

# Assisting growers to achieve effective pollination in NZ hazelnut orchards

Presented by:

Murray Redpath

Chairman, Hazelnut Growers Association of NZ

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# Project Outline

- Creating standardised methods and forms for recording flowering data.
- Holding six workshops (four in the South Island) to describe the recording methods to hazelnut growers.
- Creating an internet-based guide to identifying hazel varieties.

# The Team

- Murray Redpath – Project Manager
- Maurice Denton - Finance Manager
- Dr. David Klinac – scientific advisor
- Christina Hansen
- Jim Jolly
- Alan Mathewson

# Recording flowering data



- Formulate recording guidelines and forms (June/July 08)
- Test at field days (June/July 08)
- Adjust forms
- Place material on NZTCA/HGANZ websites
- Hold 6 workshops over the winter of 2009 to explain techniques to growers

# Guide to identifying hazel varieties



- Collect and dry nut samples (autumn 08)
- Collect data on winter bud & catkin characteristics, photograph (winter 09)
- Check identification at NCGC, Oregon (August 08).
- Photograph nuts and nut clusters (Feb/March 09)
- Write guide
- Check guide at field days
- Develop website
- Complete by December 2009

# Hazel flowering

- Wind pollinated during winter.
- Self-incompatible.
- Incompatible with varieties with same S alleles.
- Fertilization in late spring/early summer.
- Nuts develop shell first then the kernel develops to fill the nut.

# Catkins





M.S.Redpath 2005



# Female flowers



# Polliniser spacing

- Each tree should be no further than 20 metres from a polliniser.
- At a 6 metre x 6 metre spacing, every 3<sup>rd</sup> tree in every 3<sup>rd</sup> row (approx. 10% of planting)
- At a 5 x 3 spacing, every 6<sup>th</sup> tree in every 4<sup>th</sup> row (approx. 4.5% of planting).
- Separate polliniser rows

# Which pollinisers?

- Need to drop pollen at the same time as female flowers of main variety are open.
- Timing varies season to season and area to area.
- Most pollen should be available at the peak of flowering.
- Need to be compatible – use compatibility charts

# Compatibility of hazel varieties grown in New Zealand

Female parent	Pollinisers		Alexandra	Barcelona	Butler	Campanica	Ennis	Keen's Late	Kentish Cob	Lansing	Negret (Appleby?)	M.de Bollwiller	Nocchione	Royal	San Giovanni	T. di Giffoni	Tonda Romano	Whiteheart
	Alleles Expressed		?	1	3	1	1	?	8 14	3	10	5 15	1	3	8	2	10 20	10
Barcelona	1	2	?L		+E			+	+L	+E	+E	+L		+	+E		+M	+M
Butler	2	3	+E,M	+		+	+E	+L	+E		+	+E	+		+		+	
Daviana	3	11	?	+		+	+	?	E		+	+E	+		+	+	+	+
Campanica	1	2	?		+E			+	+	+L	+E	+		+E	+E,M		+L	L
Ennis	1	11	?M		+			+L	+E	+	+	+E		+	+	+	+	+
Keen's Late	?	?	?	?	+	?	+		?	+	?	+E	?	?	?	?	?	?
Kentish Cob	8	14	?E,M	+	+	+	+	?		+	+	+E	+	+		+	+	+
Lansing	1	3	?M,L					+	M		+	+M			+E	+E	+E	+E
Merveille de Bollwiller	5	15	+M	+	+	+	+E	+L	+E	+	+		+	+	+	+	+	+
Negret (Appleby?)	10	22	+L	+E	+	+	+E,M,L	?	+	+E,M,L		+L	+E	+	+E	+E		
Nocchione	1	2	?		+E,M			+	+	+E,M,L	+E,M	+L		+	+E		+E,M	+M,L
Royal	1	3	?					+	+M,L		+	+M,L			+	+	+E	+E
San Giovanni	2	8	?	+M,L	+E	+E,M	+L	?		+M,L	+M	+	+E,M	+E			+L	+L
Tonda di Giffoni	2	23	?	+E	+E	+	+M,L	?	+	+E,M,L	+E	+	+E	+	+E		+M,L	+L
T.G.D.L.	2	7	?	+	+	+	+	?	+	+	+	+	+	+	+		+	+
Tonda Romano	10	20	?	+	+	+	+E,M	?	+L	+E		+L	+	+	+	+E		
Whiteheart	2	10	+M	+	+	+	+	+L	+E	+E		+E	+	+	+			

## Notes:

+ indicates that pollen is compatible with the flower of the female tree.

A blank cell indicates an incompatible cross

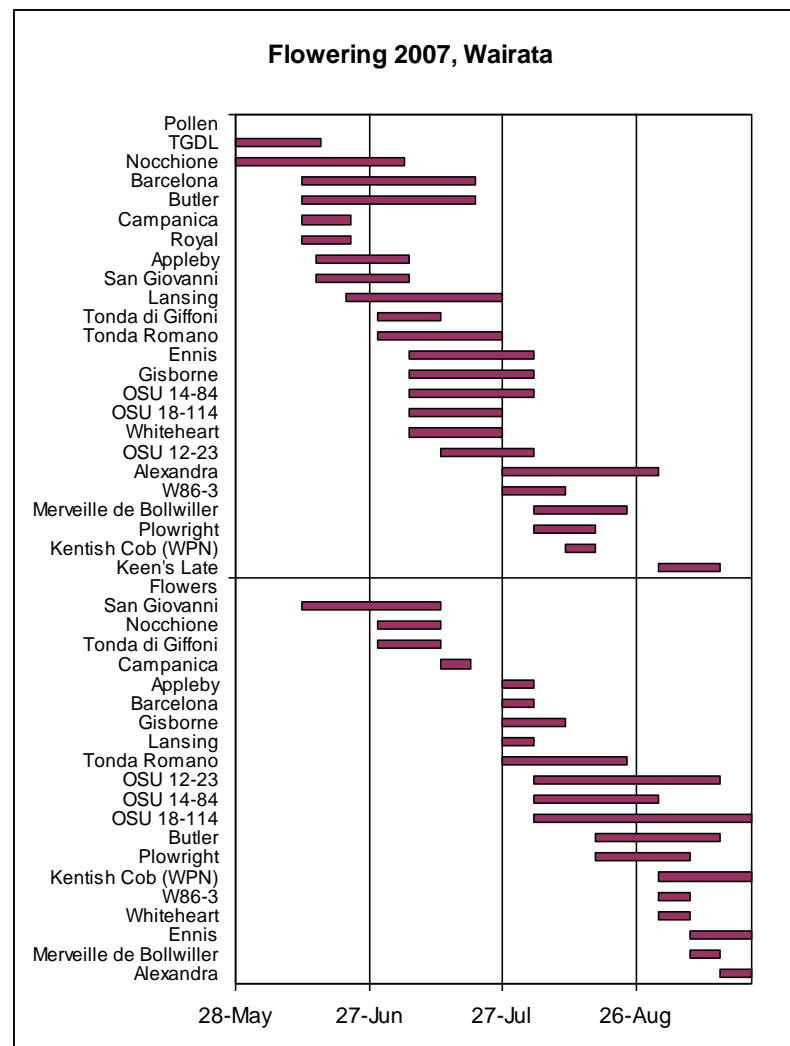
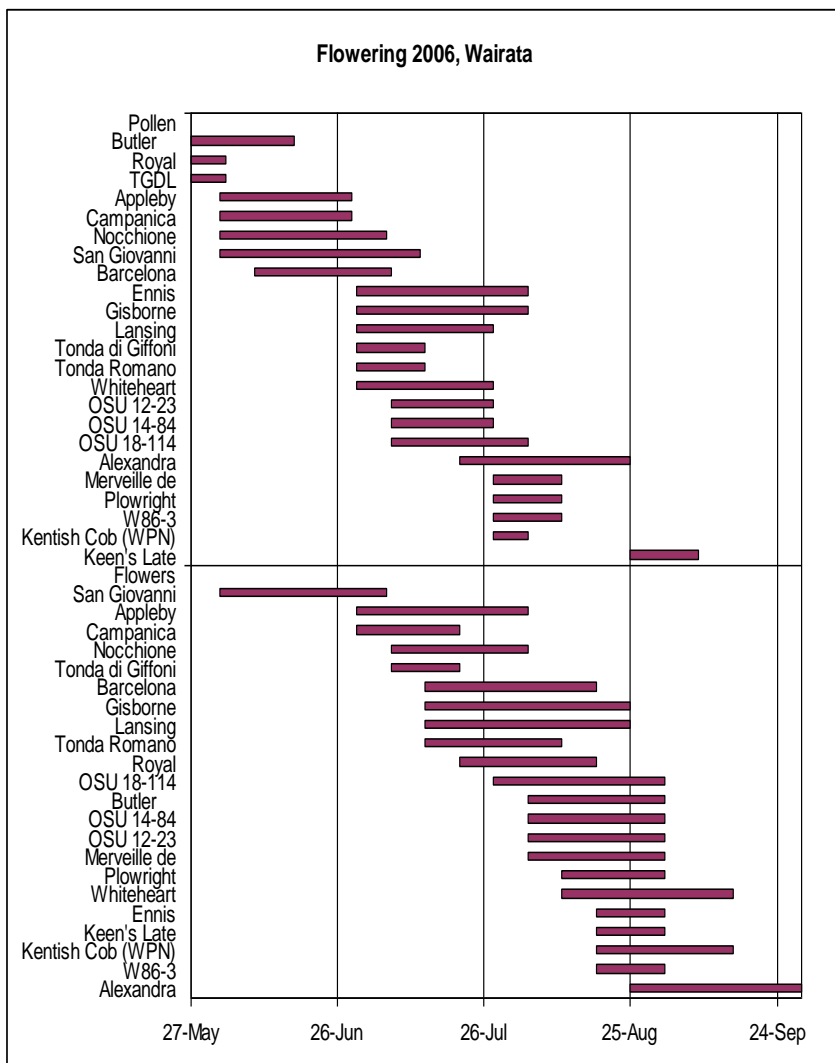
A "?" indicates that the compatibility is unknown

Dates have been calculated from records taken at Wairata Forest Farm, Bay of Plenty, over 2006 and 2007. Variations may occur in other parts of New Zealand.

# Hazel flowering, Wairata 2006 and 2007

Used to assess early, mid and late pollinisers for the chart.

Upper box contains peak pollen period, lower box the peak female flowering period.



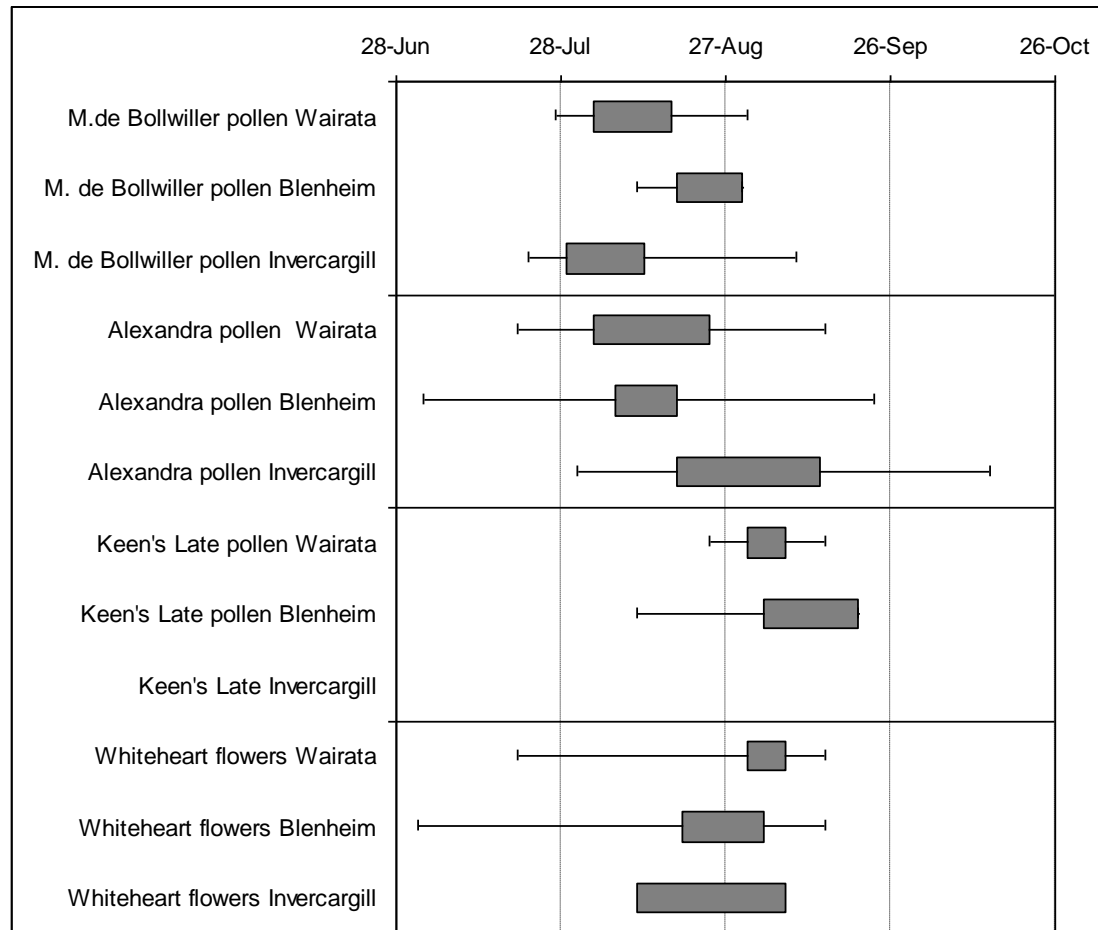
# Pollination problems in NZ

- Inadequate information on differences in flowering times through NZ.
- Poor advice on correct pollinisers
- Poor quality pollinisers for Whiteheart
- Incorrect naming of polliniser varieties.

# Whiteheart flowering and pollinisers.

## Wairata, Blenheim and Invercargill. 2007

Note differing times of pollen release and Whiteheart flowering between different regions

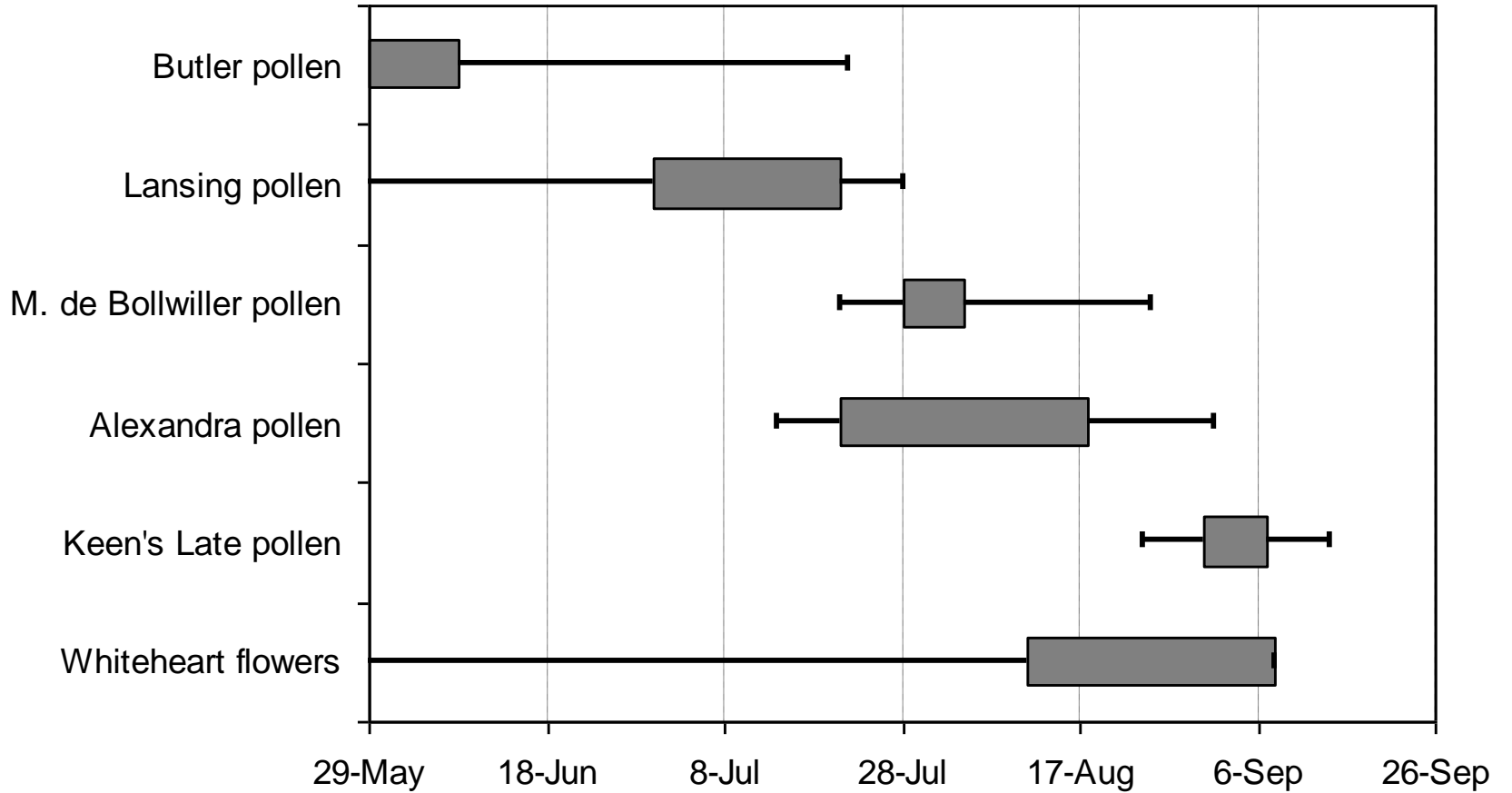


# Checking the timing of suitable pollinisers for Whiteheart at Wairata Hazels, eastern Bay of Plenty

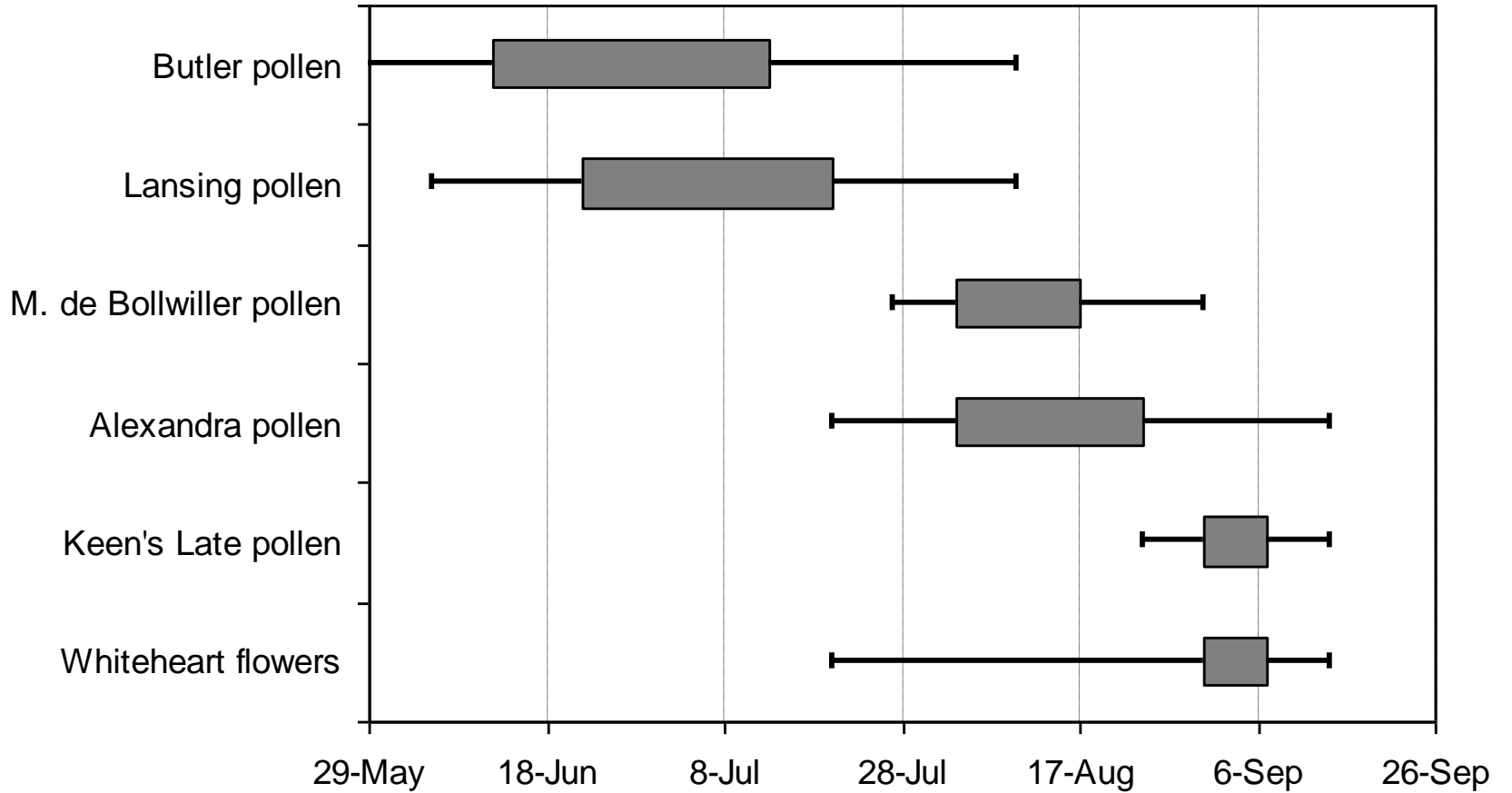
- The main pollinisers usually recommended for Whiteheart are Merveille de Bollwiller and Alexandra.
- Keen's Late was selected as a late polliniser for Whiteheart in the North Island.
- Over the last 8 years, Butler and Lansing have been suggested as suitable early pollinisers for Whiteheart.
- The following charts examine the flowering periods for Whiteheart and the suggested pollinisers over a 5 year period. Note the difference between flowering periods in 2006 and 2007, years with differing chilling characteristics.
- The box indicates the peak of flowering/pollen release, the whiskers cover periods with few flowers/pollen released, comparable to <5%.
- From these charts, the main polliniser recommended for Whiteheart in this orchard should be Keen's Late. Butler and Lansing are not suitable as they drop pollen far too early.



### Whiteheart flowering + pollinisers, 2006, Wairata



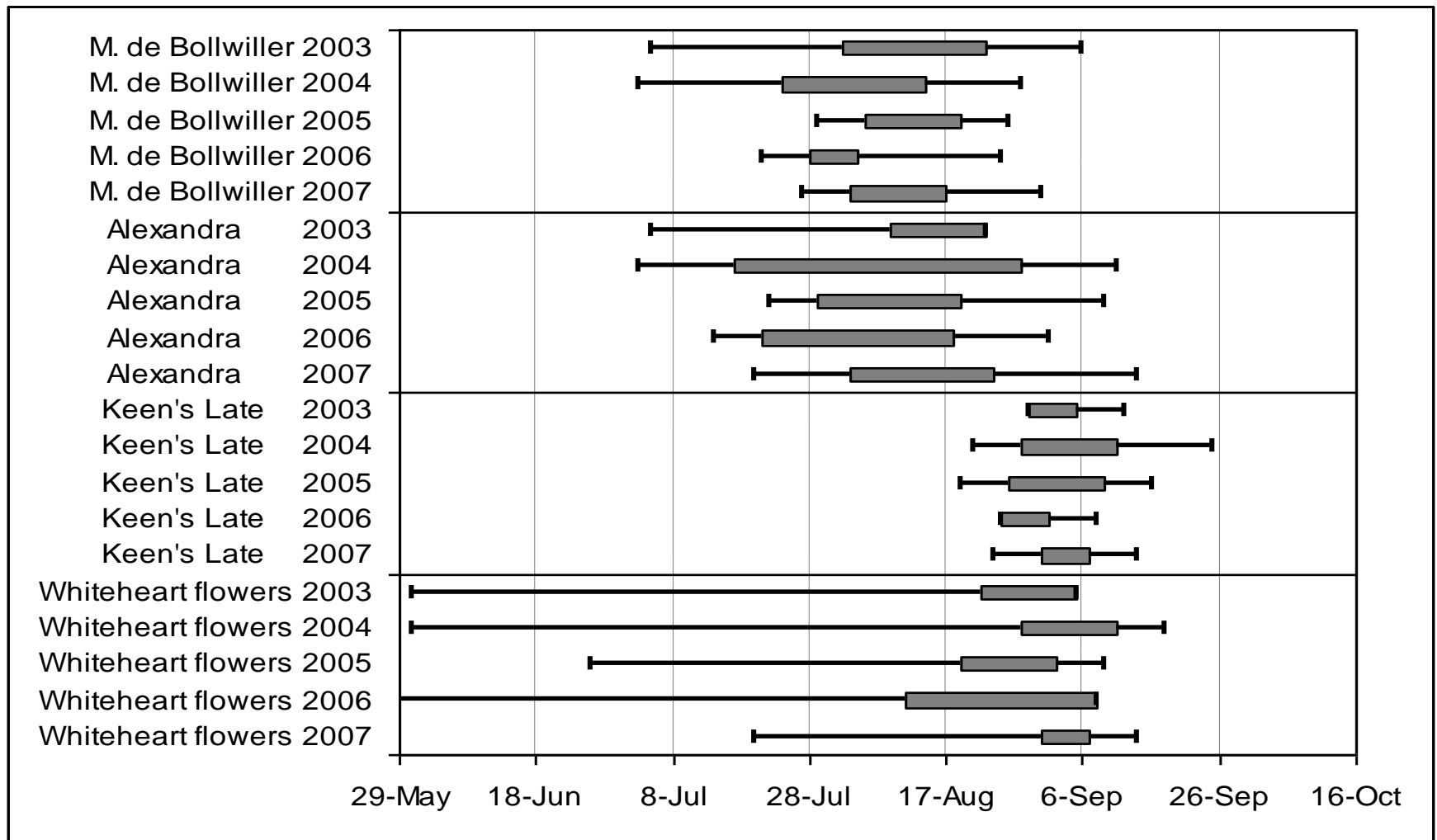
### Whiteheart flowering + pollinisers, 2007, Wairata



# Whiteheart and pollinisers

## Wairata, 2003-7

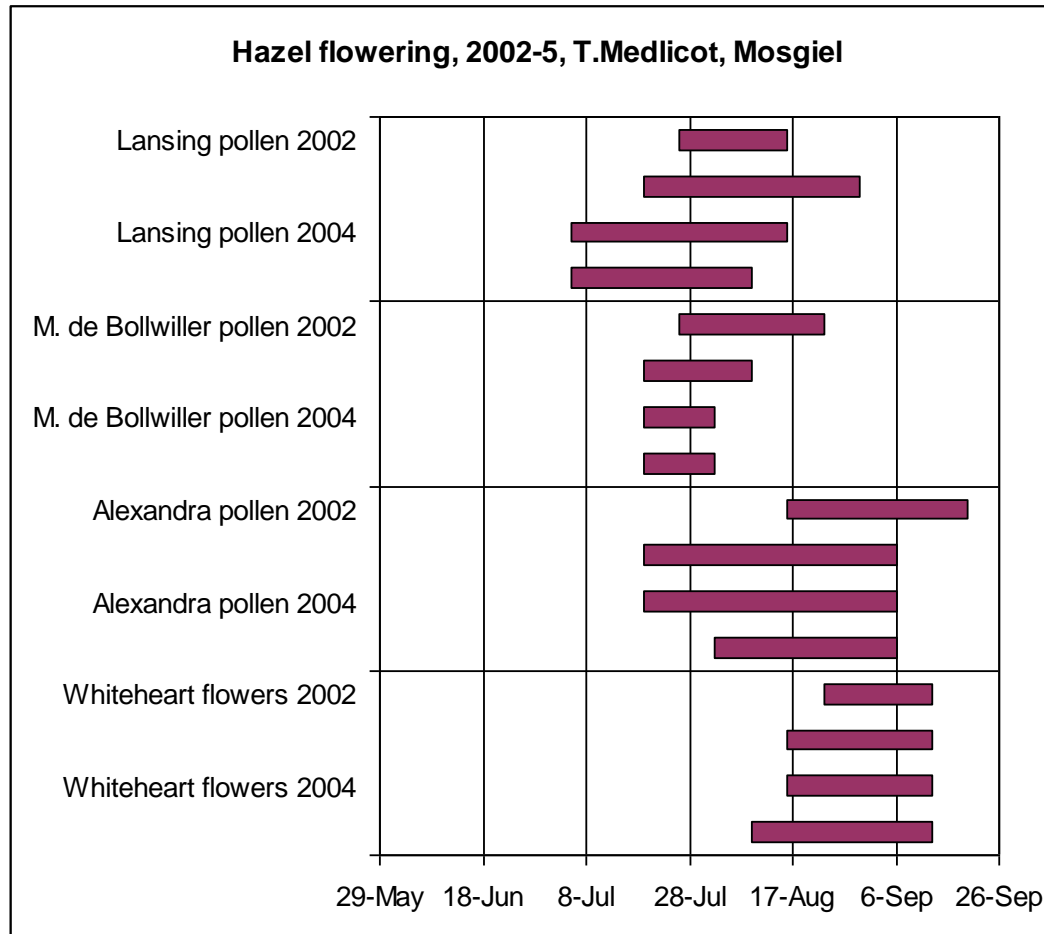
Note the lack of pollen from most of the pollinisers after August 17<sup>th</sup>, when the peak flowering of Whiteheart starts. In this orchard, Keen's Late obviously does most of the pollinating of Whiteheart flowers



# Whiteheart and pollinisers

## T. Medicott, Mosgiel, 2002-5

The main flowering period for Whiteheart occurs after 17<sup>th</sup> August. In this orchard Alexandra is the only polliniser consistently providing pollen over this period.



# Recording your own flowering dates

- Select a convenient part of the orchard with all the varieties grown.
- Try to record on the same day each week.
- Record the date when about 5% of the flowers or catkins are open – ignore a few early or late flowers/catkins.
- Send data to HGANZ



June		July		August		September	
Date	Julian	Date	Julian	Date	Julian	Date	Julian
1	152	1	182	1	213	1	244
2	153	2	183	2	214	2	245
3	154	3	184	3	215	3	246
4	155	4	185	4	216	4	247
5	156	5	186	5	217	5	248
6	157	6	187	6	218	6	249
7	158	7	188	7	219	7	250
8	159	8	189	8	220	8	251
9	160	9	190	9	221	9	252
10	161	10	191	10	222	10	253
11	162	11	192	11	223	11	254
12	163	12	193	12	224	12	255
13	164	13	194	13	225	13	256
14	165	14	195	14	226	14	257
15	166	15	196	15	227	15	258
16	167	16	197	16	228	16	259
17	168	17	198	17	229	17	260
18	169	18	199	18	230	18	261
19	170	19	200	19	231	19	262
20	171	20	201	20	232	20	263
21	172	21	202	21	233	21	264
22	173	22	203	22	234	22	265
23	174	23	204	23	235	23	266
24	175	24	205	24	236	24	267
25	176	25	206	25	237	25	268
26	177	26	207	26	238	26	269
27	178	27	208	27	239	27	270
28	179	28	209	28	240	28	271
29	180	29	210	29	241	29	272
30	181	30	211	30	242	30	273
		31	212	31	243		

# Pollinisers for Whiteheart

Advantages and disadvantages of the main varieties used.

## Advantages

Merveille de Bollwiller:

- Good quality pollen
- Healthy trees
- Good quality kernel

Alexandra:

- Long pollen release period
- Covers the main Whiteheart flowering period in most areas
- High yields

Keen's Late:

- Late pollen
- High yields

## Disadvantages

Merveille de Bollwiller:

- Pollen can be too early for Whiteheart
- Short pollen shedding period
- Low yields
- Nuts have a low crack out

Alexandra:

- Poor quality kernel, low crack out
- Susceptible to blight
- Difficult to propagate = expensive plants

Keen's Late:

- Poor quality, long nut
- Susceptible to Big Bud Mite and blight



# Whiteheart pollinisers



# Incorrect naming of varieties

This problem came to the notice of the HGANZ during the AGM weekend held in Nelson in 2007. Incorrectly named plants had been provided as pollinisers for Whiteheart in one of the orchards visited. Pollinisers selected were Alexandra, Merveille de Bollwiller, and Butler, one third of each variety.

- The “Alexandra” plants were identified (from the nuts) as Campanica. This variety is compatible with Whiteheart but drops pollen too early.
- The “Butler” plants are not the true Butler but probably a seedling. It seems to drop pollen at a similar time to M. de Bollwiller but compatibility with Whiteheart is unknown.
- The Merveille de Bollwiller are true to type and the only recommended polliniser for Whiteheart in this orchard at present.

# Hickford's Whiteheart pollinisers



# Butler?



# Correctly identifying NZ hazelnut varieties

The second part of the Project aims to set up a guide to identifying the hazel varieties found in New Zealand to help growers ensure that they have the correct pollinisers in their orchards.

This part of the project involves:

- Checking the nut characteristics of the main NZ hazel varieties against nuts of those varieties held in the US Dept. of Agriculture National Clonal Germplasm Repository at Corvallis, Oregon, USA.
- Photographing nuts, green nut clusters, catkins, and buds of NZ varieties, and recording the characteristics of these.
- Placing these photos in an internet based guide to identifying NZ hazelnut varieties.

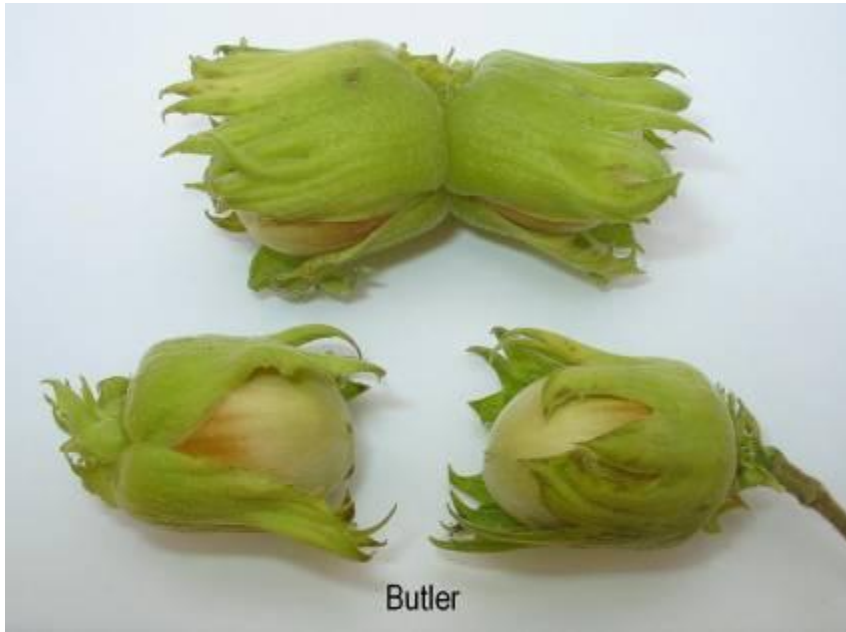
# Results of comparing NZ hazel varieties against trees at USDA NCGR

- Most hazelnut varieties commonly grown in New Zealand are true to type.
- The true Butler is correctly named. The “Butler” with a small ovoid nut sold in the South Island over the past few years is not Butler.
- A variety sold as Webb’s Prize Nut has been incorrectly named and is probably Kentish Cob (syn. Du Chilly).
- Plants sold as Nottingham may not be Nottingham, but either Wispit or White-skinned Filbert

# USDA NCGR Butler



# NZ Butler





# Webb's Prize Nut?

Variety sold as "Webb's Prize Nut" in NZ shown on left. From the involucre (husk) this is clearly not the same as Webb's Prize Cob (top right) as seen in the USDA NCGR but looks to be identical to Du Chilly (syn. Kentish Cob) (bottom right).



# Nottingham

The variety sold as “Nottingham” in New Zealand (left) has a very different involucre shape compared to the USDA Nottingham. The NZ “Nottingham” is probably incorrectly named.



# White Skinned Filbert / Wispit

The “Nottingham” sold in NZ is indistinguishable from these two varieties. Further investigation is required to define the differences (if any) between these varieties.



# Summary

- Growers recording their own flowering data enables them to ensure that adequate pollination is occurring.
- Data from around NZ will enable the HGANZ to deliver accurate recommendations to hazel growers.
- Growers need to record the peak period of pollen release and female flowering.