AGRONOMY NOTES

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In Memory of
Martin B. Adjei

The University of Florida and Florida growers lost a dedicated and respected researcher and extension specialist in a tragic automobile accident on August 15, 2006. Dr. Adjei conducted considerable research with colleagues throughout Florida and the tropical regions of the world for more than 28 years, including 9 years with IFAS. His numerous on-farm research/demonstrations projects and the respect of ranchers earned him the Florida Cattlemen's Researcher of the year award for 2005. Martin will surely be missed by his research colleagues and especially by the Florida Cattlemen. A memorial service will be held on August 26 in Arcadia, Florida followed by burial in Sanderson, Florida on August 27th.

IN THIS ISSUE

Cotton Changes

Monsanto Company and Delta and Pine Land Company announced today that they have signed a definitive agreement whereby Monsanto will acquire Delta and Pine Land Company for $1.5 billion in cash. The transaction was unanimously approved by the Boards of Directors of both companies and is subject to Delta and Pine Land shareowner approval, antitrust clearance, and customary closing conditions. The result may be that new technology will be available faster to growers and many new traits developed.

David Wright

Cotton Use in the U.S.

Global cotton use has stayed the same for a number of years. However, this is now changing. Many of the cotton mills in the U.S. have moved overseas in the past 5 years, greatly impacting the textile industry. In 1995, 8 million bales of cotton were made into apparel while only 1 million bales are projected to be used in 2006.

David Wright

Worldwide Impacts of Genetic Technology in Cotton

India, U.S., and China are the world's largest producers of cotton. Currently, U.S. cotton companies are producing hybrid varieties to introduce traits in other countries, making pirating of the technology more difficult. Therefore, hybrid cotton will allow companies to be compensated for the technologies they have developed. One in particular is the *Bt* trait which is likely to increase average cotton yields in India by 200 lbs/A. This is because insecticides are rarely used and insect pests routinely reduce cotton yield.

David Wright

Peanut Problems

Just when we thought rain made some of the peanut problems go away, diseases have begun showing up from plants damaged by lesser corn stalk borers and cut worms. Several growers have sprayed pyrethroids for larvae and have gotten poor control since the insects were too large to be adequately controlled. It is important to be sure to use the right material for the size and kind of insect being controlled.

With some rainfall in most peanut areas, peanuts appear to be 2-3 weeks later than normal due to water stress. The drought has caused many fields to still be pegging and flowering heavily. In this scenario, it will be very important to stay on schedule with fungicides to keep from having severe problems with leaf spot with the extended growing period.

David Wright

Soybean Rust

Soybean rust has been widespread in late August in both 2005 and 2006. This is because the high humidity and rainfall that is common in August hastens spore buildup and dispersal. Several fungicide studies were conducted in 2005 on late planted soybeans. Most of the fungicides tested were effective against Asian soybean rust if applied at R1 growth stage, or as soon as rust was found. Applications made with flat fan nozzles at 30 psi appeared to do a very good job of controlling the disease. Yield increases by nearly 30% when applications

were made at first bloom and again 2 or 3 weeks later. Fungicides applied after R5 stage are not expected to increase yields.

David Wright

How Herbicides Work – PROWL

Prowl is the trade name for the herbicide that contains the active ingredient pendimethalin. Prowl is registered for use in a variety of crops, including corn, cotton, peanuts and soybeans. It is also registered for use in certain turfgrasses and many fruit and nut crops. Pendimethalin is active on many grasses and certain broadleaf weed species. In general, broadleaves controlled by pendimethalin are "small-seeded" and include weeds such as pigweeds, Florida pusley and common lambsquarters.

Pendimethalin is applied to the soil surface for preemergence weed control. The herbicide must be incorporated soon after application with tillage or left on the soil surface to be incorporated with rainfall or irrigation. If incorporation does not occur within 7 days after application, breakdown due to photolysis (photodegradation) will occur and deactivate the herbicide. Pendimethalin can be applied over the top of many crops without harmful effects, but only has activity on weeds that have not germinated. Pendimethalin **does not** have postemergence activity.

Pendimethalin is classified as a growth inhibiting herbicide, or sometimes it is called a mitotic inhibitor. This herbicide blocks the process of mitosis, the process whereby cells divide to form new cells. More specifically, pendimethalin binds to tubulin, which comprises the spindle fibers. As seen below, spindle fibers "pull" the chromosomes to each newly developing cell. The binding of pendimethalin to tubulin does not allow the spindle fibers to form, thus preventing cell division.

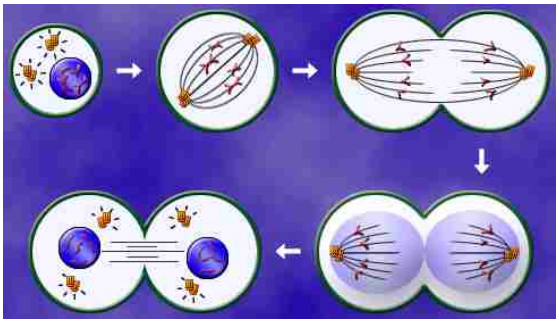
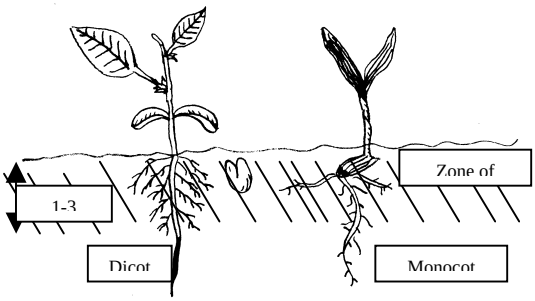


Figure 1 – Mitosis - adapted from www.phoenix 5.org

Pendimethalin is effective on new and rapidly dividing tissues; most often observed in developing seedlings. Specifically, this herbicide prevents shoot and root growth in susceptible seedlings. Because seedlings have only 2 growing points (the tips of shoots and roots), blocking both or one of these areas will result in death. Plants that have established root systems are not generally affected. However, pendimethalin will cause root pruning in certain instances.

The big question then becomes, "If Prowl inhibits root growth, why doesn't it hurt my crop?" The answer can be explained in two ways: uptake and water solubility. First of all pendimethalin is not very soluble in water, but is readily moving into plant tissues. However, due to this lack of water solubility, pendimethalin does not move within the plant. Essentially, it behaves as a contact herbicide. Since the growing point is the susceptible tissue, there must be critical level of pendimethalin in the soil at the region where the shoot and/or root growing points exist. This is called the zone of activity. This is shown in the figure below.



Monocots are susceptible to pendimethalin because their growing regions (both root and shoot) are directly in the herbicide treated zone. As grasses germinate, the shoot and root tips are exposed to lethal levels of the herbicide and stop growing; thus killing the seedling. Dicots will germinate below the treatment zone, or lower in the zone where a minimal amount of root uptake occurs. Additionally, the growing point of the shoot is shielded by the cotyledons as the shoot emerges, and this limits the amount of herbicide that can be taken up directly by the shoot tip.

In a nutshell:

1. Pendimethalin must be applied to the soil surface and watered in, or incorporated to prevent losses from photodegradation.
2. Due to low water solubility, pendimethalin does not move appreciably within the soil column; it stays in the top 1-3 inches.
3. Pendimethalin is readily absorbed into cells, but does not move within plant tissues.
4. Pendimethalin must contact the susceptible growing points to be effective, therefore the growing tips must be in the zone where pendimethalin is applied.
5. Pendimethalin will prevent mitosis in any cell tissues, but established plants do not have dividing tissues (growing tips) in the herbicide treated zone.

Greg MacDonald

MSMA in Cotton

Now that the cotton crop is maturing, it is an ideal time to look back over the season and evaluate your weed control program. Were any new weeds present this year? Was control less than desirable on any weeds? Basically, the questions should center on whether changes in the weed control program need to be made for next year. If so, you might want to consider returning to MSMA.

MSMA has long been used over-the-top in cotton early in the season and post-directed applications late in the season. Although MSMA does not have a great fit early in the season due to cotton injury issues, it remains an excellent option for post-directed applications. I believe there are two reasons why MSMA should be used more often in cotton.

First, more residual herbicides (Direx, Valor, Caparol, Prowl, etc) should be sprayed at layby. When layby applications are typically made, there is still a lot of growing season left giving plenty of time for weeds to germinate and become established. Yes, glyphosate is excellent at controlling weeds of all sizes, but the lack of residual activity often often increases the occurrence of late-season weeds. Therefore, residual herbicides offer the unique ability to extend weed control later into the season. However, these residual herbicides often lack significant grass and sedge activity. By adding 2.5 pt/A of MSMA, grass and sedge activity are dramatically improved at a relatively low cost.

Secondly, MSMA + residual herbicides offer differing herbicide modes of action to the weed control program and significantly reduce the probability of developing herbicide resistant weeds. In Georgia, glyphosate-resistant Palmer amaranth was verified in 2005. The primary reason for resistance in this field was because glyphosate was the only herbicide used for weed control for over 7 years. Repeated applications of the same herbicide, or herbicides with the same mode of action, leads to high levels of selection pressure and, in time, herbicide resistant weeds. However, adding MSMA to the herbicide

program will dramatically reduce the occurrence of resistant weeds.

MSMA is a very old herbicide, but it maintains great usefulness in cotton production. If late-season sedges are a problem, consider adding MSMA to the program. If you plan to use residual herbicides at layby, MSMA is an ideal tank-mix partner.

Jason Ferrell

Where are all of these weeds coming from? Weed seed banks.

Despite the hard work of growers, continuing research by weeds scientists, and improvements in application technologies, weeds are a persistent problem for most growers. Why is it that a grower can achieve near perfect weed control one season, yet have to battle the same weed problem the next? It turns out that the old adage **"One year's seeding- seven years' weeding"** is accurate. When weed seeds fall to the ground, they become part of a weed seed bank in the soil and can cause weedy conditions for many years.

Even in the cleanest fields it is likely that a few weeds will escape control and produce seed. Depending on the species, a single plant can produce anywhere from a few to thousands of seeds. It has been estimated that less than 10% of the viable weed seeds produced each year germinate. The rest accumulate on the surface and in the soil to form the weed seed bank. The total number of seeds in agricultural soils can be enormous. Most research estimates the number to be between 13,000,000 and 435,000,000 seeds per acre.

Although a large number of the buried seeds are lost to decay, predation, and physical damage, some species can remain viable for decades. Some weed seeds enter a state of dormancy, a relatively inactive or resting condition, that slows down or stops weed seed germination. This allows them to escape or avoid exposure to control practices that target emerging and emerged weed seedlings.

Preventing weed seed development may not have an immediate impact, but will help reduce soil seed banks in the long term. As with other weed management strategies an integrated approach is best. Chemical and mechanical weed control practices should be timed to prevent seed development and dispersal. Keeping canals and field edges clean can also help reduce seed rain. In Florida, many weeds can grow and produce seed year round, thus it is critical to maintain weed control during fallow periods. Cleaning cultivation and harvest equipment between fields can also prevent moving seeds from one location to another.

Curtis Rainbolt

What is a 24(c) registration?

Consider the two following scenarios:

- A new pesticide application technology has been developed specifically for nursery producers; however, current pesticide labeling does not support its practice. The new technology could result in fewer pounds of pesticides introduced into the environment and less applicator exposure.
- An insect pest introduced into Florida during the 1960s has shown continuous activity on vegetable crops. Producers recently discover that a pesticide already in use for other pests will also control this pest, but it isn't listed on the pesticide's label.

These scenarios have a common theme -- pesticides that have been in use over the years could be adapted to fit unique

production situations within the state. How can producers call attention to these situations and convince state and federal agencies to allow special use of pesticides? By applying for Special Local Need Registration, also known as a 24(c). Both groups of producers bring their situations to the attention of scientists at the University of Florida and their respective commodity associations. In turn, these groups provide supporting evidence to the Florida Department of Agriculture and Consumer Services (FDACS). FDACS forwards the supporting documents to the U.S. EPA for review and consideration of use approval. With these groups working cooperatively, special local needs labels are written specifically for Florida to address these unique situations.

A *special local need* means an existing or imminent pest problem has been identified by producers of a given agricultural commodity within Florida. Major pieces of supporting information required for such a use is that the 24(c) use:

- Is covered by necessary tolerances or other clearances under the Federal Food, Drug, and Cosmetic Act. A tolerance is a term that is used legally to describe the amount of a pesticide's residue that may remain on or in a treated crop according to federal regulation.
- Registration for the same use has not previously been denied, disapproved, suspended, or canceled by the EPA, or voluntarily canceled by the pesticide's registrant. This can occur because of health or environmental concerns about an ingredient contained in the pesticide product. If new data become available that resolve the EPA's concerns, a 24(c) may be considered.
- The 24(c) registration is in accordance with the intent of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).
- If the proposed use or product falls into one of the following categories, FDACS must determine that it will not cause unreasonable adverse effects on humans or the environment:
    - Use of a product which has a composition not similar to any current federally registered product.
    - Use of a product involving a use pattern not similar to any federally registered use of the same product or a product of similar composition.
    - Use of a product for which other uses of the same product, or uses of a product of similar composition, has had registration denied, disapproved, suspended, or canceled by the EPA.

FDACS can consider uses such as the following for 24(c) registrations:

- New method of application or timing of application.
- New pest.
- Altered rate.
- Application in particular soil type.
- New product/different formulation.
- Products useful in managing pesticide resistance in a particular crop.

A price differential between products is generally not viewed as a legitimate justification for a 24(c) registration.

FDACS can issue 24(c) registrations for the purpose of avoiding the buildup of pest resistance. Documenting this need is met if:

The pesticide with the 24(c) registration has a different mode of action from products that are already available; or if registering two pesticides under a 24(c), they must have different modes of action.

- There are currently registered pesticides; however, there is only one effective mode of action remaining.
- The pest has a history of developing resistance to existing or canceled pesticides and this resistance is documented through field studies or references to field studies.
- The currently registered pesticide has a history of resistance which is documented through field studies or references to field studies.
- Evidence must exist that the pest(s), use patterns, and climatic conditions for the proposed use under the 24(c) is the same or substantially similar to situations where resistance has been documented.
- A brief description of the resistance management plan and how the pesticide's use under a 24(c) registration will fit into the plan.

Each state is encouraged to set time limits for 24(c) registrations. Because 24(c) registrations are considered by FIFRA to be section 3 registrations (fully registered) after 90 days, EPA generally is not in a position to impose time limits on 24(c) registrations. So long as the registrant of the 24(c) is in FIFRA's compliance requirements for maintaining the registration by paying its fees, EPA will not cancel the registration, even if a state has done so. An exception is a situation in which a registrant voluntarily cancels the product or EPA has a cause to issue a notice of intent to cancel.

An example of a 24(c) registration that was granted in Florida during 2005 involved a new application of an older pesticide. The herbicide Surflan® received its patent in 1968, but current labels prohibit its application by air. The 2005 approved 24(c) registration by FDACS approved aerial application to caladiums in Florida. Another example of a recent granting of a 24(c) registration involved altering planting restrictions. The fungicide Switch® is applied to certain vegetable crops and strawberries. In Florida, a 24(c) registration was granted to allow for planting of subsequent crops on the Switch® label anytime following its last application and a 30-day waiting period for crops not listed on its label. Another recent 24(c) registration that was recently approved involved a new timing of application. Paraquat is an older herbicidal active ingredient with Syngenta Crop Protection as the current registrant for the product Gramoxone®. The full section 3 label allows only for post-directed applications of the product. However, the new supplemental label now allows the product to be applied as a post-harvest desiccant to strawberry following harvest.

Applicators who wish to use a product in a manner approved by the 24(c) registration are required to have in their possession a copy of the supplemental 24(c) label at the time of application as well as the Section 3 label. They are also required to fully follow all applicable directions, restrictions, Worker Protection Standard requirements, and precautions on the EPA-registered label.

Fred Fishel

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