An Annual Meeting, Turf Reports — and Perspectives about California Agriculture

By Dr. Gayle L. Worf

I've just returned from participating in the plant pathologists' national meeting (technically, the American Phytopathological Society) in San Diego. And before that I spent two days on an optional tour of commercial ornamental production along the southern California coastline. Both left some strong perceptions with me about what is likely in store for Wisconsin agriculture — turf included — first from the standpoint of general agriculture overtones, and also, from the research reports that were shared at the meeting. I'd like to comment on both subjects.

Even those of us who have not visited in California must know of its dominance in agricultural production. Though we pride ourselves as the nation's dairy state, for instance, the projections say that California will overtake us even with that statistic by the beginning of the next century. They dominate the majority of fresh fruit and vegetable markets, and they are probably on top in ornamental production, too. In Los Angeles County alone, their annual wholesale ornamentals value is $150,000,000 (almost one-fourth of Wisconsin estimated total turf value). So what happens in California — even if it's 2,000 miles away — influences the sociological, philosphical, bureaucratic and economic trends in agriculture — and turf — in a very profound way.

On the tour I felt almost as a stranger in my own land. I couldn't understand what was being said by all the workers — they're Hispanic! So the migratory and labor laws affecting agriculture are coming out of California experiences. And I never saw such a delicate and precarious ecological structure in my life — virtually all of their agriculture is supported by a very limited amount of water coming out of the Colorado River, supplemented a bit by reservoirs up north. Small wonder that people are becoming more concerned than ever about agriculture and water. I couldn't help but think of the experiences that Mark Kienert and Bull's Eye Country Club had this summer, and to sense that even though our water problems should never be as acute as the great southwest, they'll have their impact upon us.

The recent Superintendents' symposium was right on as a critical and timely topic. Nurseries in California now are being required to prevent all runoff from their properties, and to recycle completely. At the Monrovia Nursery, they have built a multimillion dollar facility that includes catch basins that double as sedimentation tanks, supplemented by anthracite coal and polymer additives for further flocculation of particulates and followed by treatments of chlorine gas, ammonia, nutrients, and 50 percent fresh water to meet local needs! It's a facility that would do most Wisconsin municipalities proud. I understand that golf courses there face similar requirements. It's not just the amount of water they use — it's quality — including groundwater — that is at issue. Will we be far behind? And when it comes here, how will our turf industry be able to cope with it? Are there some steps we should be taking now to assure both ourselves and the people we serve that our industry is already policing itself from waste of water and pollution of the resource?

My first instincts were that we are fortunate with turf to have a ground cover and a modicum of thatch that minimizes the problem. This may be true, but interestingly, as I was preparing this article I had to stop for an appointment across campus, and as I was walking along, I noticed that the buildings and grounds personnel had just made a fall fertilizer application. There were lots of granules on the sidewalk, a problem which can lead to wash-off into gutters and lakes. But in this case it appeared innocuous and okay to leave the granules there. The rain should wash it off onto the adjacent grass. But then I noticed the gutter drain down the sidewalk just a few feet away, with direct access to Lake Mendota!

Perhaps we need to have a "committee of the whole" soon to outline the simple things we know right now that we could do to minimize environmental problems and set ourselves straight for the future, such as the use of buffer zones, kinds and types of fertilizers that can be applied when and where, etc. Our own state is now mandating the development of acceptable "best management practices" for several crops to protect groundwater — alfalfa, corn, cranberries, potatoes among them. Can we be very far behind?

California is also the land where grocery chains advertise that they have contracted with NutriClean, a commer-

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cial laboratory for guaranteeing freedom of their produce from pesticide residues — even though the EPA and FDA already attest to food safety; where all pesticide recommendations must now be given in writing; and where 75 percent of pest management information now arrives to the 80,000 farmers through licensed Pest Control Advisors. In other words, pesticide issues are very evident and political. Perhaps in Wisconsin we need to be placing more emphasis in our pesticide applicator training programs, to recognize this potential, and try to emphasize even more IPM practices and justification steps when we make decisions about fungicides and other pesticides. And we might also be doing some serious thinking about what kind of research we should be including regarding environmental issues at the O.J. NOER RESEARCH CENTER.

There's considerable research taking place with biological control methods generally, including some in turf. Perhaps the most significant trend there is, is the interest that Industry appears to be showing now in taking some of the organisms that have demonstrated some potential and developing techniques to grow and to package them. Moreover, the EPA and USDA have retreated from some of their earlier restrictions upon releasing microorganisms in the environment. As long as the organisms have not been genetically engineered, the pathway is now much easier for their release. Several turf pathologists have included biocontrol as an important component of their research programs — Hank Wilkinson (patch disease control) and Lee Burpee (snow mold control) among them. And resistance to turf diseases is being emphasized by Eric Nelson at Cornell (Dick Smiley's replacement) and Phil Colbaugh in Texas. Improved disease prediction schemes are being emphasized by Bill Shane at Ohio State, including both epidemiological and pathogen detection systems. The Agridiagnostics turf disease detection kits are a component of the latter, which may also become useful in time for some courses to defend or justify their selection and use of fungicides.

What's significant to me is that all of these people are young researchers, really just getting started, and reading these directions as the wave of their future.

We probably should recognize that it will take awhile before profound benefits occur. Useful resistance to dollar spot and other pathogens were reported (informally), for instance, but it may take some genetic engineering to implant them into culturally acceptable golf course grasses. And researchers report some progress in learning how to do that with monocots — most of the successes are still confined to dicots.

And one word of concern. We are really vulnerable right now to miracle claims with products that supposedly destroy thatch, control diseases, make nutrients, or perform other ecological miracles without introducing supposed problems. Unfortunately, many of these have already been introduced in the "buyer beware" mode. At the least, these products should be subject to the same efficacy protocols as chemicals, e.g., replicated testing in several locations for several years. But most of these are offered up under "testimonial" process. The current public attitude will probably increase these problems for us!

MEET "SARA"

EDITOR'S NOTE: Winter months offer the best time for golf course superintendents to get a handle on what is becoming an avalanche of regulations and legislation affecting the way we do business.

One of those pieces of legislation is the Superfund Amendments and Reauthorization Act — SARA. The following summary was drawn together by Russ Weisensel, primarily from a paper by Roger Flashinski of the University of Wisconsin Extension Service in August of 1988. If you would like a copy of Mr. Flashinski's paper or more information about SARA, Russ has offered to make both available. Contact him at the Wisconsin Agri-Business office.

Facility Requirements Under SARA and Wisconsin Law

The Superfund Amendments and Reauthorization Act (SARA) and the 1987-88 Wisconsin Act 342 set forth requirements for planning and reporting relating to hazardous and toxic chemicals. The laws are aimed at having every community ready to handle an accident.

SARA has four major sections: emergency planning, emergency notification, community right-to-know, and spill reporting.

Emergency Planning

EPA has prepared a list of 366 Extremely Hazardous Substances. (Pesticide EHS list is found after this article.) Any facility (including farms, dealers, and warehouses) that produces, uses, or stores any of these substances in an amount greater than their TPQ (Threshold Planning Quantity) [this number relates to the amount of *active ingredient* in inventory] must notify the Wisconsin Division of Emergency Government and the Local Emergency Planning Committe (LEPC) that the facility is subject to the planning requirements of the act. Notification shall be in writing and specify the name and location of the facility. Seasonal inventories are not exempt from this requirement. A complete list of hazardous substances can be secured from the Wisconsin Division of Emergency Government.

The facility must also provide their LEPC with other information necessary to develop and implement an emergency response plan.

This reporting was to have been completed by May 17, 1987. However, most people were not aware of this requirement and penalties for late reporting haven't been strictly enforced.

The written notification of your inventories in excess of the TPQ must be sent to the State Emergency Response Commission, Wisconsin Division of Emergency Government, 4802 Sheboygan Avenue, Madison, WI 53705. Notice must also be made to your LEPC.

Wisconsin Act 342 requires a one-time emergency plan notification fee of $800.00 for facilities that have the equivalent of 10 or more full-time employees.

Emergency Notification

In addition to TPQ amounts, SARA also has established reportable quantities for spills of each listed extremely hazardous substance. Under SARA farmers and ag chemical dealers are subject to this report only if the release of the extremely hazardous substance is in excess of its reportable quantity *and* if the spill has potential off-site exposure.

Wisconsin Act 342 however, requires notification of all spills for hazardous substances regardless where it occurred. Wisconsin law applies to all facilities including farms. With spills involving pesticides, Wisconsin requires reporting of undiluted pesticides of one quart or more, and diluted mixture spills of five gallons or more. This report must be made to your LEPC, the State Emergency Response Commission and the DNR.

Community Right-to-Know

This law has been expanded to include all non-manufacturing facilities, including agriculture. By September

Pesticides Included in EPA's List of Extremely Hazardous Substances

Chemical Name	Trade Name	Threshold Planning Quantity (Sec 302)	Reportable Quantity (Sec 304)	MSDS & Tier II Reporting Quantity (Sec 311 & 312)
		..... lbs. active ingredient		
acrolein		500	1	500
aldicarb	Temik	100*	1	100
aldrin		500*	1	500
allyl alcohol		1000	100	500
aluminum phosphide	Phostoxin	500	100	500
ammonia (anhydrous)	(fertilizer)	500	100	500
antu		500*	100	500
arsenic pentoxide		100*	5000	100
azinphos-ethyl	Ethyul Guthion	100*	1	100
azinphos-methyl	Guthion	10*	1	10
bromadiolone	Maki, Bromone	100*	1	100
carbofuran	Furadan	10*	10	10
chlordane		1000	1	500
chlorfenvinfos	Supona	500	1	500
chlorophacinone	Rozol	100*	1	100
chloroxuron	Tenoran	500*	1	500
chlorthiophos		500	1	500
coumaphos	Co-Ral	100*	10	100
demeton	Systox	500	1	500
dichlorvos	vapona (many)	1000	10	500
dicrotophos	Bidrin	100	1	100
dimefox		500	1	500
dimethoate	Cygon, De-Fend	500*	10	500
dinitrocresol	DNOC	10*	10	10
dinoseb	Premerge, Dyanap	100*	1000	100
diphacinone	Ramik, Diphacin	10*	1	10
disulfoton	Di-Syston	500	1	500
endosulfan	Thiodan	10*	1	10
endothion		500*	1	500
endrin		500*	1	500
EPN		100*	1	100
ethion		1000	10	500
ethoprophos	Mocap	1000	1	500
fenamiphos	Nemacur	10*	1	10
fenitrothion		500	1	500
fensulfothion	Dasanit	500	1	500
fluoroacetamide (1081)		100*	100	100
fonofos	Dyfonate	500	1	500
formetanate hydrochloride		500*	1	500
formothion		100	1	100
leptophos	Phosvel	500*	1	500
lindane		1000*	1	500
mephosfolan	Cytrolane	500	1	500
methamidophos	Monitor	100*	1	100
methidathion	Supracide	500*	1	500

24, 1988 all facilities were to submit copies of the MSDS for each hazardous chemical or a list of such chemicals to the State Emergency Response Commission, the LEPC, and the local fire department. Family farms, or incorporated farms with fewer than 10 full-time employees are exempt.

There is a difference between the term "extremely hazardous substance" in SARA and the term "hazardous chemical" used by OSHA for worker right-to-know. The EPA has listed 366 EHS and established a TPQ and reportable quantity for each. Hazardous chemicals are based on categories of health and physical hazards and include some 50,000 products. These of course include all the substances on EPA's list. An MSDS should be developed for all hazardous substances.

Filing must take place for each extremely hazardous substance if the inventory amount at any one time is equal or greater to the TPQ or 500 pounds, whichever is lower (see table). An MSDS for each hazardous chemical not on EPA's list must be filed if the inventory exceeds 10,000 pounds or more at any one time. This 10,000 pound threshold was subject to change on October 17, 1989. Draft rules will be published on or about January 1, 1989 which may greatly reduce this threshold.

The Wisconsin Act also requires an inventory form fee to be paid annually based on the number of chemicals reported. For one to 100 hazardous chemicals the fee is $100; for 100 to 500 chemicals, $150; and for over 500 pounds of hazardous chemicals, $300. Facilities including farms with the equivalent of less than 10 full-time employees are exempt from this payment.

Chemical Name	Trade Name	Threshold Planning Quantity (Sec 302)	Reportable Quantity (Sec 304)	MSDS & Tier II Reporting Quantity (Sec 311 & 312)
		..... lbs. active ingredient		
methiocarb	Mesurol	500*	10	500
methomyl	Lannate, Nudrin	500*	100	500
methyl bromide	Meth-O-Gas	1000	1000	500
methyl isothiocyanate		500	1	500
mevinphos	Phosdrin	500	10	500
mexacarbate	Zectran	500*	1000	500
monocrotophos	Azodrin	10*	1	10
nicotine		100	100	100
norbormide		100*	1	100
oxamyl	Vydate	100*	1	100
paraquat	Gramoxone Super	10	1	10
parathion-ethyl		100	1	100
parathion-methyl		100*	100	100
phenylmercury acetate		500*	100	500
phorate	Thimet	10	10	10
phosfolan	Cyolane	100*	1	100
phosmet	Imidan	10*	1	10
phosphamidon	Dimecron	100	1	100
pirimifos-ethyl		1000	1	500
promecarb		500*	1	500
sodium arsenate		1000*	1000	500
sodium arsenite		500*	1000	500
sodium fluoroacetate (1080)		10*	10	10
strychnine		100*	10	100
sulfotep	Bladafume	500	100	500
TEPP		100	10	100
terbufos	Counter	100	1	100
thallium sulfate		100*	100	100
thiofanox		100*	100	100
triazofos		500	1	500
warfarin		500*	100	500
zinc phosphide		500	100	500

Where the TPQ is followed by an asterisk (*), granular formulations of that active ingredient may be produced, used, or stored in quantities up to 10,000 pounds of active ingredient before the facility is subject to the emergency planning requirements of this act. Values without an asterisk relate to all formulations (including granules) containing that active ingredient.

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Start the New Year Right — Send a Pledge to the NOER CENTER

The list of donors who have already given money and pledged more over this year and next year is slowly growing. It now approaches a total of 50. The sad thing is that the list includes so few WGCSA members and/or their golf courses and golf clubs.

That list of donors is noted above and includes everyone whose gift and pledge had been received by December 16. Deep and sincere thanks go to them. For members who haven't dedicated anything to the NOER CENTER, please make 1989 your year to do so. There is still a lot of money to be raised.

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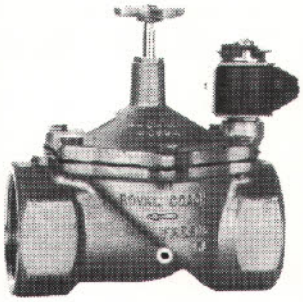

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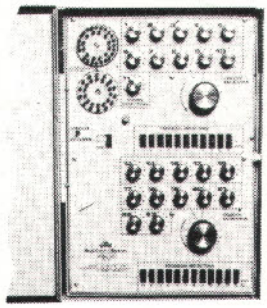

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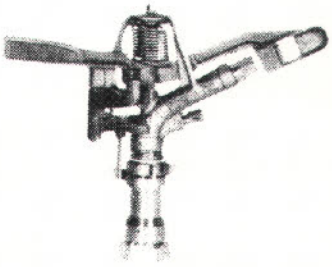

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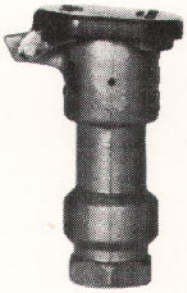

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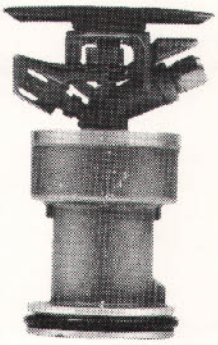

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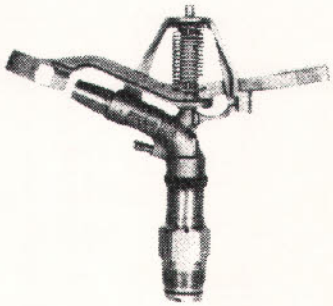

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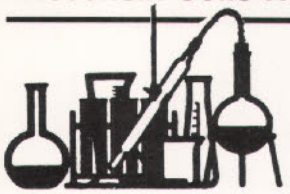

USE OF GYPSUM ON TURF

By Dr. Wayne R. Kussow

Turf managers in the state are occasionally being advised to apply gypsum ($CaSO_4 \cdot 2H_2O$). Reactions to this recommendation have fallen into one of three categories: (1) recommendation followed; (2) recommendation questioned; and (3) recommendation ignored. Obviously, this is a recommendation that needs examination.

There are three reasons one could cite to justify application of gypsum on turf:

1. To improve soil structure.
2. To supply the turfgrass with additional sulfur
3. To achieve the proper balance among exchangeable calcium, magnesium and potassium in soil.

The third reason is what is prompting soil testing laboratories to recommend use of gypsum on turf in Wisconsin. But let's include the other two reasons in this discussion as well, since these are potential selling points for gypsum.

Gypsum has long been used in the process of reclaiming for agricultural use those soils suffering from excessive amounts of sodium. Such soils are essentially structure-less because the sodium prevents aggregation of the clay particles. The function of gypsum is to provide a low-cost source of calcium ions that displace sodium ions from the soil's cation exchange sites. The sodium ions are then leached out of the soil during the long period of intensive irrigation. Replacing sodium with calcium on the exchange sites permits aggregation of clay particles and eventual formation of soil structure.

But, do we have high sodium soils in Wisconsin? NO. These soils reside only in arid to semi-arid regions of the country. Applying gypsum to our soils has no measurable effect on soil structure and, we must never perceive gypsum as being a substitute for lime.

When soil supplies of sulfur are inadequate for normal plant growth, gypsum is an excellent, slow-release source of the nutrient. Some crops grown in Wisconsin have high sulfur requirements and occasionally the soil supply is inadequate. However, turfgrass is a low sulfur requiring crop and we have to remember that potassium sulfate rather than potassium chloride is used almost exclusively in turf fertilizers. For every pound of K_2O applied as potassium sulfate, approximately 0.3 lb. sulfur is being applied as well. Considering that turfgrass requires approximately eight times as much potassium as sulfur, we can readily see that use of potassium sulfate on turf will very effectively avoid having to apply gypsum as a sulfur source.

Having dispelled the notion that gypsum will resolve soil compaction problems or is needed to prevent sulfur deficiency on turf in Wisconsin, let's examine the principal reason why some of you are being advised to apply gypsum. Believe it or not, this reason has its roots in some research reported on in 1901. This work presented evidence that soil Ca:Mg ratios affect plant growth. By the 1940s, researchers had accumulated enough evidence to formulate what is known as the basic cation saturation ratio (BCSR) theory.

According to the BCSR theory, soil is not an optimum environment for plants unless 65 to 85% of the cation exchange sites are occupied by calcium ions, six to 12 percent by magnesium ions and two to five percent by potassium ions. In short, what this theory suggests is that plant accumulation of sufficient quantities of these nutrients depends more on their ratios in soil than the amounts actually present. When this theory is applied in the interpretation of soil analyses, it is possible to conclude that even soils with a pH of 6.5 or more require additional calcium or magnesium to ensure their presence in the proper ratios.

How can Wisconsin soils with near neutral pH not contain what the BCSR theory perceives to be the "proper" Ca:Mg ratio? Actually, this is not an uncommon occurrence. The reason is dolomitic limestone. All lime produced in Wisconsin is dolomitic and contains Ca and Mg in a ratio of approximately 1.1:1. This is considerably below the minimally acceptable Ca:Mg ratio of 5:1 put forth by the BCSR theory. But one need not apply dolomitic lime to get their soil Ca:Mg ratio down to less than 5:1. Irrigating with well water that has seeped down through dolomitic limestone has the same effect.

It is when the Ca:Mg ratio falls below 5:1 in soils with satisfactory pH for turfgrass that the BCSR theory leads to the recommendation to apply gypsum. Is this a valid recommendation? The

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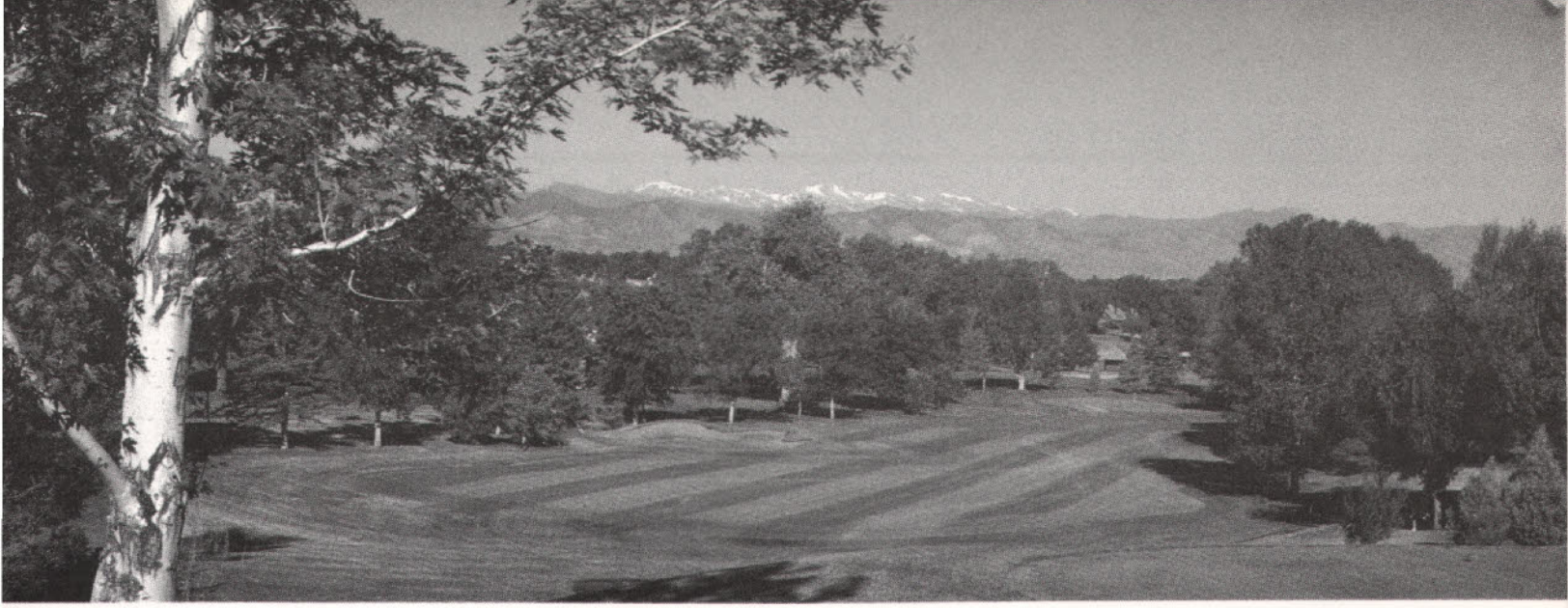

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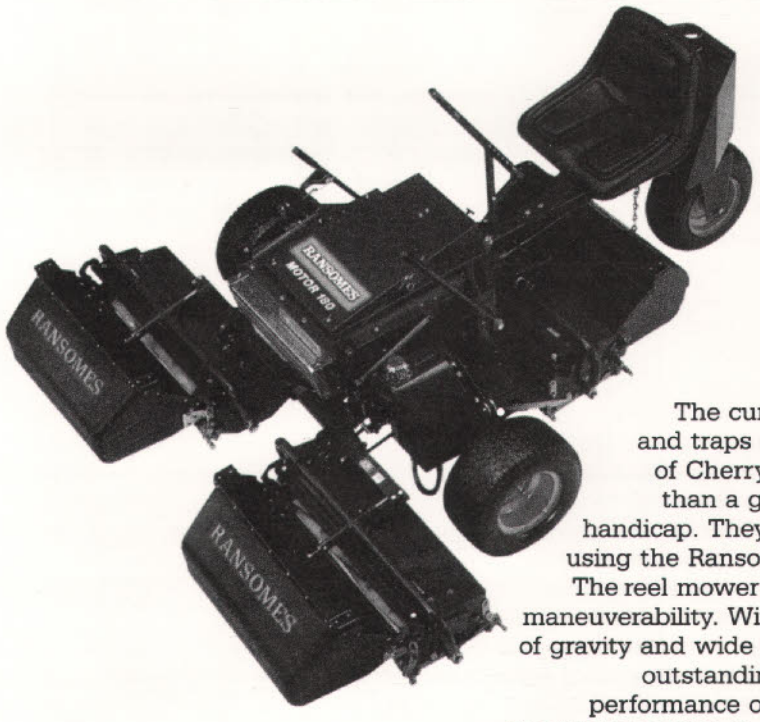

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answer to this question lies in the answer to the question of what controls plant accumulation of Ca, Mg and K — the ratios at which they are present in soil or the actual amounts present? To summarize a lot of research conducted in the Midwest, the evidence strongly favors the notion that plant growth and accumulation of Ca, Mg and K is much more dependent on the amounts present in soil than their ratios. Ratios become the prime factor only in extreme conditions deliberately created in experiments. It is in light of this convincing body of research data that most soil testing laboratories do not apply the BCSR theory when interpreting soil analyses. Thus, they do not recommend adding additional Ca or Mg to soils whose pH values are already satisfactory for plant growth.

To carry this discussion one step further let's review the results of field trials that Dr. Don Waddington and his graduate students carried out on turf at eight different sites in Pennsylvania in the 1970s. They applied calcitic lime (Ca:Mg=14:1), P and K prior to establishment of several turfgrass species and on turf ranging from two to ten years in age. Soil pH on the eight sites ranged from 5.1 to 6.5 and the soil Ca saturation percentage was less than 65% on seven of the eight sites and averaged 45% over all eight sites. Hence, according to the BCSR theory, the turfgrass should have responded to lime application, if not because of increased soil pH, because of an increase in Ca saturation percentage. What actually happened was that liming had no significant influence on turfgrass clipping weights, turf quality or turfgrass tissue Ca content at any of the research sites.

A major manufacturer/distributor of turf products in the U.S. utilizes the services of a soil testing laboratory that continues to employ the BCSR theory to interpret soil analyses. Utilization of this service will occasionally result in the recommendation that gypsum be applied to turf in Wisconsin even though the soil contains many-fold more than the 15 to 25 pounds/A of Ca that turfgrass annually requires. In my opinion, the evidence is overwhelming that this recommendation merits a "category 3" response.

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True lightweight mowing. Newly designed low-profile turf tires produce the lightest ground pressure, and the rear wheels roll on a different track than the front, so your tender turf thrives with less compaction. And the wide 4-wheel stance offers excellent traction, increased stability and a tight turning radius.

Built to last. The LF-100 has a proven, rugged chassis, a durable and simple hydraulic system and liquid-cooled diesel engine for a longer, trouble-free life on your fairways.

What's more, the entire machine is backed by your Jacobsen distributor, so you're never far from dependable parts and service support.

See all the LF-100 differences. Ask your Jacobsen distributor for a free demonstration. Attractive lease and finance plans available. Or contact: Jacobsen, 1721 Packard Ave., Racine, WI 53403.

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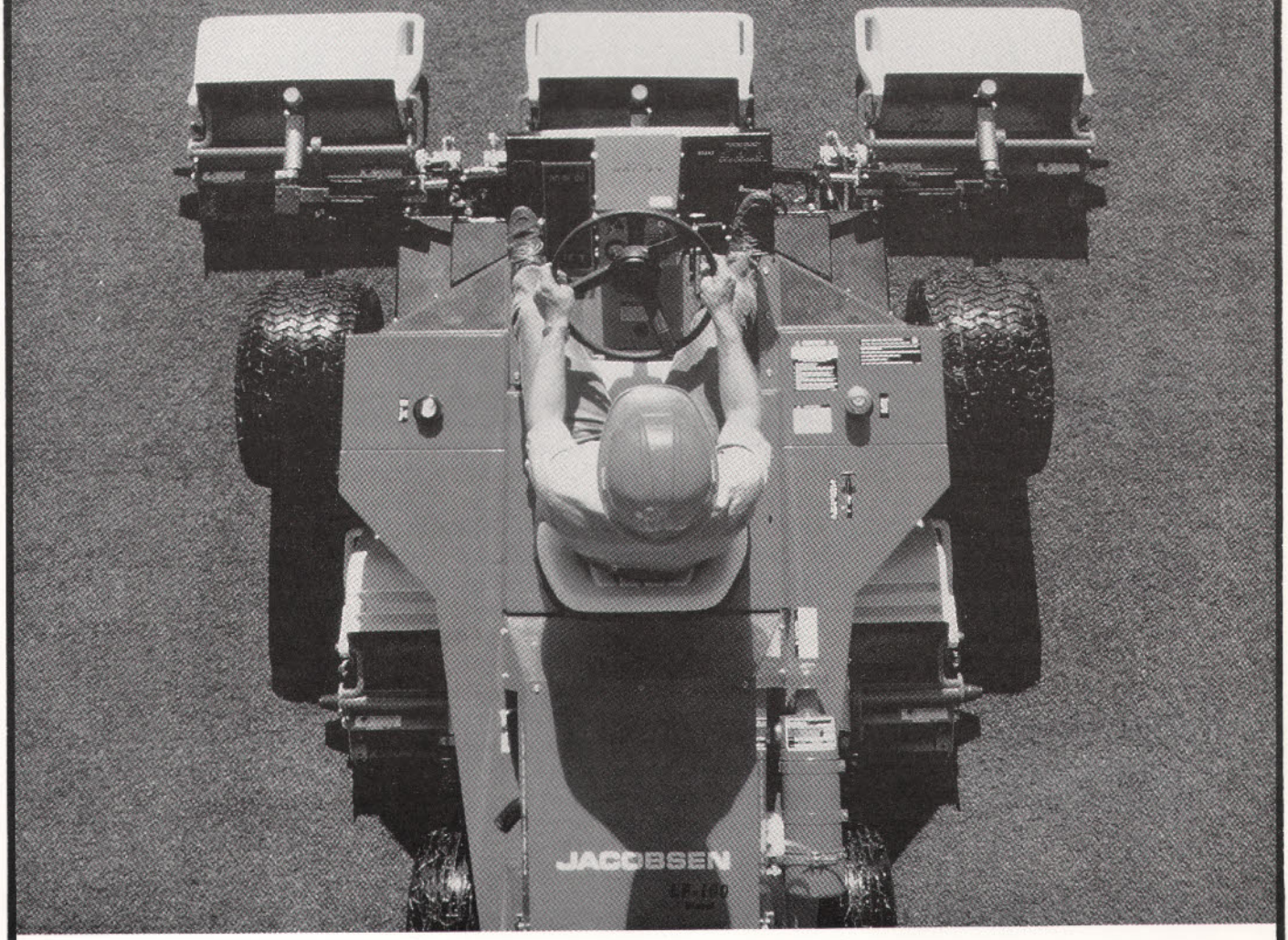

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