Michigan Wheat Program

Evaluation of Oilseed Radish added to Wheat to Increase Wheat Yields in Michigan

Final Report

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Summary

This project investigated reports of increased wheat yield resulting from interseeding low levels of oilseed radish (OSR) with wheat. Over four years, on-farm and plot trials were establish to quantify the impact of this practice on yield and economics. Seventeen large (field) scale harvested paired plots showed OSR increases wheat yield 82% of the time and on average 2.8 bushels/acre (ranging from a reduction of 5.9 to an increase of 9.7 bushels/acre). However, for 106 paired small scale (plot) harvested plots, wheat yields increased 48% of the time and decreased 52% of the time, reflecting random chance. In 2017, a final replicated trial at the W.K. Kellogg Biological Station (KBS) controlling the distribution of OSR in the small plots failed to show any difference in yield between OSR and no-OSR interseeded plots.

After four years of study, with the inability to reproduce the large scale results in the many small scale trials, we cannot conclude there is statistically significant scientific evidence that the interseeding of OSR with wheat increases wheat yields.

However, although there is no statistical evidence that interseeding OSR in wheat increases wheat yields, particularly on a small scale, the large scale results need to be acknowledged. A number of farmers who have been using this practice feel it has value and improves their wheat yields. Just as there is no evidence of an upside to using this practice, there is no evidence of a downside either. For farmers wishing to interseed OSR in wheat, the risk and cost is low. The cost of the practice is estimated to be $2.00 - $5.00/acre requiring a 1 - 2 bushel per acre yield increase to breakeven.

Background

Over the last few years several farmers from Michigan and Ohio have added low rates of OSR to their wheat at planting. Many of these farmers have claimed yield increases from this practice. Our proposal was funded to investigate these claims through a combination of on-farm trials with wheat farmers and research plots at the MSU W.K. Kellogg Biological Station (KBS) in Michigan. This research occurred between 2012 and 2017.

Over a four year period starting with planting in 2012 and ending with harvest in 2017, OSR was interseeded with wheat at planting and compared to control plots without OSR on farm and at the W.K. Kellogg Biological Station (KBS). We compared locations, OSR planting rates and planting dates with this statewide project.

Wheat and OSR trial locations:

Trial locations and the years that trials were performed at each are given in Figure 1. Cooperating farms and locations were:

- John Burk
    - Bay City, MI
- Dean Kantola
    - Ravenna, MI
- Henry Miller
    - Centreville, MI
- Gerald Heck
    - Monroe, MI
- Kellogg Biological Station
    - Hickory Corners, MI

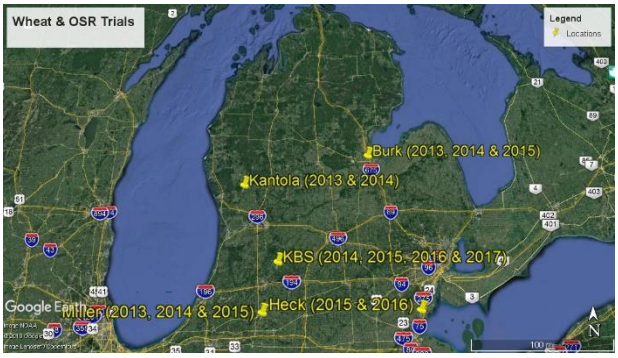

Figure 1. Wheat and OSR trial locations.

Figure 2. Wheat harvest at Kantola farm.

Treatments:

For all years of the study at all locations, the treatments of OSR 3lbs/acre plus wheat (at farmer's rate) and wheat alone (at farmer's rate) were tested. In addition, during various years and at various locations additional OSR seeding rates and planting dates were tested. Plots were harvested large (field) scale by the farmer or small (plot) scale by MSUE personnel (Figure 2). Table 1 summarizes all the treatments tested and harvesting scale. In trial years 2013 – 2016, OSR was always mixed with wheat and planted simultaneously. In the 2017 trial at KBS the OSR and wheat were planted separately to improve the distribution of OSR. Also a treatment was planted at a wheat population reduced to reflect the reduction in wheat that results from mixing OSR at 3.0lbs/acre and planting at the same drill setting, approximately 3%.

Results and Discussion

From 2013 – 2016, all of the trials resulted in 123 paired comparisons of OSR interseeded in wheat, a number of different rates and a number of different planting dates. Yield results for each of those pairs is given in Figure 3. The results showed that when the trial plots were field scale and harvested with a large combine (17 of 123 pairs), the addition of OSR showed a yield increase 82% of the time. When trial plots were field or plot scale and harvested small scale with the plot combine (106 of 123 pairs), the addition of OSR showed a yield increase 48% of the time. The latter for small scale reflects random chance of getting a yield increase.

Table 1. OSR interseeded in wheat treatments by location and year.

L = Large, S = Small Harvest Area			OSR Seeding Rates (lbs/acre)						Reduced Wheat
Trial Location	Year	Plant Date	0	1.5	3.0	4.5	6.0	15.0	Population, No OSR
Burk	2013		L		L				
	2014		L		L				
	2015		L		L				
Miller	2013		L		L				
	2014		S	S	S	S			
	2015		L		L				
Kantola	2013		S		S				
	2014		L		L				
Heck	2015		S		S				
	2016		L		L				
KBS	2014	Early	S	S	S	S			
	2014	Middle	S	S	S	S			
	2014	Late	S	S	S	S			
	2015	Early	S		S	S	S		
	2015	Late	S		S	S	S		
	2016	Early	S	S	S	S			
	2016	Late	S	S	S	S			
	2017		S	S	S	S		S	S

The lack of consistency between large and small plot trials was a concern. We hypothesized that due to the small amount of OSR mixed into a large amount of wheat (one OSR seed per 22 wheat seeds), even distribution was not possible. On a large scale, these low and high OSR regions were averaging out to produce a yield increase. On a small scale the low to high variation may have occurred plot to plot producing random results. An additional hypothesis was that the reduced wheat population with OSR could be producing the yield increase and not the OSR.

For the 2017 harvest year, we tested the un-even distribution by planting four replications of four rates of OSR, including a very high rate (15lbs/acre) separate from the wheat which resulted in even distribution of OSR plants within the plots. No OSR replications were also planted. In addition, we planted a reduced rate of wheat without OSR. We believed if a wheat yield increase was due to OSR interseeded into wheat that we should be able to statistically prove the effect within small highly controlled plots.

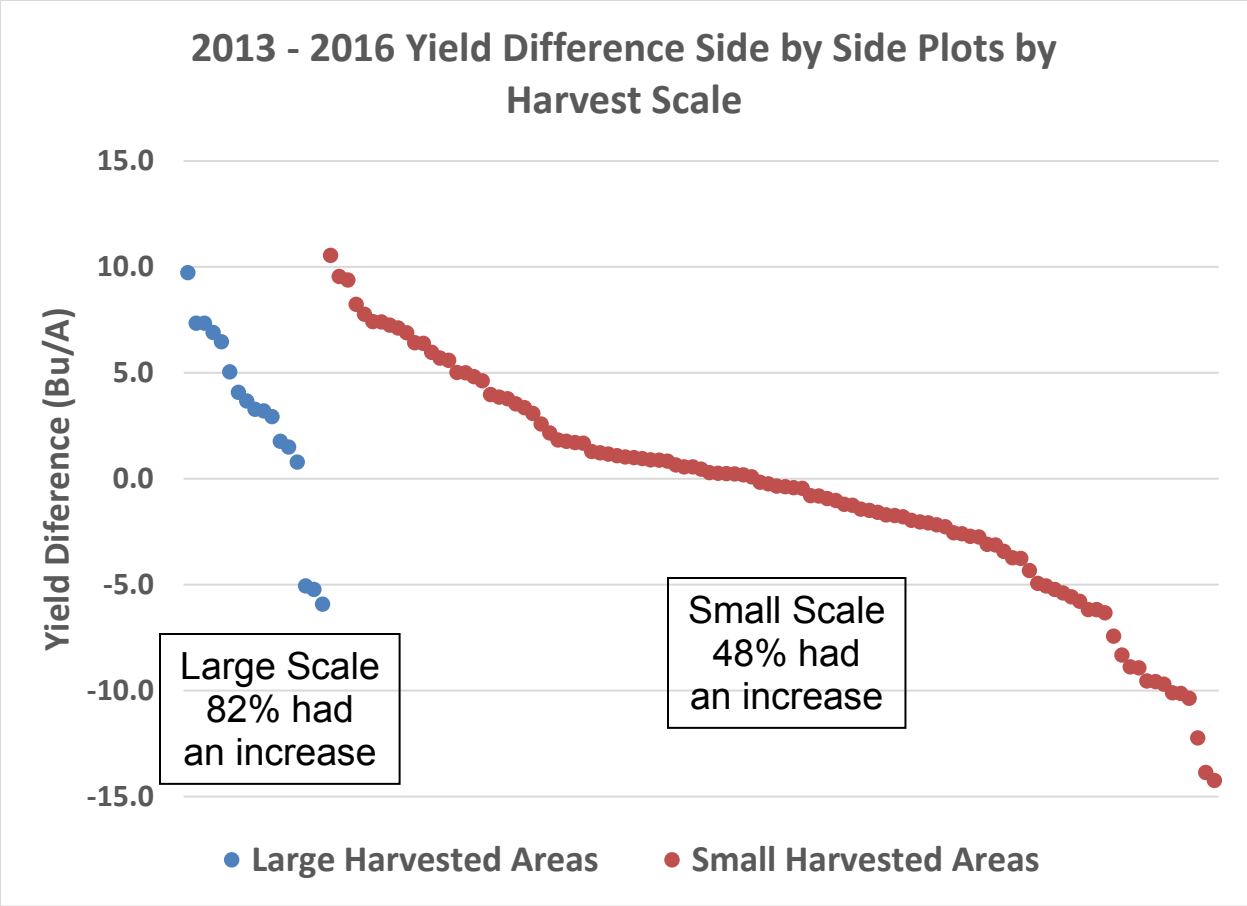

Figure 3. Yield difference between side-by-side plots with and without OSR interseeded in wheat.

The yield results from this trial are shown in Figure 4. The yields for none of the four OSR seeding rates (1.5, 3.0, 4.5 and 15lbs/acre) or the reduced wheat population were statistically different than for the no OSR treatment. After controlling the distribution of OSR within the plots we were still unable to produce a yield increase from interseeding OSR in wheat. Therefore, there is no scientific evidence to support that the practice increases or decreases wheat yield.

However, although there is no statistical evidence that interseeding OSR in wheat increases wheat yields, particularly on a small scale, the large scale result that OSR increases wheat yield 82% of the time and on average 2.8 bushels/acre (ranging from a reduction of 5.9 to an increase of 9.7 bushels/acre) needs to be acknowledged. A number of farmers who have been using this practice feel it has value and improves their wheat yields.

Just as there is no evidence of an upside to using this practice, there is no evidence of a downside either. When considering interseeding OSR in wheat, note that:

- The risk and cost are low,
- 3 lbs/acre OSR cost roughly $6.50/acre,
- The replacement of wheat seed with OSR seed (approximately 3%) saves $1.50 - $4.50/acre depending on seed source,

- The actual cost ranges from $2/acre - $5/acre, and
- A 1 - 2 bushel/acre wheat yield increase would be needed to breakeven.

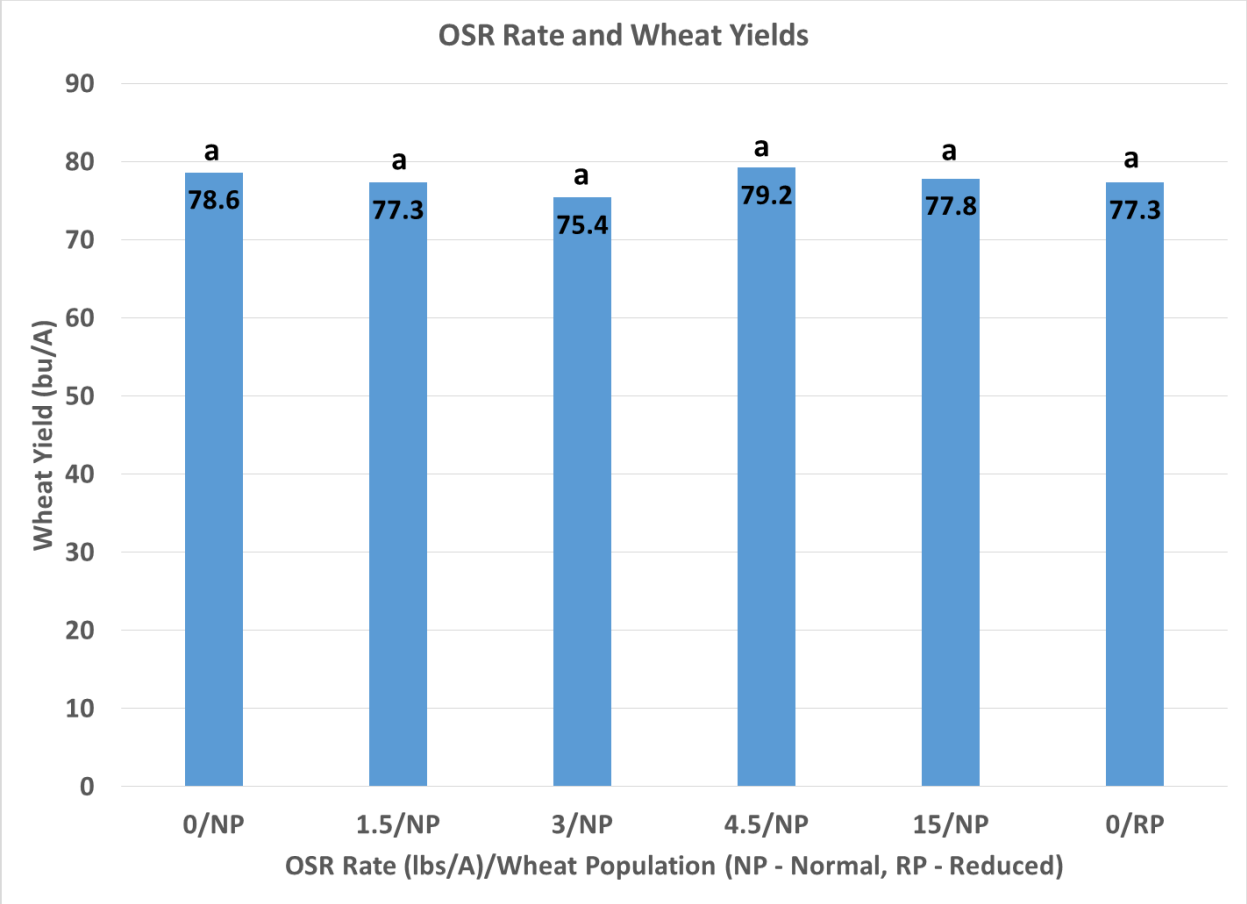

Figure 4. 2017 yield results for different rates of OSR interseeded in wheat and reduced wheat population. P-value = 0.738. LSD, 95% confidence: bars with the same letter are not different.

Conclusions

- After four years of study, there is no statistically significant scientific evidence that the interseeding of OSR with wheat increases wheat yields.
- In 106 paired small scale harvested plots, wheat yields increased 48% of the time and decreased 52% of the time, reflecting random chance.
- Controlling OSR distribution in the small scale plots or reducing wheat population did not improve the previous random results in small plot wheat yield increases.
- In 17 paired large scale harvested plots, wheat yields increased 82% of the time and on average 2.8 bushels/acre.

- The large scale harvested data indicates there may be some effect on yield from interseeding OSR in wheat, but this cannot be replicated under small scale, controlled conditions.
- For farmers wishing to interseed OSR in wheat, the risk and cost is low. The cost of the practice is estimated to be $2.00 - $5.00/acre requiring a 1 - 2 bushel per acre yield increase to breakeven.

Acknowledgements

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