

## Bloom Update – Jimmy Nichols

### Potential Impacts of 2020 Pistachio Crop Yield

Many orchards throughout the state are showing symptoms of “low chilling”. This is described as delayed bud break in many areas within the tree canopy. A typical description of “low chilling” is more advanced leaf out in the lower canopy compared to higher parts in the tree. A more severe symptom description is the northeast side of the tree is generally more advanced than the southwest. Often times there can be fully expanded leaves on the northeast side of the tree and minimal leaf out on the southwest side as shown in Figure 1. The orchard shown in the photo suffered a “crop disaster” in 2015 where it produced ~200 pounds per acre.

Figure 1 – April 11, 2015 9 yr old Kerman (Coalinga)



The symptomology in 2015 appears to be more severe than in 2020 as it seemed to be more uniform throughout the orchards. One difference between 2015 and 2020 is many growers used oil in February 2015 to help “wake up” the trees. The oil seemed to exacerbate the “low chill” symptoms. However, (we/I) have not heard of many growers using oil this year, which could be a reason why many orchards or parts of orchards show limited “low chill” symptoms.

Looking back at the possible causes of the “low chill” symptoms, the 2019/2020 winter chilling year was not optimal. It started off with the warmest November in the past 10 years and also had the highest average daily solar radiation between the months of

September through March. Recent research suggests “low chill” symptomology is tied to a lack of stored carbohydrates. When the temperature is warm and solar radiation is high, the trees respire as a function of temperature. The actual calculation is not known, but many other organisms have an exponential relationship, meaning higher temperatures can lead to faster carbohydrate depletion, which will cause “low chill” symptoms.

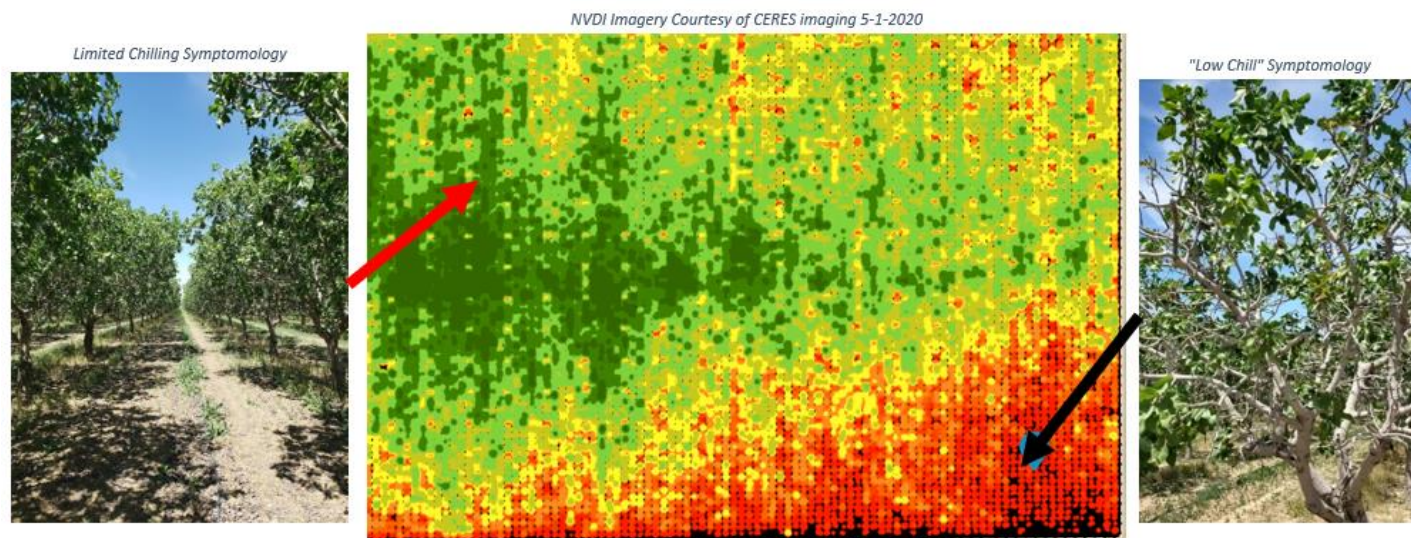
Figure 2 - Average Max Temperature Per Month 2019/2020 Winter

Other causes of the symptomology can be cultural. As a depletion in carbohydrates is the likely main cause of the “low chill” symptoms, anything that limits carbohydrate accumulation going into the dormant season (crop load and

Average High Temp per Day Location and Month	Chilling Year									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
<b>Coalinga</b>										
Sept	90	92	93	87	91	92	89	88	89	89
Oct	77	78	79	66	83	82	77	79	78	79
Nov	64	62	67	68	67	62	68	68	69	70
Dec	52	58	57	59	59	56	56	61	58	58
Jan	51	62	57	66	58	58	55	60	61	58
Feb	58	63	62	64	69	67	60	64	56	69
Mar	63	65	71	71	76	69	69	65	65	64
<b>Grand Total</b>	<b>65</b>	<b>68</b>	<b>69</b>	<b>69</b>	<b>72</b>	<b>69</b>	<b>68</b>	<b>69</b>	<b>68</b>	<b>69</b>

photosynthesis), can be a cause. Irrigation management, soil, topography, and proximity to a road appear to have the biggest impact on the “low chill” symptomology. Figure 3 shows a NDVI image of a

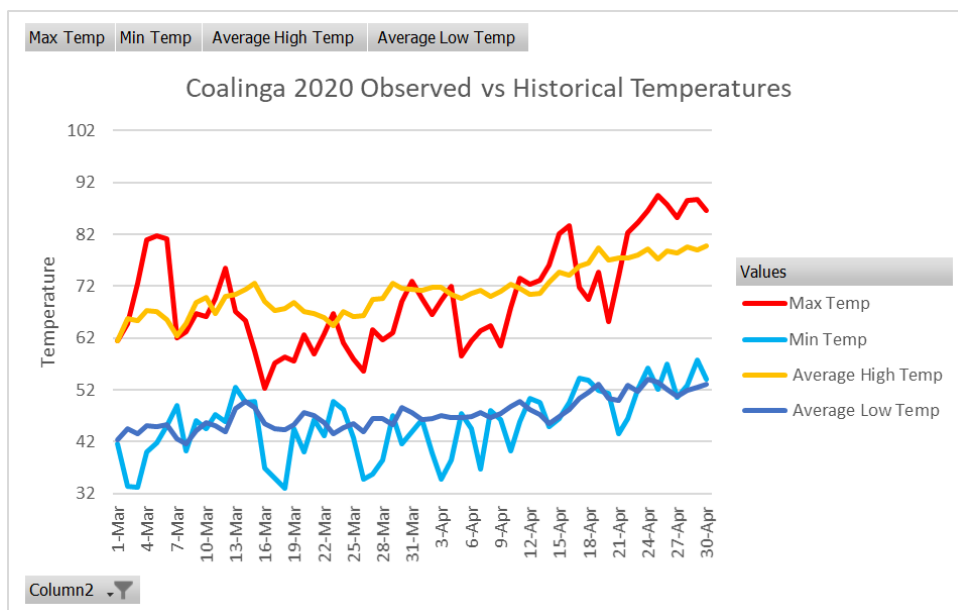
field in Coalinga, CA. The southeast side of the image is elevated by roughly 30-40 ft compared to the northwest side of image. The southeast side of the orchard shows severe “low chill” symptomology whereas the northwest side of the orchard shows no “low chill” symptoms.



It is difficult to know the root cause of the “low chill” symptomology as all four are likely in the previous example. The higher elevation could cause low pressure leading to less applied water and lower overall photosynthesis/carbohydrate accumulation over the life of the orchard. Higher elevations generally have higher winter temperatures as well. In summary, there are many questions as to why the trees are responding the way there are this year, and there are very few answers/hypotheses (which many included above!).

Figure 3 Observed vs Historical Temperatures Coalinga 2020

Another observation this bloom season is the cold weather’s impact on bloom. The warm February caused many of the trees to begin pushing but hit a wall in early March when it turned cold and rainy. Nearly every day in March was below historical averages, which delayed the development.



The ultimate impact of the “low chill” symptomology on this year’s state pistachio crop is going to be negative. This appears to have the most impact on the west side orchards (which makes up the majority of California production). Some orchards or parts of orchards will likely have limited production.