The White Grub Complex: 
Update on Preventives and 
Species Composition in NJ
Albrecht M. Koppenhöfer, Ph.D., Specialist in Turfgrass Entomology

You may have noticed that Japanese beetle adults and their feeding damage have drastically declined over the last 10 years or so. My grub collecting activities over the last 3 years already indicate that Japanese beetle has been reduced to a minor player in the white grub complex in New Jersey. Last October with the help of the Master Gardener Program, my laboratory and Jim Wilmott (Ag Agent, Camden County) conducted a preliminary grub survey. Grubs were collected from a total of 61 sites in 5 counties (Monmouth, Camden, Somerset, Mercer, Sussex). Most sites had more than one species present. On average the grub populations consisted of 63% oriental beetle, 15% Asiatic garden beetle, 9% masked chafer, 8% Japanese beetle, 4% May/June beetles (Phyllophaga spp.), and 2% green June beetle.

While this survey is still preliminary in nature and needs to be confirmed and also expanded to northern and southern New Jersey this year, the trend is clear. The oriental beetle is our No. 1 white grub pest in turf (as well as ornamentals and various other crops). However, keep in mind that species composition can vary considerably among sites. I have seen several turf areas devastated by masked chafer last year. At this point we have no explanation for the switch from Japanese to oriental beetle (probably a whole complex of interaction factors).

The basic biology of the oriental beetle is similar to that of the Japanese beetle. Adult beetles emerge early summer, mate and lay eggs in the soil. The eggs and the 1st and 2nd larval stage each take about 3 weeks to develop. During September most of the larvae molt into the 3rd and last larval stage. This is typically the stage that can cause rapid and severe turf loss under hot and dry conditions. The 3rd larval stage overwinters in the soil below the frost lines and resumes feeding in April. Pupation occurs around late May and 3 weeks later the next generation of beetles emerges. However, there a few but important differences between Japanese and oriental beetle. Oriental beetles start emerging about 2 weeks earlier, fly mainly in the evening around dusk, fly only short distances, and don’t do any significant feeding. The
upside is that we get less adult feeding damage than we used to get with the Japanese beetle and the oriental beetles are slower in infesting new areas or reinfesting successfully treated areas. The down side is that they are much more likely to catch us with ‘our pants down’ because they don’t ‘advertise’ their presence with mating balls, extensive foliar feeding, and a colorful appearance during daytime as Japanese beetles do.

And now they are out. Probably due to the mild winter, the beetles seem to be out a week earlier than usual. Oriental beetles started flying in the second week of June in central New Jersey and the peak flight activity should be from the last week of June to about mid July. Masked chafer are probably already a week ahead and Japanese beetle will peak in early to mid-July.

If you have chronic white grub problems, this is the time for preventative applications. The obvious disadvantage of preventative applications is that they have to be done before white grub populations can be estimated through soil sampling. Because white grub infestations tend to be localized and sporadic, preventative applications tend to be applied over larger areas than required for grub control. This increases the cost of grub management and may in the long-term dramatically reduce populations of natural enemies by depriving them of prey or hosts. Smart turfgrass managers will restrict preventative applications to high-risk areas, i.e., areas with extremely low damage threshold and tolerance, areas with a history of white grub infestations, and areas with high beetle activity (egg-laying) in June-July.

And now an update on the preventive compounds available. The 2 insecticides presently on the market are imidacloprid (Merit®, Grub-X), a neonicotinoid, and halofenozide (MACH2®, GrubBGon), an insect growth regulator. If white grubs are the primary targets, the optimal application time for imidacloprid and halofenozide is mid June to late July when the female beetles are laying eggs. At this time, control efficacy against most white grub species is typically in excess of 80%. As the larvae hatch and go through their 3 larval stages, they become less susceptible to insecticides, and applications after mid August are not recommended.

Our major white grub pest, the oriental beetle is very susceptible to imidacloprid but a summary of recent research has shown that the average control with halofenozide was only 50-60%. The Asiatic garden beetle appears to be immune to halofenozide and, as recent trials in New Jersey and Massachusetts have shown, also to imidacloprid (average 20% control). Masked chafer are highly susceptible to halofenozide but less susceptible to imidacloprid. Where masked chafers are common, applications should be done no later than mid-July and at the highest label rate (0.4 lb ai/A). Only the Japanese beetle is highly susceptible to both imidacloprid and halofenozide.

The bottom line is, to optimize any preventive grub controls you need to apply the right stuff against the right pest at the right time. You might have to learn those grub rafter patterns after all. For more details on white grub biology and management check my articles in the 8/9/2001 issue of this newsletter (available at www.rce.rutgers.edu/pubs/plantandpestadvisory) and my upcoming white grub fact sheet.

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**Chinch Bug Management in Turfgrass**

Albrecht M. Koppenhöfer, Ph.D., Specialist in Turfgrass Entomology and Richard J. Buckley, Coordinator, Plant Diagnostic Laboratory

The hairy chinch bug (HCB) attacks Kentucky bluegrass, fine fescues, perennial ryegrass, bentgrass, and zoysia. Chinch bugs suck sap from and inject toxins into the crowns and stems of grasses, disrupting the water-conducting system of the grass, causing the grass to wilt, turn yellow, then brown and die. Because chinch bugs generally occur in scattered patches, their feeding results in localized turfgrass injury. The spots often coalesce into large areas of thinning, dead, or dying turf. Moisture or heat stressed turf with thick thatch is most susceptible to chinch bug injury. The injury closely resembles drought injury or sunscald and is often mistaken as such during the summer when the grass is in a dormant state. The 1st indication of injury is often when the grass fails to recover after irrigation or late summer rains. Chinch bugs seem to prefer open sunny lawns with a high percentage of perennial ryegrass and/or fine fescues.

Hairy chinch bug adults are about 3/64” wide by 1/8” long. They are black with shiny white wings. There can be long-winged and short-winged adults. The shiny-white wings are folded flat over the body so that the tips overlap in the long-winged adults. Each wing has a distinctive, triangular-shaped black marking in the middle of the outer edge. From these markings extend black lines in an “X”-shaped pattern across both wings. Chinch bug immatures, called nymphs, increase in length from 1/32” in the 1st stage to about 1/8” in the 5th stage. Young nymphs are orange with a characteristic white stripe across their backs. Intermediate stages darken to an orange/brown and the final stage is black. Wingpads become apparent by the 3rd stage.

In New Jersey the hairy chinch bug has 2 generations each year. Adults overwinter in thatch, plant debris, and in or on other objects that border turf areas. The adults become active when the temperature reaches 45°F. They migrate mainly by walking, and start to feed and mate. Females begin to lay eggs after...
about 2 weeks. Peak egg-laying occurs from early May through early June, about the time when white clover is in early bloom. The 1st generation brood develops through the 5 nymphal stages in 4-6 weeks between May and mid-July. Emergence of the 1st-generation adults occurs around the time when sumac is in full bloom. These adults lay eggs from mid-July through late August. The 2nd generation nymphs mature by September or October.

Chinch bugs are fairly easy to control if infestations are detected early. Lawns with a history of infestation should be monitored, especially after warm dry springs. Larger nymphs and adults can be detected by parting the grass at the interface of healthy and damaged turf and inspecting the lower stems and thatch. The best sampling method for chinch bugs is flotation. A metal cylinder made by cutting off both ends of a can (e.g., large coffee can) is pushed through the thatch of the area to be inspected and filled with water to the brim. Keep the water level above the grass foliage. Any chinch bugs present will float to the surface within a few minutes. Adjust the number in the sample to 1 ft$^2$. The potential for injury is greatest when the population reaches 25-30 per ft$^2$.

Endophyte-infected perennial ryegrasses and fescues are more or less resistant to chinch bugs. Thatch reduction, proper fertilization, and regular irrigation can minimize chinch bug damage. Especially after cool wet springs and during warm moist summers, insect pathogenic fungi can nearly wipe out chinch bug populations. Beware that fungicide applications will reduce this natural enemy of HCB. Furthermore, a predatory mite, big-eyed bugs, and ground beetles feed on chinch bugs. All these will also be ‘controlled’ by insecticide applications.

The hairy chinch bug is best controlled from June to August when peak populations are active. Preventive early spring applications against overwintered females are often wasted because the pest may not reach damaging levels. Preventive applications should be restricted to potential hot spots as determined by monitoring and site history.

Effective insecticides for chinch bug control include the organophosphates acephate (Orthene$^\text{®}$/Address$^\text{®}$), diazinon (Diazinon$^\text{®}$; not for golf courses, sod farms, turf areas > 1 A), chlorpyrifos (Dursban$^\text{®}$; not for residential turf or where children may be exposed), the carbamate carbaryl (Sevin$^\text{®}$), the pyrethroids bifenthrin (Talstar$^\text{®}$), cyfluthrin (Tempo$^\text{®}$), deltamethrin (Deltagard$^\text{®}$), lambda- cyhalothrin (Battle$^\text{®}$/Scimitar$^\text{®}$), and permethrin (Astro$^\text{®}$). Chlorpyrifos and all pyrethroids except permethrin are restricted use insecticides (purchase and use only by certified applicators).

Either liquid or granular applications can be effective. For liquids, a light irrigation (1/8") done before the spray dries will help move the insecticide into the thatch. If thatch and soil surface are very dry, watering the day before application helps the spray to move into the thatch. Granular applications should be made to dry foliage and followed by light (1/8") irrigation. Be sure to rotate materials of different chemical classes to reduce the chance for resistance development.

For more detail on chinch bug biology and management look for our upcoming chinch bug fact sheet.

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Armyworm IPM for Turfgrass
Bill Sciarappa and Rich Obal, Monmouth County Agricultural Agents and Frank Spiecker, Garden State Pest Management

In the spring of 2001 an armyworm infestation of considerable magnitude hit New Jersey lawns and fields. Some area lawns were completely devoured by this marching menace. Could this scenario play out again this year? Rutgers Cooperative Extension turned to the Vegetable IPM Field scouting teams of Kris Holmstrom in North Jersey, Frank Spiecker in Central Jersey, and Sally Walker in South Jersey and their network of blacklight traps that are set up to monitor Corn Earworm (CEW, Tomato Fruitworm), and the European Corn Borer (ECB), major pests for a variety of vegetable crops. The monitoring program forewarns of the pest that may cause significant injury. This will reduce the likelihood of an unnecessary treatment by predicting the first appearance of the larval stage of the pest. This is only part of what is better known as an Integrated Pest Management (IPM) program.

Blacklight Trap Distribution of True Armyworm Moths
May 7, 2002 - May 31, 2002

Monitoring has continued in the central counties (Middlesex, Monmouth, Ocean, and northern Burlington) by Garden State Pest Management and Rutgers Cooperative Extension of Monmouth County. This past winter was a rather mild one which may have caused overwintering larvae to develop into adults. The blacklight traps have shown a drop in population over the past two weeks. This is generally an indication that the first generation is actively feeding.

See Armyworm on page 4.
The True Armyworm (*Pseudaletia unipuncta*) is primarily a pest of field crops such as field corn, grains, timothy hay and has been reported in alfalfa fields. Armyworms will attack all “grass-type” crops, including home lawns. When armyworms are marching, many other plants are devoured. In high populations where food is scarce, armyworms will move as a group, feeding indiscriminately on plants in their path. A True Armyworm will consume about 80 percent of its food in its final three to five days as a caterpillar. If the host crop is gone and the larvae are still hungry, they’ll move as a unit to the next grassy field or lawn. The name “Armyworm” fits appropriately.

It is important to accurately identify insects found in lawns as many of them are not pests. In addition, the most effective treatment for one pest may not work on another. If you are not sure, you can contact your local extension office for a positive identification.

True Armyworms are larvae of heavy-bodied, night-flying moths. The white eggs of these moths are laid in masses, darkening as they approach hatching. Larvae can grow up to 2 inches (5 cm) long and typically curl up and lie still when disturbed. Armyworms can be recognized by the black stripes on the four pairs of prolegs near the middle section of the body.

They feed on leaves and crowns and may cut off plants near the soil surface. Larvae feed at night and hide in the thatch layer or burrow in the soil during the day, including aeration holes. Damage appears as circular spots of dead grass. An acre sized lawn can be completely defoliated in a few days when armyworm populations are large. They are active from about April to October.

Cultural control can also help keep damage to a minimum. The removal of thatch will help eliminate much of the daytime protective habitat for larvae. Also avoid wet areas by irrigating according to evapotranspiration needs of turfgrass, because armyworms prefer laying eggs in areas comprised of wetness and/or stressed plants.

Threshold levels are an average of 2 to 4 third instar larvae (1/2 inch) per square yard. This level can cause cosmetic damage and treatment may be necessary. Depending on the size of the property, monitor 4-10 square yard sections for armyworm activity. The most likely locations are alongside fences, in or near mulched areas, edges of browned turf and under leaf litter and thatch. Look for little larvae or frass/droppings or evidence of feeding damage. You can also perform a pyrethrum test to establish the infestation level.

Mow and irrigate the site before applying insecticide and do not mow or irrigate the turfgrass for at least 24 hours after treatment. If Bt is applied, do not irrigate for 2 days after treatment.

**Additional Resources**

Rutgers University Pest Management Office: www.pestmanagement.rutgers.edu

Landscape Integrated Pest Management: www.rce.rutgers.edu/lipm

Rutgers Field Crops Home Page: www.cropmaster-icm.org

Monmouth County Extension: www.visitmonmouth.com/07050coopext

Garden State Pest Management: www.gspm-inc.com
Manganese Fertilization Suppresses Take-All Patch Disease on Bentgrass
Joseph R. Heckman, Ph.D., Specialist in Soil Fertility and Bruce Clark, Ph.D., Specialist in Turfgrass Pathology

Take-all patch disease of bentgrass is caused by the root-infecting fungus *Gaeumannomyces graminis* (var. *avenae*). The incidence of this disease on golf courses is related to soil conditions and soil fertility management. Symptoms are most apparent in the spring. Infected grass first appears bronze to reddish-brown in color and then fades to a dull brown. Infected patches are typically circular or ring-shaped and range in size from several inches to two feet or more in diameter. The centers of affected turf are frequently colonized by bluegrass (*Poa* spp.), fescue (*Festuca* spp.), or weed species. The disease tends to be most prevalent on sandy textured soils that have high pH and low levels of soil test manganese. Under such conditions the application of manganese fertilizer is very effective in reducing the severity of take-all patch. Excessive applications of lime, however, can create a high soil pH and can further decrease manganese availability, thus encouraging the development of the disease.

Results from recent experiments conducted on a golf course in central New Jersey by Rutgers researchers suggest that the following approaches to soil fertility management should help suppress this disease:

- Have the soil tested for pH and manganese availability. The soil test results can help identify soils that are most conducive to take-all patch disease.
- Apply manganese fertilizer to soils that have a low soil test level and on bentgrass areas that have a history of take-all disease. Manganese sulfate (32% Mn) is a good source of this micronutrient. Manganese sulfate should be applied at the rate of 2 lbs. Mn per acre in the spring before disease symptoms develop. Because much of the manganese is rapidly converted to unavailable forms in the soil, annual applications of manganese are necessary to maintain effective disease control.
- Nitrogen fertilizers that acidify the soil also help to control the take-all patch. Ammonium sulfate is one of the most effective nitrogen sources for soil acidification but can burn foliage during hot, humid weather. Calcium nitrate is a nitrogen source that raises soil pH. It should not be used where take-all patch has been a problem.
- When lime needs to be applied, apply coarse grades that will raise soil pH slowly, and carefully calibrate your lime spreader to prevent over-application of limestone.
- Finally, maintain a soil pH range of 6.0 to 6.2 for best results, since soil pH levels above 6.2 encourage disease development. Also, measure pH frequently in the 2-inch surface layer of soil to monitor soil pH changes following the application of lime and nitrogen fertilizers.

Plant Diagnostic Laboratory Highlights
Richard J. Buckley, Plant Diagnostic Laboratory Coordinator

Turf

Take all patch is still the disease of the week in golf turf at this time. Samples diagnosed with take all were submitted to the laboratory from Atlantic, Morris, Monmouth, and Mercer Counties, as well as on bentgrass from golf courses in Virginia, Pennsylvania, and New York. Almost all of these samples also had anthracnose. Speaking of anthracnose, the disease is beginning to pick up on area golf greens. Samples with anthracnose basal crown rot were submitted from golf greens in Ocean and Camden County, and from a Philadelphia area golf course. These are the first of the “summer stress” related anthracnose problems and we expect to see many more as the summer approaches. We also had one sample of annual bluegrass weevil. The population of weevils in a single cup cutter plug was 2 adults, 17 pupae, and one larva, which is obviously a population large enough to cause significant injury to the *Poa annua*. To add insult to injury, the sample also had anthracnose!

Ornamentals

In the landscape, rust diseases appear to be the most common problem. Ruts were identified on ash samples from Middlesex and Bergen County, crabapple samples from Middlesex and Warren County, hollyhock samples from Middlesex and Warren County, and on snapdragon from Middlesex. A large population of Oystershell scale, *Lepiolosaphes ulmi,* was found on a sample of dogwood from a Camden County residential client. This insect has caused significant injury to the plant. Another dogwood sample, this one from Morris County, had numerous small cankers that were caused by the fungus *Botryosphaeria botryosphaeria.* Botryosphaeria canker was also identified on serviceberry from a Monmouth County nursery. We assume that the fungus followed fire blight into this plant.

Fee Increase

Sample submission forms that reflect the new fees, which will be in effect beginning July 1, 2002, are currently available on our website. Starting July 1st, we will begin to accept payment with Mastercard and Visa. Credit card payment information is also reflected on the new forms. Visit us on the web at www.rce.rutgers.edu/plantdiagnosticlab/index.html for the fee schedule and to get your new forms.
Dutch Elm Disease
Ann B. Gould, Ph.D., Specialist in Plant Pathology

Dutch elm disease is one of several “vascular wilt diseases” that affect amenity trees in New Jersey landscapes. Vascular wilt diseases are caused by pathogens that reside in the water-conducting tissue (or xylem) of plants, thus disrupting the uptake of water and minerals. The primary characteristic of such diseases is wilting due to water stress. This stress occurs when xylem vessels are blocked by the pathogen (disease agent) or by the host itself as it attempts to halt the movement of the pathogen through the transpiration stream.

One of the most important vascular wilt diseases of amenity trees is Dutch elm disease. In New Jersey, Dutch elm disease, caused by the fungal pathogens Ophiostoma ulmi and Ophiostoma novo-ulmi, appears on affected American elms in June through August. The first symptom of the disease is wilting (called flagging) of leaves on individual branches throughout the canopy. These leaves rapidly turn yellow, then brown, and then curl and drop from the tree. Affected branches die shortly after. Rapid mortality (within one season) occurs in trees that become infected with the pathogen in early spring. Trees infected later in the summer may often take several years to die.

Disease Spread

Dutch elm disease is transmitted (or vectored) from tree to tree by insects or through root grafts. Beetles that vector the disease include the Native elm bark beetle and the smaller European bark beetle. The insects are attracted to dead or dying elm wood, where they lay eggs in tunnels (called galleries) just beneath the bark. As new beetles emerge, they may carry spores of the pathogen on their bodies, and will transmit these spores to healthy trees as the beetles feed on branch inner bark or in the crotches of twigs. Alternatively, when the pathogen spreads from an infected tree to a healthy tree through root grafts, it can move very quickly through the transpiration stream of the healthy tree. Thus, root graft transmission is very important in trees that are closely spaced.

To detect Dutch elm disease, look for vascular discoloration in the outer layers of wood on infected twigs and branches. Peel back the bark using a pocketknife; vascular discoloration usually appears as brown streaks in the sapwood of the current growing season. To detect infections that may have occurred the previous year, look for streaking as you cut deeper into the wood, or look at the branch in cross section.

Another vascular disease of elms, called Verticillium wilt, also causes vascular streaking in the wood. For a positive diagnosis, submit a sample to a diagnostic laboratory (such as the Rutgers Plant Diagnostic Laboratory) for analysis.

Management

The most effective means of saving elm trees includes a combination of cultural and chemical controls. Prompt removal of diseased limbs up to 10 feet behind yellowed foliage is essential. For best results, control bark beetles with dormant applications of methoxychlor, remove dead or dying elms as soon as they are noticed, and debark or burn dead wood prior to beetle emergence next spring. To prevent root graft transmission of this disease, dig a trench (3 feet deep) midway between diseased and healthy elms, or apply Vapam per manufacturer’s recommendations. In addition, valuable trees may be injected on a preventive basis with Alamo, Arbotect, or Phyton 27 as per manufacturer’s recommendations. When trees exhibit more than 5% crown symptoms, fungicide injection may be ineffective.

Native American elms vary in their susceptibility to Dutch elm disease. The most susceptible elm is the American elm (Ulmus americana), whereas other elms such as winged elm, slippery elm, rock elm, and cedar elm vary from susceptible to somewhat tolerant. Within species, individual trees or cultivars may vary in susceptibility. Siberian and Chinese elms are less susceptible to Dutch elm disease.

For more information, refer to a listing of elm cultivars with comments on their susceptibility to Dutch elm disease written by Frank Santamour and Susan Bentz (see reference list below). American elms that have a history of tolerance or resistance include the Princeton Elm, American Liberty, Independence, Valley Forge, and New Harmony.

References:


Positive diagnosis, submit a sample to a diagnostic laboratory (such as the Rutgers Plant Diagnostic Laboratory) for analysis.
Southern NJ Summer Christmas Tree Growers Meeting

Tuesday, June 25, 2002 - 6:30 P.M.
Belly Acres Tree Farm
Royal Avenue, Franklinville, NJ

Sponsored by Rutgers Cooperative Extension of Gloucester County.

A walking tour of the Belly Acres Farm will be led by owners Charles and Eileen Rauchfuss, and Agricultural Agent, Jerome L. Frecon and speakers listed in the following program:

6:30 p.m. Management Tips, tree Species, and Marketing at Belly Acres by Eileen Rauchfuss and Dr. Mark Vodak, Specialist in Forestry, Rutgers Cooperative Extension

6:50 p.m. “Current Disease and Stress Management in Christmas Trees” by Dr. Ann Brooks Gould, Specialist in Ornamental Pathology, Rutgers Cooperative Extension

7:20 p.m. “Major Insect Problems and Management Strategies” by Dr. Jim Lashomb, Research Professor, Department of Entomology, New Jersey Agricultural Experiment Station, Rutgers Cooperative Extension

7:45 p.m. “Weed Management Strategies” by Dr. Dr. Stephen Hart, Specialist in Weed Science Rutgers Cooperative Extension

8:10 p.m. “Shearing and Pruning Christmas Trees” by Dr. Mark Vodak

8:30 p.m. “New Pesticide Regulations for Christmas Tree Growers” by Dr. George Hamilton, Specialist in Pesticides/Pest Management, Rutgers Cooperative Extension

9:00 p.m. Adjourn

PESTICIDE APPLICATOR UNITS ARE: 4 UNITS OF 1A, 3A AND PP2; 1 UNIT OF CORE.

This facility is not accessible to the physically impaired. Contact Jerome Frecon at (856) 307-6450 at least 1-day prior to meeting and every effort will be made to make special accommodations.

Turf Research Field Day

The Rutgers Lawn and Landscape Turf Research Field Day has been set for July 31, 2002 at the Adelphia Research Farm in Freehold, NJ. Registration will begin at 8:00 AM. Guided tours will commence at 9:00 AM and will conclude at 3:30 PM, “rain or shine.” The Rutgers Golf and Fine Turf Research Field Day will be held on August 1, 2002 at the Turf Research Farm (Ryders Lane) in North Brunswick, NJ. This event starts at 9:00 AM (registration); field tours will run from 10:00 AM to 3:00 PM, “rain or shine.” The cost of registration will be $35 (including a full lunch) for the July 31 field day and $30 (with a sandwich lunch stop on the tour) for the August 1 event. Recertification credits will be available at the conclusion of each program. Call Marlene at (732) 932-9400, ext. 339 for further information or directions.

Rutgers Lab Services

❖ The Plant Diagnostic Laboratory and Nematode Detection Service provides accurate and timely diagnoses of plant problems. For sample submission instructions and forms, visit our web site at: www.rce.rutgers.edu/plantdiagnosticlab/submissions. Forms may also be obtained from your local county Rutgers Cooperative Extension office or via fax request (732/932-1270).

❖ The Rutgers Soil Testing Laboratory performs chemical and mechanical analyses of soils. For More Information please write or call us: Rutgers Soil Testing Laboratory, P.O. Box 902, Milltown, NJ 08850, 732/932-9295, Fax: 732/932-9292 or visit us on the web at: www.rce.rutgers.edu/soiltestinglab.
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