Pest e-alerts

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Vol. 9, No. 27 http://entoplp.okstate.edu/Pddl/ July 13, 2010

Pecan Scab Update

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The weather so far this growing season has been a dream for plant pathologists. These wet growing seasons really demonstrate the power of plant diseases. With that said, it has been a growing season that has been mostly conducive for pecan scab. In research trials in the central and southern portions of Oklahoma, we have already observed high levels of scab severity, especially in lowland pecan growing areas. Susceptible cultivars have been hard hit and if early fungicide sprays were not applied, some growers may be looking at substantial damage to their crop by scab this season. As with any crop, fungicide should be used preventatively to manage scab. Many growers have likely already applied at least one and likely more preventative fungicide applications. Early preventative applications of fungicide appear to be extremely beneficial when it comes to managing pecan scab. We have found in our research that early applications of fungicide play an important role in reducing the amount of pecan scab later in the season. That is not to say that later cover sprays are not important to protect shucks when they are susceptible, however, if attention was not directed to epidemics early in the season (e.g. fungicide applied earlier in the season), then "getting ahead" of the epidemic at this stage in the season will be difficult.

If you happened to be able to attend the 2010 Oklahoma Pecan Growers Association (OPGA) Meetings held in Ardmore, Oklahoma a couple of weeks ago then you probably got a chance to see my presentation on managing pecan scab using fungicides. I reported the results of the 2009 fungicide trial, which we conducted at the Cimarron Valley Research Station located in Perkins, OK. If you were unable to attend the meeting the methods and results of those trials can be found below.

While presenting the data I mentioned that the first application in each of the fungicide programs was applied as an early pre-pollination spray without the assistance of the Oklahoma Mesonet Pecan Scab Advisor. That is to say that the first spray was a phonological-based spray, which was applied prior to catkin opening. All subsequent sprays where then applied based on the Oklahoma Mesonet Pecan Scab Advisor. I have received many questions inquiring about the theory behind the timing of the first application of fungicide.

The theory is actually based on concepts that were introduced by two pioneering plant disease epidemiologists. J.C. Zadocks and R.D. Schein published a text titled "Epidemiology and Plant Disease Management" in 1979. In the text they introduced three ways to slow plant disease epidemics. According to Zadocks and Schein, one way to slow an epidemic is to eliminate or reduce the initial inoculum (spore) level. This will translate to a reduced level of initial disease. When dealing with pecan scab, levels of initial inoculum can be reduced by conducting winter pruning, using good sanitation practices, and maybe using very early fungicide applications. The second way to slow a disease epidemic is to slow the rate of disease increase. This is typically accomplished by using pecan varieties that are resistant to scab and also by using periodic fungicide sprays. Finally, Zadocks and Schein indicated that a plant disease epidemic could be reduced by shortening the time of exposure of the crop to the pathogen. In row crops this is easily accomplished by adjusting planting dates. In a perennial crop like pecans, however, this strategy is not easily accomplished.

In pecans we can feasibly rely upon methods one and two. In figure 1 I have demonstrated the effect that using combinations of management strategies to reduce initial inoculum level and the rate of increase can have on a disease epidemic. The black line indicates an epidemic where no management strategies were used. The gray line illustrates what can happen if the initial inoculum level and the rate of disease increase are influenced by sound disease management strategies. Note that disease still occurs when management strategies are used, but the amount and rate of disease increase is substantially reduced.

So how does all of this relate to the early pre-pollination fungicide applications we applied in our fungicide evaluations? Well by applying those early applications, I theorize that we have managed to reduce initial spore load of the scab fungus. In turn this reduces the amount of initial disease. By combining this with the subsequent fungicide applications applied according to the Oklahoma Mesonet Scab Advisor, the rate of disease increase can also be reduced. We have applied treatments again this season to verify this theory. Hopefully the results will be consistent with those of 2009.

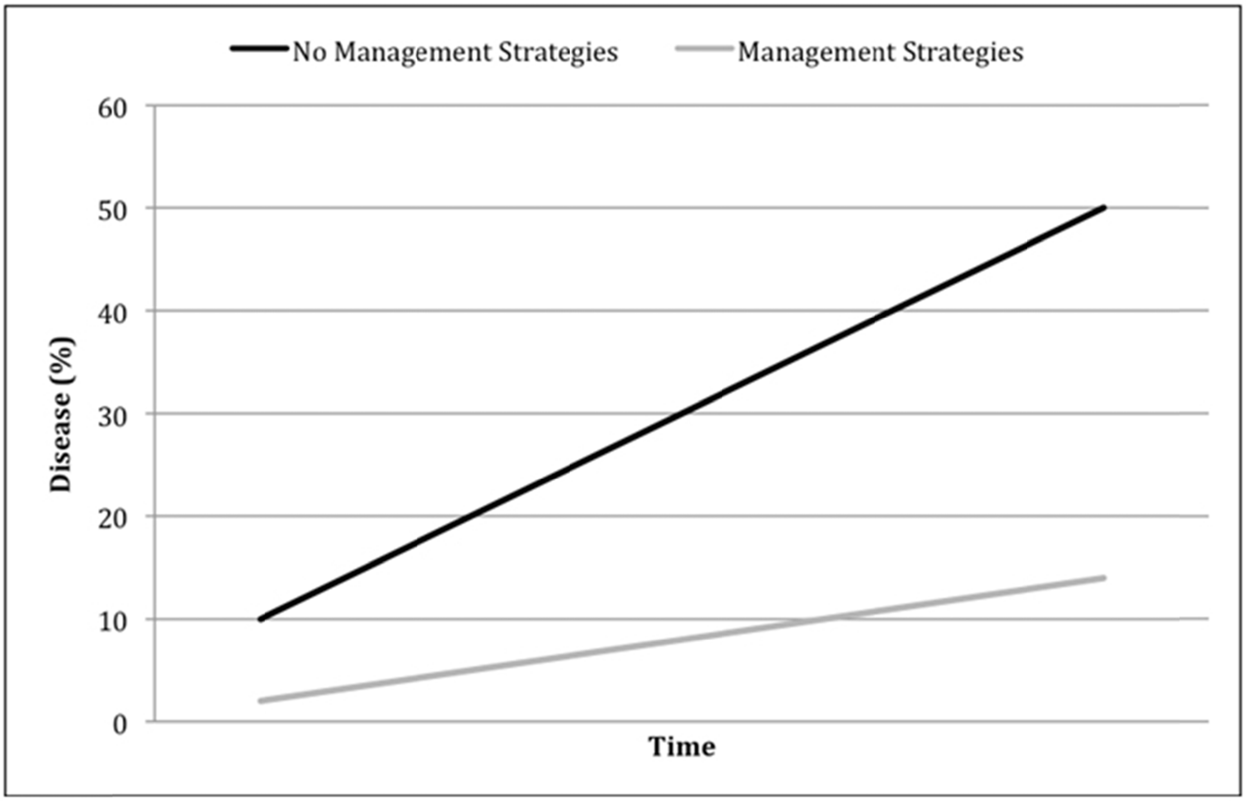

Fig 1. The effect of disease levels over time when using no scab management strategies (black line) vs. using scab management strategies (grey line). Note the difference in initial disease level (lower starting point) and reduced rate of disease increase (lower slope of the line) for the treatment where management strategies were used (grey line).

2009 Oklahoma State University Pecan Fungicide Evaluation: The fungicide trial was established at Cimarron Valley Research Station, Perkins OK. Rootstocks ('Colby' seedlings) were planted on an upland site with a Konawa fine sandy loam soil in 1994. Established rootstocks were grafted using 'Maramec' scion in 1996 and 1997. The experimental design was a randomized complete block with four replicates. Plots consisted of two trees with at least one border tree between adjacent plots on all sides. Trees were spaced 35 ft apart with a between-row spacing of 35 ft. Recommended maintenance practices were followed throughout the growing season, including crop-load thinning. Fungicides were applied with a tractor mounted Nut Hustler air blast sprayer, calibrated to deliver 104 GPA.

First fungicide applications were applied on 4 May (pre-pollination). Subsequently, treatments were applied using the Oklahoma Mesonet Pecan Scab Advisor (http://agweather.mesonet.org/index.php/data/section/hort) which was modified so that a scab hour was calculated based on a temperature threshold of 65°F and 85% relative humidity. Ratings of leaf incidence (percent of leaves with symptoms of pecan scab), leaf severity (average percent of leaf area with symptoms of pecan scab), fruit incidence (percent of clusters with symptoms of pecan scab) and fruit severity (average percent of cluster area with symptoms of pecan scab) were taken as an average of 8 branch terminals on each tree on 19 May, 11 Jun, 1 Jul, 7 Aug, and 4 Sep. Pecans were harvested on 6 Nov, dried to 6.5% moisture and yield data recorded on 9 Nov. Area under the disease progress curve (AUDPC) were assessed for five ratings of the percentage of leaves or fruit with symptoms of scab, averaged over 8 branch terminal ratings per tree. Leaf disease incidence and severity data were subjected to the area under the disease progress curve (AUDPC) transformation to account for season-long ratings. These data and final fruit incidence, severity, and yield data were analyzed using ANOVA ($\alpha = 0.05$). Treatment means were compared by Fisher's test of protected least significant difference ($\alpha = 0.05$).

Results and Discussion: Weather throughout most of the season was wet with below-normal temperatures. Abnormally hot weather was documented for a period of time in June. However, this weather did not persist. Highest levels of leaf disease incidence were recorded in non-treated check plots (Table 1). All fungicide programs resulted in significantly lower levels of leaf disease incidence compared to non-treated control plots (see table). Lowest levels of leaf disease incidence were recorded in plots treated according to the EARLY STROBILURIN program and were not significantly different from plots treated according to QUILT and STRATEGO programs. Plots treated according to the LATE STROBILURIN program had the highest levels of leaf disease incidence among plots where fungicide was applied. However, leaf disease incidence was not significantly different from QUILT and STRATEGO programs. Highest levels of leaf disease severity were observed in the non-treated control plots. No significant differences in leaf severity were noted among fungicide treatments and non-treated control plots. Fruit disease incidence and severity were highest in non-treated control plots. All fungicide programs resulted in lower levels of fruit disease incidence and severity compared to the non-treated control plots, however, no significant differences in fruit disease were noted among fungicide programs. No significant differences in yield were recorded among treatments.

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Table 1. Results comparing four fungicide programs and a non-treated control for managing pecan scab in Oklahoma.

Treatment and rate/A	Timing[z]	Leaf Incidence AUDPC (%-days)[y]	Leaf Severity AUDPC (%-days)[x]	Final Fruit Incidence (%)[w]	Final Fruit Severity (%)[v]	Yield (lb/a)[u]
Non-treated control	N/A	3991.8 A	647.6	76.9 A	10.6 A	270.2
LATE STROBILURIN						
Folicur 3.6F 8.0 oz	1					
Enable 2F 8.0 oz	2,4					
Topsin 4.5FL 20.0 oz	3					
Headline 2.09EC 7.0 oz	5	2429.6 B	402.1	18.8 B	2.4 B	206.2
QUILT						
Quilt 1.66SC 27.5 oz	1,3,5					
Topsin 4.5FL 20.0 oz........	2,4	1371.1 BC	215.0	4.7 B	0.8 B	397.0
STRATEGO						
Stratego 2.08EC 10.0 oz	1,3,5					
Topsin 4.5FL 20.0 oz	2,4	1109.0 BC	240.1	8.8 B	2.9 B	404.2
EARLY STROBILURIN						
Headline 2.09 EC 7.0 oz	1					
Topsin 4.5FL 20.0 oz	2,4					
Abound 2.08EC 12.3 oz	3					
Enable 2F 8.0 oz	5	806.4 C	350.7	2.4 B	2.0 B	304.2

[z]Application timing of each fungicide within each 5-spray sequence. N/A indicates not applicable.
[y]Means followed by the same letter are not significantly different according to Fisher's test of protected least significant difference where: LSD=1208; R^2=0.78; CV=41; *P*-value <0.01.
[x]Area under the disease progress curve (AUDPC) ratings per two-tree plot: R^2=0.64; CV=55; *P*-value = 0.08.
[w]Means followed by the same letter are not significantly different according to Fisher's test of protected least significant difference where: LSD=21; R^2=0.88; CV=62; *P*-value<0.01.
[v]Final fruit severity based on ratings (4 Sep) of average % per fruit cluster. Means followed by the same letter are not significantly different according to Fisher's test of protected least significant difference where: LSD=3.5; R^2=0.81; CV=62; *P*-value<0.01.
[u]Average yield (moisture = 6.5%) measured on 9 Nov: R^2=0.46; CV=41; *P*-value=0.21.