

## Lambsquarter (*Chenopodium album*)

Model summary (Table 3) and analysis led by Aaron Heinrich, OSU CSS Dept., with assistance from Ed Peachey, Nick Andrews, Hiedi Noordijk, and Leonard Coop, Oregon State University. CROPTIME project funded by USDA-Western SARE.

**Methods:** Using events monitored in the field, the lowest C.V. (coefficient of variation) was used to determine lower (Table 2 & Fig. 2) and upper (Fig. 3) threshold values based on 7 site-years, all from the Willamette Valley of Oregon (2013 n=2; 2014 n=3; and 2015 n=2). Sites (Table 1) included the OSU Vegetable Farm (near Corvallis, OR), Gathering Together Farm (near Philomath, OR), the OSU NWREC research farm (near Aurora, OR), and Sauvie Island, OR. Degree-day values were calculated by the single sine (Baskerville-Emin) method using the online calculator at [uspest.org](http://uspest.org).

The main model interval used to determine thresholds was from cotyledon stage to first germinable seed (date when 1 or more seed germinated following removal from mesh bags that had been buried in the soil during the winter for 2-3 months and then germinated in the laboratory in the dark at 25C). The stages from cotyledon to first emerging inflorescence, and from first inflorescence to first germination, were also tested for lowest C.V. (Table 2). Degree-day requirements for juvenile stages were estimated based on average number of days as a proportion of days for first germinable seed, multiplied by the DDs for first germinable seed (proportionate development method). To approximate sample error and genetic variability in development rates, the lower and upper 95% confidence intervals were determined for first germinable seed.

**Table 1. Primary data used to derive lambsquarter model.**

Year	Site	Field	Weather station	Start date (cotyledon)	Date first germinable seed	Days coty to first germinable seed	DDs (single sine) (42/95)
2013	VF	A7	CRVO agrimet	06/21/13	08/21/13	61	1633
2013	VF	A8	CRVO agrimet	05/21/13	07/31/13	71	1568
2014	GTF		CRVO agrimet	05/28/14	07/31/14	64	1511
2014	VF	Pop-up	CRVO agrimet	05/23/14	07/24/14	62	1389
2014	VF	Fum	CRVO agrimet	06/09/14	07/28/14	49	1206
2015	VF	A18	CRVO agrimet	05/25/15	07/20/15	56	1449
2015	NREWC		ARAO agrimet	06/29/15	08/17/15	49	1480
					Mean	59	1462
					St. Dev.	8.1	138.0
					C.V.	13.7	9.4

**Table 2. Days and cumulative single sine degree-days (DDs) (Tlow=42F and Tmax=95F) for each growth interval.**

Growth interval	Mean (days)	Range (days)	CV		Range (DD)	CV (DD) (%)
			(days)	(%)		
Cotyledon to emerging inflorescence (see image)	24	19-28	13.4	542	459-671	16.0
Emerging inflorescence to 1st germination <sup>1</sup>	33	27-36	10.8	919	856-1013	8.8
Cotyledon to 1st germination <sup>1</sup>	59	49-71	13.7	1462	1206-1632	9.4
Lower 95% CI				1360		
Upper 95% CI				1564		

<sup>1</sup>Date when 1 or more seed germinated following removal from mesh bags that had been buried in the soil during the winter for 2-3 months and then germinated in the laboratory in the dark at 25C.

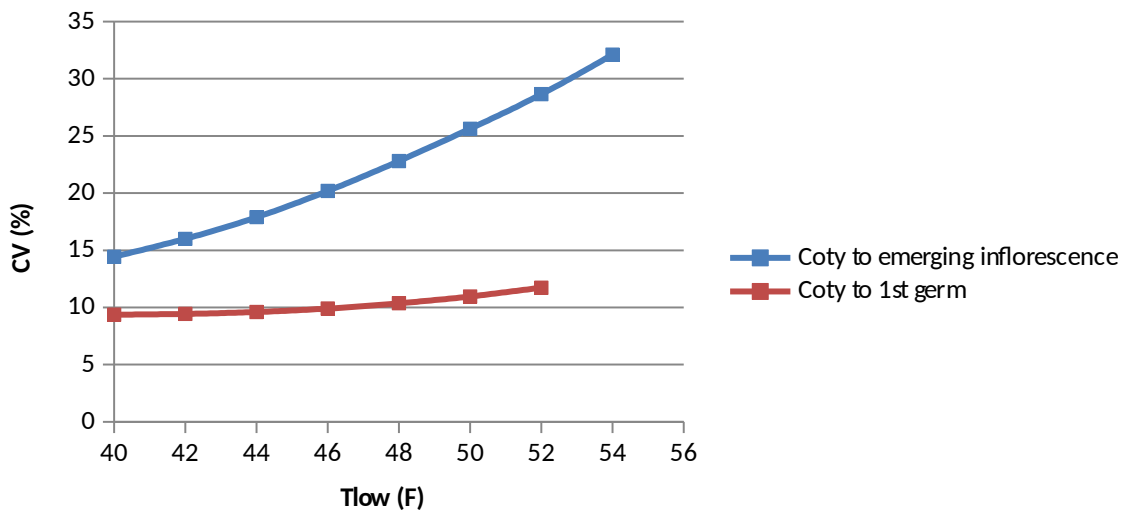
**Table 3. Degree-Day Model Summary.**

<b>Model:</b>	Lambsquarter, <i>Chenopodium album</i>
<b>Calculation method:</b>	Single Sine degree-days (Baskerville-Emin)
<b>Tlow:</b>	42°F      5.6°C
<b>Tupper:</b>	95°F      35°C
<b>Region of known use:</b>	Willamette Valley, Western Oregon
<b>Validation status:</b>	New research model based on 7 site-years

Events table	Days	DDs (F)	DDs (C)
0. Cotyledon (start)	0	0	0
1. 2 leaves (1 leaf pair)	3	75	41
2. 4 leaves (2 leaf pairs)	7	173	97
3. 6 leaves (3 leaf pairs)	11	273	152
4. First infloresc. emerging (see image)	24	596	331
5. First germinable seed (lower 95% CI)	53	1360	756
6. First germinable seed (mean)	59	1462	812
7. First germinable seed (upper 95% CI)	65	1564	869

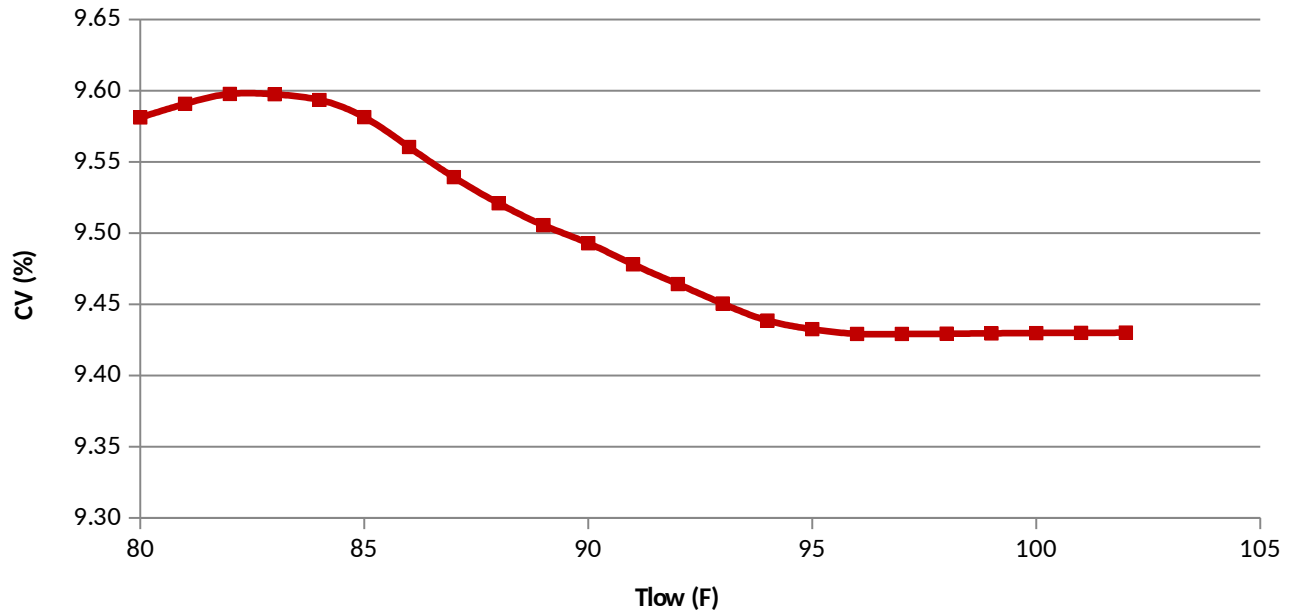


**Fig. 1.** Lambsquarter approximately 16 days after cotyledon with inflorescence just visible (left) and inflorescence 5 days later (right). The picture on the right is the growth stage designated “inflorescence emerging” used in the GDD model.



**Fig. 2.** Lowest C.V. used to determine lower temperature threshold (Tlow) for lambsquarter.

### Coty to 1st germ



**Fig. 3. Lowest C.V. used to determine upper temperature threshold (Tupper) for lambsquarter.**