Crops Day Discussions

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Speakers during the morning portion of the all-day meeting were John Yocum, manager of the Landisville Penn State Research Station, Dr. Elwood Hatley, a Penn State agronomist, and Bob Anderson, a Lancaster County extension agent.

Yocum discussed weed herbicide resistance and strategies farmers can use to avoid propogating fields of herbicide-resistant weed strains.

He also talked about new herbicides for the year, labeling changes, and difficult weeds.

Hatley discussed corn variety selection, especially selecting hybrids for silage. Basically, he said that there are some hybrid advantages for making silage, but farmers who use them most likely find they have to get used to raising the plants, as traditional eyeballing clues some farmers used to determine readiness for harvest aren't dependable with the hybrids.

Anderson announced some county winners of the state 5-acre corn club contest, though awards were originally announced during the Pennsylvania Crops Conference and reported in the Feb. 3 issue of **Lancaster Farming.**

Yocum said that several cropping practices can set up an ideal setting for developing herbicide resistance in weeds, and those are the ones that farmers should strive to avoid in order to prevent that from occuring in their fields.

He said that rotating chemistry and using strategic tank mixes can reduce the potential to create resistance.

Using a slide presentation he helped develop, Yocum said that a growing layman opinion is that herbicides are causing mutations in weeds and thus creating resistant strains.

That is not the case, he said. The resistance is showing up in plant species that already have the genetic potential to be resistant.

He said that the way resistance is developed, a plant that reproduces using a high number of seeds, such as most annuals, is treated with an herbicide that has a specific killing strategy.

What he meant by a specific killing strategy is that some herbicides are created to interfere with a specific metabolic function in a plant, such as blocking photosynthesis (photosynthesis is the basic function of a plant converting solar energy into stored energy).

A photosynthetic-blocking chemical would bind with a chemical in the plant integral to photosynthesis, thereby blocking photosynthesis and basically robbing the plant of its ability to make its own food.

Within the plant population there are subtle variations in some of the photosynthetic chemicals, and while the majority of plants representative of that species are affected by the herbicide, those individual plants with an inherent chemical variation that is not affected by the herbicide are the ones that survive and provide the genetic material for the next population.

What happens is that the farmer who does not change his herbicide chemistry and continues the same cropping and herbicide practices in same fields year after year, eventually will (given that the plant has the genetic variability to resist and enough time) foster an herbicide resistant strain.

The herbicide chemicals themselves aren't causing the resistance, Yocum said, that ability is already existant in the genetic pool of the plant species, it just needs a farmer to create a situation that rewards that genetic variation.

It has been the observation of some that nature fills a vacuum. Others have described it more as filling an empty niche.

When herbicides are used extensively and repeatedly in the same area against the same plants, without variation, it creates an empty niche. The plant able to resist the herbicide grows in number and can quickly take over and cause a high population of resistant plants.

The way to get the most effect out of an herbicide that works is to work it into the program so that it kills effectively one year, then allow a reprieve.

While it might sound perverse, the idea is to not destroy the parent weed stock that is susceptible to the herbicide. If the susceptible parent stock is all killed off, then only the resistant stock is left to take over, and it will.

If susceptible stock is allowed to remain, it's more probable that since it is already the dominant stock, it would help suppress the resistant variation.

According to Yocum, there are severl conditions that lead to an high risk of developing resistant weed stock.

- The seed of the weed can't have a long dormancy. It can't be able to survive more than a couple seasons without germinating. If it would, then susceptible stock would mix in with the resistant stock and probably limit the expression of resistance.
- The weed must have a high susceptibility to the herbicide. Again, this kills off the susceptible, dominant variety and allows the resistant strain to populate. Also it must a high frequency of resistance. In other words, the chances of an individual weed plant carrying a trait for resistance should be more like 1:million, rather than 1:trillion.
- The herbicide must be used at the same site for a number years without change.
- The herbicide must have a long residual efficacy, meaning that it doesn't break down quickly and allow susceptible plants to survive.
- The amount of herbicide used must be high relative to the amount needed to do the job. This sounds as though farmers might be purposefully using herbicides way beyond recommended levels, but frequently when using an herbicide to kill a variety of susceptible weed species, a minimum rate of application needed to kill one species may actually be twice what is needed for another species.

If all the above conditions describe current farming practices, they should be changed.

Those herbicides that attack plants by interferring with several plant functions are considered better at not developing resistance, because total resistance would require selection for several different resistant traits.

By using a combination of crop rotations (not only fields, but crops with different seasonal life cycles), herbicide rotations, and care when introducing machinery into fields so as not to introduce resistant weed seed, there is good chance of not developing herbicide resistance.

Yocum said that farmers really need to pay attention to those plants that do escape and survive after being treated. Without paying attention to potentially low populations of what may be an herbicide-resistant weed, it can quickly spread and overwhelm the field before the farmer realizes he has a resistant population.

Generally Yocum said, "You don't realize resistance until about a third of the population survives."

Yocum showed a slide of a table that compared estimated years of herbicide use until weed restistance would probably occur.

The purpose of the table was to illustrate and re-emphasize the lesson that the simpler the function of an herbicide, and the more the plant species depends on the production of large amounts of seed to carry it through from season to season, the more the opportunity for resistance to develop.

The goal of the farmer then is to integrate cultural, chemical and mechanical cropping techniques to diminish the possibility of creating that scenario.

Yocum also reviewed some of the herbicide labeling changes and newly approved chemicals.

The rest of the meeting was devoted to a presentation by members of the State Conservation Commission Nutrient Management Advisory Board, staff of the SCC, and support staff from the state Department of Agriculture and the state Department of Environmental Protection.

In a public meeting held in conjunction with the Lancaster County Crops and Soils Day, Karl Brown, executive director of the State Conservation Commission, reads a question from the audience about proposed regulations to implement the state's Nutrient Management Act. Sitting on stage in the background and fielding questions are some of the members of the SCC Nutrient Management Advisory Board and officials with the departments of Environmental Protection and Agriculture.

After a presentation explaining the regulatory package proposed and recommended by the advisory board to implement the state Nutrient Management Act, staff collected questions that members of the audience wrote down on index cards about specifics of the regulations.

The meeting was the last in a series of educational public meetings the advisory board, SCC staff, PDA and DEP officials held around the state.

A series of public hearings to receive comments on the proposed regulations are about the begin. A hearing is scheduled for the Farm and Home Center for March 11.

Weed Knowledge Is Weed Control

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LEBANON (Lebanon Co.) — If a weed can't be identified within days, perhaps hours of emerging, then determining the most efficient and least weed management program is difficult if not impossible.

While many people can identify adult specimens of weed species, that's way too late to determine what control program may be needed to prevent losses.

The solution is to become adept at identifying weeds soon after they emerge, according to Del Voight, a Penn State Extension agronomic agent for Lebanon County.

There are several reasons that justify making the effort to learn how to identify immature weeds and they all have to do with designing a professional-quality weed management program.

Seed identification can be helpful in some instances, but mostly seed knowledge only needs to be limited to a general understanding of how each weed species reproduces, the hardiness and germination of seeds.

There is no need to memorize all the weed species and life cycles, because there are good references available, but it is important to use them. The more those references are used and weeds identified, the faster and more efficient the farmer's management program can be applied.

Voight said that to start a solid, workable weed control program, farmers should scout and map their acres for weed species.

This can be done up to just before corn canopy, or during combining. Preferably, scouting and mapping should not be an isolated event, but should occur with updating on every trip to the field — if something looks different, a new plant, etc., write it done.

Also map out nearby "weed banks" — areas on or off the farm that have undesirable plants of which the seeds could be moved by wind, water or wildlife onto the cropland.

The soil itself could be a prodigious weed seed bank, and some common weed seeds remain viable in the soil for 40 years or more, which is why tilling can be a problem in some areas.

There is a technique for determining the weed seed-bank profile of a soil. Taking a measured sample of a known depth of soil, putting it into a container and adding water and a surfactant (such as a soap, which prevents the soil from adhering to the seeds), it can be estimated how much of a potential problem is in the soil already.

Identifying the seeds can show relative populations of seeds, but it shouldn't be used to plan a specific control program.

Since the emergence of weeds from soil seed is unpredictable, it is considered foolish to attempt to treat a field with a pre-emergence herbicide to control a weed suspected of being a problem based soley on the soil seed population.

However, a soil seed analysis can help determine what kinds of weeds are potentially there, which ones potentially pose a problem, and whether or not tillage will help or hurt control unwanted growth.

Voight said for example, one plant of redroot pigweed produces about 117,000 seeds. Not only does this show an opportunity of the plant to quickly spread out, but also indicates a stronger opportunity to develop herbicide resistance.

Other seeds, such as the large, heavily coated burcucumber seeds may not be as prolific, but are easily moved around by tilling, tougher to kill with pre-emergent herbicide, and can germinate at a wide variety of depths.

Further, burcucumber germinates all summer long and if tillage distributes the seeds throughout the soil depth, plants can continue to emerge even after an applied post-emergence herbicide such as atrazine has been applied and loses effectiveness.

The goal of the weed control program should be to control the wild growth of plants in a field intended for domestic plant production.

A weed control program has to take into account the types of plants (crops) intended to be grown. They also should be considered according to plant lifecycle.

For example, there are summer annuals such as corn, winter annuals such as winter wheat, and summer and winter biennials and perenials.

Each type of plant and its season of growth should be listed according to catagory.

The weeds in a field should also be identified and catagorized according to life cycle and seasonality.

For example, pokeweed is a perennial, wild mustard can be a winter annual, wild carrot is a biennial.

Voight cited two publications which are low cost and can provide Pennsylvanians with a good key to weed identification.

He said a publication available through Penn State Extension is the "Common Weed Seedlings of Michigan."

Produced by Michigan State University Extension, the 16-page key provides color photographs of 33 of the most common problem

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