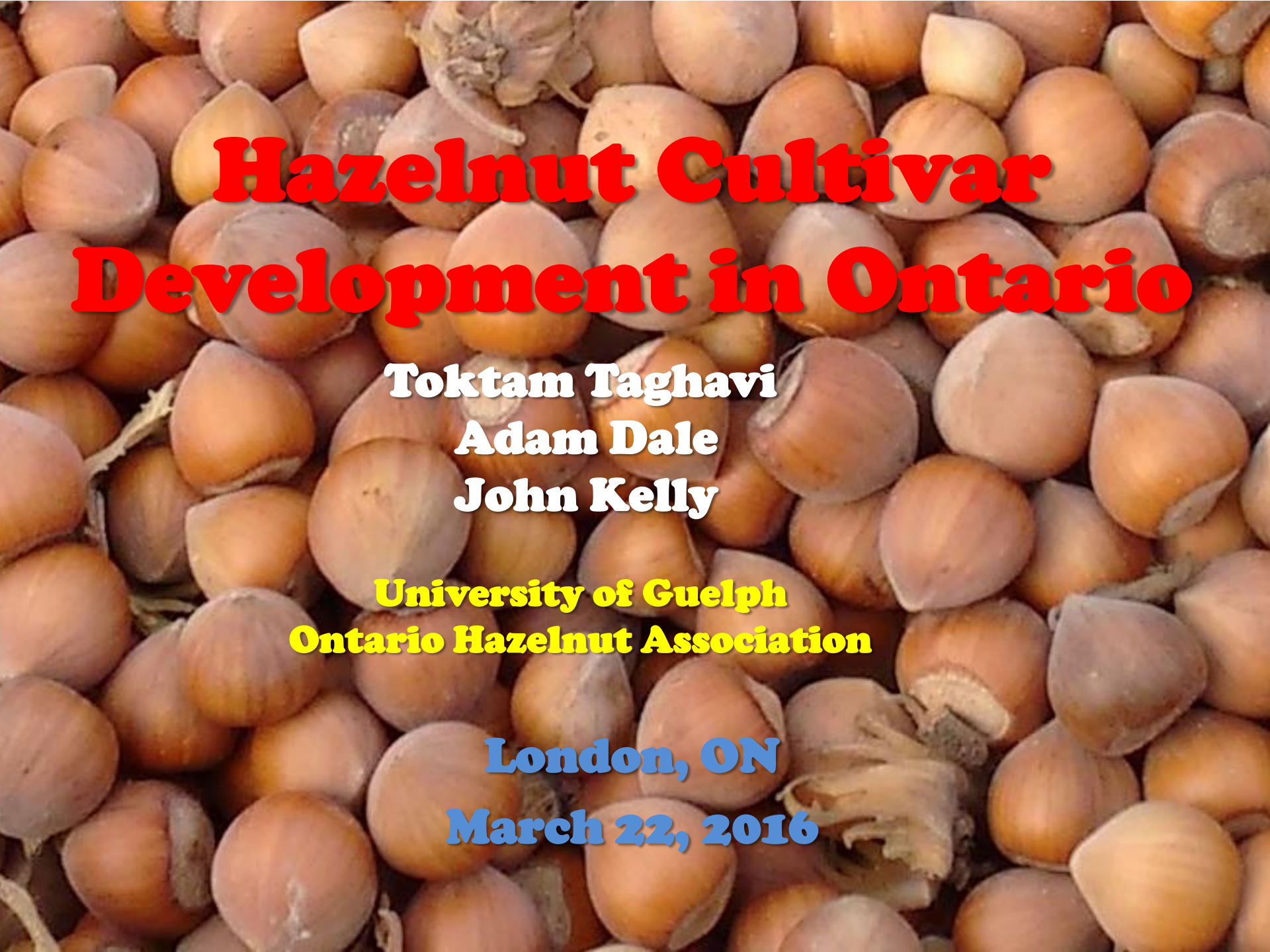


The background of the entire slide is a close-up photograph of many hazelnuts. The nuts are light brown to tan in color, with some showing the characteristic triangular shape and others showing the stem scar. They are piled together, creating a textured, organic background.

Hazelnut Cultivar Development in Ontario

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**London, ON
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Cultivar Trials

- Goal: Introduce cultivars adapted to Ontario
- Selection criteria
 - Yield
 - Spring, Winter damage
 - EFB resistant
 - Pollination
- Recommended list



Cultivar Trials

2008 and 2009 Simcoe

- 10 and 13 hazelnut varieties from different sources and geographic origins
- Replicated planting
 - 12 trees/variety
 - Except Sacajewa; only 2 replicates
- Measures taken of
 - yield
 - Catkin and tree survival
 - Phenology (flowering stages)

Cultivar Trial – North field

Planted 2008

Cultivar	Size	Yield (kg/tree)						
		2010	2011	2012	2013	2014	2015	Total
Butler	5 ft	.042	0.8	2.0	2.8	0.8	3.0	9.5
Gene	4 ft	.024	1.3	2.2	2.7	0.5	2.6	9.4
Grimo 186M	4 ft	0.04	0.3	1.3	2.9	0.8	2.3	7.6
C-16	1 ft	.016	0.5	0.9	2.0	1.0	1.8	6.2
C-28	1ft	.016	0.2	0.7	2.0	0.4	2.2	5.6
C-409	1ft	0	0	0.4	1.8	0.2	1.4	3.9
Lewis	3ft	.018	0.2	0.1	2.6	0	0.1	3.1
Jemtegaard	5 ft	.007	0.3	0.7	0.9	0.6	0.3	2.9
Clark	3ft	.021	0.2	0.6	1.8	0	0.1	2.7

Cultivar Trial: South field

Planted 2009

Cultivar	Yield (kg/tree)					Total
	2011	2012	2013	2014	2015	
Gene	0.14	1.12	1.6	0.08	2.1	5.0
Gamma	0.09	0.95	2.8	0.03	0.9	4.8
Jefferson	0	0.41	2.5	0.02	1.2	4.1
Slate	0.34	0.89	0.9	0.40	1.5	4.0
Yamhill	0.06	0.25	2.3	0	0.2	2.8
Santiam	0.05	0.56	1.5	0	0.7	2.8
Hall's Giant	0.03	0.52	1.6	0.05	1.2	3.4
Delta	0.01	0.12	0.5	0	0.6	1.2
G-17	0	0.17	0.3	0	0.6	1.1
Epsilon	0	0.17	0.8	0	0.0	1.0
Barcelona	0.03	0.26	0.2	0	0.2	0.7
Tonda di G	0.01	0.08	0.05	0.02	0.2	0.4
Sacajawea	0.05	0	0	0	0.0	0.0

Catkin Survival (%) –North field

Cultivar	Catkin Survival (%)						Avg
	2009	2010	2011	2012	2013	2014	
Gene	100	90	71	97	100	85	91
C-16	-	93	99	100	95	67	91
C-28	-	97	70	98	98	75	88
Butler	75	81	90	100	92	66	84
Grimo 186M	-	90	67	97	90	67	82
C-409	-	-	-	100	98	44	81
Jemtegaard	95	44	65	99	48	0	59
Barcelona	30	32	45	98	75	7	48
Lewis	25	35	53	70	35	0	36
Clark	30	16	23	74	1	0	24
LSD	40	42	18	22	27	16	

Catkin Survival (%) –South field

Cultivar	Catkin Survival (%)					Avg
	2010	2011	2012	2013	2014	
Gene	96	91	98	96	81	92
Jefferson	-	-	100	95	34	76
Santiam	100	50	95	15	24	57
Slate	61	32	99	84	1	55
Gamma	-	25	100	83	3	53
Yamhill	97	27	3	8	43	36
Hall's Giant	81	90	99	96	52	84
Barcelona	-	-	100	59	5	55
Epsilon	-	25	100	83	0	52
Delta	7	16	64	13	0	20
G-17	-	-	43	4	29	25
Tonda di Giffoni	91	9	24	0	2	25
Sacajewea	-	-	-	-	0	0
LSD	29	31	34	29	44	

Winter hardiness of hazelnut trees in North and South field at Simcoe Research Station after cold winter 2015. Winter hardiness was scored from 0 to 5 (0=dead, 5= no damage).

North field		South field	
Genotype	Winter hardiness	Genotype	Winter hardiness
C16	5	Gamma	5
C28	5	Theta	4.9
Gene	5	Gene	4.7
C409	4.8	Santiam	4.4
Grimo 18	4.8	Hall's Giant	4.2
Butler	4.4	Slate	4.1
Barcelona	3.2	Delta	4.1
Jemtegaard	2.1	G-17	3.9
Clark	1.8	Jefferson	3.4
Lewis	1.7	Epsilon	3.1
LSD	0.5	Barcelona	2.4
		Yamhill	2.1
		Tonda di Giffoni	1.5
		Zeta	0.8
		Sacajewea	0.2
		LSD	0.8



Cumulative percentage of dead hazelnut trees in North and South field at Simcoe Research Station since 2009.

North field		South field				
Genotype	2015	Genotype	2011	2013	2014	2015
C16	0	Gamma	0	0	0	0
C28	0	Gene	0	0	0	0
Gene	0	Santiam	0	0	0	0
C409	0	Hall's Giant	0	0	0	0
Grimo 18	0	Slate	0	0	0	0
Barcelona	0	Yamhill	0	0	0	0
Clark	0	Epsilon	0	0	0	0
Lewis	0	Jefferson	0	0	8	8
Butler	8	G-17	0	0	8	17
Jemtegaard	17	Barcelona	0	0	8	17
		Delta	0	0	25	25
		Tonda di Giffoni	0	8	25	33
		Theta	0	0	42	42
		Zeta	0	0	25	50
		Sacajewea	58	58	67	92

Cultivar Selection Criteria

- Yield
- Disease and pests
 - Eastern Filbert Blight
 - Bud mite
- Environmental Sensitivity
 - Catkin hardiness
 - Winter damage and survivability
- Fruit quality
 - Shape, size

Recommended Provisionally

Cultivar	EFB	Hardiness	Nut shape and size	Markets
Gene	Resistant	Zone 6, 7	Pointed, med	All except Ferrero
Jefferson	Moderately resistant	Zone 7	Round, large	All
C-16	Resistant	Zone 6, 7	Oval, med	All except Ferrero
C-28	Resistant	Zone 6, 7	Oval, large	All except Ferrero
Gamma	Moderately resistant	Zone 6, 7	Round, med	All
Yamhill	Moderately resistant	Zone 7	Round, small	Ferrero
Santiam	Moderately resistant	Zone 6, 7	Round, med	All
Lewis	Moderately Resistant	Zone 7	Round, small	Ferrero
Tonda di Giffoni	Somewhat	Zone 7	Round, med	All

Gene



Jefferson



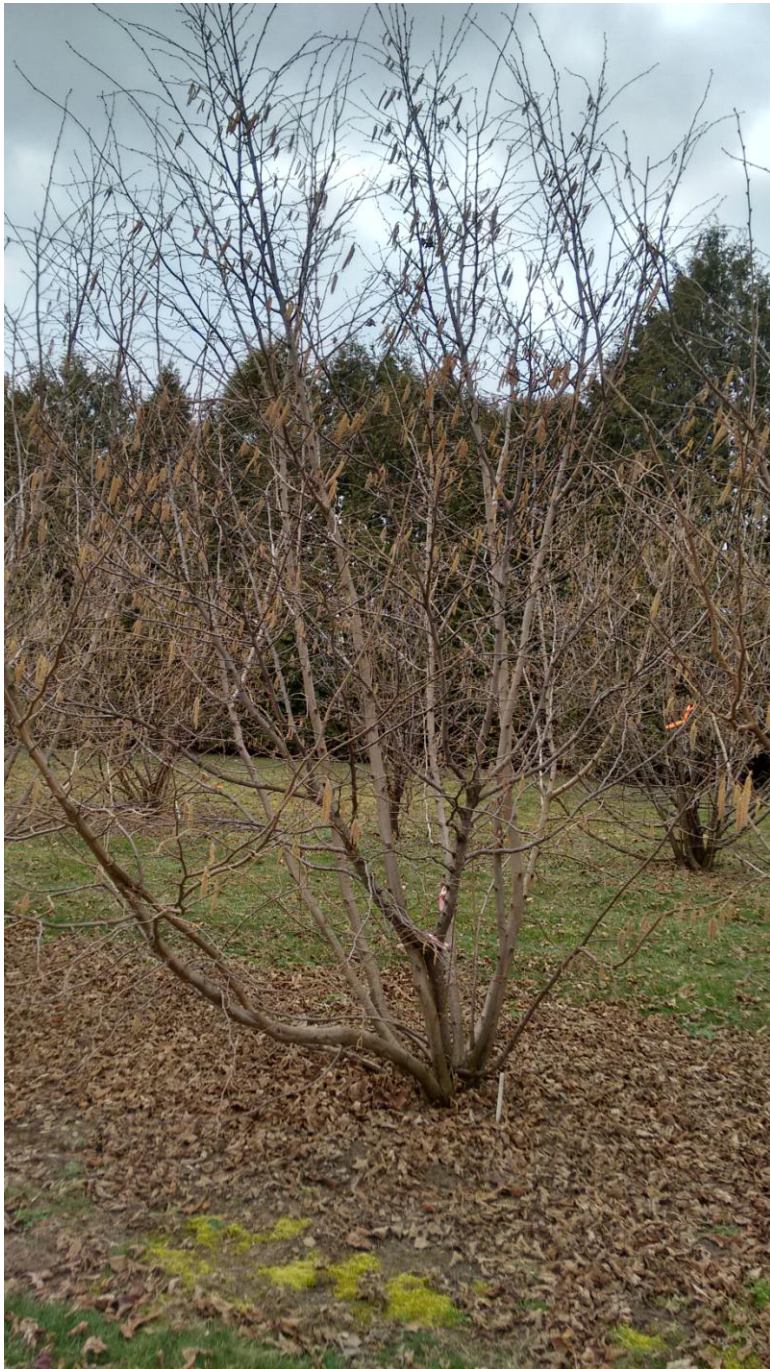
C-16 (Norfolk)



C-28 (Chelsea)



Gamma



Yamhill



Santiam



Lewis

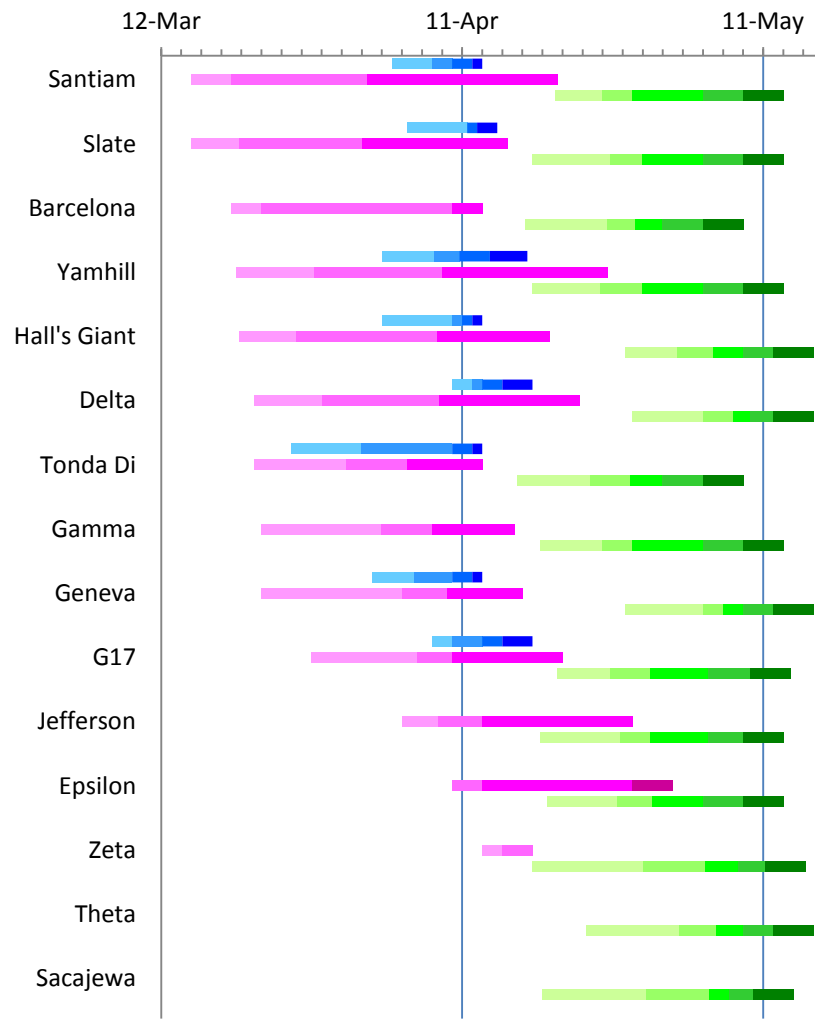
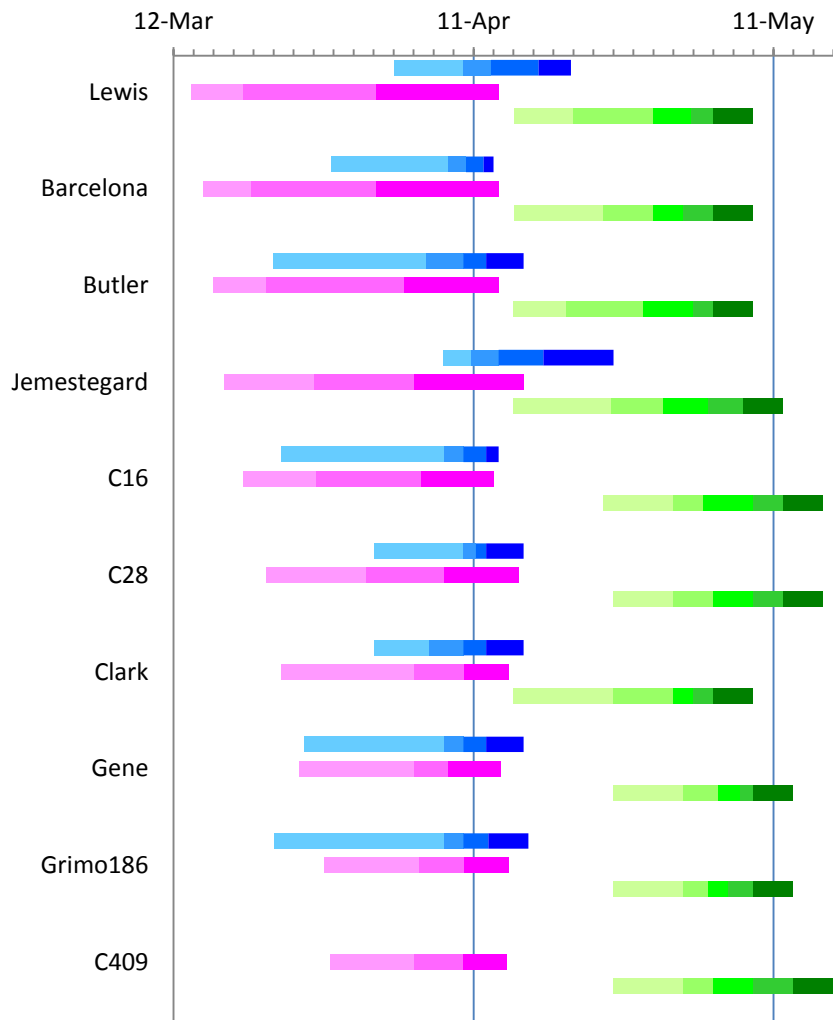
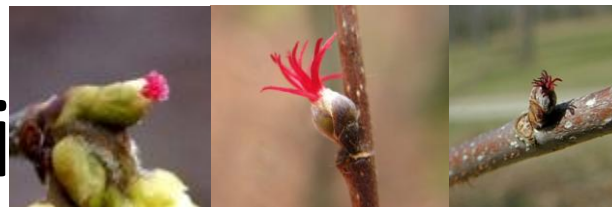


Tonda di Giffoni





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Pollen compatibility Chart

	Pollen	Male Parent	Gene	Jefferson	Lewis	Yamhill	Tonda	C16	C28
Female parent	Alleles	Expressed	15	3	3 8	8	2	?	?
Gene	15	23	-	+	+	+	+		
Jefferson	1	3	+	-	-	+	+		
Lewis	3	8	+	-	-	-	+		
Yamhil	8	26	+	+	-	-	+		
Tonda	2	23	+	+	+	+	-		
C16	?	?							
C28	?	?							

Pollinizers

Gene, Slate

Jefferson, Gene, Gamma, Yamhill

Yamhill, Gamma, Santiam, Tonda di Giffoni, Jefferson

Santiam, Gamma, Epsilon, Zeta, Barcelona

Lewis, Tonda di Giffoni , Gene, Slate

Tonda di Giffoni, Gene, Yamhill, Lewis, Jefferson

C16 , Unknown

C28 , Unknown

(The first variety is the main cultivar, the second variety is its best pollinator, additional varieties will pollinate with one or the other of the first two. For best pollination, add varieties in the order listed.)

Approved Grants

- **AAFC-Federal Growing Forward 2**
 - Micropropagation, Production practices, Nursery production, Ferrero
- **Provincial GF2**
 - Cultivar development, orchard management and nursery management, Ferrero
 - Self incompatibility
- **OCE, Hazelnut suitability map, Ferrero**



Acknowledgment



Thank you

Questions?