UofA UNIVERSITY OF ARKANSAS
DIVISION OF AGRICULTURE
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Management of the Insect Pests of Rice

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In general, the rice crop in Arkansas does not suffer large losses from insects each year. However, moderate to severe insect losses do occur in individual rice fields each year. The most important pests of Arkansas rice are the rice water weevil and the rice stink bug. During the years 2000 and 2001, the rice stink bug populations were very high and caused significant damage. Grape colaspis, rice stalk borers, billbugs, rice seed midges, chinch bugs, fall armyworms, short-horned grasshoppers and aphids are present in most fields and occasionally cause damage.

Rice Water Weevil

Biology and Description

The rice water weevil overwinters as an adult in accumulated leaf litter in well-drained wooded areas, bunch grasses and other sheltered places. The small (1/8 inch) brown beetles begin to emerge from overwintering in late April and continue until early June. They are attracted to water, colonize rice fields strongly after flood and often are found in higher densities near levees where water is deeper and plant stands are thinner.

Adults fly about in the early evening and early morning. Feeding adults produce narrow, linear scars on the rice leaves. Adults may move into fields and cause scars by feeding prior to flood, but eggs are not laid until fields are flooded. Female rice water weevils swim from plant to plant and deposit eggs in the leaf sheaths below the water surface. Peak egg laying usually occurs 1-2 weeks after flooding.

The eggs are small (1/32 inch), white, elongate and slightly curved. They hatch in 4-9 days (depending on temperature). The white larvae are aquatic and require water saturated soils to survive. Newly hatched larvae feed in the leaf sheath for a short time, exit, sink to the soil surface and locate rice roots on which to feed. The larvae are tiny (1/32 inch long) when first hatched, but quickly grow through four larval stages to 3/16 inch in about four weeks. When the larvae become fully grown, they build water-tight, oval mud cells in which they pupate. They emerge as adults after spending 5-10 days in the pupal stage.

The adults of the first in-field generation begin emerging about five weeks after flooding. They may continue to emerge for several weeks. The life cycle ranges from 35 to 65 days, and adults and some larvae can be found in reproductive stages of the rice crop. These first-generation adults feed on the rice leaves and can occasionally be found on rice heads. No economic damage is done by adults on rice heads. A small number of adults will lay eggs in young or old rice fields. By late August, rice water weevil movement to overwintering sites is strongly underway.

Damage

The damage from rice water weevil is caused by larval feeding on or in the roots of rice plants. Normally, the window of time during which economic loss occurs begins as adults move into fields soon after flood. Occasionally, rainy weather floods rice fields prior to flooding by

the farmer. When this happens rice water weevils may move to fields and lay eggs before the farmer floods a field.

The leaf scarring produced by adult feeding does not cause yield losses. Rather, it is an indication that adults are present and is used to make decisions about use and timing of insecticides.

Management

Preventative Insecticide Treatments

Preventive treatments, such as a seed treatment insecticide, should be used on fields which have had historically severe rice water weevil problems. ICON® seed treatment is very effective and will give season-long control of rice water weevil larvae. ICON is available only from dealers who have been licensed to apply this seed treatment insecticide.

Foliar Insecticide Treatments for Control of Adults and Eggs

The key to preventing damage by rice water weevils is use of appropriate scouting techniques in a timely manner. Begin scouting rice 3 to 5 days post-flooding. Begin sampling at least 6 feet past levee furrows. Inspect only the newest unfurled leaf (youngest leaf) for leaf scarring. Check 40 plants at each field stop. Accumulate the number of leaves with feeding scars and compare your accumulated total and stop number in Table 1. When the number of plants with feeding scars, for the sample number you are on, is lower than the number in the Don't Treat column, stop scouting and do not treat. When the number of plants with feeding scars, for the stop number you are on, is higher than the number in the Treat column, stop scouting and treat. If the number of feeding scars you found, for the sample number you are on, falls between that in the Don't Treat column and the Treat column, keep sampling.

Leaf-Feeding Scar Scouting Method

1. First, examine the youngest leaves of seedling rice for feeding scars, beginning within three to five days after flooding. If a field requires more than five days to flood, scout the area flooded during the first three days and then scout the area flooded during the next two to three days.
2. Inspect the youngest leaf on 40 rice plants at each stop. Check plants out in the bay area at least 6 feet from levees and avoid areas with a thin stand. Record number of plants with scars on the new leaf.
3. Make the decision to treat or not to treat after each stop by using Table 1. If you cannot decide after five stops, begin treatment on upward trend or rescout field in four or five days.

The insecticide Karate® Z is labeled and is effective, if properly timed, for control of rice water weevil adults. The insect growth regulator Dimilin® 2L is labeled and will prevent rice water weevil eggs from hatching. Dimilin must be present on the foliage and/or in the water to be effective.

Scouting for Larvae

No insecticides are available for post-flood larval control. However, fields can be sampled to determine if larvae are the cause of unusual growth or color. Fields can be sampled from 14 to 35 days post-flood by taking core samples from the soil in rice fields. Cores should be 4 inches in diameter and should be taken to a depth of 4 inches in silt loam soils and at 2 to 3 inches in heavy clay soils. Randomly sample at least five locations per field or in an affected area by

Table 1. Treatment Levels for Rice Water Weevil Using the Leaf Feeding Scar Method[1]

	Total Number of Plants With Feeding Scars on New Leaves[2]		
Sample Site Number[3]	Don't Treat Stop Scouting When Total is Less Than	No Decision[4] Keep Scouting When Total is	Treat Stop Scouting When Total is More Than
1	ND[5]	Between	40
2	11	Between	56
3	28	Between	72
4	44	Between	89
5	61	Between	105
6	78	Between	122
7	94	Between	139
8	111	Between	156
9	128	Between	173
10	145	Between	189

[1] Best results when used within 7 days after first flooding.
[2] Inspect youngest leaf on 40 rice plants at each stop out in the bay at least 6 feet from levee.
[3] Total number of leaf scars should be accumulated. (Example: stop 1, plus stop 2, etc.)
[4] If a decision is not reached within a reasonable number of stops, either reinspect field in 4 to 5 days or follow trend. (Example: Treat if totals progressively move toward the treat level.)
[5] No decision can be made – continue scouting.

taking a core sample at each location. Vigorously wash core samples through a screen (a screen-bottomed bucket is helpful in washing). Count the larvae on the screen or immerse the bucket in water and count the larvae as they float to the surface of the water. The economic damage level is 10 or more larvae per core sample. If mostly small larvae (1/8 inch) are found, more damage can be expected. If mostly large larvae are found (3/16 inch or larger) most of the damage has already been done. In this case, root pruning has already occurred and an application of 25-30 lbs/A of nitrogen to stiff-strawed varieties may be of benefit.

Scouting for Larvae

1. Fourteen to 35 days after flooding is the ideal time to use this method of scouting.
2. For counting larvae, you need a core sampler four inches in diameter and four inches deep and a screen-bottom bucket for washing the sample.
3. Randomly sample five places in the field. Wash soil through screen-bottom bucket and count larvae as they float to water surface.
4. The economic damage level is 10 larvae or more per core sample.

Other Management Options for Controlling Rice Water Weevil Larvae

Draining and allowing the soil to dry until cracks form about 2 weeks after flood is an option that can be used to control rice water weevil larvae. However, growers using this technique risk loss of nitrogen fertilizer, increased weed problems, increased mosquito populations, increased risk of rice blast infection and delayed crop maturity. In addition, they incur the cost of reflooding fields.

Due to the availability of pre-emergence herbicides, flooding of drill-seeded rice can be delayed for up to one additional week. This reduces the damage rice water weevils can cause because the crop root system is allowed to become larger and better developed before the larvae begin feeding.

Continuously flooded or pin-point flooded, water-seeded rice is normally under more intensive rice water weevil pressure than drill seeded rice because adult weevils begin moving into it as soon as the rice seedlings emerge from the water. Normally, larger populations develop on water-seeded rice. Weevils colonize water-seeded rice earlier and they feed for a longer time. ICON treated seed should be considered for use on these fields. If an insecticidal seed treatment such as ICON is not used, continuously flooded or pin-point flood, water seeded rice should be scouted very carefully for rice water weevil, and foliar insecticides should be applied as needed.

Table 2. Insecticides for Control of Rice Water Weevil

	Formulation/Acre	Acres/Gallon
Adulticides Karate Z 2.08 CS*	1.92-2.56 oz	67-50
Fury 1.5 EC*	4.3 oz	29.8
Ovicide/Sterilant Dimilin 2L*	12-16 oz	10.7-8
Larvicides ICON Seed Treatment	0.025 to 0.05 lb ai/acre	Applied to seed
*Apply Dimilin, Karate and Fury within 10 days after permanent flood on drill seeded rice and 7 days after on water seeded rice.		

Rice Stink Bug

Biology and Description

The rice stink bug adult is a small, tan, shield-shaped insect about 3/8-1/2 inch long which produces a strong odor when disturbed. Rice stink bugs can be distinguished from other similar insects by the forward-pointing spines on the segment behind the head. Adults move to leaf litter and bunch grasses to find hibernation sites in early October, and they emerge from over-wintering in late April or early May. Egg laying begins soon after emergence. Light green, barrel-shaped eggs are laid in clusters of 10 to 40 eggs placed in double rows on the leaves and seed heads of host plants. Nymphs hatch about five days after the eggs are laid and shed their skins five times before becoming adults. The nymphal stage lasts 15-28 days. Nymphs are bright red with black markings at first, and then become tan colored with intricate black and red markings on the abdomen. The period from egg to adult ranges from 20-33 days. Adults live about 28 days during the summer, and four to five generations are produced per year. Barnyardgrass, bearded sprangletop, broadleaf signalgrass, dallisgrass and crabgrass are the primary non-crop hosts of rice stink bug.

Damage

As rice seed heads emerge and the grain begins to fill, rice stink bugs move into fields from grassy areas. They are generally more numerous at field margins. Rice stink bugs damage the rice crop by piercing the developing grain with their mouthparts and sucking out the juices. If kernels are in the pre-milk stage, rice stink bug feeding stops kernel development resulting in lost grain. Similarly, stink bugs feeding on milk stage grain may remove the entire contents of the seed causing grain loss. But, as the crop moves into the dough stage, a smaller portion of the seed contents are removed. Stink bug damage to milk or dough stage rice causes shriveled kernels, or a chalky, discolored area on the rice grain called “pecky” rice.

Management

The preferred sampling tool for rice stink bug is a 15-inch diameter sweep net. Sweep nets can be made or purchased from entomological supply companies (your county agent can help with instructions or supplies).

Begin scouting fields when 75 percent of rice panicles have emerged. Scout once or twice a week through harvest. Sweep rice panicles in 180 degree arcs as you walk through the field. Ten consecutive 180 degree sweeps are considered a sampling unit. Sample 10 or more randomly selected sites in each field and calculate the average number of rice stink bugs per 10 sweeps.

Beginning at 75 percent panicle emergence and for two weeks thereafter, an insecticide should be applied for rice stink bug control when infestations reach an average of five or more rice stink bugs (adults and nymphs)/10 sweeps. During the third and fourth weeks after 75 percent panicle emergence (milk and soft dough stage), apply an insecticide for rice stink bugs when infestations reach an average of 10 or more adults and nymphs/10 sweeps. For larger acres and infestations at near threshold levels, the number of 10 sweep samples may need to be increased to increase your confidence that a correct decision is being made.

The best time of day to sweep sample for rice stink bugs is early in the morning, about the time the dew dries. When sampling, the field margins should be avoided.

Table 3. Insecticides for Control of Rice Stink Bug

Insecticide	Formulation per Acre	Acres per Gallon	Days to Harvest
Fury 1.5 EC	4.3 oz	29.8	14
Karate Z 2.08 SC	1.6-2.56 oz	50-80	21
Malathion 57% 8EC	1/2-1 pt	8-16	7
Methyl Parathion 4EC	1 pt	8	15
Penncap-M 2EC	2 pt	4	15
Sevin 80S	1 1/4-1 7/8 lb	----	14
Sevin XLR (4L)	2-3 pts	2.7-4	14
Treatment Level: The two weeks following 75 percent panicle emergence, treat when five or more stink bugs are found per 10 sweeps. During milk and hard dough stage (3-4 weeks after 75 percent panicle emergence) treat when 10 or more bugs are found per 10 sweep sample.			

Grasshoppers

Several grasshopper species attack rice. The most common is the meadow grasshopper which has antennae longer than the body and is green in color. This grasshopper is usually about 7/8 to 1 1/8 inches long, feeds on rice leaves and anthers (male flower parts), but causes little damage to rice yields or quality.

The differential grasshopper is larger (1 1/4-1 1/2 inches long) than the meadow grasshopper and is light brown to tan or yellow in color. Differential grasshopper is often a more serious pest of rice. This grasshopper has antennae shorter than the body length and dark chevron-like markings on the sides of the hind (jumping) legs. These grasshoppers generally move into rice fields from surrounding fields, pastures and non-crop areas as the grasses they feed on begin to dry up. Adult differential grasshoppers feed on the newly emerged panicles and stems of rice plants. When rice stems are attacked before or during panicle emergence, white or “blasted” heads can occur.

Treat seedling rice when grasshopper populations reach one or more per square foot. Treat during panicle emergence when grasshoppers are seen and stem or panicle damage can be found. After heads have emerged, treat when 10 or more grasshoppers per 100 seed heads are seen. If one or more grasshoppers per square foot can be found on field borders, treatment of the field borders is justified to keep grasshoppers from moving into fields.

Table 4. Insecticides for Control of Grasshoppers

Insecticide	Formulation per Acre	Acres per Gallon	Days to Harvest
Karate Z 2.08 SC	1.6-2.26 oz	50-80	21
Malathion 57% EC	1 pt	8	7
Methyl Parathion 4EC	1/2-1 pt	8-16	15
Penncap-M 2EC	1-2 pt	4-8	15
Sevin 80S	1 1/4-1 7/8 lbs		14
Sevin XLR 4L	2-3 pts	2.7-4	14
Treatment Level: Treat when damage is evident. Border treatment may be beneficial.			

Grape Colaspis (lespedeza worm)

The larva of grape colaspis can cause damage to seedling rice in Arkansas as they feed on roots and seeding rice plants in fields grown under soybean (or other legume crop) rice rotation. The larvae are small (1/8-1/6 inch long), white-colored grubs. Adult grape colaspis beetles are small (about 1/6 inch long), oval shaped, tan beetles with distinctive grooved longitudinal lines on the wing covers. The larvae overwinter 6-8 inches below the soil surface then move to near the soil surface in the spring and feed on the developing seedlings. The adult beetles are common from mid- to late-summer in fields of soybeans, clover, timothy and other legumes. Mating and egg laying occurs in legumes from mid-summer through late summer (two generations per year). The eggs are laid in the soil around the roots of legume host plants, where they hatch in 6-9 days. Second generation larvae feed then migrate deep into the soil to spend the winter.

Rice seedling damage occurs as rice is planted following soybeans and overwintering grape colaspis larvae girdle the underground stem leaving only a thread-like connection between the seed and the

above-ground plant. Above-ground symptoms are stunted, yellowed plants. Damaged plants are susceptible to drought stress and will die during dry periods. Stand loss can be severe under drought conditions when populations of grape colaspis larvae are high. Grape colaspis infestations are most often associated with silt loam soils that have a somewhat sandy texture. Fields with heavy clay soils seldom have grape colaspis damage. Most of the damage is seen between germination and the two leaf stage.

Spring tillage may produce considerable larval mortality if grape colaspis larvae are near the soil surface when fields are tilled. Flushing will allow damaged plants to recuperate and is a recommended practice. **ICON seed treatment** has been found to give effective control of grape colaspis in rice.

Armyworms

Two armyworm species commonly infest Arkansas rice fields, armyworm (true armyworm) and fall armyworm. Larvae are either green or brown but have a distinctive pattern of longitudinal stripes – a dark stripe along each side and a broad stripe along the back.

True armyworm leaf feeding occurs along the borders of rice and wheat fields. Growers should observe rice fields located adjacent to wheat fields and watch for movement of armyworms from wheat into rice. Occasionally, all above-ground rice foliage is consumed. But, if the growing point is not damaged, the seedlings will recover if soil moisture is adequate. However, crop maturity in the affected area will be delayed. Insecticide applications on field borders may be justified when armyworms are numerous.

Table 5. Insecticides for Control of Armyworms

Insecticide	Formulation per Acre	Acres per Gallon	Days to Harvest
Karate Z 2.08 CS	1.6-2.56 oz	50-80	21
Methyl Parathion 4EC	1 pt	8	15
Penncap-M 2EC	2 pt	4	15

Treatment Level: 6 or more small worms per square foot, and/or flag leaf damage, head feeding or head cutting is occurring.

Comments: Methyl Parathion or Malathion can be safely applied 7 days before or after propanil is applied. Application of propanil and methyl or Malathion within a shorter period of time will cause severe leaf burn.

Fall armyworms are striped grey-green caterpillars with dark brown to black heads and a preference for feeding on grasses. They can appear in large numbers fairly suddenly during August and September after the grey marked adult moths have moved into fields and field borders. The female moths lay their eggs in masses of 50 to 300 eggs each on the leaves of the host plants. The egg masses hatch and the larvae disperse through the rice. The larval life is about 20 days. The caterpillars feed on rice leaves and occasionally on the seed stalks and heads. Most of the leaf and grain loss occurs when larvae are 1 1/4 to 1 1/2 inches long (the last 4 or 5 days of the larval life). Large amounts of leaf loss can occur when populations are large. Additionally, grain loss may occur if the caterpillars begin to cut rice heads.

Chinch Bug

Chinch bug adults are small (1/6 inch) black bugs which have white wings marked with a small black triangle near the outer edge. The adults overwinter in weedy and brushy areas. They remain in these areas until daytime temperatures reach about 70°F for several hours during the day. They then crawl up grass stems and take flight. Many of these adult chinch bugs find fields of small grain or patches of winter grasses where they feed and lay eggs. The eggs are laid behind the leaf collars or on the roots of these host grasses. Females lay about 200 eggs over a period of 3 weeks to 1 month. The eggs hatch into active red bugs (nymphs) which become darker as they grow. They become adults in 30-40 days.

Table 6. Insecticides for Control of Chinch Bug

Insecticide	Formulation per Acre	Acres per Gallon	Days to Harvest
Karate Z 2.08 SC	1.6-2.56 oz	50-80	21
Methyl Parathion 4EC	1 pt	8	15
Penncap-M 2EC	2 pts	4	15
Sevin 80S	1 1/4-1 7/8 lb		14

[1] 21 days if 3.28 oz or less is applied, 28 days if 3.28 to 6.56 oz is applied.

Treatment Level: Treat when chinch bugs are causing stand reductions.

ICON-will suppress chinch bugs.

Chinch bugs in rice can be found feeding on roots when the soil cracks around rice plants prior to flooding. Flooding will move chinch bugs out of the soil and onto the plants but will not prevent damage.

Rice Stalk Borers

Rice stalk borer larvae have been found in practically all rice production areas of Arkansas. Rice stalk borers are occasional pests of rice and are one of the causes of "white heads," "blank heads" or "white flags." The small, tan adult moth has a sprinkling of tiny black dots on the forewings, white

hind wings and a pointed structure coming off the front of the head. Eggs are deposited in clusters of flattened eggs and resemble fish scales. About 10-50 eggs are laid per cluster on rice foliage.

The caterpillars hatch in 3-7 days and feed about 25 days before pupating. The larvae are yellowish white and are marked with a longitudinal brown stripe and a fainter brown stripe below it, both of which run the length of the body. The larvae eat a hole in the stem just below the panicle or behind leaf sheaths and then hollow out the stalk, moving downward as they increase in size. Infested plants are normally at field edges, levees and in areas with thin stands. Large-stemmed varieties and late-seeded fields are more prone to damage. Larvae overwinter in stubble and pupate in the spring. The pupa is brown, tapers to a point and is enclosed in a heavy web inside the stem.

Timely destruction of rice stubble helps reduce populations. Normally, populations are not large enough to cause economic damage. **ICON seed treatment** is labeled for control of rice stalk borers and will reduce the number of whiteheads by 40 to 70 percent.

Billbugs

Billbugs are another of the insects which can cause “white heads” or “white flags” in rice. The female weevil chews a small cavity near the base of the plant and lays a single egg in it. The egg hatches and the legless, brown-headed, c-shaped grub feed in the stem and hollow it out about 2 inches above and below the soil surface. The white head is the result of the larval feeding which disrupts the movement of water and nutrients. Billbug damage is often limited to levees or unflooded areas of rice fields since the grubs cannot survive flooded conditions. Billbug damaged “white-heads” break off easily near the soil surface when pulled gently. Billbug damage is not of economic importance in properly flooded fields, but levees can be severely damaged.

Rice Seed Midges

The larvae of Chironomid midges (Genera, *Tanytarsus* and *Chironomus*) are called rice seed midges or bloodworm larvae. These aquatic larvae of gnat-like flies can become abundant in flooded rice fields. The female flies lay their eggs on the water surface. The larvae move to the bottom and construct tubes of silk, mud and plant fragments. The midge larvae then damage rice by feeding on the sprouts of submerged germinating rice seeds or entering the seed and feeding before the seedling can emerge. Water-seeded rice seedlings are vulnerable to rice seed midge damage from seedling through the 3-inch-tall seedling stage. Dry-seeding, delaying flood, draining water-seeded fields, increasing seeding rates and use of pre-sprouted seeds for quick seedling establishment can help reduce rice seed midge damage. **ICON seed treatment** is recommended for control of rice seed midges.

Aphids

Adults are small, oval, soft-bodied insects with or without wings. Near the tip of the abdomen, aphids have a pair of tube-like structures called cornicles. Two species, the greenbug and the bird cherry-oat aphid have been reported in rice. The greenbug has a pale green or yellowish-green body, pale green legs with dark tips, a dark green stripe down the center of the abdomen and pale green cornicles with black tips. The bird cherry-oat aphid has a purplish-green to dark purple body, legs with black tips, cornicles with black tips, and at the base of the cornicles is a reddish-orange spot across the bottom half of the abdomen.

Aphids have piercing-sucking mouthparts and feed on plant liquids. The toxin which the greenbug introduces into plants is a component of the saliva it injects while feeding. The toxin causes yellowing of leaves, and small plants may die. Rice plants with one to two leaves have been killed with only two or three greenbugs present per plant. Two or three greenbugs per plant on larger plants caused leaves to turn yellow, but the plants did not die. Little or no symptoms of damage and no dead plants have been seen when bird cherry-oat aphids were found feeding on rice plants.

Experience has shown that insecticide applications are justified when two to three greenbugs per plant occur on rice in the one to two leaf stage. The insecticides Karate Z and methyl parathion are recommended for control of aphids in rice.

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