A Guide - Determining Yield Losses from the BYD in Wheat and Barley

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1) Symptoms in barley – we are seeing extensive yellowing of leaves that are consistently and uniformly distributed throughout the affected fields. Reddening may be present but more often we are seeing extensive yellowing of the upper portions of leaves. NOTE the yellowing does not always include the whole leaf, but often just the upper portion of the leaf. Dwarfing may or may not be obvious with the symptoms.

2) Symptoms in wheat are similar, but more frequently we also see the reddening of leaves. There are entire fields that look only yellow from a distance, but up close you may see leaves with reddening.

How do we determine the extent of yield loss? This is a very difficult question. Much of the previous research relies on data from the mid-west where incidence is about 10 – 40% of the plants in the field. It is unusual to have as widespread damage where 85-99% of the plants in the field are showing symptoms.

Also remember that visual symptoms alone may UNDERESTIMATE the actual incidence in the field.

Based on our experience from the 2013 southern Idaho epidemic and from published research, we are providing the following suggestions:

In many fields, 20-30% yield loss will be common and in fact may be optimistic. We saw yield losses greater than 50%. Published reports indicate that for every 1% increase in incidence, there will be a decrease of 0.25 bu/A. (Australian paper: McKirdy, S.J., R.A.C. Jones, and Nutter, F.W., Jr.)

(Incidence is simply the presence of the disease – any plant showing symptoms. This does not consider severity of the disease on those affected plants.)

Data from Kansas State University determined that over seven years, the following equation applied: Yield = -0.659X + 134.9

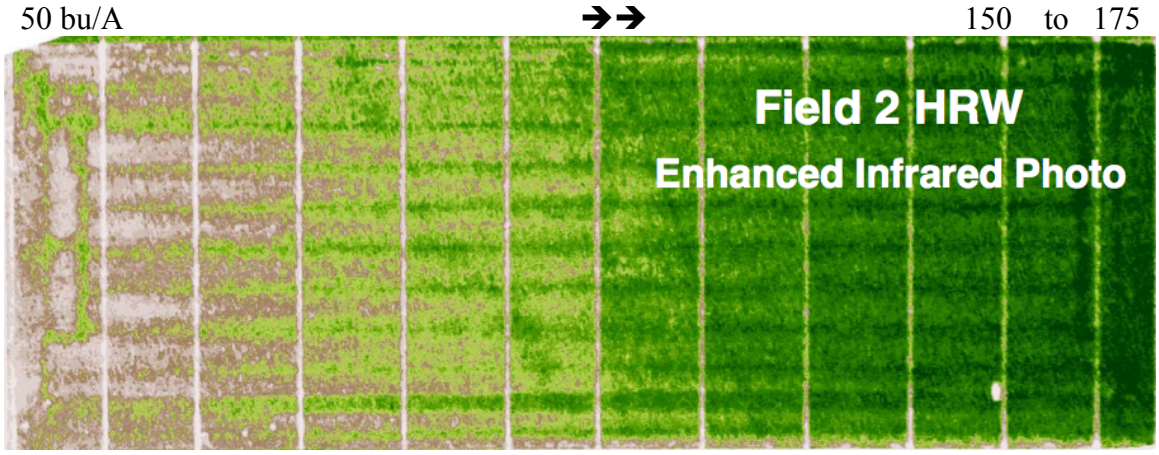
Where x is the incidence (percentage of tillers showing symptoms).

X = incidence If X =	then yield equals	Percent yield	Percent yield loss
0	135	1.00	0.00
1	134	0.99	0.01
5	132	0.97	0.03
10	128	0.95	0.05
15	125	0.93	0.07
20	122	0.90	0.10
25	118	0.88	0.12
30	115	0.85	0.15
35	112	0.83	0.17
40	109	0.80	0.20
45	105	0.78	0.22
50	102	0.76	0.24
55	99	0.73	0.27
60	95	0.71	0.29
65	92	0.68	0.32
70	89	0.66	0.34
75	85	0.63	0.37
80	82	0.61	0.39
85	79	0.58	0.42
90	76	0.56	0.44
95	72	0.54	0.46
100	69	0.51	0.49

Things to consider in Idaho:

- This table was not developed for Idaho conditions. In 2013, yield losses exceeded 70% in heavily damaged fields.
- BYD will decrease yield, test weight, plumps. Therefore, winter barley for malt, even with low percentages of infection (less than 30%), may not make malt quality!
- Our current water stress will exacerbate the losses. The ability to mitigate damage depends on nitrogen and water. Right now – we have neither. No precipitation or irrigation to reduce plant stress.
- There **are** differences in varieties for susceptibility. While at this point we do not have good data on the yield of susceptible varieties under high BYD pressure, we will be able to rate the varieties we currently grow for susceptibility in the UI Extension variety trials planted at various locations (Kimberly, Rupert, Aberdeen, Ririe and Idaho Falls).
- Insecticidal seed treatments do help to reduce BYD. With long falls, seed treatments will not last long enough to protect earlier planted cereals. In this instance, fields planted late with emergence from October 7 – 10 show no symptoms of infection.

2013 BYDV – approximate yield of a hard red winter wheat with gradations of infection:



Recommendations for severely affected fields:
Destroy severely affected crops (dead plants do not harbor the virus). Treat infected grain by spraying with Roundup or other burn down chemicals. Plow or disc down the crop four to five days after applying Roundup. Wait at least two to three weeks after spraying before planting a spring crop. If you replant with spring grain, be aware that replanting quickly can result in an increase in additional soilborne disease problems (like crown rots, take-all, Pythium seedling damping off, Rhizoctonia, etc) in newly planted wheat or barley unless you give enough time for the winter grain to decompose.

Leaving infected crops in place (including infected strips for crop adjustment purposes) can result in a disease reservoir that will serve as a source of the virus for newly planted spring crops. This is termed a "green bridge" where overlapping generations of crops result in transfer of diseases to the newer crop. Such practices will maintain BYD as an issue in future cropping cycles.

References:

Marshall and Rashed. 2014. Barley Yellow Dwarf Virus in Idaho Cereal Crops. CIS 1210. University of Idaho. http://www.cals.uidaho.edu/edcomm/pdf/CIS/CIS1210.pdf

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