

2020-21 OrchardWatch sensor analysis

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```
## Warning: package 'reshape2' was built under R version 4.1.3

## Warning: package 'dplyr' was built under R version 4.1.3

##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
## 
##     filter, lag

## The following objects are masked from 'package:base':
## 
##     intersect, setdiff, setequal, union

## Warning: package 'tidyverse' was built under R version 4.1.3

##
## Attaching package: 'tidyverse'

## The following object is masked from 'package:reshape2':
## 
##     smiths

## Warning: package 'psych' was built under R version 4.1.3

##
## Attaching package: 'psych'

## The following objects are masked from 'package:ggplot2':
## 
##     %+%, alpha

## Using datetime as id variables

## [1] "rh"      "n-main"   "rh"      "n-main"   "rh"      "n-main"   "n-main"
## [9] "rh"      "n-main"

## Warning in matrix(unlist(test_out), ncol = 3, byrow = T): data length [10] is
## not a sub-multiple or multiple of the number of rows [4]

##      [,1]      [,2]      [,3]
## [1,] "rh"      "n-main"   "rh"
## [2,] "n-main"   "rh"      "n-main"
## [3,] "rh"      "n-main"   "rh"
## [4,] "n-main"   "rh"      "n-main"
```

Numeric exploration

values orchard-wide during first inoculum period

Temperature

```
## [1] "2020"  
  
##   Min. 1st Qu. Median   Mean 3rd Qu.   Max. NA's  
## 28.29 42.98 51.57 52.03 60.06 83.73 10784
```

```
## [1] "2021"
```

```
##   Min. 1st Qu. Median   Mean 3rd Qu.   Max. NA's  
## 21.03 44.81 51.57 52.59 59.72 89.49 12208
```

Relative humidity

```
## [1] "2020"  
  
##   Min. 1st Qu. Median   Mean 3rd Qu.   Max. NA's  
## 14.07 42.83 61.40 63.03 84.90 100.00 5557
```

```
## [1] "2021"
```

```
##   Min. 1st Qu. Median   Mean 3rd Qu.   Max. NA's  
## 17.18 49.55 66.94 66.62 84.91 100.00 12208
```

Leaf wetness

```
## [1] "2020"  
  
##   Min. 1st Qu. Median   Mean 3rd Qu.   Max. NA's  
## 0.00 0.60 1.80 13.68 7.60 100.00 6981
```

```
## [1] "2021"
```

```
##   Min. 1st Qu. Median   Mean 3rd Qu.   Max. NA's  
## 0.00 2.40 4.10 19.91 6.50 100.00 2555
```

Site Comparisons

North - main vs South - main 2020

```
## [1] "Temperature"
```

```

##  

## Welch Two Sample t-test  

##  

## data: nmain_temp$value and smain_temp$value  

## t = 0.45387, df = 59100, p-value = 0.6499  

## alternative hypothesis: true difference in means is not equal to 0  

## 95 percent confidence interval:  

## -0.1419796 0.2275502  

## sample estimates:  

## mean of x mean of y  

## 52.27425 52.23146

## [1] "Relative humidity"

##  

## Welch Two Sample t-test  

##  

## data: nmain_rh$value and smain_rh$value  

## t = -4.1437, df = 59388, p-value = 3.422e-05  

## alternative hypothesis: true difference in means is not equal to 0  

## 95 percent confidence interval:  

## -1.109438 -0.396918  

## sample estimates:  

## mean of x mean of y  

## 64.27969 65.03287

## [1] "Leaf wetness"

##  

## Welch Two Sample t-test  

##  

## data: nmain_wet$value and smain_wet$value  

## t = -19.614, df = 57706, p-value < 2.2e-16  

## alternative hypothesis: true difference in means is not equal to 0  

## 95 percent confidence interval:  

## -6.001772 -4.911260  

## sample estimates:  

## mean of x mean of y  

## 15.39000 20.84652

```

Relative humidity as a function of temperature and wetness (additive - North Main site)

```

##  

## Call:  

## lm(formula = nmain_rh$value ~ nmain_temp$value + nmain_wet$value)  

##  

## Residuals:  

##      Min       1Q   Median       3Q      Max  

## -51.107 -12.786  -1.223  13.703  40.640  

##  

## Coefficients:  

##              Estimate Std. Error t value Pr(>|t|)

```

```

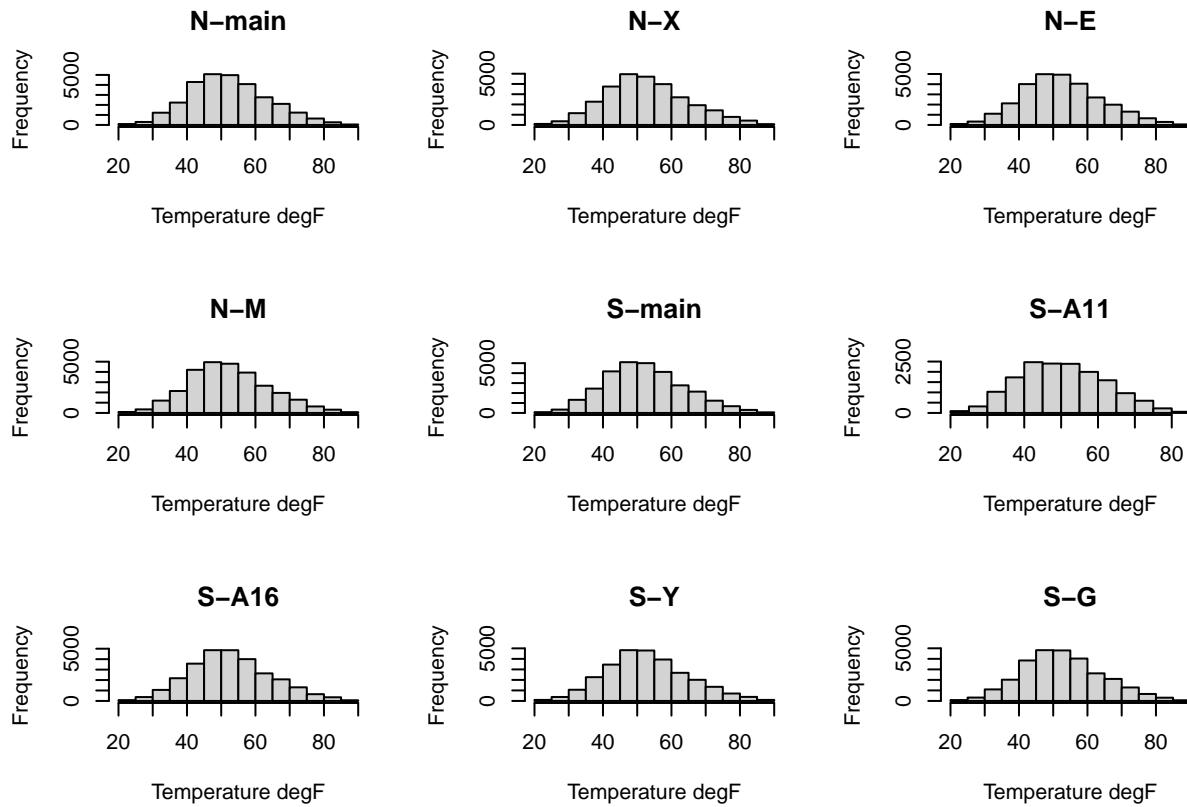
## (Intercept)      74.169342   0.502371  147.64    <2e-16 ***
## nmain_temp$value -0.308098   0.009159  -33.64    <2e-16 ***
## nmain_wet$value   0.429884   0.003341  128.68    <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 17.36 on 28626 degrees of freedom
## (1144 observations deleted due to missingness)
## Multiple R-squared:  0.4042, Adjusted R-squared:  0.4041
## F-statistic:  9708 on 2 and 28626 DF,  p-value: < 2.2e-16

## Analysis of Variance Table
##
## Response: nmain_temp$value
##           Df  Sum Sq Mean Sq F value    Pr(>F)
## nmain_rh$value     1 180206 180206    1462 < 2.2e-16 ***
## Residuals       29327 3614920      123
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

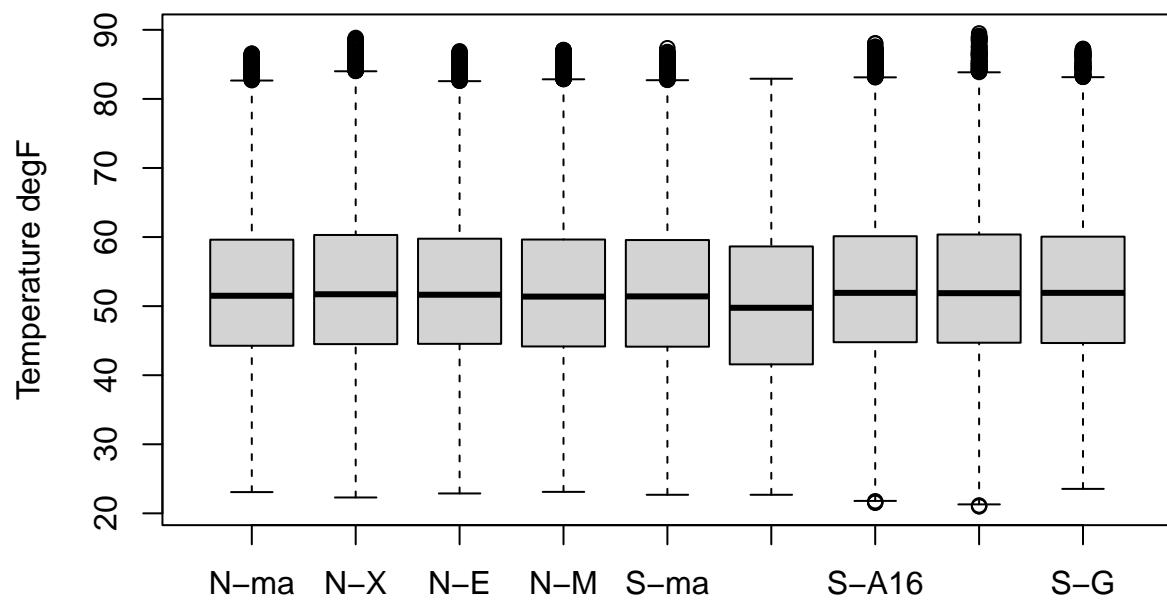
```

Graphical exploration

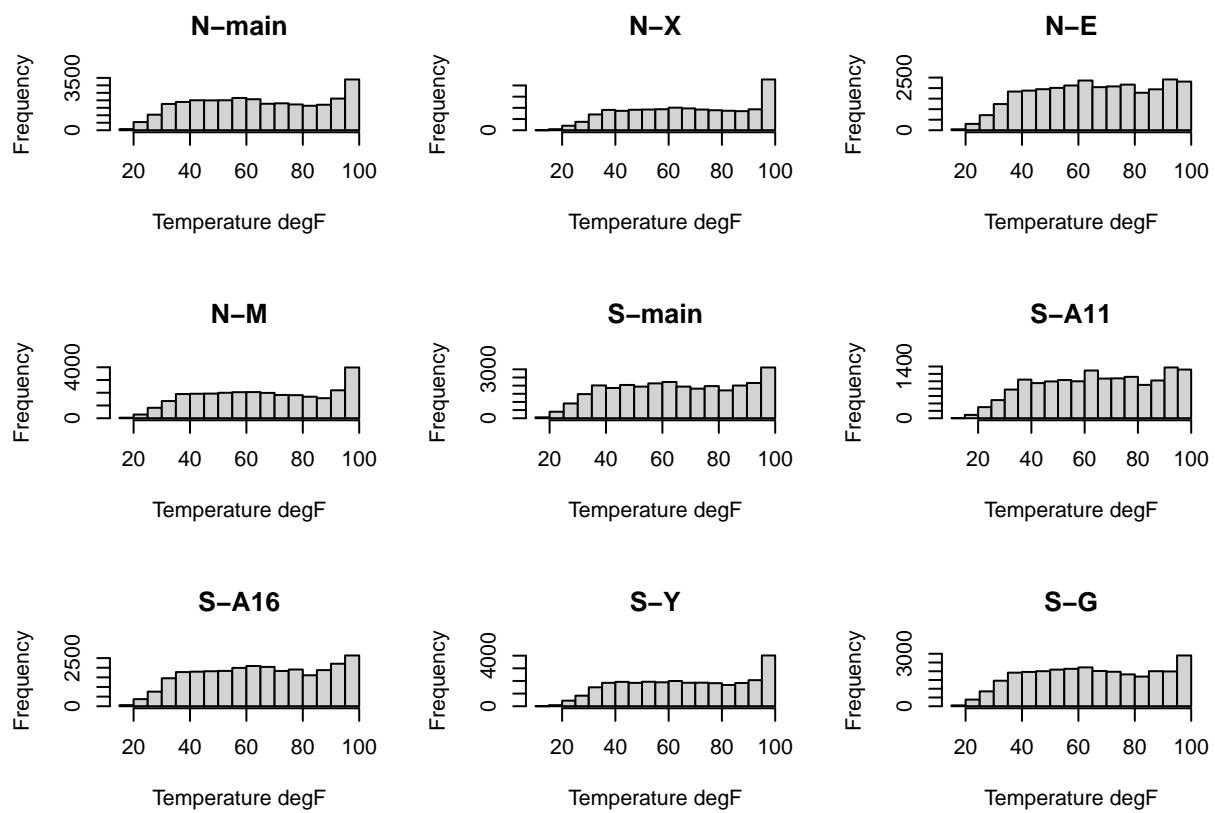
Temperature values by site



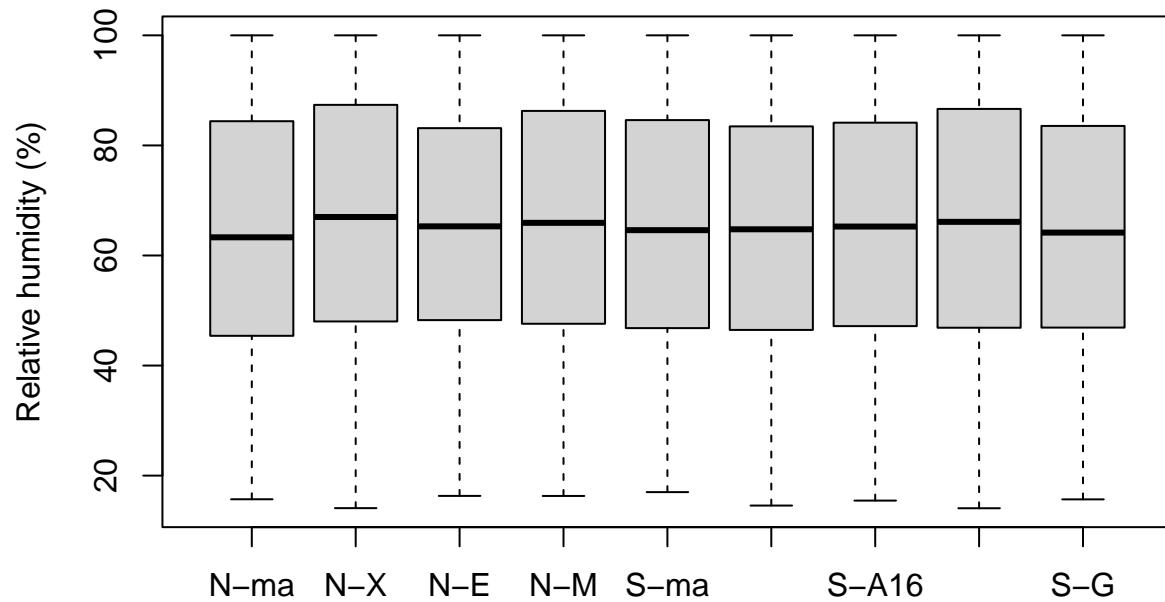
2020–2021 Temperature ranges



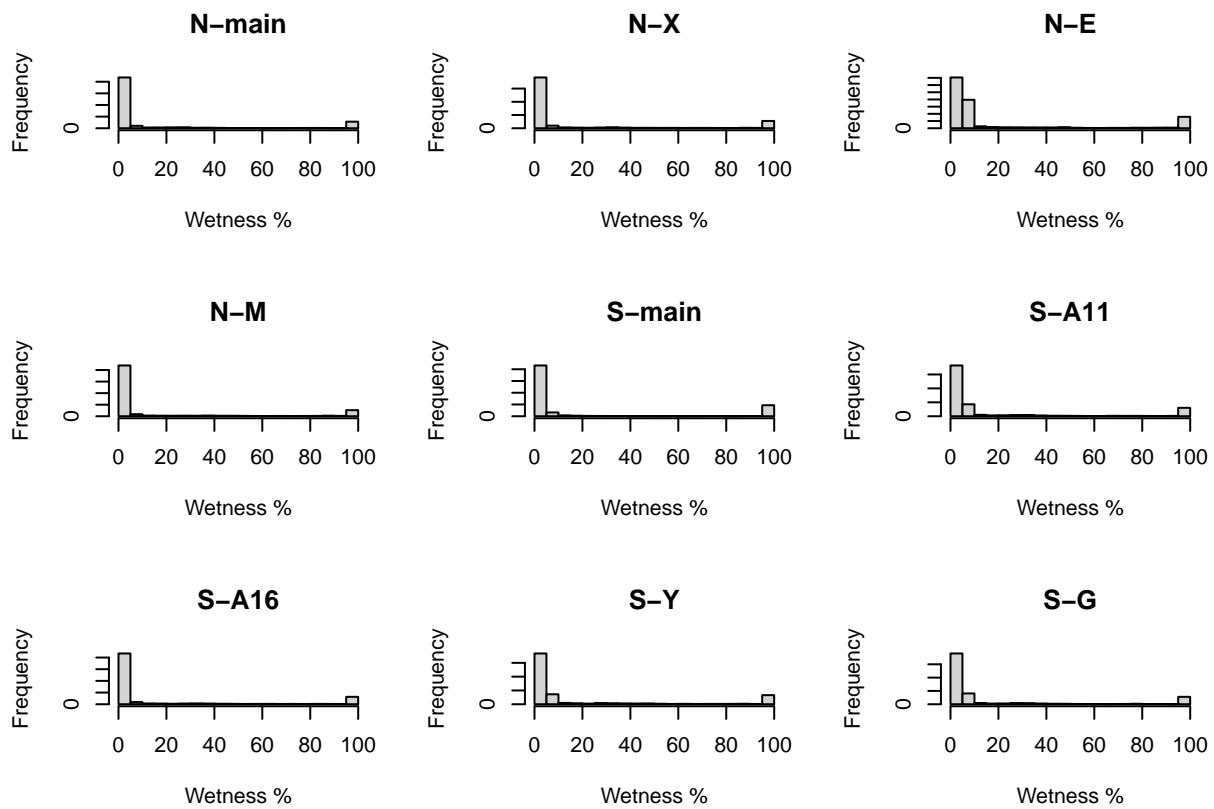
Relative humidity values by site



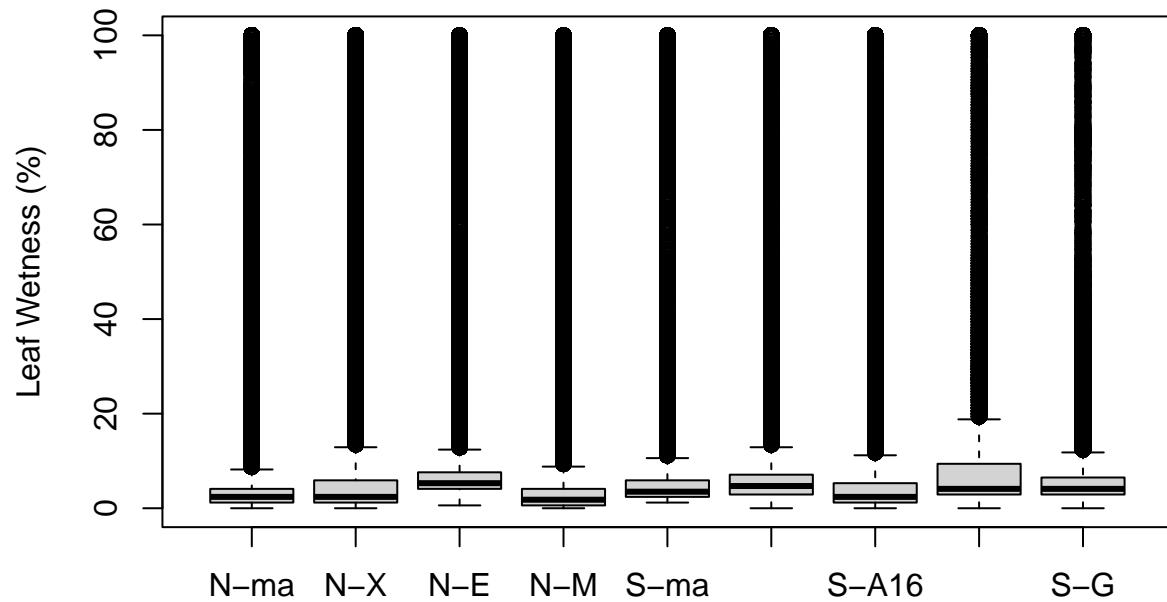
2020–2021 RH ranges



Wetness values by site



2020–2021 Leaf Wetness ranges



North sites RH ~ leaf wetness

