CORNELL UNIVERSITY TURFGRASS TIMES

CUTT

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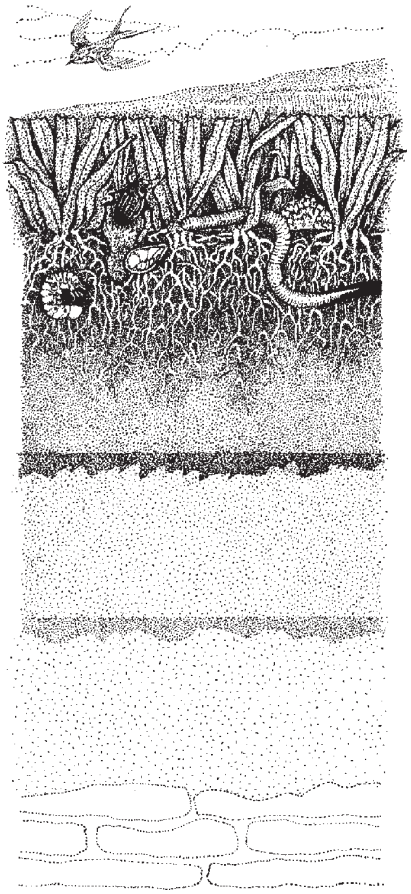

The Advent of Biological Controls for Turfgrass Disease Management

A new era of disease management is emerging as we enter the 1990's. Biological forms of disease control offer the potential to largely replace conventional chemical fungicides. Research at Cornell and other universities around the country is focussing on this novel and environmentally sound approach to turfgrass disease control; methods that could revolutionize the turfgrass industry ■

Over the past five to ten years, there has been a great deal of concern regarding the high volumes of fungicides being applied to turfgrasses. Of greatest concern are the problems of soil and water contamination, as well as undue exposure of consumers and turfgrass managers to fungicides. Moreover, continued application of many of the modern systemic fungicides has led to the development of pathogen resistance, making turfgrass disease control no longer effective. Therefore, alternative management practices are being explored to not only reduce overall fungicide use, but to prevent the development of fungicide-resistant pathogen strains.

Among the technologies most attractive for reducing chemical fungicide usage are biological controls using microbial based fungicides. This strategy has been used successfully on an experimental and commercial basis the control of plant pathogens on several crop plant species. Several types of biological control products are commercially available and many others are likely to become available in the next few years.

Approaches to Biological Control

Plants rely heavily on microorganisms to promote an environment conducive to plant health. Microorganisms release nutrients in soil, produce substances stimulatory to plant growth and development, and protect plants against infection from pathogenic fungi. The use of biological control as a management tool takes advantage of these interactions among microbial populations to limit the activities of plant pathogens.

Nearly all organisms that are antagonistic to turf pathogens are capable of surviving on dead and decaying organic matter such as thatch, decaying plant tissues, and soil organic matter. Some methods used to maintain golf course turf will discourage the development of a diverse microflora. Examples include the use of low organic matter sands in new green construction and in top-dressings, as well as the continued use of broad-spectrum, long-residual pesticides. Although pathogens are suppressed by most fungi

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This Times

Short Cutts

Welcome to CUTT! The Cornell Turfgrass Faculty proudly presents the premier issue of CUTT – a quarterly newsletter designed to keep you on the cutting edge of turfgrass management.

Please turn to the back page for subscription information.

Faculty and Student Update

Two students received graduate degrees from the Turfgrass program at Cornell in 1989 and have embarked on new careers.

Mark Carroll received his Ph.D. in June 1989 and is now Assistant Professor of Turfgrass Science in the Agronomy Department at the University of Maryland. Mark worked under Marty Petrovic's direction. His dissertation was titled "Diurnal Water Flux and Soil Moisture Depletion Patterns of Kentucky Bluegrass."

Jim Skorulski just recently received a Master of Professional Study (MPS). Jim has worked the past few months as a Northeast regional agronomist for the United States Golf Association. Jim worked under the direction of Norm Hummel, Marty Petrovic, Eric Nelson, and Mike Villani. Jim's project was titled "Development of Integrated Pest Management Strategies for Turfgrass Pests of Golf Courses."

We wish both Jim and Mark well in their new endevours.

Short Course a Success

The 1990 Cornell Turfgrass Short Course was once again a success. Sixty two people from New York, Pennsylvania, Vermont, New Jersey, Deleware, Massachusetts, Quebec, and California completed the grueling two week program.

Participants in the short course received over seventy hours of instruction from Cornell and SUNY Ag and Tech Faculty, as well as several individuals from industry.

The short course concluded with an optional exam, the top five scorers receiving plaques. Due to a tie for fifth place, the following seven people received awards: James VanHouten (Orangeburg, NY), Martin Bailey (Branchport, NY), James Rambuski (Canandaigua, NY), Stanley Lisk (Endwell, NY), Danial Daub (Albion, PA), David Coker (Dover, DE), and Anthony Borzcik (Lucernemines, PA). Congratulations to these fine students.

Congratulations also go to Joann Gruttadauro, coordinator of the short course, for a job well done.

Plans are in the works for an advanced short course this summer on diagnostics. We'll keep you informed.

Thanks to Matching Funds Contributors

Last year was the first of a three year program initiated by Cornell's research office to encourage industry giving to turfgrass research. Thanks to the generosity of many associations and companies, $37,000 was raised and matched by the research office. These funds have supported technical staff and provided badly needed facility support. For this, we are grateful to the following:

- The New York State Turfgrass Association
- Northeast Golf Course Superintendents Association
- J.& L. Adikes
- Metropolitan Golf Course Superintendents Association
- Nassau Suffolk Landscape Garderers Association
- New York Lawn Care Association
- Pine Island Turf Nursery
- Shubeck's Sod
- DeBuck Sod Farms
- DeLea Sod Farms
- Delalio Sod Farms

We would also like to thank the several associations who contributed to the matching funds program through the New York State Turfgrass Association. Thanks also go to S.V. Moffett Co. and Eaton Equipment for their generous donations of equipment. We look forward to a successful matching funds program again in 1990. THANK YOU!!!

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Superficial Fairy Rings Not Caused by Benomyl

Superficial fairy rings (SFR) in turf are caused by thatch-inhabiting basidiomycetes. Superficial fairy rings appear as white patches or circles ranging from 4 inches to 3 feet in diameter. It was originally reported that SFR appeared only on areas previously treated with benomyl. Researchers at the University of Maryland have found that this is not true. In fact, they found SFR occuring on new greens and tees that had never received a fungicide application. They also reported that the growth of SFR fungi was not enhanced by the presence of benomyl in agar. While it is possible that certain species of SFR fungi may be stimulated by fungicides, this study did not find any evidence of it.

(From: Kackley, K.E., P.H. Dernoeden, and A.P. Grybauskas. 1989. "Effect of fungicides on the occurence and growth in vitro of basidiomycetes associated with superficial fairy rings in creeping bentgrass." (*Plant Disease* 73:127-130.)

Use Care With Herbicides on New Sod

Preemergence and postemergence herbicides are commonly used to control annual weeds during production and after establishment of grass sod. Herbicides have the potential, however, of delaying establishment by inhibiting rooting. Researchers at Iowa State looked at bensulide, Dacthal, and pendimethalin applied at the time of sod installation, and fenoxyprop (Acclaim) applied prior to harvest and after establishment. Fenoxyprop applied at 5.6 oz a.i. per acre caused injury on three of four application dates. Fenoxyprop applied at 2.8 oz a.i. per acre discolored turf when applied 14 days before harvest. None of the treatments, including the preemergence herbicides, affected rooting when measured 4 or 8 weeks after sod installation.

(From: Reicher, Z. J. and N. E. Christians. 1989. "Establishment of Kentucky bluegrass sod following application of herbicides." (*HortScience* 24:799-801.)

Bentgrass Does Need Phosphorus

The fear of encouraging annual bluegrass on golf course turf has led superintendents to use less, or even eliminate phosphorus from their fertility program. A study recently published demonstrated the importance of phosphorus on high sand based greens. Researchers in Colorado found a dramaticimprovement in quality as phosphorus levels were increased from 0 to about 4 oz P_2O_5 per growing month. There was no benefit at rates beyond this. The researchers also reported no visual benefit from potassium in this test, but qualified this by stating the turf had never really been stressed during the test. (From: Fry, J. D., M. A. Harivandi, and D.D. Minner. 1989. "Creeping bentgrass response to P and K on a sand medium." (*HortScience* 24:623-624.)

Mow It Soon

Annual ryegrass is sometimes used in seed mixtures to provide soil stabilization, this due to its extreme seedling vigor. The use of annual ryegrass has been discouraged, however, because of its undesireable qualities (coarse texture, pale color, short-lived). Researchers at Oklahoma investigated means of using annual ryegrass in a mixture with tall fescue to provide soil stabilization, but to minimize its competitiveness. They looked at the effect of mowing height and timing after emergence. Using a 4:1 fescue to ryegrass mixture, waiting 6 weeks after emergence to mow the area favored annual ryegrass. Tall fescue was favored by a single close clipping (2.5 inches) 0 to 3 days after ryegrass emergence. This initial clipping reduced ryegrass ground cover at 60 days from 80% ryegrass to as little as 46%. EDITORS NOTE: The practice of planting annual ryegrass in mixtures should be limited to areas prone to erosion/washout.

(From: Brede, A. D. and J. L. Brede. 1989. "Establishment of Tall Fescue and Companion Annual Ryegrass". (*Agronomy Journal* 80:27-30.)

Scanning the Journals

A review of current journal articles

Biological Controls

continued from cover

The biological balance must be restored to turfgrass soils if we are to take advantage of beneficial microbial interactions to manage turfgrass diseases. We must learn to not only manage the turf, but to also manage the microorganisms associated with it.

cides, these chemicals also harm many other non-target organisms, including organisms antagonistic to diseases. Likewise, many herbicides, insectides, and plant growth regulators have similar detrimental effects on non-target microorganisms. Reduced populations of the natural antagonistic organisms will allow pathogenic microorganisms to more readily become established on susceptible plants. This is one of the major reasons why turf diseases are generally so devastating and difficult to control. It also partly explains the emergence of "new" turf diseases, especially some of the more destructive root and crown diseases.

The biological balance must be restored to turfgrass soils if we are to take advantage of beneficial microbial interactions to manage turfgrass diseases. We must learn to not only manage the turf, but to also manage the microorganisms associated with it. This will undoubtedly be the key to sustained turfgrass management in the future.

Composts and Organic Fertilizers

In order to re-establish the microbiological balance of turfgrass soils, sufficient organic matter must be introduced into the soil/plant system. Unfortunately, peat has no disease suppressive properties. Some of the best sources of both organic matter and populations of antagonistic microorganisms are composted materials and organic fertilizers. In composting, organic materials are broken down in a controlled manner so that a very uniform and nutritive material is produced. Composting requires the activity of different microorganisms during various phases of organic matter decompostion. It is only after decomposition slows that a more stable and disease-suppressive microflora develops.

Results of our research over the past two years have shown the potential to biologically suppress dollarspot, brownpatch, and red thread with topdressing applications of composts and organic fertilizers (see table). This concept is now being widely accepted by golf course superintendents who are enthusiastically incorporating it into golf course disease management programs. They have reported improved disease control with reductions in fungicide use.

Unfortunately, we currently do not know how predictably suppressive certain composts might be from year to year and batch to batch. It is clear that composts of different origin and stage of decomposition differ in their disease-suppressive properties as well as in the spectrum of diseases that are controlled. This is primarily a result of the microbial variability among different composts and among the different qualities of organic matter present in any one compost at various stages of stabilization. Although microbial activity is necessary for a compost to suppress disease, we know nothing of the specific microorganisms that are involved. Identification of the specific organisms in composts with biological control activity will be a key factor in understanding how composts suppress diseases.

Eric B. Nelson, Turfgrass Pathologist, Department of Plant Pathology

Results of our research over the past two years have shown the potential to biologically suppress dollarspot, brownpatch, and red thread with topdressing applications of composts and organic fertilizers (see table).

Biological Suppression of Dollar Spot, Brown Patch, & Red Thread with Compost-Amended Topdressings, 1989

Treatments	Dollar Spot Spots/plot	Brown Patch % plot area diseased	Red Thread % plot area diseased
Controls			
Untreated1	9.8	72	47
Banner (Fungicide check)	0.6*	8*	-
E. cloacae	8.6*	-	-
Composts & Organic Fertilizers			
Ringer® "Compost Plus"	5.2*	18*	20
Ringer® "Greens Restore"	6.8*	24*	43
Sustane® (Poultry compost)	13.8	18*	10*
Endicott Sludge Compost	13.0	42*	40
IPS Cow Manure Compost	16.9	54	43
Baltimore Sludge Compost	17.3	60	23
Peat	17.4	50	37
AB Brewery Compost	17.8	54	30
Endicott Leaf Compost	18.9	44*	53
MH Manure Compost	20.2	72	53
Autoclaved Cornmeal Sand	21.0	-	-
Schenectady Sludge Compost	21.4	66	57
Spent Mushroom Compost	21.8	54	53

*Numbers followed by an * are not significantly different from untreated plots.*

Is Coated Seed Worth It?

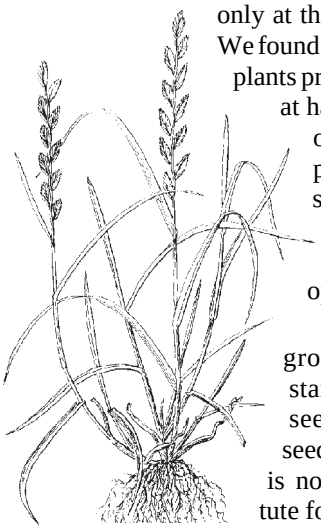
An Evaluation of Coated Bentgrass and Ryegrass Seed

Turfgrass managers have always looked for ways of hastening seed germination. Methods now used in the industry include pregermination of seed and seed priming. In recent years, a process of coating seed with fertilizer and fungicide was developed with improved stand establishment in mind. Nutri-Kote plus Apron® is a process that coats seed with 50% fertilizer and fungicide (metalaxyl) by weight.

Research conducted at Cornell compared Nutri-Kote treated perennial ryegrass and creeping bentgrass seed to untreated seed. The trials were planted as spring (May 25), summer (July 5), and fall (September 10) seedings at normal recommended rates. Nutri-Kote treated seed was also seeded at half rate. This treatment was included to see if a half rate of seed was sufficient to establish an acceptable turfgrass stand. The cost of Nutri-Kote treated seed is about twice that of untreated seed. Scotts Starter Fertilizer (18-24-3) was applied in conjuction with treated and untreated seed.

Perennial Ryegrass

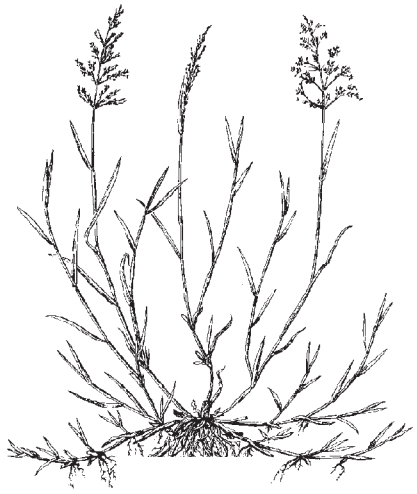
Nutri-Kote treated perennial ryegrass seed had slightly greater seedling vigor than untreated seed in the summer seeding, and only at the higher seeding rate. We found had half the number of plants present when we seeded at half rate. The half rate of Nutri-Kote treated perennial ryegrass seed, while having an economic advantage, is not an acceptable option.



The best turf was grown where we used starter fertilizer in the seedbed, regardless of seed coating. Coated seed is not an adequate substitute for a starter fertilizer in the seedbed. If you do not use fertilizer in a seedbed, however, a full rate of coated seed is better than untreated seed alone.

Creeping Bentgrass

The seedling vigor of creeping bentgrass was greatest where a starter fertilizer was used in the seedbed. Nutri-Kote treated bentgrass seeded at the full rate was better than seed alone in the spring seeding, but seemed to reduce vigor in the summer seeding. Studies in North Carolina also had redused establishment of bentgrass that was coated.



The half rate of treated seed usually produced thinner stands. Like the perennial ryegrass studies, these results demonstrated that coating seed is not an acceptable substitute for seedbed fertilization. The fact is, seedbed fertilization masked any benefits from seed coating. Also, you must seed bentgrass at the full "seeding rate" to produce an acceptable quality turf.

What are the Benefits?

After looking at these results, one might ask “What are the benefits of using coated seed?”. If the situation should arise where it would be impossible to apply fertilizer in the seedbed, coated seed should result in better stand establishment than uncoated seed. However, since you will have to seed at a full rate, your seed costs will be double that of uncoated seed. Seed Nutri-Kote treated seed at 10 lb and 2 lb seed per 1000 square for perennial ryegrass and creeping bentgrass, respectively.

Seed coating would be beneficial for extending a limited seed supply. When bentgrass seed was in short supply, some seed distributors coated a portion of their seed to stretch the amount that they had available to sell.

While coating seed with fertilizer and fungicide may seem to make good sense, our studies failed to find many benefits to coating seed.

Norman W. Hummel, Department of Floriculture and Ornamental Horticulture

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The Cornell University IPM Program

IPM Corner

The development of a sound IPM program for turfgrass managers responsible for producing sod, maintaining turfgrass on golf courses, in residential or commercial landscapes, athletic fields and school grounds is based on research developed at Cornell and throughout the United States.

Nineteen eighty-nine marked the fourth year of the New York State Statewide Integrated Pest Management (IPM) Program at Cornell University. In 1985, legislation for a Statewide Integrated Pest Management (IPM) Program was signed into law. The New York State Department of Agriculture and Markets contracted with the College of Agriculture and Life Sciences at Cornell University to address pest management in ornamentals, vegetables, fruits, and dairy and field crops. This legislation authorized funds from the State of New York through the Department of Agriculture and Markets to Cornell University for the Statewide IPM Program.

Ag and Market funds provide the resources necessary to develop, demonstrate, and implement IPM concepts with pest managers throughout the state. Specifically, state funding is used for, but not limited to, research and development grants; implementation grants; and support for Regional IPM Specialists. For Annual reports contact the IPM House, New York State Agricultural Experiment Station, Geneva, NY 14456 (315/787-2353).

The program has made great progress towards its goal: reducing the level of chemical pesticides to the minimum level necessary to produce food and agricultural products that will be competitive in the marketplace, while protecting human health and the environment.

Ornamentals IPM Program

Ornamental horticulture in New York State is a vigorous and diverse industry that comprises a variety of commodities and services. In each commodity area there is an enormous list of plant species and varieties grown under all types of conditions. The complex of arthropods (insects and mites), plant diseases, and weeds attacking these crops is staggering. The Ornamental Program is divided into three commodity areas; turf, floriculture, and nursery.

The development of a sound IPM program for turfgrass managers responsible for producing sod, maintaining turfgrass on golf courses, in residential or commercial landscapes, athletic fields and school grounds is based on research developed at Cornell and throughout the United States. The Turfgrass IPM program is lead by the Cornell Faculty including Drs. Norm Hummel [Floriculture and Ornamental Horticulture (F&OH)], Marty Petrovic (F&OH), Eric Nelson (Plant Pathology), Michael Villani (Entomology), Joe Neal (Weed Science, F&OH, and Rod Ferrentino (IPM Support Group). This group of researchers is a model interdisciplinary approach to developing basic pest management information. The information is then transfered to turfgrass mangers via the normal Cornell Cooperative Extension system.

Future IPM Articles

Future articles in the IPM Corner will focus on the basic IPM methods and techniques for all aspect of turfgrass production and maintenance. Special emphasis will be placed on practical field information, applicable to real turfgrass situations.

Gerard W. Ferrentino, Ornamentals IPM Coordinator
Cornell University

Waging War..., *continued from page 6*

cues. Balan, Team and Ronstar may injure fine fescues if applied at the higher labeled rates. Pendimethalin is safe on fine fescues but may injure bentgrass. Team is labeled for bentgrass fairways but not on tees and greens. Betasan and Tupersan are safe on all cool season turfgrass species including closely cut bentgrass. Check the herbicide label carefully for species, variety, and overseeding restrictions.

The last criteria for selecting the appropriate herbicide is cost. Granular formulations of herbicides will generally cost more than sprayable formulations; but, prices will vary, so check with your distributors for the best price available.

Remember that the first line of defense against weeds is a well maintained, dense sod. But when conditions warrant the use of a preemergent herbicide, compare the efficacy, longevity, weed control spectrum, formulation, turfgrass safety, and cost, so you can choose the best herbicide for your situation. Also remember that no herbicide controls all weeds, and that sometimes weather conditions are unfavorable for weed control. Where escapes occur, postemergent herbicides are available for "clean-up" operations.

Joseph Neal, Dept. of Floriculture and Ornamental Horticulture

Waging War on Crabgrass

There are many effective herbicides available for the control of crabgrass and other summer annual grasses in cool season turfgrasses. Crabgrass, however, continue to plague turfgrass managers and homeowners. With proper turfgrass management and herbicide use, crabgrass can be effectively controlled.

Crabgrass is a summer-annual weed, meaning that seeds germinate in the spring as the soil temperature rises. The plants grow, flower, and seed during the summer then die in the autumn with the first frost.

Control

The first line of defense against weeds is to maintain a healthy, dense sod. Demonstrations conducted by Cornell around the state showed that a dense sod, with a history of good management, prevented crabgrass germination without herbicides. This test, however, also showed that medium to low quality turf was very likely to need annual herbicide treatments for crabgrass control. Unfortunately, most turfgrass areas fall into the second category.

The most commonly used herbicides for crabgrass control are preemergent compounds. These are soil residual herbicides which, when applied in the spring before weeds germinate, will prevent the establishment of the young weed seedlings. If applied too early, some herbicides will dissipate before weeds germinate, resulting in poor control. If applied after weeds emerge, these products do not provide control. As a general rule-of-thumb, make preemergent herbicide applications when the Forsythia (yellow bells) is in full bloom. Table 1 provides a comparison of the herbicides labeled for crabgrass control.

How does one choose the correct herbicide? Several factors must be considered including: length of control, efficacy on other weeds, formulations available (granular or spray), turfgrass species, and, of course, price. You will note that all of these products, except Tupersan, provide excellent crabgrass control for 4 to 6 weeks. However, if evaluated 12 to 15 weeks after treatment, some herbicides are better than others. Dacthal has a short residual and will not provide full season control from one application. Balan and Betasan provide fair control 12 to 15 weeks after treatment. Team, Ronstar and pendimethalin have long residual activity and can provide full season control from one application. Tupersan has a very short residual but is safe in newly seeded (or newly overseeded) turf.

Several annual broadleaf weeds are best controlled using preemergent herbicides; including prostrate spurge, yellow woodsorrel (Oxalis), and chickweed. Table 1 also ranks the performance of preemergent herbicides on these common turf weeds.

Another criteria is the equipment you will use to apply the herbicide: a sprayer or a granular spreader. Balan, Team, Betasan, Dacthal, Ronstar, and pendimethalin are available in granular formulations. Several of these are also available on fertilizer granules. Betasan, Dacthal, pendimethalin, and Tupersan are available in sprayable formulations. Some formulations may be more readily available in your area than others; so, check with your suppliers for availability and price.

The next criteria is turfgrass safety. All of these herbicides are safe on established bluegrass, perennial ryegrass and tall fescue, but they differ in their safety on bentgrass and fine fes-

continued on page 6

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When conditions warrant the use of a preemergent herbicide, compare the efficacy, longevity, weed control spectrum, formulation, turfgrass safety, and cost, so you can choose the best herbicide for your situation.

Comparison of Preemergence Herbicides

Herbicide	Trade Name	Crabgrass Control		Broadleaf Weed Control		
		4-6 wks	12-15 wks	Spurge	Oxalis	Chickweed
Benefin+trifluralin	Balan	E	F	P	P	F
Benefin	Team	E	G	P	P	F
Bensulide	Betasan and others	E	F	P	P	F
DCPA	Dacthal	E	P	E	P	G
Oxadizaon	Ronstar	E	G	F	E	P
Pendimethalin	Pre-M, Scotts Weedgrass Ctrl.	E	G	G	E	G
Siduron	Tupersan	F	N	N	N	N

Weed Control: E excellent G good F fair P poor N essentially no control

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