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In This Issue:

Forage Restrictions Amended for Cereal Herbicides

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Recent changes in labeling for certain DuPont cereal herbicides now allow small grain growers the opportunity to treat wheat, barley, or triticale and harvest the crop as a forage. Specific herbicides affected by these changes include **Harmony SG**, **Harmony Extra SG**, and **Express** with TotalSol. The new forage restrictions are highlighted below:

"Allow at least 7 days between application and grazing of treated forage. In addition, allow at least 7 days between application and feeding of forage from treated areas to livestock. Allow at least 30 days between application and feeding of hay from treated areas to livestock. Harvested straw may be used for bedding and/or feed."

NOTE - The restriction interval for hay concerns the amount of time between application and feeding the crop to livestock. Therefore, if a grower cuts wheat for hay 20 days after application; he needs to wait an additional 10 days after cutting before the treated crop can be fed as hay to livestock (i.e. 30 days between application and feeding hay).

The following definitions are based on EPA's interpretation and help clarify the label restrictions:

Forage - Samples cut at the 6 to 8 inch growth stage up to stem elongation (jointing) stage, at approximately 25 percent dry matter (DM).

Hay - Samples at the early flower (boot) up to soft dough stage. Hay should be field-dried to a moisture content of 10-20 percent.

Straw - Cut plant residue (dried stalks or stems with leaves) left after grain has been harvested (threshed)

Labels for **Harmony Extra SG** and **Express** with TotalSol were also amended in regards to the preharvest interval for grain. These two products require at least 45 days between application and harvesting cereal crops for grain.

By-Product Gypsum: What's It Worth to the Small Grain Producer? *John Grove—Soil Fertility*

The short answer is, not much. Gypsum, also called calcium sulfate ($CaSO_4 \cdot 2H_2O$), is a good source of plant available calcium (Ca) and sulfur (S), being 23.3% Ca and 18.6% S in the pure compound, if you need these nutrients in your soils. However, Ca and S deficiencies have never been observed on wheat or barley in Kentucky.

By-product gypsum is produced, in large tonnages, from one of three industrial processes: 1) sulfur removal during electricity generation from coal and refining of crude oil; 2) phosphate fertilizer manufacturing; and 3) waste water treatment. The major industrial use of by-product gypsum was in wallboard manufacture, but the slowdown in new housing construction has left by-product generators with mountains of this stuff, mountains that need to go somewhere, mountains that look like an agricultural opportunity to some.

The physical consistency of these materials varies. Some are fine and rather dusty, while others are somewhat moist, caked and lumpy (see below).

Few are "field-ready" for optimal spreading behavior in the field (see below).

The chemical consistency of by-product gypsums also varies because of other chemical constituents trapped in the by-products during the industrial processes that generate them. These contaminants are not consistently present in all by-product gypsums, or are at such low levels as to be innocuous in many, but no agricultural user of by-product gypsum should proceed without a chemical analysis of the material. That analysis should not only confirm the material's Ca and S levels, but should determine whether the material possesses unreacted alkalinity (liming value), stronger salinity (other sulfate and/or chloride salts) and concentrations of other nutrients (magnesium, potassium, phosphorus, boron, copper, iron, manganese, molybdenum, and zinc), and elements (aluminum, arsenic, selenium, silicon, sodium, nickel, chromium, mercury, etc.) of biological concern. Some nutrient elements (boron, copper, molybdenum and zinc) become toxic at high concentrations. Not all elements found in such materials are immediately bioavailable, either. The agricultural user should ask for a complete "chemical analysis profile" of the material.

In Kentucky, deficiencies of Ca and S have not been observed, and UK extension personnel are always on the lookout for them. Sulfur deficiencies in wheat and barley are best determined by analysis of whole plants (cut about one-half inch above the soil surface), at Feekes 5, just prior to emergence of the first joint on the main stem of each plant. If the N:S ratio is greater than 15:1, then S should be added at a rate of 20 to 40 lb S/acre. A rate of 120 to 240 lb gypsum/acre will be enough to meet that need, if it is ever observed.

Kentucky soils contain large amounts of bioavailable Ca, making it very unlikely that Ca deficiency will ever be observed here. There have been reports, from the southeastern United States, Brazil and South Africa, that a high gypsum application rate (at least 1000 lb gypsum/acre) would reduce subsoil acidity, improve crop root development, increase subsoil water use, and raise crop yield. Some Kentucky soils have acid subsoils that might benefit from this practice, but few of these soils are under small grain production.

Another reported benefit of gypsum application to agricultural soils is improved soil physical properties, including improved structure, greater water infiltration, and reduced crusting. These benefits are associated with the use of gypsum on saline-sodic and sodic soils, found in the more arid parts of the western United States. Such soils do not occur in Kentucky, because of our long history of a humid climate, which has resulted in soils with very different chemical properties. The positive benefit of organic matter to the physical properties of Kentucky soils is well known. However, a soil physical property response to gypsum application, of any kind, has never been shown.

Overall, the expected benefits of by-product gypsum applications are few. However, it is also true that these materials, if they do not contain hazardous contaminants, are not harmful to agricultural soils. This suggests that small grain producers should, if they apply the material at all, ***be paid to use it***. By-product gypsum that is applied to agricultural soils does not incur long-term storage or landfill charges.

Supplemental Label for Headline® Fungicide for "Plant Health":

Will it Improve Corn, Soybean and Small Grain Health?

Paul Vincelli and Don Hershman—Extension Plant Pathologists
Chad Lee—Extension Grain Crops Specialist

A couple of weeks ago, we learned of a supplemental label for Headline® fungicide for use on several crops for "disease control and plant health". The impacted crops grown in Kentucky are corn, small grains (barley, rye and wheat), and soybean, as well as other edible legumes. Headline® and related strobilurin fungicides (Quadris®, Quilt®, and Stratego®) provide excellent control of certain fungal diseases of the above crops. In Kentucky, for example, use of these products to control gray leaf spot and/or northern leaf blight in corn, frogeye leaf spot and brown spot of soybean, and tan spot and leaf rust of wheat makes sense when the risk of disease is high. However, this new supplemental label makes claims that go way beyond disease control.

Claims Made on the New Supplemental Label

The supplemental label indicates that, through preventive applications of Headline® to crops, "The plant health benefits may include improved host plant tolerance to yield-robbing environmental stresses, such as drought, heat, cold temperatures, and ozone damage". The supplemental label also claims that "Headline can improve plant utilization of nitrogen and can increase tolerance to bacterial and viral infections. These benefits often translate to healthier plants producing greater yields at harvest, especially under stressful conditions."

The supplemental label also claims that additional specific benefits can occur, including:

- Improved stalk or straw strength and better harvestability (barley, corn, rye, wheat);
- Induced tolerance to stalk diseases (corn);
- Better tolerance to hail (corn);
- More uniform seed size (corn, soybean, and edible legumes);
- Better seed quality (soybean and edible legumes).

Will "Plant Health" Be Improved?

Based on publically available research reports, we see very little evidence that Headline® or other strobilurin fungicides should be applied to any of the above crops for any reason other than disease control. To date, no data have been circulated in either the scientific or farm communities which suggest that any strobilurin product, including Headline®, can reliably live up to the claims made for stress tolerance under field conditions.

Claims of stress tolerance sound exciting but, based on the data we have seen, deserve to be viewed with cautious skepticism. There are certainly studies in the laboratory, the greenhouse, and occasionally in the field that show beneficial physiological changes in crops treated with strobilurin fungicides. But don't assume that the beneficial changes observed in those studies result in increased yield under field conditions. When a "greening effect" and/or yield improvement is observed in a treated crop (in the absence of significant disease pressure), it is assumed that stress tolerance and/or improved "plant health" (apart from disease control) is at work. This isn't necessarily true. In order for any real-world stress tolerance claims to pass muster, scientifically, it is necessary to conduct replicated field studies where the appropriate environment, plant, and crop measurements are made, and appropriate experimental controls are in place. We do not believe these data exist in sufficient quantity to support the above stress tolerance claims. Certainly, it is inappropriate to draw conclusions about stress tolerance based solely on crop appearance and yield. For example, we have observed the greening effect in field crops, but it often does not translate to higher yields. We have also observed occasional yield increases in crops (mostly soybean) following a fungicide application, when no obvious disease symptoms were present. But there are a large number of potential reasons why yields are improved in treated crops. Tolerance to one or more stresses is a possibility, but it is also possible that some soilborne disease or disease complex is being controlled, but we cannot easily observe it. There are many other possible reasons and the only way to know for certain is to conduct the appropriate replicated, controlled field studies.

Let us look at an example from soybean from two replicated studies conducted at the Research and Education Center where disease pressure was minimal and late season moisture stress was significant (especially in 2007). If Headline® application improves tolerance to drought stress (as per the supplemental label), then the application should improve yield in treated crops. But as can be seen in Table 1, soybean yields were not improved by Headline® in either year. Table 2 shows the results of a similar field trial for corn conducted on a Kentucky farm under drought conditions. You can see that Headline® provided no yield bump.

Table 1. Results of Headline® application (6.0 fl oz + induce at R3 stage) in soybean where disease pressure was insignificant, under late season moisture stress (UKREC, Princeton, KY, 2007-2008).

	2007	2008
Treatment	**Yield (bu/acre)**	**Yield (bu/acre)**
Check	24.5	51.5
Headline®	23.8	53.0
Statistical result (LSD, P=0.05)	No statistical difference	No statistical difference

Table 2. Results of Headline® application in corn where disease pressure was insignificant, under late-season moisture stress (Logan County, KY, 2007)

Treatment	% gray leaf spot*	Yield (bu/acre)
Check	1.3	160
Headline®	2.0	155
Statistical result (LSD, P=0.05)	No statistical difference	No statistical difference

*Disease assessed on ear leaf at half milk line.

It is important to emphasize that the data in Tables 1 and 2 are merely examples. The above data are typical of what has been seen over and over in a large number of university-conducted trials conducted over the past several years in corn, soybean, and small grains. If Headline® regularly improves yields by imparting stress tolerance to crops in the absence of disease, then more complete and convincing proof needs to be made public. And in the world of science, claims based on evidence that has not been made public are treated with suspicion.

The claims about improved stalk health in corn are not unreasonable. Occasionally (and we stress the word "occasionally"), applications of strobilurin fungicides have been shown to improve stalk strength and/or reduce stalk rots in university-conducted field trials. However, in our experience, that improvement in stalk health relates to control of foliar diseases (gray leaf spot, for example). You see, if foliar diseases are aggressively attacking the plant during grain fill, then the corn plant will attempt to fill the grain by "cannibalizing" the reserves in its own stalk. That weakens the stalk and can result in more aggressive stalk rots as well as reduced stalk strength. So, if foliar diseases are killing the upper and middle foliage during grain-fill, then it makes sense that a fungicide like Headline® might sometimes improve stalk health, which it sometimes does. But note carefully: this benefit still relates to control of foliar diseases. And like we said above, strobilurin fungicides are very good for controlling foliar diseases like gray leaf spot and northern leaf blight of corn *if these diseases are present*.

What about a fungicide enhancing tolerance to hail? Actually, conducting a study that tests for this type of benefit is more complex than you may realize. You must have the right kind of experimental design or you could be misled by the results. The only study we are aware of that tests this claim with a valid experimental design is one conducted in 2008 by Dr. Carl Bradley and colleagues at the University of Illinois. In that study, researchers used a weed-eater to simulate hail damage. In that study, they found absolutely no yield benefit from Headline®, Quadris® or Quilt® when applied following simulated hail damage.

Is there a downside?

Producers should be aware that sometimes the late-season "greening" effect observed with strobilurin fungicides can result in higher grain moisture and therefore additional drying costs and a slower (more expensive) harvest. Conversely, if crop harvest is delayed until the desired harvest moisture content is reached, there can be a yield and/or quality penalty, depending on the crop. For example, delaying wheat harvest will result in delayed planting of doublecrop soybean, which can lead to lower yields in soybean. In soybean, if harvest is delayed, pod and stem blight levels may increase, which can reduce the quality of grain destined for seed use. This may necessitate additional grain clean-out and/or the use of seed-treatment fungicides prior to planting next season. (Strobilurins, in general, do not do a good job in controlling soybean pod and stem blight). The bottom line is that fungicides applied to corn, soybean, and wheat will sometimes increase production costs.

Another concern specifically relating to the "plant health" issue is that the use of a fungicide when disease activity is too low to affect yield increases the risk of fungicide resistance. It is because anytime you expose a fungus to the fungicide, even when fungal activity is low, you increase the selection pressure on the fungus towards resistance. Resistance to strobilurin fungicides is an important concern worldwide, and the use of any strobilurin fungicide for "plant health" reasons increases the risk of developing strobilurin-resistant gray leaf spot. Use of strobilurins may also incite flares in certain insect and mite populations under field conditions, because fungicides can sometimes suppress fungi that kill these arthropod pests.

Bottom line

The strobilurin fungicides are very good for control of specific crop diseases (see product labels for a list), if they are present at high enough levels (or the risk is high enough) to reduce yields. However, applying a strobilurin fungicide for "plant health" or stress tolerance reasons alone—with little or no threat from foliar diseases—doesn't make sense to us, based on our extensive study of the best available information. Land-Grant University trials, thus far, generally do not support claims of reliable improvement in crop yield under stress conditions from an application of Headline®, or any other strobilurin fungicide. Nor have fungicide manufacturers provided sufficient field evidence in support of these claims. In fact, the vast majority of industry data show yield impacts (usually in side by side comparisons) associated with specific fungicide treatments, but provide no measurements of diseases or stresses. The upshot of this is that there is absolutely no way to know what the cause of apparent yield improvement is in the vast majority of industry studies. Thus, at this time, we do not feel there is a scientifically defensible basis for assertions of improved plant health/stress tolerance in the absence of the diseases the fungicide was originally developed to control.

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University of Kentucky Wheat Field Day

Tuesday, May 19, 2009

Boddie Farm - Christian Co.

(more details later)

UK Ag Extension

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