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of the International Sports Turf Institute, Inc.

The International Newsletter about Current Developments in Turfgrass

IN THIS ISSUE

New Insecticides Expected to be Available in Summer 2000: Old Standbys Likely Will be Lost

Daniel A. Potter

The turf manager's palette of insecticides is rapidly changing as the EPA's targeting of organophosphates (OPs) and carbamates continues under the 1996 Food Quality Protection Act (FQPA). **Chlorpyrifos (Dursban®), long a mainstay for surface-feeding insect control, may soon to be lost. Bendiocarb (Turcam) also has been challenged and will not be defended; thus, it is on its way out.** They likely will go the way of isazophos (Triumph®), isofenphos (Oftanol®), fonofos (Crusade®), diazinon, and other OPs that have been canceled or severely restricted in recent years.

Where do we stand insofar as suitable substitutes? **Pyrethroids such as bifenthrin (Talstar®), cyfluthrin (Tempo®), deltamethrin (DeltaGard®), and lambda-cyhalothrin (Scimitar®) are filling the void for cutworms, sod webworms, armyworms, chinch bugs, and other surface feeders, providing fast, reliable control at low use rates.** Sprayable formulations of Spinosad (Conserve®) and halofenozide (MACH2®) are other options for caterpillars. Mole cricket control still relies heavily on OPs and carbamates; loss of such products as acephate (Orthene®), carbaryl (Sevin®), and chlorpyrifos would presently cause some real problems for southern turf managers.

For white grubs, imidacloprid (Merit®) and halofenozide continue to provide excellent preventive control. We'll be in real trouble, though, if we lose trichlorfon (Dylox®), the OP that currently is our most effective fast-acting curative control. Without it, professional turf managers may have few options for grub control once the damage appears and skunks start to dig. Research on biologicals, especially new strains of insect-pathogenic nematodes, is promising, but cost and availability may remain limiting.

Now, some good news.... Registrations are anticipated for two powerful new insecticides in 2000. These products offer another viable option for grub control, and a versatile granular product for controlling nuisance ants on golf courses.

Thiamethoxam. This summer, Novartis expects to introduce **Meridian™ (thiamethoxam), a new turf and landscape insecticide that provides broad-spectrum preventive and curative control of all major white grub species at very low rates of active ingredient.** Meridian is in a new chemical class called neonicotinoids that represents a mode-of-action different from that of all other insecticides discovered in recent decades. It is not a cholinesterase inhibitor like OPs and carbamates. It has a favorable ecological toxicology profile, with low toxicity to humans, wildlife, and earthworms. Meridian has been granted an expedited review by the EPA as a replacement for OPs, and is under concurrent review in California. Two formulations (25 WG and 0.33 G) will be available.

University tests across the United States indicate that Meridian provides excellent preventive grub control, comparable to Merit and MACH2, with a similar broad application window. **Ongoing work suggests that thiamethoxam also provides good curative control of**

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FEATURE ARTICLE

Previously Removed Herbicides Metsulfuron and Chlorsulfuron Return to Turf Market

Fred Yelverton

Remember DMC Weed Control® and TFC Weed Control®? These herbicides were two very popular products that were taken off the market a few years back. As of March, 2000, these products are coming back on the market as Manor 60DF® (metsulfuron—formally known as DMC Weed Control) and Corsair 75DF® (chlorsulfuron—formally known as TFC Weed Control). Both products will be distributed by Riverdale Chemical Company. DMC Weed Control was previously sold by the Scotts Company and TFC Weed Control was previously sold by Lesco. Their return to the market will be a welcomed addition for both cool-season and warm-season turfgrass managers.

Both metsulfuron and chlorsulfuron are manufactured by DuPont and belong to the sulfonylurea herbicide family. This is the same family of herbicides as halosulfuron, which is sold by the Monsanto company by the trade name of Manage®. Because DuPont does not sell products in highly maintained turf, metsulfuron and chlorsulfuron are marketed by other companies. Following several lawsuits involving the fungicide benomyl, sold by the trade name Benlate® in the ornamentals market, DuPont decided to remove all products from the turf and ornamentals market. As a result, they pulled metsulfuron and chlorsulfuron off the market, even though they were marketed by Scotts and Lesco, respectively. Recently, DuPont decided to allow these products to be sold again and Riverdale will market both products.

Manor 60DF® (metsulfuron). Although some Manor will be used in cool-season turf, **the largest use of this product will be in warm-season turfgrasses.** Tolerant turf species and Manor rates are:

Turf Species	Manor Rates (oz/ac)
• Bermudagrasses (dactylon and hybrid) *Cynodon* spp.	0.25 to 1.0
• Zoysiagrasses (Meyer and Emerald) *Zoysia* spp.	0.25 to 1.0
• St. Augustinegrass *Stenotophrum secundatum*	0.25 to 1.0
• Centipedegrass *Eremochloa ophiuroides*	0.25 to 0.5
• Kentucky bluegrass *Poa pratenais*	0.25 to 0.5
• Fine-leaf fescues *Festuca* spp.	0.25 to 0.5

Note that the use rates of Manor are very low (not more than 1 oz/ac). This herbicide (as well as Corsair) is very effective at extremely low use rates. There are 62 weeds listed on the label that are controlled by Manor. More importantly, **there are several weeds controlled by Manor that are not controlled, or are poorly controlled, by currently registered herbicides. For instance, wild garlic *(Allium canadense)* and wild onion *(Allium vineale)* are two perennial weeds that are unsightly in dormant warm-season turf.** Manor applied at 0.33 to 0.5 oz/ac is very effective in controlling these two troublesome perennials. **Manor is the most effective herbicide in selectively removing bahiagrass *(Paspalum notatum)* from bermudagrass, zoysiagrass, and St. Augustinegrass.** Manor applied at 0.75 oz/ac when bahiagrass is actively growing (but before seedhead development) is effective in controlling this troublesome perennial. **Perhaps the most popular use of Manor will be the removal of overseeded perennial ryegrass *(Lolium perenne)* from bermudagrass and zoysiagrass.** Manor applied at 0.25 to 0.5 oz/ac is very effective in removing perennial ryegrass. The transition is more rapid than with pronamide (Kerb®). Manor will kill perennial ryegrass in about 10 to 28 days, depending on weather conditions at application.

Manor can also be used on Kentucky bluegrass and fine-leaf fescues. Rates should not exceed 0.5 oz/ac and applications to these cool-season turfgrass species should not be made when temperatures exceed 85°F (30°C).

As a general rule, Manor applications should include the addition of a nonionic surfactant at a 0.25% volume/volume solution. Manor is moderately mobile in soil. Therefore, this product should not be applied up-slope of any sensitive turf or ornamental species.

Corsair 75DF® (chlorsulfuron). Although Corsair is in the same herbicide family as Manor, **the largest use of this product will most likely be in cool-season turf species.** The old formulation (TFC Weed Control) was highly effective in removing tall fescue *(Festuca arundinacea)* from Kentucky bluegrass, fine-leaf fescue, and other tolerant turfgrass species. Corsair can be used on all turfgrass species except tall fescue, American buffalograss *(Buchloe dactyloides),* and ryegrasses. Some discoloration or delayed greenup may occur on St. Augustinegrass, centipedegrass, zoysiagrass, or bahiagrass *(Paspalum notatum)* if applied while the turf is under environmental stress or during spring transition.

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FEATURE ARTICLE

Invasive Weed Issue Emerges

James B Beard

Certain plant species are serious invasive threats to cropland, rangeland, and wildlands of the United States. **Invasive weed species have been defined as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health."** In cropland the threat is primarily a reduction in productivity and economic loss. Wildlands typically have a diversity of species within the plant community, with the threat from an invasive weed species being to invade, dominate, and crowd out the diversity of species in a given ecosystem.

A large number of extremely damaging invasive weed plants have been introduced and become established in the United States and other countries throughout the world. The means by which invasive weed introduction occurs may be as a contaminant in seedlots or with plant materials such as ornamental plant species. In other cases, it occurs by purposeful introduction, such as for a potential ornamental plant for gardens or for assessment as to the agricultural potential for use in crop production. Since 1950 the risk of introducing undesirable invasive plant species has greatly accelerated due to the expansion in global travel via air cargo, ship cargo, and private individuals traveling from country to country. A number of these species do not survive, but others may become established and emerge as a significant threat as an invasive species.

The obvious approach to addressing the invasive weedy plant issue is by preventive methods. The key dimensions in protecting ecosystems include (1) using procedures for predicting plant species that are likely to enter the United States and subsequently establishing methods to prevent introduction of those species, such as specific regulations, inspection, and quarantine, and destruction where needed; (2) initiating quarantine measures on key invasion sites in order to prevent spread to other regions; and (3) identifying and implementing management zones at sites where the invasive weed species have become established, with the management eventually involving the initiation of controls to prevent spread to other areas. **A government preventive program should be implemented that ensures accountability by all transportation systems involved in importation.** There should be a permitting system that aides in identifying potentially invasive plants. This permitting system should be uniform from state to state, with vigorous minimum standards. In addition, both wholesalers and retailers of materials that could contain suspected invasive plant species should be made fully aware of these import restrictions and the means to properly identify potentially invasive plants.

Recently there has been a proliferation of invasive plant species lists. There is a lack of commonality in the range of species listed as invasive plants. Unfortunately certain of these lists have been assembled irrationally by activists with questionable agendas and goals. Others have defined all species that were not originally native plant species as being invasive. **Certain of these lists contain most of the turfgrass species currently in use in the United States and many other countries around the world.** These turfgrass species have been no threat to dominate and crowd out the diversity of species normally found in an ecosystem. Many turfgrass species have been in North America for 400 to 500 years, and have become naturalized and a member of plant ecosystems without a loss of diversity of plant species within specific ecosystems. Because of the large number of different invasive plant species lists being circulated, it is appropriate to include herein a list of invasive plant species assembled by scientists with knowledge of this problem. The following list has been published by the Council for Agricultural Science and Technology (CAST) under the title Invasive Plant Species, Issue Paper No. 13, February 2000, of 18 pages in length.

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Partial List of Major Economically and Ecologically Important Invasive Weed Species in the United States.*

Habitat	Scientific Name	Common Name	Distribution
Aquatic or Wetlands	*Alternanthera philoxeroides*	alligatorweed	Widespread in southeastern U.S., some infestations in California
	Egeria densa	Brazilian elodea	West of the Mississippi River; some in California and southeastern U.S.
	Eichhornia crassipes	water hyacinth	Widespread throughout southeastern U.S. and California
	Hydrilla verticillata	hydrilla	Widespread in Southeast and mid-Atlantic coast to Connecticut, threatens western states
	Lythrum salicaria	purple loosestrife	Widespread in northern and central states, expanding range in West
	Melaleuca quinquenervia	melaleuca	Widespread in Florida
	Myriophyllum aquaticum	parrotfeather	Widespread throughout U.S.
	Myriophyllum spicatum	Eurasian watermillfoil	Widespread throughout U.S.
	Salvinia molesta	giant salvinia	Well established in Texas, new infestations in California and other western and southeastern states
	Spartina alterniflora	smooth cordgrass	Native in estuaries of eastern U.S., spreading along coast of Pacific Northwest
	Trapa natans	water chestnut	Expanding range in northeastern U.S.
Rangeland and Wildland	*Acacia auriculiformis*	earleaf acacia	Expanding range in Southeast
	Acroptilon repens	Russian knapweed	Widespread throughout U.S., particularly western states
	Aegilops spp.	goatgrasses	Widespread in western U.S.
	Ammophila arenaria	**European beachgrass**	Isolated infestations along sand dunes of California
	Andropogon virginianum	**broomsedge**	Hawaii (native to southeastern U.S.)
	Bromus madritensis ssp. rubens	red brome	Widespread in western states, especially Mojave and Sonoran deserts
	Bromus tectorum	**downy brome**	Widespread throughout U.S., particularly western states
	Cardaria draba	hoary cress	Widespread in western U.S.
	Carduus nutans	musk thistle	Widespread throughout U.S.
	Carpobrotus edulis	iceplant, sea fig	Spreading in coastal areas of West
	Centaurea calcitrapa	purple starthistle	Expanding range in California
	Centaurea diffusa	diffuse knapweed	Widespread in western U.S.
	Centaurea maculosa	spotted knapweed	Widespread throughout U.S., particularly western states
	Centaurea solstitialis	yellow starthistle	Western states, particularly California, Idaho, and Oregon
	Centaurea squarrosa	squarrose knapweed	Expanding range in western U.S.
	Chondrilla juncea	rush skeletonweed	Expanding range in western U.S.
	Cirsium arvense	**Canada thistle**	Widespread throughout U.S.
	Cirsium vulgare	**bull thistle**	Widespread throughout U.S.
	Conium maculatum	poison hemlock	Widespread throughout U.S.
	Convolvulus arvensis	**field bindweed**	Widespread throughout U.S.
	Cortaderia jubata	jubatagrass	Widespread along California and Oregon coasts
	Cortaderia selloana	pampasgrass	Widespread along California and Oregon coasts
	Crupina vulgaris	common crupina	Expanding range in California and northwestern states
	Cynara cardunculus	artichoke thistle	Expanding range in California
	Cynoglossum officinale	houndstongue	Expanding range in many regions of U.S.
	Cytisus scoparius	Scotch broom	Widespread throughout Pacific Coast states

Habitat	Scientific Name	Common Name	Distribution
	Ehrharta spp.	veldtgrass	Expanding range in coastal areas of California
	Euphorbia esula	**leafy spurge**	Widespread in northern states, particularly western U.S.
	Foeniculum vulgare	fennel	Widespread throughout Pacific Coast states, especially southern California
	Genista monspessulana	French broom	Widespread in western U.S.
	Hedychium gardnerianum	Kahili ginger	Hawaii
	Hieracium aurantiacum	**orange hawkweed**	Expanding range in Northwest
	Hieracium pratense	**meadow hawkweed**	Expanding range in Northwest
	Hyperricum perforatum	St. Johnswort	Widespread in western U.S.
	Imperata cylindrica	cogongrass	Expanding range in tropical and subtropical areas of U.S., southeastern U.S. to Texas and southern California
	Isatis tinctoria	Dyer's woad	Spreading in Utah, California, and other western states
	Lantana camara	lantana	Expanding range in Florida and Hawaii
	Lepidium latifolium	**perennial pepperweed**	Rapidly expanding range in West
	Leucanthemum vulgare	**oxeye daisy**	Widespread throughout U.S.
	Linaria dalmatica	Dalmatian toadflax	Expanding range in West
	Linaria vulgaris	yellow toadflax	Expanding range in West
	Lonicera japonica	Japanese honeysuckle	Eastern and central U.S. and Hawaii
	Melia azedarach	Chinaberry tree	Spreading in Southeast
	Miconia calvescens	Miconia	Hawaii
	Myrica faya	firebrush	Hawaii
	Onopordum acanthium	Scotch thistle	Widespread throughout West
	Passiflora mollissima	banana poka	Hawaii
	Polygonum perfoliatum	mile-a-minute	Expanding range in East
	Potentilla recta	sulfur cinquefoil	Widespread in northern states
	Psidium calleianum	strawberry guava	Hawaii
	Pueraria lobata	kudzu	Widespread in Southeast to Pennsylvania and Illinois
	Rubus argotus	Florida pickly blackberry	Hawaii (native to southeastern U.S.)
	Salsola tragus (=S. kali)	Russian thistle	Widespread in West
	Salvia aethiopis	Mediterranean sage	Expanding range in western U.S.
	Schinus terebinthifolius	Brazilian pepper	Expanding range in southwestern U.S.
	Senecia jacobaea	tansy ragwort	Widespread in Pacific Northwest
	Solanum viarum	tropical soda apple	Spreading in southeastern U.S.
	Spartium junceum	Spanish broom	Spreading in western states
	Taeniatherum caput-medusae	medusahead	Widespread in West
	Ulex europaeus	gorse	Isolated infestations in Pacific Coast
Cropland	*Abutilon theophrasti*	velvetleaf	Widespread throughout much of U.S.
	Amaranthus retroflexus	**redroot pigweed**	Widespread throughout U.S.
	Chenopodium album	**common lambsquarters**	Widespread throughout U.S.
	Cirsium arvense	**Canada thistle**	Widespread throughout U.S.
	Convolvulus arvensis	**field bindweed**	Widespread throughout U.S.
	Cyperus esculentus	**yellow nutsedge**	Widespread throughout U.S.
	Cyperus rotundus	**purple nutsedge**	Widespread throughout U.S.
	Echinochloa crus-galli	**barnyardgrass**	Widespread throughout U.S.
	Elytrigia repens	**quackgrass**	Widespread throughout U.S.
	Kochia scoparia	**kochia**	Primarily invasive in western U.S.
	***Setaria* spp.**	**foxtails**	Widespread throughout U.S.
	Sorghum halapense	**Johnsongrass**	Widespread throughout U.S.
	Striga asiatica	witchweed	Eradicated or close to eradication in North and South Carolina

* Species in bold face type occur as weeds in turfs.

New Insecticides Expected...

Continued from page 1

small to mid-sized grubs. Further testing is needed to determine its performance as a fast-acting curative for large grubs. Registration of Meridian™ is anticipated for late summer of 2000.

Fipronil Granular®. Golf superintendents who contend with mound-building nuisance ants on putting greens and tees can look forward to relief from a new granular formulation of fipronil. Familiar to southern turf managers as the active ingredient in Chipco Choice®, fipronil has been used for several years for mole cricket control on golf courses and commercial grounds. Unlike the label for Chipco Choice, which requires that the product be applied by slit-placement application equipment, **the new fipronil granular ant formulation will allow standard broadcast applications.** Fipronil is a member of a new insecticide class called phenyl pyrazoles. It has a favorable environmental profile, with a unique mode-of-action that poses relatively low hazard to humans, pets, wildlife, and earthworms.

Used as a broadcast treatment, granular fipronil is very effective for ant control. It works both through contact and ingestion. Worker ants foraging in treated soil pick up the residues on their bodies; then, through grooming and food transfer, other members of the subterranean colony are exposed to the insecticide. Despite its very low use rates, **fipronil is quite persistent in soil.** University tests indicate that one application in the spring will suppress ants on putting greens throughout the growing season, and possibly for 12 months or more. Aventis CropScience, which recently formed from a merger of Rhône-Poulenc and AgrEvo, has applied for accelerated registration of fipronil for general purpose ant control. Use sites will include lawns and golf courses. Approval and registration of granular fipronil are expected by late summer of 2000.

Summarizing Turf Rolling

James B Beard

From the 1700s up to the 1920s turf rolling was one of the two major cultural practices used on turfgrasses, the other being mowing. However, the development of an understanding as to the significance of turf rolling in increasing soil compaction and the resultant root system loss and declining turfgrass health subsequently resulted in turf rolling falling into disfavor among turf managers. Recently, the widespread use of high-sand root zones of the proper particle size distribution that have a minimum compaction tendency has allowed increased use of turf rolling on putting greens, bowling greens, tennis courts, and sports fields.

Spring Turf Rolling Practices. Turf rolling is an important spring cultural practice on most kinds of turf regardless of the soil texture. It is usually practiced in early spring, prior to the first mowing, and especially in colder climatic regions where frost heaving occurs. **Turf rolling functions in pushing the turf, including the critical grass crowns, back into proper contact with the soil, which minimizes the chance of desiccation.** Frost heaving can be so severe with turf grown on muck soils of golf courses that it can be lifted in frost domes as high as 3 feet (0.9 m). Obviously, such turfs are very prone to desiccation unless rolled back into the proper position to maximize the positive soil moisture relationships. In addition, **turf rolling smooths the turf-soil surface, thereby minimizing the potential for scalping during the first few mowings in the spring.**

Rolling of Closely Mowed Turfs. Turf rolling can be used as a positive advantage on putting greens under certain circumstances. Irregularities can arise on greens as a result of ball marks, foot depressions during wet soil conditions, improper hole changing techniques, insect and small animal activity, vandalism, and certain cultural activities, such as turf cultivation. Thus, **turf rolling can be used as a finishing technique to ensure maximum surface smoothness and trueness of ball roll,** as well as to increase the speed of ball roll. Both effects are especially important during a major tournament or championship. Use of a water ballast roller allows filling with a quantity of water to no more weight than is needed in order to minimize the potential for compaction. **On properly constructed high-sand root zones, rolling may be accomplished with minimum concern for soil compaction problems.**

Typically, **turf rolling can cause an increase in ball roll distance of 10%, even on greens with an inherent ball roll distance of 9 to 10 feet (2.7–3 m).** Furthermore, the use of a mechanically powered turf roller unit with four individual rollers can increase the ball roll distance up to 20%. **The effect of turf rolling on ball roll distance may persist for 2 to 3 days. Generally, turf roll-**

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JB COMMENTS

Spring Nitrogen Fertilization

The timing and amount of nitrogen fertilization to be applied in the spring can vary greatly depending on the turf condition and on a diversity of environmental and usage considerations. In addition, the approach is different between warm- and cool-season grasses. Thus, this discussion will be separated into these two species groupings.

Cool-Season Turfgrasses. Ornamental turfs that are in good condition in terms of shoot density and color usually need minimal early spring nitrogen fertilization. Such turfs may either be fertilized with a very light rate of nitrogen, or in many cases it may be best to delay the spring nitrogen fertilization until after the major flush of shoot growth associated with the optimum spring temperatures. A major nitrogen application during this peak shoot growth period further accentuates growth, thereby resulting in a depletion of carbohydrate reserves and associated root loss just prior to the progressive increase in temperatures leading to heat stress, which further accentuates the negative affects of root loss.

On the other hand, weakened turfs coming out of the winter, such as a result of (a) extensive autumn usage for sports or (b) injury during the winter period, should receive a significant complete analysis (NPK) fertilizer application to enhanced tillering, lateral stem development, and recovery of shoot density. Spring sports that cause significant damage to the turf also should receive a significant complete analysis fertilization. If the opening of the spring sports schedule is quite early, then an early nitrogen application can stimulate earlier shoot greenup in the order of two weeks.

Situations have occurred where the turf manager has made an application of water-soluble, quick-release nitrogen in early spring and gotten no response. Then another application was made in 7 to 10 days, gotten no response, and in some cases even a third application was made. Subsequently, there was a sudden tremendous flush in shoot growth, which required a very high mowing frequency, exhausted the carbohydrate reserves, and caused root loss. What happened? The problem was that although the air temperatures were relatively warm on certain days, the turf manager failed to take into consideration the actual soil temperature. Somewhat warm air temperatures can cause greening of the turf, but any significant shoot growth can still be delayed if the soil temperatures are not sufficiently high. In other words, one should not expect to see a significant response from a water-soluble nitrogen application until soil temperatures have reached the range of 46 to 54°F (8–12°C), with the specific threshold temperature varying with individual turfgrass species and/or cultivars.

Warm-Season Turfgrasses. Spring greenup of winter-dormant warm-season turfgrasses typically occurs when the soil temperature at a 4-in. (100-mm) depth rises to 64°F (18°C). If temperatures rise very rapidly following greenup, the potential for spring root decline (SRD) to occur is high. If SRD is confirmed by root profile examinations, nitrogen fertilization should be delayed for at least 2 to 3 weeks. It also is common in certain regions for a yellowish chlorosis of bermudagrass (*Cynodon* spp.) to occur during the spring, which typically can be corrected with an application of iron. It is especially important that this be done if SRD has occurred in order to facilitate maximum chlorophyll levels for carbohydrate synthesis and supply for root regrowth.

There are situations in which spring greenup of warm-season grasses occurs, but very little shoot growth occurs for 2 to as long as 4 weeks. Consequently, minimal mowing is required. This is caused by a very slow warming trend and resultant persistence in cool soil temperatures, which limit the amount of shoot growth that will occur. Consequently, nitrogen applications during this period will give a minimal shoot growth response in turfs where thinning has occurred during the winter period.

...Metsulfuron and Chlorsulfuron...

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Use rates of Corsair range from 1.0 to 5.33 oz/ac. One to two ounces/acre will control annual or perennial ryegrass. The highest labeled rate (2.76 to 5.33 oz/ac) will be needed to remove tall fescue. Repeat applications may be necessary for tall fescue control. Like Manor, Corsair will control wild garlic *(Allium canadense)* and wild onion *(Allium vineale)* but the highest labeled rates will need to be used. A total of 48 weeds are listed on the Corsair label. **Several troublesome annual and perennial weeds are controlled. Common and mouseear chickweed, henbit, buttercup, filaree, groundsel, prostrate knotweed, and white clover,** just to name a few, are species that can be controlled with Corsair.

Corsair application should include a nonionic surfactant at 0.25% volume/volume of spray solution. As with Manor, Corsair is moderately mobile in soils and should not be applied up-slope of sensitive turf or ornamental species.

The return of metsulfuron and chlorsulfuron as Manor and Corsair, respectively, is certainly good news for both cool-season and warm-season turf managers. Their use will provide control of many troublesome weedy pests in highly maintained turf.

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Summarizing Turf Rolling

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ing should not be practiced at a frequency of more than two times per week, in order to minimize the negative effects of turfgrass wear injury. However, turf rolling on a daily basis may be practiced during major tournaments, provided negative turf effects do not appear. Most of the positive and negative turf responses from rolling have involved assessments on creeping bentgrass (*Agrostis stolonifera*). Unfortunately, there have not been comparable studies conducted on bermudagrass (*Cynodon* spp.) to ascertain whether similar turf responses occur.

Other Turf Rolling Functions. The use of the turf roller has other important functions, such as **firming a root zone during site-soil preparation for planting turfgrasses.** The rolling operation itself also allows one to better detect very shallow depressions in the surface, which can then be corrected through additional smoothing operations. Turf rolling also is frequently employed during the turf establishment phase as a **smoothing operation for the turfgrass seedlings or vegetative propagules during the grow-in period.** Finally, it also is valuable **following sod transplanting to provide good contact between the sod interface and the underlying soil.** This ensures a positive soil moisture relationship rather than producing air pockets, where drying of the roots can cause a delay in transplant rooting.

ASK DR. BEARD

Q *Is spring a good time for seeding turfgrasses in the northern contiguous United States?*

A A key factor in timing the seeding of cool-season turfgrasses is the soil temperature. **Optimum temperatures for seed germination of most cool-season turfgrasses are at soil temperatures in the order of 86°F (30°C) during the daytime and 68°F (20°C) at night.** Optimum grass shoot growth occurs at soil temperatures in the range of 60 to 70°F (16–21°C). **Thus, depending on the location, late summer to early autumn is the preferred time for seeding cool-season turfgrasses.** This timing is when temperatures are in the higher range for optimum seed germination and progressing to cooler temperatures, which favor shoot growth, tillering, and lateral stem development for sod formation. In contrast, spring is a period of progressively higher temperatures, which is just the opposite of what is desired. In addition, the late spring–early summer period typically is when numerous annual weedy grasses—such as barnyardgrass, crabgrass, foxtail, and goosegrass—are germinating and can create a highly competitive weed situation. Except for the northern areas of Canada and Alaska in North America, **the preferred time for seeding cool-season turfgrasses is late summer–early autumn, with spring being a distant second choice but better than the midsummer heat and drought stress season.**

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