Leafcutter Bee Daily Incubation Development

Produced by the Alfalfa Seed Commission (Alberta)
with funding from the Alberta Crop Industry Development Fund Ltd. (ACIDF)

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Background

In this presentation, bee larva came out of controlled winter storage and were immediately warmed to 30˚C.

Note: Some colour variation on the first 4 pictures is the result of lighting when the photograph was taken.

Additional photos related to this project can be viewed on the Alfalfa Seed Commission (Alberta) website, www.alfalfaseedab.com.

Acknowledgements

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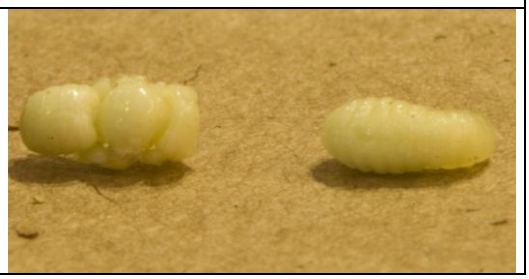
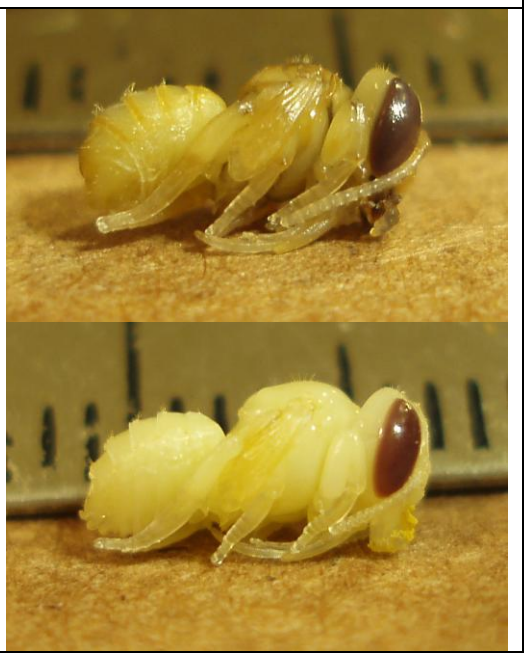
Day 1	Incubation begins. Bees are in a worm-like larval form (prepupal stage), totally white in colour	
Day 3	Larva continues to develop with top surface layer whitening slightly. (*Pteromalus* undergo their final molt into the pupal stage.)	

Day 5	Begin to see transition as worm form appears to condense. The body shape is now nonsymmetrical, with left side of larva in picture shortened and enlarged (also see larva picture below on Day 8)	
Day 8	Leafcutter bees begin to undergo their final moult into the pupal stage (right). Bees are very sensitive to temperature fluctuations. (First *Pteromalus* begin to emerge)	

Day 9	Bee larvae begin to develop into white pupae.	
Day 10	Begin to show some eye colour (the pink-eyed stage).	

Day 11	**Sexing Bees** The ability to sex bees begins around day 11. Although males are generally more developed and darker in colour this does not help sex individual bees. The key is to look at the shape of the abdomen. In the male (top picture) the abdomen is more compact and tapers off quickly, resulting in a more rounded abdomen shape. In the female (bottom picture) the longer abdomen tapers off gradually, resulting in a more pointed abdomen.	

Day 12	Pupae continue to darken in colour, in the eyes and over the back.	

Day 13	Male (Dark eye stage): some are fully darkened Female (Red eyes stage): are behind in development with some still having white bodies	

Day 14-15	Leafcutter bee pupae continue to darken in colour. Females remain significantly behind in development. Bees can move body within cell. Native leafcutter bees emerge. If incubation must be slowed (due to weather or insufficient bloom), the **cocoon temperature** (not just the air temperature) is lowered to 10º-15ºC for up to two weeks, virtually stopping development.	

Day 16	Most advanced males are fully developed (see day 17-18 photo for an example). Advanced females (top) have darkened while many females have some darkening (bottom).	

Day 17-18	First adult males begin to emerge (top). While other males are still completing development: the wings, hair and eye colour have not reached full adult form (bottom). Bees become very susceptible to high temperature.	

Day 19	Male bees continue to emerge at this time. Some females are fully developed in the cell while others are nearing full development (see picture).	

Day 20	The first female bees emerge. Slowest developing females are still a week away from emergence	 

Day 21-22	Female emerging (top). Male bee emergence peaks (bottom).	

Day 22-23	Female bee emergence peaks. 30-50% of the females should have emerged by this time.
Day 28	Alfalfa leafcutter bee emergence is virtually complete.

This is the bee development calendar expected assuming that the leafcutter bee larva were stored correctly in post summer and winter storage prior to incubation. When hives are removed from the field between mid-August and mid-September, hives should spend two weeks at a constant temperate (between 18-22˚C). Then hives are cooled to a constant temperate, between 8-12˚C, until extraction begins. Post extraction the bee cells should be stored at a constant temperate between 8-10˚C.