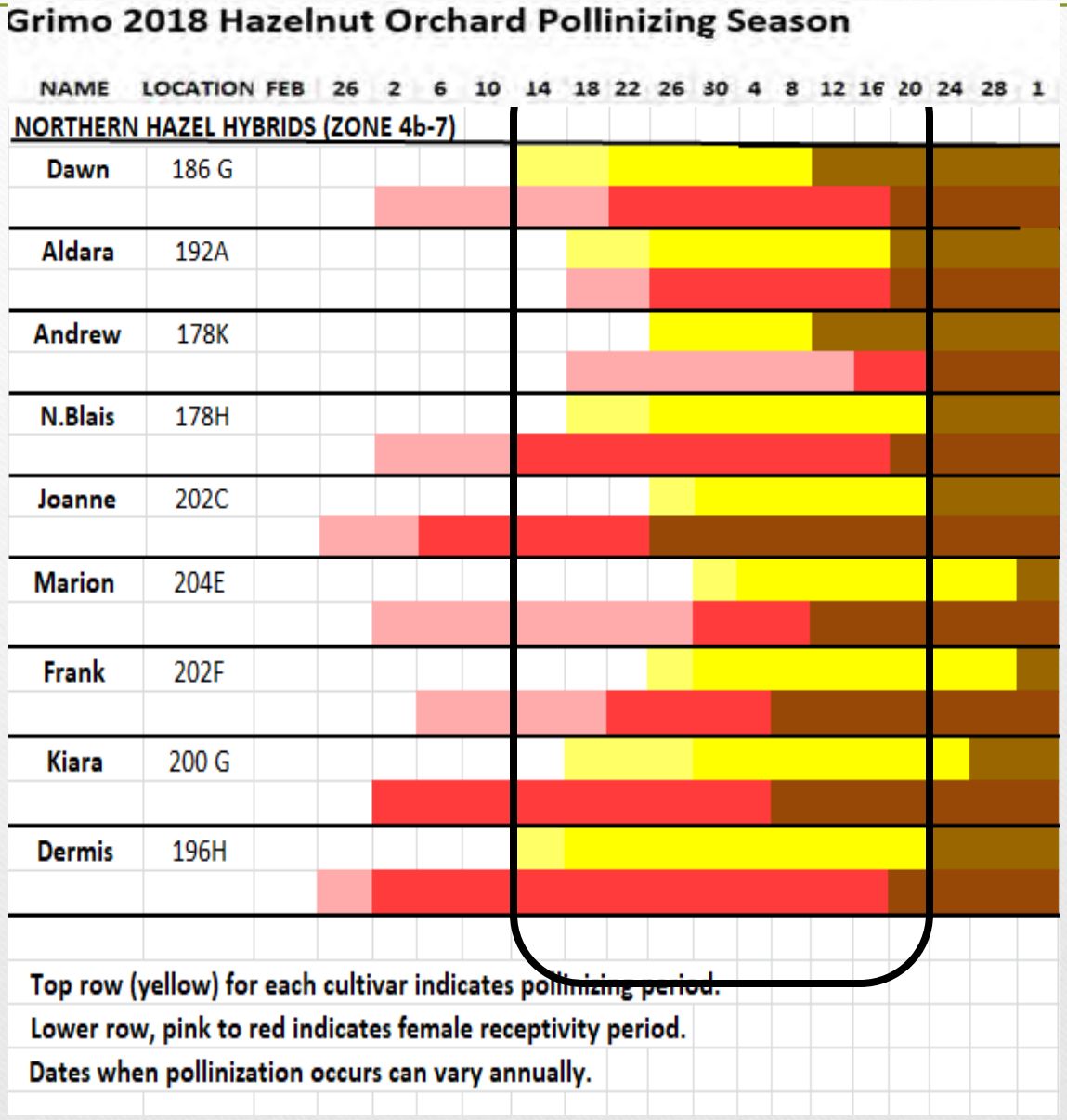

Crosses
Jan-Mar 2019
Harvest
Sept. 2019
Stratify
Winter 2019-20
Plant
Spring 2020
Field Plant
April 2022
Evaluate
2023-2037

Grimo Research

Pollination & Phenology
Alleles
Yields
Percentage Kernel

Pollination & Phenology

Grimo 2018 Hazelnut Orchard Pollinizing Season

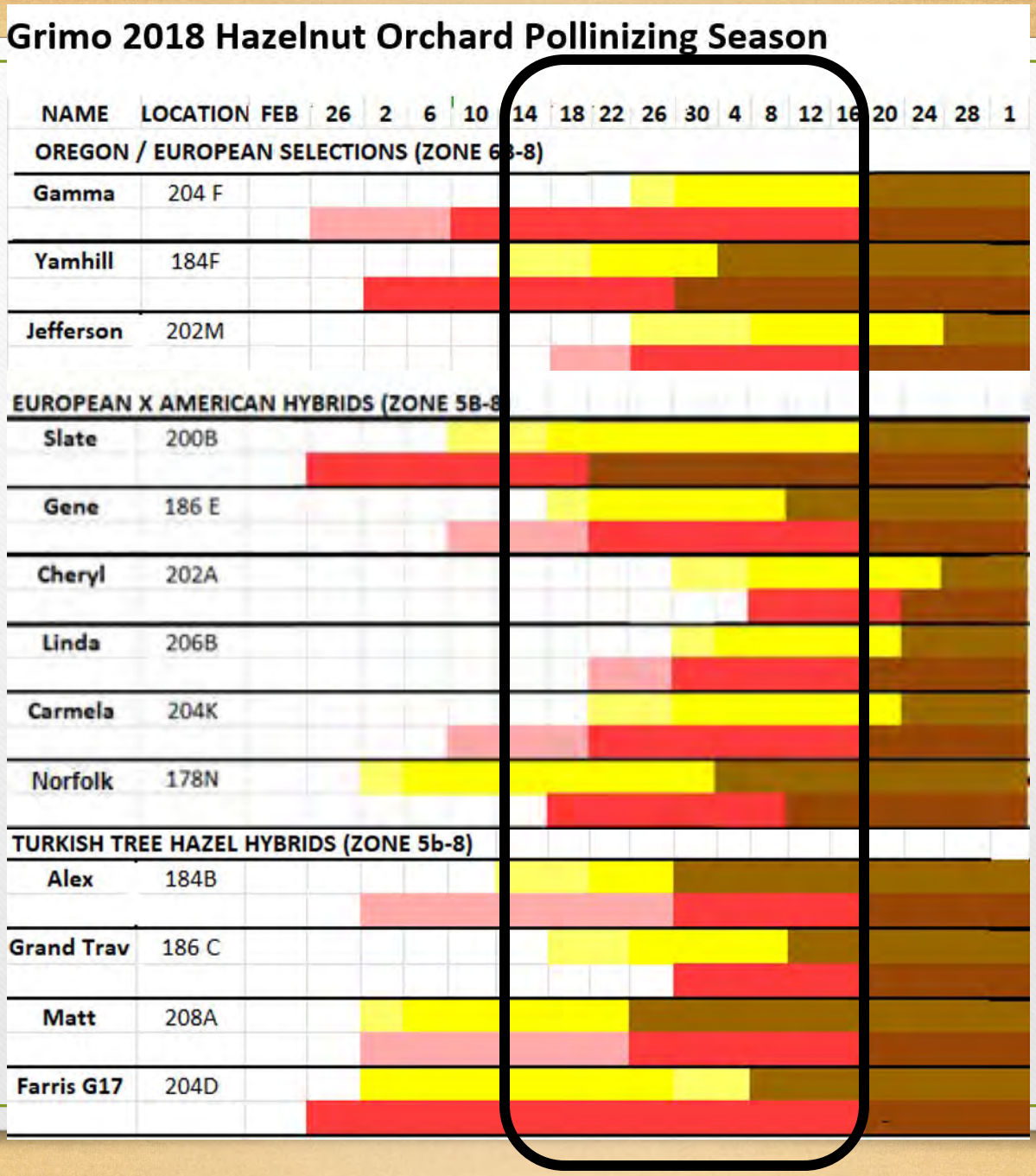


In February 2018 we had a warm spell that encouraged the females to begin blooming.

Fortunately the catkins did not elongate until March.

Most pollination took place within a 4 week window.

Grimo 2018 Hazelnut Orchard Pollinizing Season



Pollination Periods in the Grimo Orchard		
Early	Mid-season	Late
Slate	Gamma	Jefferson
Matt	Gene	Cheryl
Dawn	Dawn	Linda
Norfolk	Norfolk	Carmela
Farris G17	Farris G17	Northern Blais
	Alex	Frank
	Andrew	Joanne
		Marion
	Aldara	Aldara
	Kiara	Kiara
	Dermis	Dermis
Note that some selections span 2 seasons		

S-Alleles

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

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

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

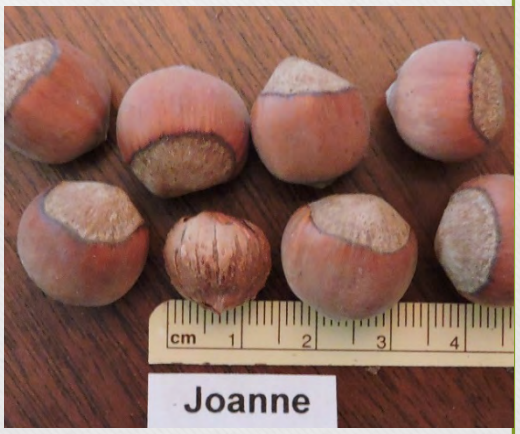
- Yamhill type = 18 x18ft
- Slate type = 18 x 15ft
- Northern types = 14 x 12ft

THREE YEAR PRODUCTION ON SELECTED HAZELS IN GRIMO ORCHARD 2016-18 BY SPACING AND BY AREA

CULTIVAR	PLANTED YEAR	3 YR AVER. POUNDS	LB/A @ 270/A	RADIUS (AVER.)	LB/FT² (LB/Πr²)	LB/70% A
GAMMA L (2 TREES)	2010	7.96	2150	6.75	0.056	1696
ASIAN/QUEBEC SOURCE						
DAWN (HET 2) L	2008	11.53	3100	6	0.102	3109
ALDARA L (3 TREES)	2008	4.77	1300	5	0.061	1852
HETEROPHYLLA SDG	2005	8.63	2330	5	0.110	3350
SASKATCHEWAN SOURCE						
MARION (ORTET	2001	4.87	1300	4.5	0.077	2334
KIARA (ORTET)	2001	8.83	2380	4.5	0.139	4232
JOANNE (ORTET)	2001	3.47	940	4	0.069	2105
FRANK (ORTET)	2001	4.52	1220	6.5	0.034	1038
SKINNER SEEDLING SOURCE						
DERMIS (ORTET)	1997	18.82	5080	10	0.060	1827
DERMIS L (2 TREES)	2013	5.79	1560	5	0.074	2248
GENEVA SOURCE AMERICAN x EUROPEAN HAZEL HYBRID						
GENE L (3 TREES)	2003	9.32	2500	8	0.046	1413
SLATE L (6 TREES)	2004	10.52	2840	6.8	0.072	2195
ORIGINAL SLATE L	1977	14.20	3800	9	0.056	1708
FAROKA SEEDLING SOURCE TURKISH TREE HAZEL HYBRID						
ALEX L (5 TREES)	2004	9.28	2500	7.4	0.054	1647

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

Summary of Data

We 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?

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

Questions?

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