UNIVERSITY OF MARYLAND EXTENSION
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Agronomy News

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Managing Pasture and Hay Fields for Long Term Health

Richard Taylor, Extension Agronomist, University of Delaware

This article was originally published September 19, 2014 in the University of Delaware Weekly Crop Update

With late summer and fall seeding occurring, it is time to think about how to properly manage the new seeding to ensure a successful establishment and long-term productivity.

Usually, even before the seed germinates, grazers want to know when they can return animals to the pasture to graze it. Hay producers have an easier time deciding when to begin using a new field, especially for fall planted fields since cool-season grasses will signal their successful establishment by flowering in late spring or early summer the year following seeding.

For new pastures, the key to long-term health of the pasture is to wait about 12 to 18 months before grazing a new field. This means that the new pasture will need to be hayed at least once and possibly several times in the year following fall seeding. From a practical viewpoint, few grazers will wait 12+ months since it means not grazing the field until the second spring following fall seeding. At a minimum, a new fall-seeded pasture should be hayed in late spring or early summer the year following seeding and then allowed to regrow to a height of 8 to 12 inches before grazing is begun. It is possible to plant in the fall and begin grazing first thing the following spring but you will be sacrificing stand health and longevity with this practice.

Nutrient management plans call for a new soil test once every three years but a yearly sample will help the grazer manage the pasture better. This is very important if nitrogen (N) fertilizer inputs are used to stimulate the productivity of a pasture. Even without N fertilizer applications, the natural deposition of urine and feces in a pasture creates small areas where the process of nitrification produces acidity that can significantly lower soil pH in the small area. Higher stocking rates and intensive pasture rotations will result in more uniform spreading of the urine and feces (especially for ruminant animals); and therefore, a greater proportion of the pasture

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will be impacted by lower pH (more acid soil conditions). Since it can take a year for lime to move an inch down through the soil, yearly soil testing will allow the grazer to begin neutralizing soil acidity as it is produced by the soil N-cycle.
Another aspect of soil fertility to consider is the use of fall applied N to improve the rooting of pasture plants as well as help stimulate growth the following spring for early grazing. Although the practice has long been used in the turfgrass industry, those of us in forage management are just realizing the potential benefits to pastures of fall N applications. Small amounts of fall N (about 30 lbs N/acre) should be applied in mid-October and mid-November, since at these times topgrowth has ceased but the deep soil layers are still relatively warm. The N stimulates further root growth, creating pasture plants with deeper and larger root systems as they enter the winter period. Some of the N is stored in the plant and available to stimulate topgrowth the following spring as the hours of daylight increase and air temperatures warm. This type of fertilization makes for a stronger plant going into the summer months (greater rooting depth and therefore greater available soil water to draw on) and can improve the competitiveness of the pasture grasses against weeds.

Probably the number one key to maintaining the health and competitiveness of a pasture is to use rotational grazing where plants are allowed to fully recover from the prior grazing period (grow to a height of 8 to 12 inches or more) and the grazing interval is kept short enough that the same plants are not grazed over and over again during a rotation cycle. Generally, this means rotating livestock out of a paddock or grazing cell within three days of moving the animals into the paddock. This time can be stretched to as much as a week but the more rapidly the animals are moved among paddocks in the rotational grazing scheme the healthier the pasture. Another aspect to using rotational grazing is to not put animals on pasture when soil conditions are too wet when the presence of animals can lead to compaction issues. Not grazing when plants are under drought stress is also a key consideration. Use the extra forage produced during the spring and fall to make hay that can support animals on a heavy use pad during periods of wet weather, drought, or other conditions leading to poor pasture growth.

Another method used to maintain healthy and vigorous pastures is to periodically overseed pastures in the fall with grasses and/or legumes. Some producers do this every year while others do it every couple of years. In most cases, the new seedlings must compete against the established plants in the pasture so that there is often limited 'take' from the germinating seed. However in the weaker areas of the pasture stand, there will be more light, water, nutrients, and space for the seedlings so establishment will be better in these areas. The weak areas would be where weeds could become established but by overseeding the pastures weed encroachment is limited or prevented.

The species to use for overseeding should be those that can grow rapidly, especially in the cool conditions of late summer and early fall. This would include such species as the ryegrasses, festulolium, ladino white clover, and red clover. Although just broadcasting the seed over the surface and then using a chain harrow or other implement to slightly cover the seed has been used, the best seeding method is to use a no-till drill and drill the seed into the soil. Seeding rates typically used are about one-quarter that of a normal new pasture seeding rate since most of the seed will be planted where established plant competition will not allow the new seedlings to establish successfully.

Finally, the producer can manage the balance of legumes and grasses in the pasture by his/her fertilization practices. Potassium and phosphorus applications along with 1 to 2 lbs of boron per acre per year and maintaining a near neutral soil pH (6.5-7.0) will encourage legume growth. If the percentage of legume is too high and the risk of bloat is too great, N application to encourage grass growth can be used to lower the percentage of legume in a pasture. Grasses, with their fibrous root system are much more competitive for applied N than are the tap-rooted legumes. The available N will stimulate the grass and help it shade the legumes as well as change the proportion of legume to grass biomass.

Cash Rents in Maryland and Delaware

Paul Goeringer, Extension Legal Specialist, AREC, University of Maryland

USDA's National Agricultural Statistic Service (NASS) updated data on cash rent paid by farmers in 2016. NASS collects this data from 240,000 farms across the United States annually through the Cash Rent Survey - data used by other agencies throughout USDA. The survey results give us an idea of what other tenants in the area may be paying per acre for farmland.

Nationally, cash rent prices were down 5.56 percent this year compared with 2015 (Table 1). Non-irrigated cropland cash rent went from $130/acre in 2014 to $133/acre in 2015 to $125 in 2016, or a 6.02 percent decrease. Irrigated cropland saw a 1.44-percent decrease, going from $209/acre on average in 2015 to $206/acre on average in 2016 (table 1). Pasture rent dropped from an average of $14/acre in 2015 to $13/acre in 2016 or a 7.14-percent decrease (table 1). Cash rent nationally decreased in 2016 reflecting a drop in projected crop prices and farm incomes for 2016.

Table 1: U.S. Average Cash Rents per Acre for 2014 to 2016

	2014 Cash Rent $/acre	2015 Cash Rent $/acre	2016 Cash Rent $/acre	Percent Change
National Cropland	$141.00	$144.00	$136.00	-5.56%
National Irrigated Cropland	$208.00	$209.00	$206.00	-1.44%
National Non-Irrigated Cropland	$130.00	$133.00	$125.00	-6.02%
National Pastureland	$12.00	$14.00	$13.00	-7.14%

How did Delaware do compared with the national increases? Delaware saw cropland cash rents increase by 12.82 percent (Table 2). Cropland cash rents in Delaware increased by $12.50/acre in 2016, going from $97.50 in 2015 to $110 in 2016. Irrigated cropland in Delaware in 2016 had an average cash rent of $150/acre up $17/acre from the 2014 average. Delaware's non-irrigated cropland had an average cash rent of $90/acre (Table 2).

In 2016, Maryland's average cropland rent is $104/acre and irrigated cropland is $100/acre (Table 2). Maryland saw a 5.26-percent increase of non-irrigated cropland rents, rising $5/acre to $100/acre in 2016.

Compared to the national averages, both Maryland and Delaware saw cash rent increases. It will be interesting to see, later this year, which counties experienced increases in cash rents in 2016. NASS will release county cash rental rates in September and I will get those posted once available.

Table 2: Delaware and Maryland Average Cash Rents per Acre for 2014 to 2016

	2014 Cash Rent $/acre	2015 Cash Rent $/acre	2016 Cash Rent $/acre	Percent Change
Delaware Cropland	$98.50	$97.50	$110.00	12.82%
Delaware Irrigated Cropland	$133.00	-	150.00	
Delaware Non-Irrigated Cropland	$82.50	-	90.00	
Delaware Pastureland	-	-	-	
Maryland Cropland	$94.50	-	104.00	
Maryland Irrigated Cropland	$143.00	-	175.00	
Maryland Non-Irrigated Cropland	$92.00	95.00	100.00	5.26%
Maryland Pastureland	$43.50	-	-	

For more information on farmland leasing, see the "Lease Agreements" section of UME's Grain Marketing website.

Daniel Bug: A smooth-looking slender predator

Cerruti R[2] Hooks[$], Veronica Johnson[*] and Alan Leslie[+],
University of Maryland, Department of Entomology
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Introduction

Nabidae (commonly called damsel bugs or nabids) is a small family of true bugs, comprising nearly 400 species worldwide. Nabids are generalist predators of small invertebrates mostly arthropods. The genus *Nabis*, which attacks several families of insect prey, is considered important because of their contribution to the suppression of economically important pests. They mostly feed on crop pests but will also attack other predators. Nabids kill their prey immediately and suck them dry. Nymphs begin eating almost immediately after hatching and consume many individuals to complete their development. As such, nabids can be valuable biological control agents of insect pests in agricultural environments. *Nabis* are encountered regularly in agricultural systems throughout North America where they are often strikingly abundant. Their generalist appetite allows them to feed on a variety of insects (e.g. aphids, leafhoppers, young caterpillar, insect eggs, etc.) of economic importance in field crops. However, this generalist feeding habit may make them less effective biological control agents than specialist predators that attack specific pest species.

Fig. 1. Nabid nymph with small bulging eyes. Photo by Mick Talbot, Creative Commons

Nabids are found more commonly in alfalfa, soybean and cotton than in other crops or orchards. In US soybean, *Nabis* spp. are among the most numerous insect predators found. In addition to agricultural systems, nabids are commonly found on low herbaceous vegetation, shrubs and grasses but a few species can be regularly found in trees. Some species are found in moist areas on the ground or at the edge of streams, ponds and marshes. Grassy fields generally have more nabids than do broadleaf weed or weed-less fields. Their predaceous behavior, together with their prevalent existence in diverse environments, particularly agricultural systems, has attracted the attention of many entomologists.

Description

Fig. 2. Nabid adult with mouthpart extended. Photo by Gbohne, Creative Commons

Nabids are slender, soft body insects with a narrow head and small bulging eyes (**Fig. 1**). They are roughly 10 to 12 mm (1/3 to 1/2 inch) long. Nabids are mostly yellowish, gray, or dull brown to gray in appearance and resemble small, smooth-looking assassin bugs. Some species of nabids are black and antlike in appearance, but these are less common in agricultural environments. Nabids have long stilt-like legs and a pair of long, four -segmented antennae. Each foreleg is slightly thickened and has a double row of spines that act as grasping organs for the containment of prey, similar to mantids. Being a true bug, their mouth is long, needle-like, and tucked under the head and body at rest, but is flexible and can be positioned in front of the head when feeding (**Fig. 2**). Nabids undergo three developmental stages (egg, nymph, and adult).

Eggs

Nabis eggs are white, oblong and flattened at the base. Some have described them as jar-shaped with the front end narrowed into a "collar". Eggs are deposited singly in soft plant tissue and stems. Several eggs may be laid in close proximity. In alfalfa, most eggs were found where stem diameter measured from 0.8 to 1.9 mm (0.03 to 0.07 in) but height of ovipo-

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sition site was not related to length of stem.

Nymphs

Nymphs look like small, wingless version of adults (**Fig. 3**). They are active shortly after hatching and begin feeding immediately, often on prey considerably larger than themselves. Nymphs go through five instars (juvenile stages) that range in size from 3-8 mm (1/8 to 1/3 in) in length. With each successive instar they shed their skin, develop wing pads, grow larger and look more like adults.

Fig. 3. Picture of nabid nymph. Photo by Mick Talbot, Creative Commons

Adults

Adults are 8-12 mm (1/3 to 1/2 in) long with two pairs of fully functional wings (forewings and hindwings). Forewings are hardened at the base and membranous at the tip. At rest, forewings cross over their back, one over the other, creating a triangle pattern behind the pronotum ("shoulders"), pointing toward the rear. A dis-tinguishing characteristic of adult nabid wings is the presence several small cells lining the margin of the membranous part of the wing which may be viewable with a hand lens (**Fig. 4**).

Fig. 4. Picture of adult nabid on leaf. Photo by Line Sabroe, Creative Commons

Life Cycle/History

Nabids have multiple generations per year and are present throughout the plant growing season. This varies, however, among species and within plant habitats. Most species of nabids overwinter as adults or large nymphs in protected places such as leaf litter, weedy areas, within perennial crops and shrubs, low plants or some sort of ground cover including winter crops such as grain. Nabids emerge from overwintering sites and begin to appear in fields during spring (e.g., May or June) when the weather warms up. Peak nabid activity is in mid to late summer.

Adults become active during warm months and females begin depositing eggs into soft plant tissue of low-growing plants soon after emergence. A female damsel bug can lay up to 200 eggs which hatch in 8 to12 days depending on temperature. Nymphs emerge and develop over 3 to 4 weeks and may be found taking cover in plant debris, at the base of plant stems or in cracks at the soil surface. Some *Nabis* species have one generation per year while others have two to five generations, depending on location. Two common nabid species, *Nabis americoferus* and *Nabis roseipennis* were reported to produce more than one generation per year as far north as southern Canada.

Temperature and development

Different laboratory studies have shown that temperature plays an important role in the development, longevity and fecundity (number of eggs produced) of different *Nabis* species. In experiments where *Nabis* species were given the same diet but were allowed to grow under different controlled temperatures, the time it took to develop from egg to adult tended to decrease with increasing temperature within a certain range. Below that temperature range, eggs did not hatch, and nymphs did not complete development and molt to the next stage. For many *Nabis* species, the temperature threshold for successful development from the egg to the adult stage in the laboratory is between 11 to 15°C (52 to 59°F). Below these temperatures, *Nabis* species may not be able to complete their development. At warmer temperatures, *Nabis* species tend to grow and develop much faster, and spend much less time at each nymphal stage. However, experiments show that there is a trade-off at the extreme end of the temperature range where mortality at different life stages increased with temperature as well. For example, experiments show that *Nabis* nymphs showed the fastest development times but also the lowest survival rates at temperatures near 32°C (90°F). Each *Nabis* species likely has its own specific

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temperature range where developmental time and survival rate are optimized to produce the most offspring that grow and develop within the shortest time period.

In addition, temperature and diet can interact to influence *Nabis* growth rate and their potential to suppress insect pests. In experiments where *N. americoferus* were reared using different insect prey as food, those that were fed alfalfa blotch leafminer larvae developed significantly faster than those fed pea aphids. Therefore, the nutritional quality of available prey in the field can determine how quickly *Nabis* grow and develop. In another experiment where researchers fed different insect prey to *N. roseipennis* at different temperatures, *N. roseipennis* tended to consume more tarnished plant bug nymphs at higher temperatures, but consumed the same amount of tobacco budworm larvae across a range of temperatures. These findings suggest that *Nabis* species may provide better biological control of arthropod pests at higher temperatures for some but not all pest species.

Biological control potential

Nabis spp. are fast moving predators and are often the most numerous species of predators present within a crop at some point during the growing season. They feed on a diversity of arthropod prey including aphids, moth eggs, and small caterpillars (**Fig. 5**). However, the polyphagous (generalist) feeding habits of nabids may make them less effective than species-specific predators that target specific prey species. Important butterfly and moth pests that they are known to feed on include the corn earworm, European corn borer, imported cabbageworm and some armyworms. Other prey may include leafhoppers (including beet and potato leafhoppers), small sawfly larvae, mites, tarnished plant bug nymphs, asparagus beetle and Colorado potato beetle eggs and nymphs. Most insect prey of nabids are plant-feeding species, but nabids sometime attack predaceous insects, including members of their own species. They can survive for up to two weeks without food. However, if no other prey is available, they will turn to cannibalism which is common throughout the life cycle of nabids.

Fig. 5. Black damsel bug feeding on caterpillar, Photo by Keith Roragen, Creative Commons

Nabids can be abundant in a wide variety of agricultural systems. They are among the most abundant predators in alfalfa, cotton, soybean and certain other crops in North America. Two of the most common species in alfalfa and soybean in eastern North America are *N. americoferus* and *N. roseipennis*. Field experiments have demonstrated the ability of *N. roseipennis* to reduce green cloverworm populations in soybean. When present in sufficient numbers and at the appropriate time, they are capable of causing significant reductions in green cloverworm numbers even when alternative prey and other predators are present. During a study in soybean, prey items that were observed to be captured by three *Nabis* species included minute pirate bug (*Orius*) adults and nymphs, *Nabis* nymphs, potato leafhopper adults, *Lygus* adults and nymphs, aphids, green cloverworm larvae, soybean thrips, locust leafminers, miscellaneous Diptera and whitefly nymphs.

Predation by *Nabis* spp. on Mexican bean beetle (MBB) was studied in the laboratory and in field cages containing soybeans. *Nabis* spp. fed upon MBB eggs, 1st, 2nd and 3rd stage larvae, but not upon 4th stage larvae, pupae, or adults. Results from field cage tests indicated *Nabis* spp. could significantly reduce MBB numbers. Consumption of prey was especially high for reproductive females. Studies have shown that attack rates on prey were highest and handling times lowest for reproductively mature females of *N. americoferus*.

Interaction with other biological control agents

Though fast predators, nabids are sometimes victims of intraguild predation (killing and eating of potential competitors or organisms that share the similar prey) and fall prey to predators such as sphecid wasps, assassin bugs, birds, and other creatures such as predaceous stink bugs and spiders. Still, there was one recorded instance in which an attacking spider

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was killed by the nabid which suggest they are not easy prey. In addition to predation, nabids are vulnerable to parasitism. A variety of organisms (e.g., fungi, wasps and tachinid flies) may impose mortality upon nabids by parasitizing their egg, nymph or adult stages. At least three species of tachinid flies and several egg parasitoids have been reported to parasitize *Nabis* species. A mymarid wasp parasitized up to 70% of nabid eggs found in California alfalfa fields. Interesting enough, there are occasions when male *Nabis* are far more vulnerable to parasitism than females. One wasp in particular, *Wesmaelia pendula*, which can be found parasitizing male nabids, only rarely parasitized female nabids.

Though nabids mainly eat plant-feeding arthropods, they feed on other predators such as lacewing larvae, minute pirate bugs and big-eyed bugs (*Geocoris*). Though *Nabis* may feed on other predators, they may be capable of lowering pest populations in the presence of other predators. For example, laboratory and field studies demonstrated the ability of a *Nabis* and *Geocoris* guild to suppress Colorado potato beetle (CPB) numbers. However, *Nabis* tended to avoid CPB predation when green peach aphids were present which suggests the species studied had a stronger preference for aphids than CPB.

Do nabids bite humans?

Though nabids mainly prey on small insects, there are several records of damsel bugs biting humans. The majority of reported cases on fortuitous or accidental bites by damsel bugs that are associated with species in the genus *Nabis*. Four species of *Nabis* in the United States have been reported to bite humans: *N. alternatus, N. americoferus, N. capsiformis* and *N. roseipennis*. The majority of these cases have the following reactions in common: pinprick-like pain when bitten, burning sensation, development of an erythema which lasts for a few days, and punctures due to the stylet of the damsel bug entering the skin. One researcher suggested that there are two possible causes for adventitious bites: 1) defense and 2) the obtaining of water and/or solutes. Attacks occurred during summer and situations with high temperatures, which suggests that they were searching for hydration resources. Additionally, in most instances, sweat was apparently involved as the attractant. Though capable of biting, *Nabis* are generally thought as medically harmless as their bites are not as dangerous as some other insect bites and theirs are mainly considered painful and annoying.

Conserving nabids

There is considerable evidence that nabids respond to habitat manipulation in the form of plant diversification in agroecosystems. For example, intercropped fields of bean and maize supported more nabids than grown alone as a monoculture. Since nabids prefer to take shelter in low growing grasses and other ground covers, maintaining such environments may encourage these predators. Grassy soybean fields had more nabids than broadleaf-weed and weed-free fields; and in soybean fields, nabids were most numerous in no-till fields previously planted with soybeans that had not received an insecticide application. Another study showed that *N. americoferus* was more effective at reducing leafhopper abundance, and protecting alfalfa from hopperburn, when alfalfa was intercropped with orchardgrass than grown alone. It was suggested that the orchardgrass, increased leafhopper movement, and *Nabis* captured leafhoppers more efficiently when they were more mobile. Planting crops adjacent to non-agricultural land may be another strategy used to enhance beneficial arthropods such as nabids within the cropping system. Species of plants in habitats next to orchards were sampled to compare beneficial arthropods within the orchard with the neighboring plant flora. The findings indicated that some taxa of beneficial arthropods such as *N. alternatus* moved into orchards from neighboring plants. Additionally, how vegetation is managed may also impact *Nabis* movement into a crop. For example, mowing adjacent habitats may cause adults to disperse into nearby cropping systems.

Using "soft" or selective pesticides that more specifically target the pest and are less harmful to nabids may help conserve their populations in cropping systems The use of some insecticides including insect growth regulators (IGR) may reduce nabid numbers. A study showed that the initial use of IGRs, buprofezin or pyriproxyfen, reduced the number of *N. alternatus* in comparison with the untreated control. In most instances, reductions in natural enemy taxa were much greater with the use of conventional insecticides. Reductions in their populations following insecticide sprays were thought to be due to direct toxicity and/or indirect effects such as a response to decreases in prey number.

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Plant feeding

First instars of three *Nabis* species were found to utilize some plant foods sufficiently to survive, but no development followed. Thus, prey appear to be more essential to the nymphal development of *Nabis* spp. than two other popular generalist predators (i.e., *Geocoris* and *Orius*). However, *Nabis* was able to proceed through nymphal development and occasionally to adulthood on some plant foods. It is likely that moisture is the chief objective for feeding on plants. However, some *Nabis* species may use plant material for food as well as for moisture. Moreover, similar to omnivorous insects (eat plant and insect prey), *Nabis* supplement their diet by feed-ing on plant tissue. Still, plant feeding by *Nabis* is minor but could help maintain them for short periods when prey are in limited supply. *Nabis* may feed on nectar also when prey and water is scarce.

Summary

Nabids (damsel bugs) are widely distributed generalist predators that feed on a variety of small, soft-bodied arthropods. This small family of generalist predators is commonly found in many crop and garden situations; and their contribution as predators against a variety of insect pests has been acknowledged. Adult and immature stages are frequently among the most abundant predatory insects in some agricultural fields. Though nabids can provide some natural control of pest species, it was proposed that it may be difficult to utilize them as biological control agents because of their polyphagy (feeding on many type of prey), cannibalism and variableness in numbers over time and space. Additionally, nabids are not commercially available for augmentation which indicates attempts to increase their numbers in agricultural systems should be via conservation practices such as manipulating the habitat to favor their population increase and avoiding chemicals that are harmful to them.

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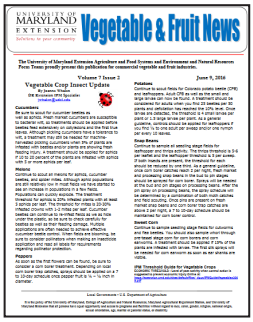
HERBICIDE RESITANT WEED WORKSHOP
THURSDAY, SEPTEMBER 8, 2016
5:00 to 7:00 PM
Bunker Hill Farm, 10365 Branchville Rd, Newburg, MD

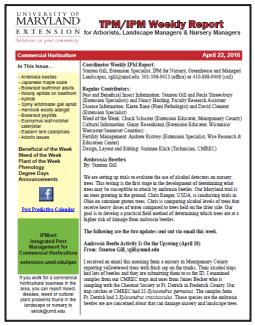
Attend an evening workshop to discuss the identification and management of herbicide resistant weeds in Southern MD. See firsthand and learn to identify ***PALMER AMARANTH***, Common Ragweed and Marestail. Palmer Amaranth is a new aggressive pig weed that is resistant to both glyphosate (Roundup) and ALS type herbicides. Trial results of pre and post emergent herbicide performance from the last two years will be presented.

Light refreshments will be available. Registration is not required. Please call Ben Beale at 301-475-4481 for more information .

Other Newsletters from University of Maryland Extension



University of Maryland Extension Vegetable and Fruit News (updated monthly)



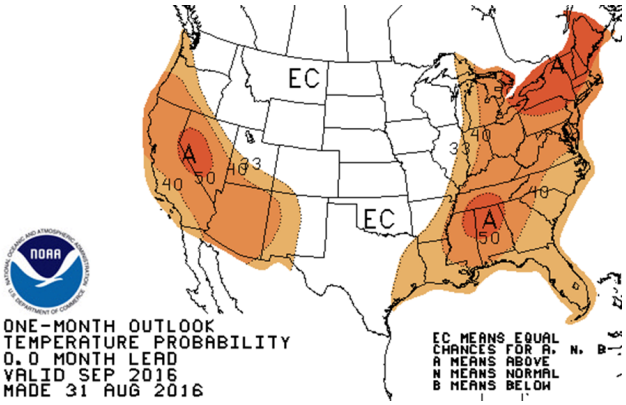
University of Maryland Extension TPM/IPM Weekly Report (for arborists, landscape managers and nursey managers)

Agriculture Weather Report

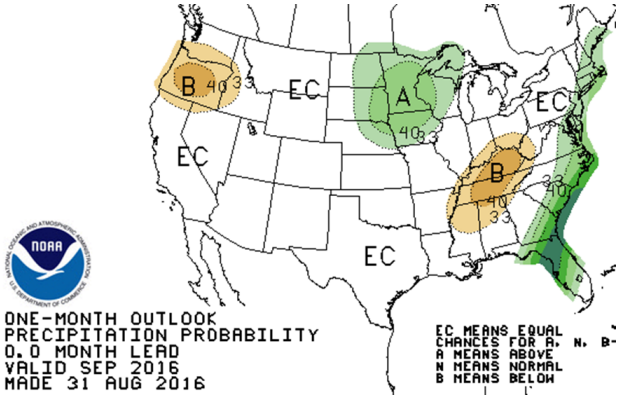
Scott A. Minnick, Meteorologist - NOAA - National Weather Service Wakefield, VA

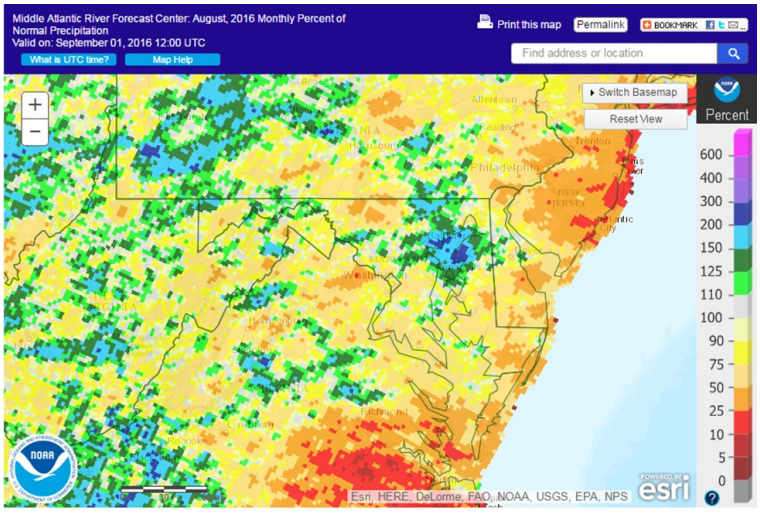
August 2016 ended with generally above normal temperatures and below normal precipitation across Maryland. The exception was around the Baltimore area, where precipitation amounts were above normal thanks to heavy rainfall toward the beginning of August. The lack of rainfall and warm temperatures during critical growth stages has put a strain on crops across the Mid-Atlantic region. Unfortunately, Hurricane Hermine didn't produce any beneficial rainfall for the region. Latest extended guidance also indicates the warm and dry trend will continue through at least mid-September. Expect an expansion of the D-0 drought conditions on the drought monitor in the coming weeks as soils continue to dry down. The Climate Prediction Center predicts increased probabilities for above normal temperatures and equal chances to above normal precipitation. Average rainfall across the state for September is around 4 inches. CPC's forecast for above normal precipitation for the month may have been based on Hermine, but with an active tropical pattern, more rainfall from a tropical system later this month can't be ruled out. September is considered the peak of the hurricane season. Average highs drop from the low 80's early in the month to the low to mid 70's by the end of the month. The average low drops into the mid 50's by the end of the month.

CPC July 2016 Temperature Outlook



CPC August 2016 Precipitation Outlook





Getting cover crops planted in September, despite late crop harvests

Sarah Hirsh and Ray Weil
Dept. of Environmental Science and Technology, University of Maryland

With harvests being particularly late this year, cover crops will likely take a hit. Waiting until the crops are harvested to start planting cover crops likely will result in very little fall cover crop growth, which will greatly reduce the benefits of the cover crops. However, there are several promising alternative strategies for planting cover crops before harvest. For corn or soybean, the cover crop can be aerially seeded with a standing crop in the field. Airplanes can successfully seed rye, radish (before mid-September), wheat, barley, triticale, Austrian winter peas and other species chosen with particular cover crop benefits in mind. Of course aerial seeding places seed on, not in, the soil, so it will be most effective if done before a rain. If conditions are dry and irrigation is available, applying about 1/3" of water once or twice after seeding would be a good investment. For the cover crop seeding into standing crops to be effective, corn should be senescing so light is getting into the canopy. Soybean leaves should be yellowing and starting to drop so they will soon drop and cover the cover crop seeds, protecting them from drying out. Alternatively, a high-boy air-seeder could be used to sow the cover crop into standing corn. A spinner spreader can also do a good job of broadcasting seed into standing soybeans at leaf yellowing.

While this may seem like a lot of effort for a few extra weeks of cover crop growth, we are finding that an extra few weeks of growth in October will likely pay off. In addition to being eligible for early-planting incentives through the MD cover crop program, planting cover crops by mid-September can capture and recycle significant amounts of nitrogen that will likely be lost if the cover crop is planted too late to get much growth in fall. Two to three weeks extra growing time in late September and early October can allow the capture of 50 pounds or more of nitrogen, much of which will be available to the next year's crops, depending on cover crop species and spring management.

Growth by December 5th of a triticale-radish-crimson clover mixed species cover crop drilled after early corn hybrid harvest in Kent County.

During 2015-2016, we ran cover crop trials in collaboration with seven mid-Atlantic farmers. They planted 1) radish, 2) a winter cereal (rye, wheat, or oats), 3) a mix of radish, winter cereal, and sometimes Crimson clover, and 4) no cover crop control. All sites were planted between 20-Aug and 11-Sep. We took aboveground biomass samples in late fall 2015, prior to any freeze-killing, and analyzed for nitrogen. Nitrogen uptake by the cover crops in the fall is indicated in the graph below. Within each farm the choice of cover crop species made a considerable difference. Overall the biggest factor in fall nitrogen uptake was the amount of available nitrogen in a particular soil from organic matter decomposition, manure and/or residual fertilizer.

We set-up a separate study to specifically compare the nitrogen uptake of cover crops planted 3-Sept vs 8-Oct. We buried 15N fertilizer at either 2 ft, 4 ft, or 6 ft. 15N fertilizer contains nitrogen molecules that are heavier than normal, and therefore the presence of this heavier nitrogen can be detected using mass spectroscopy technology. We planted cover crops on top of the buried 15N. If the cover crop tissue contained the heavier 15N, this indicated that the roots reached

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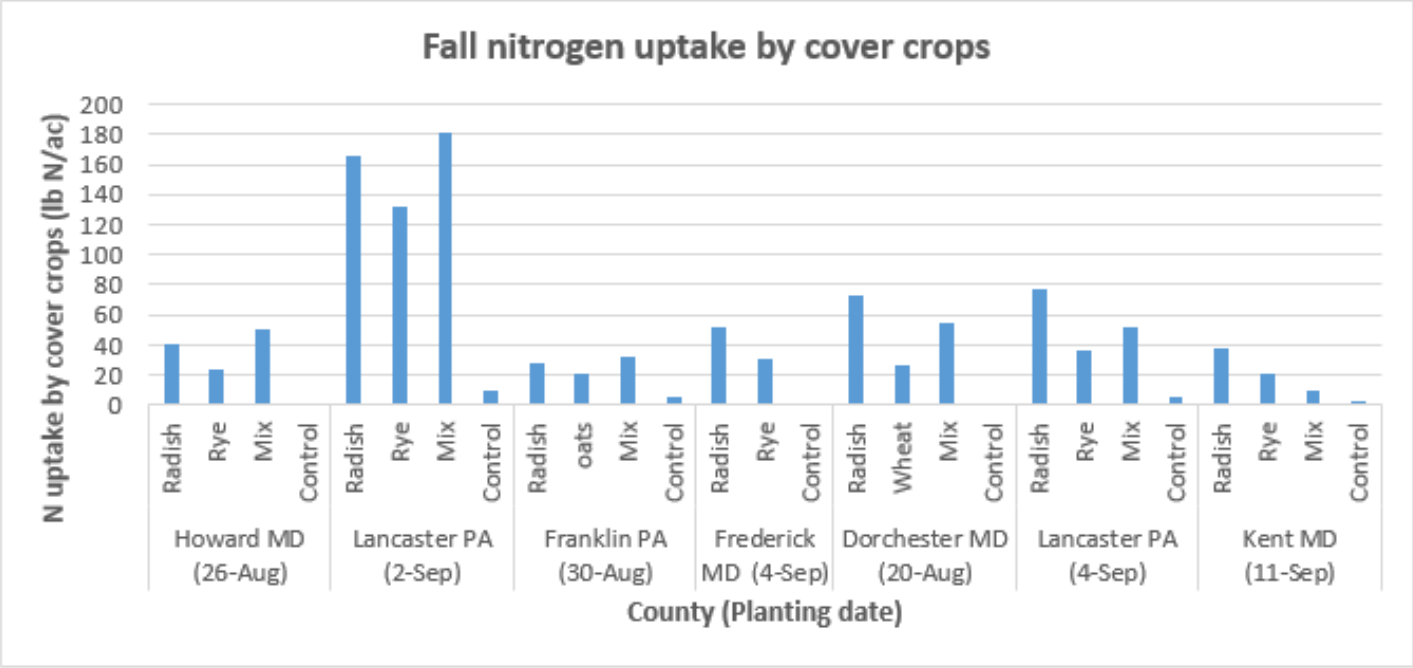
the depth at which the 15N was buried. We planted four different cover crops—1) rye, 2) radish, 3) rye + radish, 4) rye + radish + Crimson clover. We found that the 3-Sept planted cover crops took up nitrogen from as deep as 6 ft, but there was a stronger signal (indicating more uptake) at 2 ft and 4 ft. Late-planted cover crops took up nitrogen only from 2 ft and had a weaker signal than the early-planted cover crops.

From nitrogen cycling, soil health and long term profitability perspectives, it seems increasingly desirable to have a look at your entire cropping system – hybrids, herbicides, rotation, and management – to see what modifications would allow better integration of cover crops into your farming operation.



Nitrogen uptake by cover crops (lb N/ac) in late-fall before freezing temperatures in 7 on-farm trials. Nitrogen uptake by volunteer weeds was measured for the "control".

Ag Law Issues and Evaluation

Let Us Know How You Feel on Ag Law Issues, ALEI Evaluation Now Online

We want to hear from you! ALEI is launching an online program evaluation to help the program meets the needs of the Maryland agricultural community. The assessment is designed to take only 10 minutes and will assist the program to determine legal issues to focus on in the coming year and best forms to present information on those top needs.

The evaluation is available online at http://go.umd.edu/ALEIEval. Please take a moment and let ALEI know what you think.

High Tunnels 101

Emily Zobel, Agent Associate, Dorchester County

Whether you are a vegetable or fruit grower looking to extend your growing season or a grain farmer looking to start growing a new crop during the offseason high tunnels might be a good opportunity for you to increase your farm's marketability. High tunnels are simple, plastic-covered structures that have been widely used for numerous years in many regions of the world where the growing season is short or the climate is unfavorable. High tunnels have not been widely used in the United States until recently, but they are becoming more popular with farmers, who are using them to enhance their current system and increase marketing opportunities. High tunnels can be used to extend the growing season and grow higher quality vegetables, fruits, herbs and cut flowers.

High tunnels are made by covering a simple frame structure with plastic. They are tall enough for a person to stand up in and for tractors to be used inside. They traditionally don't use fans, heaters and lights, instead they depend mainly on the sun to provide light and warm the air and soil inside them. Unlike greenhouses where crops are grown in flats or pot on tables, crops in high tunnels are grown directly in the ground in raised beds. In many areas, high tunnels are viewed as being temporary structures and do not require a building permit and may not be taxed, but you should always check with your local zoning ordinances before building. High tunnels, on average, cost $2-3 per square foot depending on the size, shape, and materials used.

High tunnel production is considerably different from field production some of the advantages and challenges of growing crops in high tunnels are listed below.

Advantages

- Extended growing seasons
- Protection from the weather
- Environmental control
- Reduced incidence of diseases
- Improved quality
- Increased revenue per square foot

Challenges

- Initial and maintenance cost
- Different pest problems
- Require regular monitoring
- Increase in labor
- Crops must be irrigated
- Crop rotation

High tunnels can be configured in a wide variety of shapes and sizes. They can be semi-permeant, temporary or movable structures. There are no standard dimensions for high tunnel, but they typically fall within the ranges of 14-30 feet wide by 30-96 feet long. Wider tunnels tend to be taller, provide better ventilation and retain heat better than narrow tunnels. There are two main shapes of high tunnels: Quonset and gothic. The Quonset shape is relatively short and squat with a rounded roof and sloped sides, while the gothic-shape looks like a cathedral with a high pointed peak and straight sidewalls. The gothic-shape tunnels are more costly, but the shape helps to shed snow, provides better air ex-

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change, has more useable space and is generally more comfortable for working in due to its higher walls.

High tunnel frames can be made of wood, PVC, aluminum or steel. While steel is the most costly, it is preferred by most growers due to its low maintenance and its durability. PVC is mainly used only for low tunnels and is not recommended due to its low durability. A well built and maintained high tunnel will last at least 20 years, however, the plastic cover will need to be replaced every few years. The most common cover is polyethylene. UV resistant greenhouse quality polyethylene is preferred over common construction grade polyethylene since it transmits more light, has a longer life and prevents nighttime heat loss. There is a wide variety of different greenhouse films to choose from. The best one for your high tunnel will depend on what is being grown and when. Ventilation is important in high tunnels in order to reduce humidity and prevent plants from getting heat stress. Ventilation can be accomplished by passive air movement through roll-up sides, gable-end doors and vents, roof vents, ridge vents and removable doors.

High tunnels don't need to be on a level site. A gradual slope can actually be beneficial, however, too large of a slope can comprise the structural integrity of the tunnel. The tunnel should be on a site with well-drained soil, which is not heavily shaded and is out of the wind. Due to the higher labor needed to maintain crops inside high tunnels, it is ideal to place them on sites that are easy to get people and equipment too. They can be orientated either North-South or East-West. North-South orientation is more traditional since it reduces shading and is good if you plan on growing only during the warmer months. East-West orientation allows for more effective collecting of sunlight during the winter and early spring. High tunnels normally take about a week to build once the land is prepared and all the supplies are gathered.

Before investing the time and money needed to build a high tunnel it's important to make sure you have a marketing plan in place. Think about the main reason you are using a high tunnel instead of a field and then determine if you have a market for it. For example, if you are trying to extend your growing season, then do you have buyers or places to sell too after the main growing season is over? If you are trying to increase your quantity and quality, then do you have additional places or people to sell too? Are they looking for a better quality then what you can produce in a field? If you are growing a specialty crop? Does it need to be grown in a more controlled environment? Is there a local a market for it?

For more information on high tunnels and construction tips see the following publications:

University of Vermont: https://www.uvm.edu/~susagctr/resources/HighTunnels.pdf
*Iowa State University:*http://www.extension.iastate.edu/valueaddedag/high-tunnel-information

LEAD Maryland Accepting Applications for Next Class of Fellows

Susan Harrison, 410-827-8056

LEAD Maryland Fellowship Program is seeking applicants for its next class of Fellows. Applications are due October 1, 2016 and are available at www.leadmaryland.org. Participants will complete a series of multi-day seminars held throughout Maryland and Washington, D.C. in 2017 and 2018 along with a travel study tour and class project.

For more information, contact Susan R. Harrison at 410-827-8056 or leadmd@umd.edu.

The Spined Soldier Bug: One of the Good Stink Bugs

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Introduction

The spined soldier bug (Podisus maculiventris) belongs to the family Pentatomidae and subfamily Asopinae. The Asopinae are set apart from other stink bugs because of their predatory behavior. The spined soldier bug (SSB) is endemic to North America and occurs in a variety of natural and agricultural ecosystems, such as shrubs, woods, streambanks, orchards and field crops. Nymph (with the exception of the 1st instar stage) and adult SSBs mostly consume soft-bodied lepidopteran (butterfly, moth and skipper) and coleopteran (beetle) larvae but reportedly feeds on > 90 insect species from eight orders. The SSB is a polyphagous predator that feeds by piercing prey and sucking their internal fluids via its rostrum (beaklike mouth part). It has shown promise as a biological control agent for inundative releases (i.e., unleashing large numbers of natural enemies for immediate pest control) and is currently the only commercially available predaceous stink bug in North America. Spined soldier bugs have been extensively studied because of their voracious feeding habit and potential value in preventing outbreaks of the Colorado potato beetle (Leptinotarsa decemlineata), Mexican bean beetle (Epilachna varivestis) and other economically important foliage-feeding pests. Despite SSB reputation of being a voracious feeder, their efficiency as a predator can vary among host plant species and agricultural ecosystems. Further, the presence of chemicals in the host plant or their prey's diet can affect their performance. Additionally, their attack rate and searching efficiency is low compared to some other generalist predators.

Fig. 1. Spined soldier bug (*Podisus maculenventris*) empty egg cases and recently hatched 1st instar nymphs on eggplant leaf. Photo by Peter Coffey

Description

Similar to other stink bugs in the family Pentatomidae, SSBs are of moderate to large size, ranging in length from 7 to 25 mm (~ 1/4 to 1 in) and are broadly elliptical in shape. Their piercing-sucking mouthpart consists of a four-segmented rostrum or labium (beak) that encloses their needlelike stylets. Whereas the rostrum of phytophagous (plant feeding) stink bugs are slender, predatory stink bugs in the Asopinae subfamily have a thickened rostrum. The first segment of the rostrum is free, which allows it to swing forward fully, making it easier for them to capture and feed on prey. When not feeding, it is kept folded under their body.

Egg: Eggs are typically metallic bronze but can range in color from pale yellow to dark black/brown and contain long projections around the operculum (egg cover) that resembles spiked crowns (Fig. 1). This is a unique characteristic of Podisus spp. eggs. Eggs are roughly 1 mm (~ 1/25 in) in diameter and are generally laid in masses of 20 to 30 at a time. Studies in the laboratory have found the egg stage to last 5 to 9 days but most reports indicate eggs hatch in 4 to 7 days, depending on temperature.

Nymph: There are five nymphal instars (juvenile stages) of the SSB. Nymphs are oval shaped, lacking the characteristic shield and shoulder spines possessed by adults. After emerging, 1st instar nymphs can be seen clustered around their egg masses as they ingest bacterial symbionts from the eggs. The brick-red colored first instar nymphs are not predaceous, whereas the remaining four instars are. Development from newly hatched nymph to adult takes 25 to 30 days and there can be up to three generations in one year. Nymphs look different in each instar and can range from 1.3 to 9 mm (0.05 to 0.35 in) depending on the instar. The first two instars are red and black, and differ only in size (Fig. 2). The third instar has red, white and orange markings on the abdomen. Wing pads are noticeable in the 4th instar, and the 5th

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instar has prominent wing pads with black, white and red abdominal markings.

Adult: Adults are pale brown and 10 to 14 mm (0.4 to 0.55 in) long. The adult male is approximately 11 mm (0.4 in) long. Females are slightly larger than males. Adults have distinct spines that project forward on the pronotum ("shoulders") and a dark spot on the membranous tip of each forewing. They usually have tiny black spots on their bodies as well as spines on their limbs.

Fig. 2. Second instar nymph of the spined soldier bug. Courtesy of University of Florida IFAS. Photo by Michael R. Patnaude

Predatory stink bug ingestion of prey

Predatory stink bugs use their stylets to pierce and hold their prey while it is partially digested from within. Their stylets inject copious amounts of saliva containing a range of digestive enzymes into the prey. The saliva quickly liquefies the prey's internal tissues, which are then sucked up through the stylet. The process is very efficient and up to 80% on the biomass of the prey, which can be up to five times the predaceous stink bug weight, can be ingested within 2 hours (Fig. 3).

Potential as a biological control (BC) agent

Fig. 3. Spined soldier bug with stylet inserted into a Colorado potato beetle larva. Photo by Peter Coffey

The SSB is found in several crop (e.g., potatoes, tomatoes, sweet corn, cole crops, beans, eggplant, cucurbits, asparagus, apples, onions, etc.) and non-crop environments. Adults and nymphs are highly polyphagous (feed on many types of prey), broadly consuming lepidopteran and coleopteran larvae and insects from several other orders. The SSB plays an important role in augmentative and conservation biological control of agricultural pests. Previous field studies showed that augmentative release of SSB effectively reduced populations of many important pests, such as the Colorado potato beetle (CPB), Mexican bean beetle (MBB), tomato looper (Chrysodeixis chalcites) and viburnum leaf beetle (Pyrrhalta viburni). They are commercially available and used commonly for augmentative releases to control the MBB, CPB, and viburnum leaf beetle. The SSB is currently the only predaceous stink bug in North America sold commercially. This predator has been released in field and greenhouse environments to control tomato and cotton pests successfully, and researchers found that augmentative releases of SSBs in small field plots reduced CPB larval population. Another well-known pest that SSB is known to attack is the diamond back moth (Plutella xylostella). The SSB will forage Brassica crops for prey, especially when caterpillar populations are high and are attracted to cabbage plants that have been damaged by diamondback moth (DBM). An individual SSB nymph has the potential to consume over 100 DBM larvae during development.

Summary

The SSB is a generalist predator that can be found in a variety of habitats including woodlands, near streams and agricultural systems. In agricultural systems, the SSB feed on a wide variety of economically important defoliating insects (e.g., MBB, European corn borers, DBM, corn earworms, beet armyworms, fall armyworms, cabbage loopers, imported cabbageworms, CPB, velvetbean caterpillars, flea beetles, etc.) impacting crops in North America. Despite this, it has a reputation of having a low attack rate. This suggests that the SSB may not be of significant benefit if targeted pests have reached their economic threshold. Still the SSB may stall the population growth of a pest and help prevent it from reaching economic damaging levels. In addition, the SSB is the only predaceous stink bug that is commercially available and augmentation of SSB has shown promise for suppression of CPB and other insects in field and glasshouse environments suggesting their importance as biological control agents.

To Read the Full Article Please Visit:

http://jarrodmiller.weebly.com/uploads/1/3/9/7/13973082/spined_soldier_bug.pdf

Agronomic Research Updates

Effects of Cover Crops on Productivity and Weed Suppression

Winter rye, alfalfa, crimson clover, white clover, hairy vetch, soybean and forage radish were examined as cover crops for weed suppression, biomass and carry over effects in New England. Forage radish were among the highest biomass producers and were also among the best weed suppressors. Relative to a fallow treatment, forage radish suppressed weeds by 89-97%. In the spring, annual ryegrass was a high producer of biomass, while alfalfa was low. Ryegrass, hairy vetch, and vetch-rye mixture all performed well for weed suppression. Biomass was greater following legume or legume mixtures.

Source: Agronomy Journal 108(4): 1624-1635

Crop Yields and Phosphorus Availability with Soluble and Humic Complexed Fertilizers

Super phosphate and humic-complexed superphosphate were applied to a corn-wheat-soybean-white oat-soybean rotation in Brazil. Higher agronomic efficiency was observed at medium application rates. Humic complexed P enhanced P soil availability and improved grain yield. Phosphorus concentrated in the upper 5 cm of the soil.

Source: Agronomy Journal. Vol 108(4): 1692-1702.

Crop Response to Subsurface Applications of Poultry Litter

No-till corn production was evaluated with the subsurface application (12 in wide, 3 in deep) of poultry litter. All treatments received 168 kg N per ha (107 lb N per acre) and included surface applied commercial fertilizer, surface and subsurface applied poultry litter. Corn yield was similar for commercial fertilizer and subsurface poultry litter application. Results suggest that subsurface applied poultry litter will not have detrimental effects on corn yield in no-till systems.

Source: Agronomy Journal. Vol 108(4): 1674-1680.

Adapt-N (Nitrogen Modeling) Outperforms Grower Selected Nitrogen Rates

Adapt-N is a computer tool that combines soil, crop and management information with weather data to estimate optimum N application rates for corn. It was evaluated over four growing seasons and 113 strips in New York and Iowa. Application rates were 28 to 47 lb/acre lower than grower application rates with no significant difference in yields. Profits from Adapt-N rates were noticeably higher under wet early season conditions when higher N recommendation rates than grower rates were used.

Source: Agronomy Journal. Vol 108(4): 1726-1734.

Development of a New Amendment for Reducing Ammonia Loss and P Runoff in Poultry Litter

Alum application to poultry litter reduces ammonia emissions and reduced phosphorus runoff, but has also been increasing in price. Sixteen amendments were examined to find an alternative, including mixtures of alum mud, bauxite ore, sulfuric acid, liquid alum and water. All of the amendments resulted in lower ammonia emissions and water soluble P. The most promising were mixtures of alum mud, bauxite and sulfuric acids, and they could be procduced for less than half the cost of alum.

Source: Journal of Environmental Quality Vol 45(4): 1421-1429

Crop Reports

Central

Cooler temperatures were noted this past week. Corn harvest for silage has begun and is proceeding well. Between 1.1 to 2.3 inches of rain fell in the region this reporting period in brisk storms. Apple harvest began during the reporting period to a strong crop.

Previous dry conditions with stretches of high temperatures have lead to a great deal of crop stress. Full season beans are still looking good but double crop were slow to emerge but did get heavy rains to get them out of the ground. They have grown taller than the stubble and have begun to bloom but are struggling under the hot dry conditions. Corn which was stressed for about two weeks earlier in the season took advantage of the same heavy rains which alleviated that stress and corn was overall looking very good until the last two weeks with later planted corn struggling. Pastures and hay ground follow the same story. Conditions until the last three weeks had been ideal for pasture but did add to the challenges of making quality hay. Dry conditions helped us to catch up but now it is too much of a good thing and the dry weather has lead to very poor pasture conditions and currentl y fox tail is the only plant thriving in timothy and orchard grass fields.

Northern

August has been fairly hot in Harford County, running an average of 4^0F hotter than the norm. Precipitation was scattered throughout the County by many isolated, but intense storms, resulting in varying amounts of precipitation. Fortunately, we did get decent rainfall in July, which was crucial for corn pollination. Most corn in the County is in good to excellent condition, but some fields look poor with the hit-and-miss rain pattern we had. Most farms that chop corn for silage started the end of the month and will continue into the first part of September. Corn has dented but very few fields have yet to reach black layer, so harvest for grain still at least a couple of weeks out—a bit delayed for us, but to be expected with the slow, cold, wet start we had to the season. August heat helped push soybeans along, especially double-cropped beans that were a bit slow growing in July due to an extended period of overcast and stormy weather we had the last week of July. Soil moisture is decent, so pods are filling nicely and I suspect most fields will yield well.

Lower Eastern Shore

Some field corn has been harvested to take advantage of local premiums on the Lower Shore, but that has now ended. Regular corn harvest should start soon. Corn looks excellent considering the shaky planting season, although some fields still remain fallow in the region. Hurricane Hermine added 1/2 to 1 inch of rain across the lower three counties, with gusty winds causing more problems for Labor Day tourists than crops. Full season soybeans have come on strong following a wet and cold planting season, but later planted double crop beans are dealing with drier conditions and deer pressure. Palmer amaranth is more prevalent in Wicomico County this year, but has not spread south of Salisbury yet. Caution should be used when sharing harvesting equipment. Your local extension office can help with educating your neighbors on identifying and managing palmer.

Crop Report Regions: Western (Garrett, Allegany and Washington), Central (Carroll, Frederick, Howard, Montgomery), Northeast (Cecil, Harford, Baltimore), Southern (Anne Arundel, Prince George's, Calvert, Charles, St. Mary's), Upper Eastern Shore (Kent, Queen Anne's, Talbot, Caroline, Dorchester), Lower Eastern Shore (, Wicomico, Worcester, Somerset)

CALENDAR

09/13	Maryland Crop Insurance Workshop, Annapolis
10/02	AGNR Open House, Central Maryland Research Center
11/15-17	Mid Atlantic Crop Management School, Ocean City
11/18	Agriculture and Environmental Law Conference, Annapolis
11/19	Image of Agriculture Symposium, College Park

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