# Plant Disease and Insect Advisory

Department Entomology and Plant Pathology
Oklahoma State University
127 Noble Research Center
Stillwater, OK 74078

Vol. 2, No. 8 Website: http://entoplp.okstate.edu/Pddl/advisory.htm Apr 16, 2003

## Wheat Disease Update - Oklahoma

**Bob Hunger, Extension Wheat Pathologist**

On Friday, April 11th, I traveled from Stillwater to Apache, west on HW 19 to HW 183 and south to Frederick. From Frederick I went west to Altus (hwy 5), and from Altus went north on HW 54 through Gotebo to Weatherford to Watonga. I finished the trip by traveling to Kingfisher, Hennessey, Marshall, and back to Stillwater.

Generally, diseases were light, but as you will read below, some leaf rust is starting to appear, and very light stripe rust was observed on 'Above' at Frederick. All along the trip from Apache to Watonga, the wheat was short and dry, with these affects being worse the more I traveled to the south and west. Between Watonga and Kingfisher the wheat started improving dramatically, and the wheat from Kingfisher back to Stillwater was beautiful to look at. I saw wheat from Apache to Watonga anywhere from about growth stage 8 (flag leaf fully emerged) to growth stage 10.5.1 (flowering).


**Leaf rust.** At nearly every stop, some scattered pustules of leaf rust were observed on susceptible varieties such as 'Above' and 'Jagger'. The heaviest leaf rust I observed was with Aaron Henson at the variety-demonstration at Frederick on Jagger. I didn't see any rust on wheat at the Altus station, and found only very few pustules at Kingfisher.

**Stripe rust.** The only stripe rust found was on the variety 'Above' in the Frederick variety-demo. This was on the lower to mid leaves, and was at a very low (<2%) incidence. The wheat in this variety-demo was mostly in the completely headed to flowering stage, so rusts won't be a factor there or in general, across southern Oklahoma.

**Other foliar diseases.** The only other foliar diseases I saw were septoria at the variety demonstration in Kingfisher, and powdery mildew on the lower leaves at Marshall. I didn't see any reason for concern with the level of either of these infections.

**Barley yellow dwarf virus (BYDV).** I stopped numerous times along the trip from Apache on looking for samples to collect for the BYDV survey. Although I found many likely BYDV


infection spots, I did not see wide-spread severe symptoms of BYDV anywhere. Most surprising was the indication of heavy aphid feeding Aaron and I observed at the Frederick variety-demo, but the lack of BYDV symptoms. Perhaps most of the aphids in these plots were not carrying BYDV. Also, Aaron indicated that the high levels of aphids were quickly controlled by beneficals, which also may have contributed to the low incidence of BYDV.

**Reports from other states – Texas**. Dr. Art Klatt visited the wheat nurseries located near Castorville, TX, and observed severe stripe rust on many lines, with leaf rust being of a more intermediate severity. Dr. Klatt indicated that Rex Herrington (Texas A&M) reported that stripe rust was moderate to sever in a band approximately 200 miles wide (north to south) across south and central Texas. Hence, it seems there has been plenty of inoculum to blow into Oklahoma, but are conditions across (especially) the southern half of Oklahoma, have not been favorable for stripe rust (i.e., it's been too dry).

**Reports from other states – Cereal Disease Lab (Minnesota)**. In addition to the above report for Texas, the CDL bulletin of April 8th indicated that many fields had been sprayed to control stripe rust in central TX, and that light levels of stripe rust had been found in fields west of Dallas.

---

# Managing Bacterial Leaf Spot Diseases of Tomato

**John Damicone, Extension Plant Pathologist**

A sure sign of spring is that transplanting of tomato is now underway. Now is the time to plan for a disease management program for tomato. Bacterial spot and bacterial speck have been the most common foliar disease of tomato in recent years. It is assumed that these diseases are introduced to a production site on infested seed or transplants. The bacteria can be present on leaf surfaces of transplants without causing symptoms. Once the bacteria are established, the diseases often become a chronic problem. Symptoms of the two bacterial diseases are very similar (Fig. 1 and 2), and they resemble the fungal disease Septoria leaf spot (Fig 3). In addition to causing premature leaf drop, the bacteria cause fruit spotting which renders affected fruit unmarketable.

A spray program is recommended for control of bacterial leaf spots, particularly where the diseases have been a problem in past years. Bacterial spot and speck are difficult to control, and the results may be visually disappointing. However, the recommendation is based on results that demonstrate the economic value of a spray program. In 2002, a trial was conducted to compare various materials for the control of bacterial spot and speck of tomato (Table 1). Copper hydroxide (eg. Kocide) and copper sulfate (eg. Cuprofix) are the most commonly used bactericides. These materials also act as protective fungicides. Tank mixing coppers with the fungicides maneb or mancozeb (eg. Penncozeb, Dithane, etc.) not only enhances control of

Fig. 1 Bacterial spot.

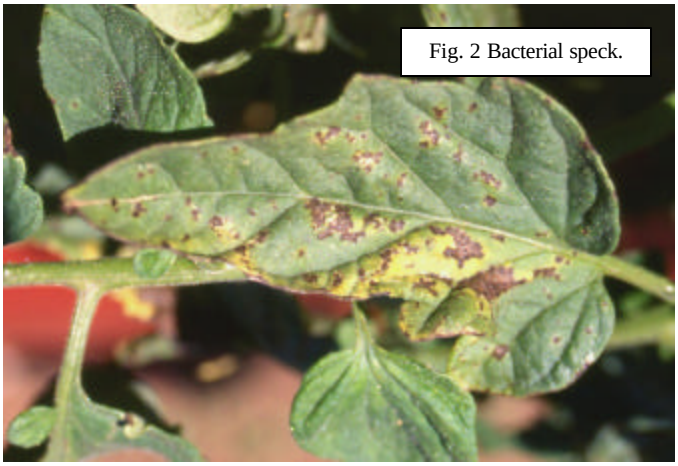

Fig. 2 Bacterial speck.

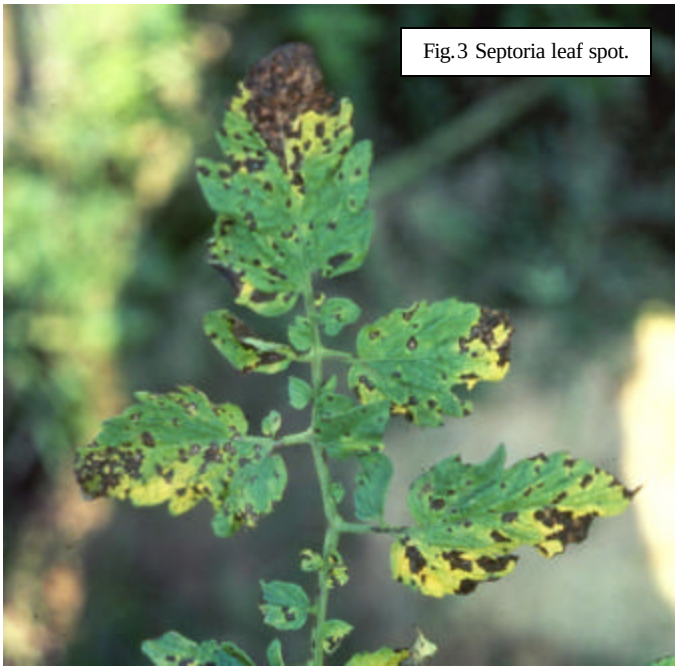

Fig.3 Septoria leaf spot.

fungal diseases, but increases the release of copper ion into solution which may enhance bacterial disease control. Actigard is a newly developed material that acts as a plant defense activator and is reported to be effective on bacterial diseases. In previous trials on pepper in Oklahoma, a full-season spray programs with Actigard provided superior control of bacterial spot, but yields were reduced compared to copper. For this reason, Actigard has not been registered for use on pepper. Actigard is registered for use on tomatoes up to 7-days before harvest, but has not yet been evaluated in Oklahoma where bacterial disease has been present. The fungicides Bravo and Quadris were included for comparison in the event of fungal disease development. Bravo was substituted for Penncozeb in several spray programs during harvest because the latter cannot be used within 5 days of harvest.

Bacterial spot and speck increased to moderate levels in the untreated check by the time the trial was terminated on 25 July. Foliar disease was caused exclusively by bacterial spot and speck diseases in this trial as evidenced by the failure of Bravo, a fungicide, to provide any disease control or yield increase when applied full-season without copper (Table 1). On 11 July, all treatments reduced levels of leaf spot compared to the untreated check (Table 1). Treatments consisting of weekly applications of Kocide or Cuprofix generally provided the best disease control. Differences between treatments, while sometimes statistically significant, were less apparent by 26 July when the trial was terminated. The greatest reductions in disease incidence and canopy defoliation resulted from Kocide and Penncozeb+Kocide treatments. The use of Actigard early in the season did not improve disease control compared to the standard treatments that consisted of weekly application of copper or copper + mancozeb. Yield of marketable fruit was increased above that for the untreated check only for treatments that consisted of weekly application of copper or copper + mancozeb. Yield of

Actigard-treated plots, although not statistically different from the check, were always numerically lower indicating a trend for reduced yield following Actigard treatment.

**Table 1.** Evaluation of spray programs for control of bacterial leaf spots of tomato, Bixby, 2002[1]

| Treatment and rate/A (timing)[1] | Leaf spot (%)[2] | | Defoliation (%)[3] | Yield |
|---|---|---|---|---|
| | 11 July | 26 July | 26 July | (cwt/A) |
| Bravo Ultrex 82.5DF 1.8 lb (1-10) | 27.5 | 51.2 | 19.0 | 298.6 |
| Kocide 2000 2 lb (1,3,5,7,9)<br>Quadris 2.08F 6.2 fl oz (2,4,6,8,10) | 20.6 | 46.9 | 18.5 | 320.5 |
| Kocide 2000 2 lb (1-10) | 5.4 * | 33.5 * | 8.7 * | 410.8 * |
| Actigard 50WG 0.75 oz (1-4)<br>Kocide 2000 2 lb (5-10) | 15.7 * | 37.5 * | 14.8 | 297.8 |
| Penncozeb 75DF 2.0 lb +<br>Kocide 2000 2 lb (1-5)<br>Bravo Ultrex 82.5DF 1.8 lb +<br>Kocide 2000 2 lb (6-10) | 9.4 * | 31.5 * | 7.9 * | 473.9 * |
| Penncozeb 75DF 2.0 lb +<br>Cuprofix 20WG 6 lb (1-5)<br>Bravo Ultrex 82.5DF 1.8 lb +<br>Cuprofix 20WG 6 lb (6-10) | 6.2 * | 37.3 * | 13.7 | 482.5 * |
| check | 31.9 | 54.8 | 25.4 | 300.4 |
| $LSD_{0.05}$[4] | 13.1 | 16.8 | 10.6 | 97.2 |

[1] Spray numbers 1 to 10 correspond to ten weekly spray dates beginning 17 May.
[2] Percentage of leaflets with leaf spot.
[3] Percentage of canopy defoliated.
[4] Least significant difference. Values in a column followed an asterisk (*) are statistically different from the untreated check.

Large yield increases (11,000 to 18,000 lb/A) were achieved with weekly applications of copper, alone or in combination with mancozeb. Yield increases did not result from applications of copper hydroxide made every two weeks (alternated with Quadris). Spray programs should be started at flowering or early fruit set after transplants have recovered and started to grow. The addition of mancozeb may enhance control of fungal disease should they develop, but may not be beneficial for bacterial disease control or yield compared to copper alone.

---

# Update on Root-Knot Nematodes in Peanut

**John Damicone, Extension Plant Pathologist**

Northern root-knot nematode has been the primary nematode species affecting peanuts in Oklahoma. The nematode is widespread in Oklahoma where it is a problem on peanut, vegetable crops, and legume crops. The nematode causes galling of the root system, but the galls are smaller than those typically observed for other species of root-knot nematode. On peanut, the nematode restricts root development and produces a dense, bushy root system (Fig. 4). The

nematode can produce galls on pods when populations are high. Severe plant stunting and yield loss on peanuts can occur where populations of northern root-knot are high.

In 2002, peanut root-knot nematode was found for the first time in Oklahoma in a field in the far southwestern part of the state. The field had been in peanuts for the fourth consecutive year. The identity of the nematode was confirmed by Dr. Nathan Walker at OSU and by Dr. Jim Starr at Texas A&M. Peanut root-knot is considered more damaging to peanut than northern root-knot. It has historically been a problem in Central Texas and the Southeastern U.S. Galls produced by the peanut root-knot nematode are large and drastically disfigure root systems (Fig. 5). Plants in infested areas of the field were severely stunted and killed (Fig 6).

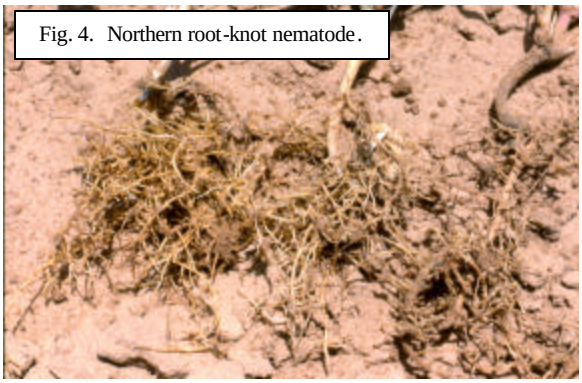

Fig. 4. Northern root-knot nematode.

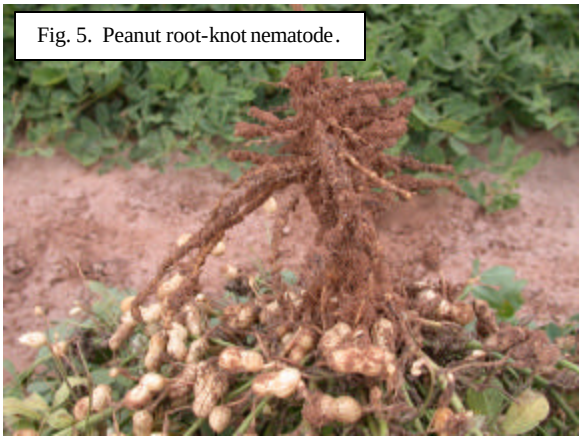

Fig. 5. Peanut root-knot nematode.

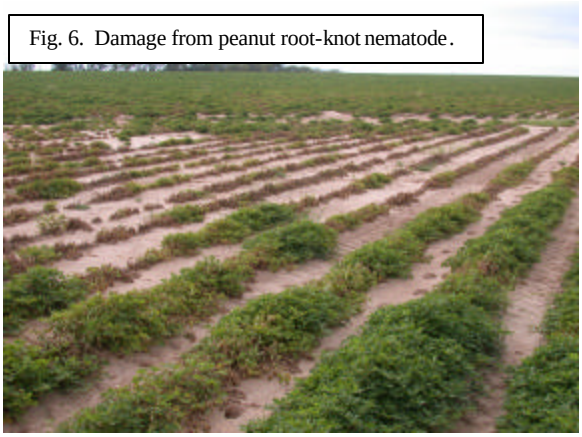

Fig. 6. Damage from peanut root-knot nematode.

Management of the two nematodes species is similar in most regards. Crop rotation for 2 to 3 years with cotton or grass crops (corn, grain sorghum, etc.) is effective for reducing populations below damaging levels. However, a second consecutive peanut crop following rotation will likely result in a population rebound and severe damage. A preplant application of granular nematicide is required to minimize yield loss where damaging levels of nematodes are present prior to planting peanuts.

Texas A&M has recently released two peanut varieties with resistance to peanut root knot nematode. 'Cowan' was the first release, but it has been discontinued because of low yield potential. 'Nematam' is a new release and has better yield potential. Both were derived from crosses with wild peanut species. Nematam also is reported to have resistance to rust and foliar diseases. Unfortunately, there are no resistant varieties for the northern root-knot nematode.

Soil-sampling for assessment of nematode populations is recommended before peanuts are planted in fields with a history of nematode problems. Sampling should also be done where peanuts are cropped behind peanuts or another susceptible crop. Decisions for management of root-knot nematode must be made before planting time.

# Mosquitoes in Oklahoma and West Nile Virus

**Russell Wright, Department of Entomology and Plant Pathology**

We are starting to receive questions about mosquitoes, West Nile Virus (WNV), and how you can control these. Most individuals know that we had an outbreak of West Nile Virus last year in birds, horses, and humans in Oklahoma. Most also know that the normal infection method is through a mosquito bite. The natural cycle of this disease between birds and some species of mosquitoes is quite complex. To understand the cycle of the disease one needs to understand something about the life cycle of the mosquitoes that transmit the virus. We often call insects that transmit a disease causing agent a vector species.

There are over 60 species of mosquitoes in Oklahoma, but only a few species are capable of picking up, developing, and transmitting WNV. It is important to know a little about mosquito biology, the season when the important biting and transmitting species are abundant, how one can help reduce populations of mosquitoes, and how one can reduce the risk of the transmission of WNV.

Mosquitoes are flies that have four distinct life stages: egg, larva (four stages), pupa, and adult. (Fig. 1) The larval and pupal stages are found only in water. Eggs are laid on the water or at the edge of the water depending on species. Only adult female mosquitoes bite and feed on blood. They must do so to develop their eggs. Mosquitoes that have become infected with WNV by feeding on an infected bird sometimes transmit WNV to other birds, horses or humans when they take a second or third blood meal. The WNV must develop in the mosquito so transmission does not occur until several days after they have become infected. **Most mosquitoes do not become infected** and most species **can not** develop and transmit WNV.

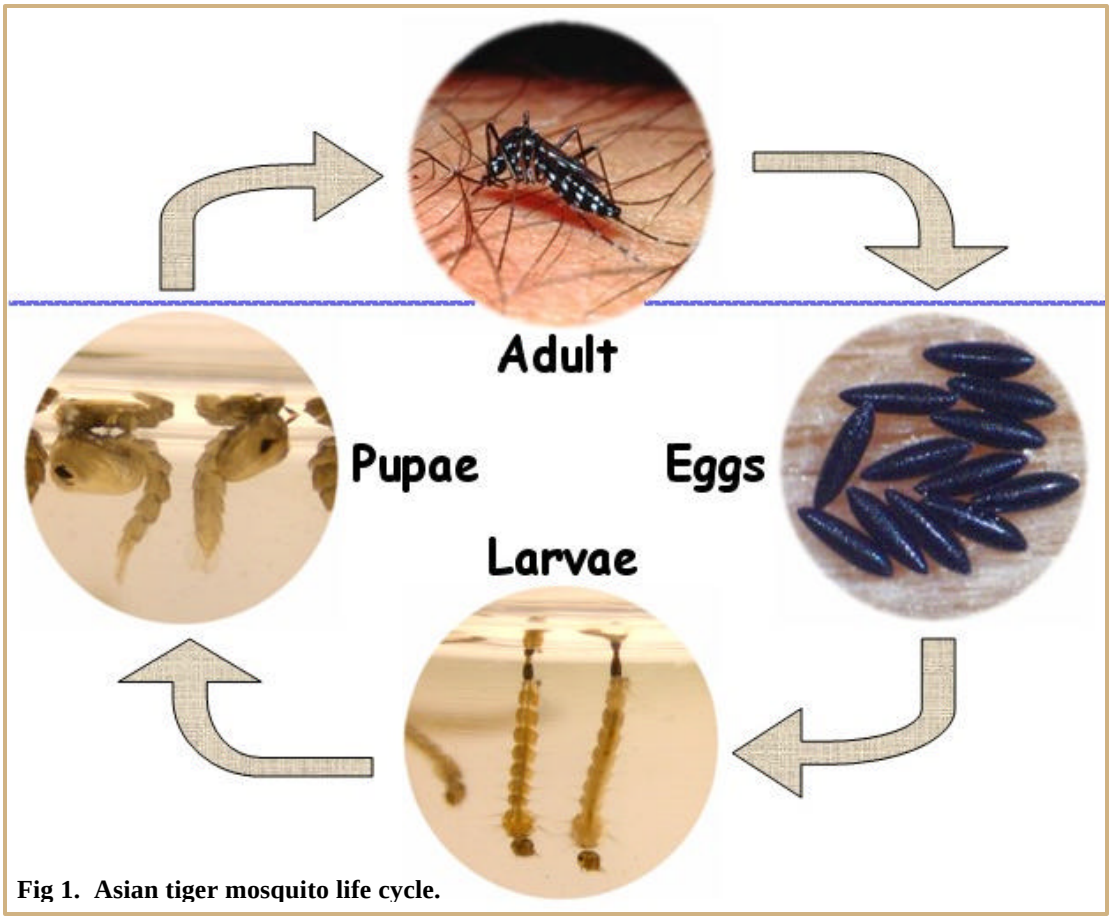


**Fig 1. Asian tiger mosquito life cycle.**

One way mosquitoes can be grouped is by the type of water (aquatic habitat) in which the larvae are found. Four such groups are: 1. Flood Water Mosquitoes; 2. Permanent Water Mosquitoes in Permanent Pools; 3. Permanent Water Mosquitoes in Transient Pools; 4. Container Mosquitoes.

## 1. Flood Water Mosquitoes (***Aedes, Ochlerotatus*, and *Psorophora* species**)

These mosquitoes are most often found in standing water remaining after heavy rainfalls or flooding. Mosquitoes in this group spend the winter as eggs that have been laid at the edge of standing water the previous year. Some species can have several generations in the same year, but in all cases the eggs hatch only after they have been dried for a time and then are **flooded** in some manner. Flood water pools must remain long enough for larvae and pupae to develop, 7-15 days depending on temperature. Many thousands of eggs are hatched at the same time and huge numbers of mosquitoes develop and emerge as adults within a few days.

These species tend to have **population peaks in the spring and early summer**, April through June, and are the primary nuisance pests that we experience this time of year. Sometimes locally heavy thunderstorms in the summer and early fall cause localized flooding resulting in large mosquito populations in those areas. Species in this group bite during the evening hours or when disturbed in shaded wooded areas. Most species feed readily on humans and a wide range of animal hosts, but do not prefer birds. Most of these mosquitoes live two to three weeks, but die sooner when the weather gets very hot. If there are no heavy rains and flooding we do not have summer populations of this group. Generally these species **are not the ones that transmit WNV**. However**,** they often can be severe nuisance pests and often warrant some type of control measure.

***Ochlerotatus* sp.**

**2. Permanent Water Mosquitoes (Permanent Pool Group)** (*Anopheles* sp., *Culex salinarius*)

Mosquitoes do not live in large open bodies of water such as lakes, rivers and ponds. However, some species live in the quiet water at the edges of such water if the edge has a lot of vegetation. Normally mosquito larvae do not last long in the typical farm pond or lake that has abundant fish or other aquatic predators. Mosquitoes from these of habitats occur from mid-spring to fall, but **are not the species** that are involved in the transmission of West Nile virus and usually are not a nuisance problem.

**3. Permanent Water Mosquitoes Transient Pool Group** (*Culex* sp., *Culiseta* sp.)

There are several species of mosquitoes that prefer water which has been standing three weeks or longer. This type of water can range from very small fresh water pools to large bodies of very polluted stagnant water. A range of this type of water would include large pools of water left three to four weeks after heavy flooding, water accumulations from poor drainage in irrigation systems, water catch basins in storm sewer systems, large tanks or containers of water, polluted sewage lagoons, seepage water from livestock holding facilities, or stagnant water in marshy or swampy area. Essentially these sites include almost any standing stagnant water that has been present for three or more weeks during the spring through the fall.

The mosquitoes that use this type of water lay their eggs in rafts on the water's **surface**. Eggs hatch in 24-48 hours and larval and pupal development takes from **6-10 days.** These mosquito species spend the winter as mated females resting in burrows, caves, culverts, sewers, unheated outbuildings, garages, and similar places. A low number of these females survive the winter. When they emerge from over-wintering sites they must find a blood meal (usually birds), and find suitable water to lay eggs on the surface. Because relatively few females start the new population, it takes a long time before populations of these mosquitoes increase. Large populations of these species **appear by late summer and throughout the fall**. Most of these species prefer to **feed on birds** and feed primarily at night. Some feed on birds infected with WNV and the virus is easily transmitted to other birds. Several of these species transmit WNV between birds until many birds are infected.

It appears the **best vectors or transmitters of WNV among birds are *Culex pipiens quinquefasciatus, Culex tarsalis*, and *Culex restuans.*** These species prefer to feed on birds, but when very abundant will feed on human or horse hosts. They most often feed at night and are not noticed as much as other species. The species *Culex tarsalis* occurs in the western half of Oklahoma and may more readily feed on horses. **The peak number of human and horse WNV cases occurs in late summer and fall when these mosquitoes are abundant and the most birds infected are present.** Other mosquito species that may be plentiful in the late summer and fall can become infected when feeding on infected birds and may be good vectors to humans or horses.

*Culex pipiens quinquefasciatus*

**4. Container mosquitoes**

Several species of mosquitoes lay their eggs on or at the edge of water in containers of all types ranging from small cans, buckets, bird baths, flower pot bases, plugged rain gutters, poorly maintained water gardens to old tires. Most of these species develop from egg to adult in 7-10 days and can have continuously emerging adults all summer. The **Asian Tiger Mosquito, *Aedes albopictus***, an introduced species, occurs in almost any kind of container and has become the **most important pest species** in most urban areas of Oklahoma **from early June through the fall.** It readily bites humans and feeds during mid-afternoon to early evening. Although scientists are not certain yet, they suspect this species may be good intermediate vectors that can become infected with WNV from birds and later transmit it to humans or horses.

This species is difficult to control in the larval stage because it occurs in many small containers that hold water. The usual mosquito adult sprays do not work well because these sprays must be applied around sunset or later when the thermal currents are not rising and when most mosquitoes are active. Since the Asian Tiger mosquito is most active in mid-to-late afternoon, the usual mosquito adult spray programs are not applied when the mosquito is active and the spray droplets do not contact the adults.

**Asian Tiger Mosquito, *Aedes albopictus***

## Mosquito Control

There is little the homeowner can do to control mosquitoes except to eliminate any source of water that will support mosquito larvae. Primarily this means keeping water from accumulating in any kind of container from a tin can to a tire. Water containers such as pet's water dishes or bowls, bird baths, flower pot bases etc. should be emptied at least weekly and the sides should be scrubbed to remove mosquito eggs that may have been laid at the waters edge. To our knowledge there are only two products that are sold across the counter that can be added to water to control mosquito larvae. These are: "**Mosquito Dunks"** containing a biological agent *Bacillus thuringensis* var *israelensis* and **"Pre Strike Insect Growth Regulator"** containing methoprene. These products are safe to use around pets, fish and children. The use of fish in large containers of water such as stock tanks and water garden pools also work well to reduce mosquito larvae in these areas.

## Personal Protection

Everyone should exercise good judgment in preventing mosquito bites. If mosquito populations are high one should avoid being in areas where they are abundant, wear long sleeves and long pants, and/or use a repellent. All the most effective brand name repellents contain the same repellent, DEET. **Many formulations will not say DEET** on the label, but all must list the active ingredient name, **N,N-diethyl-meta-toluamide** on the label. Look for this chemical name and its percentage concentration before buying a product. Concentrations can range from 7% to 100% with most being in the range of 10 to 18%. All concentrations are effective except that the higher concentrations last longer. Even the lowest concentration, which is preferred for small children, gives one to two hours of protection if it is not washed or rubbed off. Use according to label instructions. Also remember that **WNV has a greater impact on people age 50 years and up**, than on children, so it is very important to protect adults.

Dr. Richard Grantham
Director, Plant Disease and Insect Diagnostic Laboratory



Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Samuel E. Curl, Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Dean of Agricultural Sciences and Natural Resources.