

Degree day model for California rice varieties

Below are the equations for calculating Degree days using the same equation as the DD50 model (common in the southern US) but with different cardinal temperatures.

1- Eq. 1 is to calculate the daily thermal time:

$$\begin{aligned}
 DD &= (T_{max} + T_{min})/2 - T_{base} && \text{(Eq.1)} \\
 T_{min} &= LT \text{ if } T_{min} > LT \\
 T_{max} &= UT \text{ if } T_{max} > UT
 \end{aligned}$$

Where T_{max} and T_{min} are the daily maximum and minimum temperature, respectively.

2- Eq. 2 is for calculating the days from planting to panicle initiation (PI), 50% heading, and R7. R7 is when at least one grain on the main stem panicle has a yellow hull (Counce et al., 2000)

$$\begin{aligned}
 \text{Days from planting to PI} &\Rightarrow \text{Sum } (DD/f(S1)) = 1 && \text{(Eq.2)} \\
 \text{Days from planting to 50\% Heading} &\Rightarrow \text{Sum } (DD/f(S2)) = 1 \\
 \text{Days from planting to R7} &\Rightarrow \text{Sum } (DD/f(S3)) = 1
 \end{aligned}$$

Table 1. Cardinal temperatures and total thermal time required for each stage. The cardinal temperatures are averages of varietal specific temperatures.

Cultivar	Thermal time			Cardinal temperatures		
	$f(S1)$	$f(S2)$	$f(S3)$	T_{base}	LT	UT
CM101	470	800	1007	10	18	27
L206	476	828	995	10	18	27
S102	469	783	1007	10	18	27
M104	466	782	996	10	18	27
M105	473	819	1034	10	18	27
M202	477	898	1101	10	18	27
M205	478	920	1120	10	18	27
M206	477	831	1044	10	18	27

Table 2. Results for RMSE between observed and predicted values for all stages

Variety	RMSE_PI	RMSE_Heading	RMSE_R7
CM101	2.32	2.91	4.49
L206	2.44	3.51	4.96
S102	2.34	2.51	4.88
M104	2.31	3.20	5.40
M105	1.80	2.58	4.00
M202	2.68	4.29	5.12
M205	2.97	4.41	6.58
M206	2.43	2.88	4.87

