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Growth Regulation for Fine Turf in the Environmental Age

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Now, with new formulations of Embark and tank mixes with Limit®, you can *tame* the growth of turfgrasses and reduce the mowing by up to 50% — or you can *slow* it down just enough to make regularly scheduled mowings easier and faster. In either instance, there are no concerns with objectionable discoloration, and the reduction in cost is very significant.

Everett Mealman, President
PBI/Gordon Corporation

The Embark PGR programs for growth regulation of fine turf are surely the most important developments to date in landscape management. They can dramatically increase the productivity of turf managers ... and productivity, of course, is the ultimate generator of profits.

The recommendation for maximum growth suppression of cool-season fine-turf species is a tank mix of Embark Lite and Limit.

Embark Lite (Mefluidide) is specially formulated and labeled for use on fine turf. And Limit is amidochlor, the root-absorbed turf growth regulator developed by Monsanto and recently acquired by PBI/Gordon.

This easy-to-handle tank mix, when applied to cool-season grasses prior to the major growth period, will reduce the number of mowings up to 50% for five to six weeks at a cost of approximately $45.00 per acre — the average cost of one mowing.

But that's only part of the good news: Turf discoloration is avoided with this combination, when used as directed. At the end of the six-week cycle when untreated turf tends to fade, the release of pent-up energies in the Embark Lite/Limit-treated turf results in a rich, vibrant green color.

And, notice, we haven't even mentioned the environmental bonus of reduced clippings.

On the other end of the Embark programs, an application of just Embark Lite will by itself slow down the growth for three to four weeks to such a degree that the mowers will virtually float over the turf ... clippings will be significantly reduced ... you'll be able to stay on schedule even during the peak growing season ... and the cost will be only $18.00 per acre.

What users say

Paragon Lawn of Edina, Minnesota is typical of the many turf management professionals throughout the country who are using Embark. Paragon is a total landscape management company owned and operated by the husband-wife partnership team of Dan and Jill Rosen.

The business is oriented toward high-visibility commercial properties in the Minneapolis suburbs, where immaculate turf is a vital part of the image the property owners want to project to the public.

A typical area where Jill and Dan Rosen, of Paragon Lawn, use Embark Lite. For approximately $18.00 per acre they can literally take the fight out of cool-season grass, so that even in the peak growing period they not only can stay on schedule but the mowed premises will maintain their freshly cut appearance longer.

On several properties, Paragon has total responsibility for designing and executing the complete program on an annual bid basis. "Such property owners don't really care what we do or when we do it," says Rosen. "The issue is that a constant image of quality and neatness be maintained."

In such instances the Rosens factor into their bid an Embark Lite/Limit tank mix treatment twice a year. Once in the spring, ahead of seedhead emergence, and a repeat prior to the fall growth season.

"It reduces our mowing costs by more than 50%, at a cost of less than $45 per acre, while actually improving the appearance of the grass . . ." states Rosen.

On the other hand, Paragon has many customers who are on a regular mowing schedule. "We get paid a flat fee per mow," says Rosen, "and at the peak of the growing season it can be a real back breaker to stay on schedule and maintain a manicured appearance."

"This is where Embark Lite is ideal. During the peak growing season, we can definitely put money in the bank by spending $18 per acre out of our own pocket for a treatment of Embark Lite that lasts three to four weeks. It eliminates double mowing . . . it makes clipping clean-up a breeze . . . it takes pressure off men handling the mowers . . . and, best of all, it keeps us on schedule."

Interestingly, the Rosens were hesitant about getting started with Embark, and actually had a gallon in their machine shop for a year before they opened it. Like so many turfgrass professionals, the concept of suppressing growth made them uncomfortable in light of the fact that they had always measured turf quality and health on the basis of how vigorously it was growing.

Consequently, the Rosens started out very cautiously and tested both the Embark Lite/Limit tank mix and the Embark Lite *mowing aid* program in low-profile areas and expanded the total commitment as the evidence became overwhelming.

The Beauty of Embark Lite/Limit Tank Mix

Above: John Van Haften, director of research and development for PBI/Gordon, demonstrates the dramatic effectiveness of an Embark Lite/Limit tank mix. This test plot of bluegrass and ryegrass in suburban Kansas City was treated on April 25, 1990. It was mowed once, on May 1 after the PGR kicked in, and never touched again until this photo was taken on May 25. This dramatic reduction in growth occurred in spite of abundant rainfall and excellent growing temperatures.

Embark is the original, undisputed leader of all PGRs for use on turfgrass. It is foliarly absorbed and translocated to the growing points of a plant, and redirects the energy to the roots, thus preventing seedhead development and stem elongation.

For almost ten years, Embark has been virtually unchallenged for use on low-maintenance turf such as roadsides and hard-to-reach areas.

But use of Embark on highly visible fine turf was not recommended until 1986, when PBI/Gordon researchers, as well as several universities, had proven that tank mixes of Embark and Ferromec® AC Liquid Iron could eliminate the problems of turf discoloration.

Limit, on the other hand, is root absorbed and has been recognized from its inception as *the* PGR for maximum growth suppression on fine turf without problems of discoloration. The major drawback was its cost.

Happily, a tank mix consisting of reduced rates of both Embark Lite and Limit has proven to be the perfect marriage. It results in growth control for five to six weeks; control of seedheads and stem elongation; reduction of clipping volumes; strengthening of the roots . . . and all of this for only $45 per acre.

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MANAGE SALT, MANAGE STRESS

An understanding of the potential salt effect of the various fertilizer materials can help the turf manager prevent fertilizer burn.

by William Knoop, Ph.D., Texas A&M

A crucial element of fertilizer selection is knowing that plant availability of essential elements is influenced by a fertilizer's salt index.

Fertilizer burn, certainly, is the extreme end result of adverse osmotic pressure in the soil solution. But high salt index fertilizers cause other plant problems that do not show up as dramatically as turf burn. Factors other than salt index should be understood by those serious about managing turfgrass against damage and stress.

A turf manager usually chooses a fertilizer based on such factors as cost, availability and—perhaps—its physical characteristics. But another characteristic associated with each of the nutrient-containing chemicals should be considered before selecting a fertilizer. This characteristic concerns the method through which nutrients become available to the plant.

Nutrients enter the plant through its roots as it draws water from the soil (from what is technically called the soil solution). So nutrients must first become part of the soil solution, regardless of whether they were applied as a liquid or a solid. That is, the nutrients must sooner or later become a part of the soil solution in order for them to be used by the plant. But even once the nutrients are part of the soil solution, they won't necessarily move into the plant through its roots. The determining factor is osmotic pressure.

Osmotic pressure

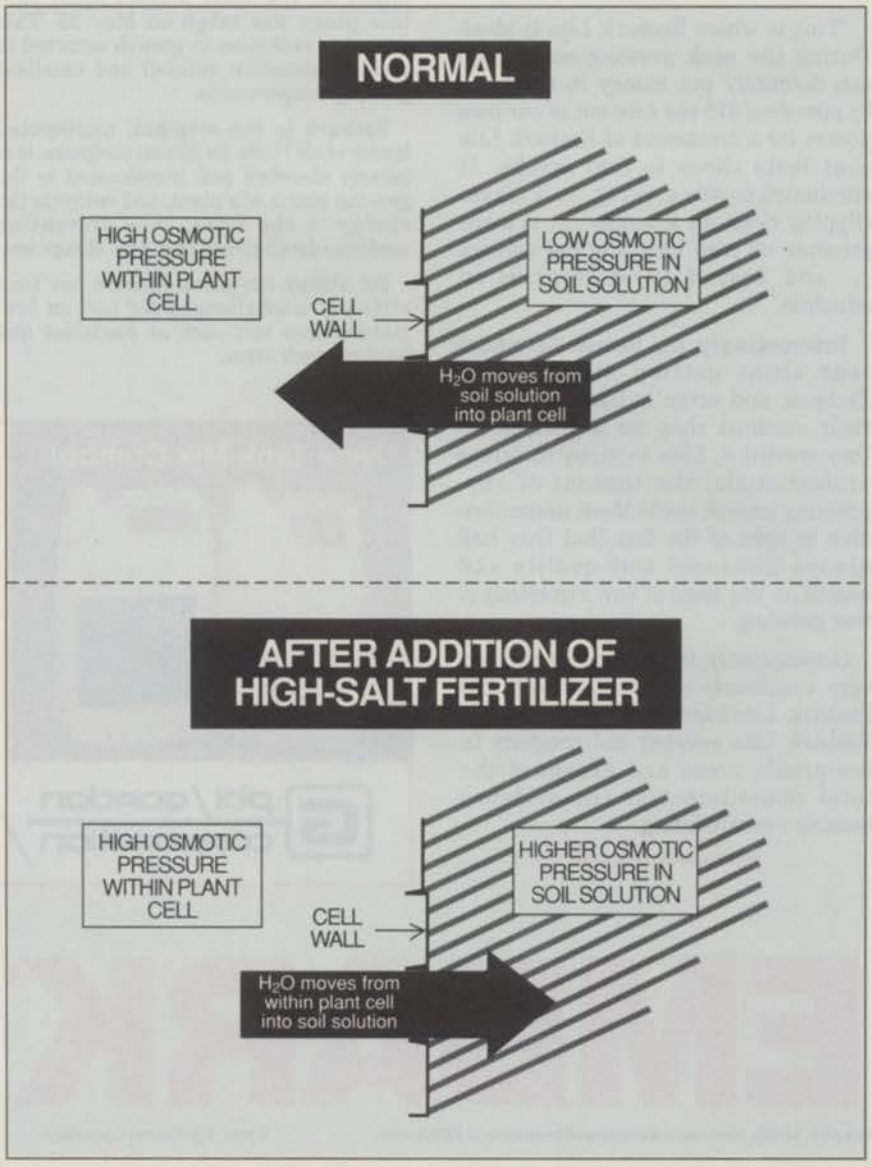
What is osmotic pressure and what does it have to do with the movement of nutrients? Osmotic pressure, in a sense, is a measure of how tightly molecules of water are held together in a solution, the very solution in which turf nutrients have dissolved.

The nutrient-containing chemicals in fertilizers are salts. As salts, they can change the osmotic pressure of a solution, and therein lies at least a potential concern. In order for roots to take up water, it must pass through a cell membrane. This process is only possible when the osmotic pressure of the cell sap is higher than the osmotic pressure of the soil solution outside the cell (Figure 1).

Influences on pressure

Water moves out of a solution that has a *low* osmotic pressure (like the soil solution) and into a solution that has a higher pressure (like plant root cells).

For water to move into plant root cells, the osmotic pressure within the roots must be higher than the osmotic pressure of the soil solution. On the



other hand, if a fertilizer causes an increase in the osmotic pressure of the soil solution above that of the cell sap, water is withheld and may actually be withdrawn from the plant. The result is called "fertilizer burn."

Virtually every fertilizing chemical—organic or inorganic—can cause some increase in the soil solution's osmotic pressure, with effects ranging from minimal to serious. Of course, the rate at which any material is applied has a profound effect on the osmotic pressure. The term "salt index" has been devised to help evaluate a given material's potential to change osmotic pressure.

Watering in a fertilizer helps move soil moisture and dissolved nutrients into root cells.

The salt index of sodium nitrate is given the value of 100 (see Tables 1 and 2) and all other materials are compared to the effect of an equal amount of sodium nitrate. The higher the salt index, the greater that material's potential to increase the soil solution's osmotic pressure and thus burn potential. As indicated in Tables 1 and 2, there are wide difference in the salt indices for commonly-used turf fertilizers.

Note that Table 1 also lists the salt indices of selected nitrogen fertilizers in terms of single units of nitrogen (based on application on a unit basis, lbs./1000 sq.ft.). Although a material such as ammonium sulfate (21 percent nitrogen) has a lower salt index than urea, the salt effect of applied urea is lower because it contains a higher percentage of nitrogen (45 percent).

Consideration should also be given when selecting a potassium source. Note that the salt index of potassium suilfate (0.9) is less than half that of potassium chloride (1.9). Additionally, potassium sulfate is a source of sulfur, a nutrient that turfgrass generally requires at levels similar to those of phosphorus.

Other factors

Burn potential is not totally dependent on the fertilizer's salt index. Moisture status of the soil and the turfgrass plant is also important. If the soil is not very moist, a fertilizer will have a proportionally increased effect on elevating soil solution's osmotic pressure

Watering in a fertilizer increases the volume of the soil solution. This beneficially reduces the osmotic pressure of the soil solution and helps move soil moisture and dissolved nutrients into root cells.

In well-drained soils, however, heavy water applications may also harm the plant by leaching nutrients past the root system. Different nutrient sources also have different rates of potential for leaching. For example, research in Florida has shown that fertilizer applications are exposed to stresses from any of several outside factors such as drought, heat or disease.

Sulfate of potash (SOP) leaches from the rootzone at about one-half the rate of potassium chloride.

Both air temperature and humidity influence a plant's water status and water requirements. That is, as air temperature increases, the plant requires more water. And as humidity decreases, the plant requires more water.

As the osmotic pressure of the soil solution increases, less water is available to the plant. Watering in a fertilizer may increase the water available to the root system by decreasing the osmotic pressure of the soil solution; but it may have the unintended effect of reducing the plant's water requirements by cooling the plant and increasing the humidity of the plant's micro-environment.

Application rates

Soluble fertilizer materials may be used at any time of year with minimal risk of damage to turf, if the factors that contribute to burn are understood. The salt index of a fertilizer material is extremely important, especially when the fertilizer is highly soluble. The rates of application must be lower when a fertilizer with a high salt index is used.

Fertilizers with a low salt index should be used when soil test results indicate that the soil already contains excessive levels of soluble salts or when turfgrass stands receiving a fertilizer application are exposed to stresses from any of several outside factors such as drought, heat or disease. **LM**

Table 1

Nitrate Salt Index

Material	Approx. % N	Avail-- ability	Salt Index	Salt Index per unit of N
Sodium Nitrate	16	Fast	100	6.3
Ammonium Nitrate	33	Fast	105	3.2
Ammonium Sulfate	21	Fast	69	3.3
Potassium Nitrate	14	Fast	74	5.3
Calcium Nitrate	12	Fast	53	4.4
Urea	45	Fast	75	1.7
IBDU	31	Slow	5	0.2
Ureaformaldehyde	38	Slow	10	0.3
Sulfur Coated Urea	38	Slow		*
Natural Organic	5	Slow	4	0.8

*The salt index for sulfur coated urea is the same as urea on a material unit basis, but the salt index is moderatd for SCU over a longer time period.

Table 2

Salt Index Values for Other Fertilizers

Material	Approx. % N	Salt Index	Salt Index per unit of N
Superphosphate	20% P_2O_5	8	0.4
Muriate of Potash	60% K_2O	114	1.9
Sulfate of Potash	50% K_2O	46	0.9
Dolomite	30% CaO	1	—
	20% MgO		
Gypsum	33% CaO	8	0.2
Epsom Salts	16% MgO	44	2.7

QUICKIE-QUIZ

Pre-emergence weed control in lawns

ED. NOTE: Answers to all questions can be found in this month's Pre-emergence Weed Control Guides.

1. Cool-season grasses thrive in the:
a) spring and summer
b) spring and fall
c) summer and fall

2. When first established, cool-season lawns should be given plenty of extra:
a) nitrogen
b) phosphorus
c) potassium
d) all of the above

3. To avoid weed establishment, you should not:
a) apply pre-emergence herbicides
b) mow too low
c) fertilize
d) none of the above

4. Spring aerification should be avoided because:
a) it brings weed seeds to the surface
b) the grass is too wet
c) the turf hasn't yet re-established itself
d) none of the above

5. Which is the only herbicide that can control annual weeds in cool-season grasses at the time of lawn establishment?
a) isoxaben
b) benefin
c) siduron

6. The first really effective post-emergence herbicide for controlling annual grasses in cool-season lawns was:
a) ethofumesate
b) oxadiazon
c) pendamethalin
d) fenoxyprop-ethyl

7. A major problem in the Midwest three of the last four years has been:
a) dry autumns
b) wet summers
c) wet autumns

8. MSMA and DSMA are effective pre-emergence herbicides.
a) true
b) false

9. The need for pre-emergence herbicides should be based on:
a) observed weeds which have emerged
b) observations on site the previous season
c) making an educated guess
d) none of the above

10. The only warm-season pre-emergence herbicide registered for application at sprigging, sodding or sodding is:
a) oxadiazon
b) prodiamine
c) siduron
d) none of the above

11. It is possible to use a single herbicide for controlling weeds in both turf and ornamentals.
a) true
b) false

12. Pre-emergence herbicides in warm season areas are best applied:
a) at least two weeks before expected weed germination
b) when the dogwoods bloom
c) immediately after the first spring rain
d) the first week in March

13. Crabgrass and goosegrass germinate first in warm-season areas:
a) the last two weeks in February
b) in moist areas
c) in dry areas
d) in thin, open stands of grass

14. Applications of pre-emergence herbicides for control of annual bluegrass and certain winter annual broadleaf weeds in warm-season areas may be:
a) mid-December
b) late August to early November
c) January and February
d) none of the above

15. Pre-emergence herbicides need at least:
a) one inch of water within three days of application
b) one inch of water within one week of application
c) one-half inch of water immediately following application
d) one-half inch of water within one week of application

16. If your lawn care or landscaping company does not apply pre-emergence herbicides correctly, you will be subject to:
a) callbacks
b) dismissal
c) legal action
d) execution
e) all of the above

ANSWERS: 1.b; 2.b; 3.b; 4.a; 5.c; 6.d; 7.a; 8.b; 9.b; 10.c; 11.a; 12.a; 13.d; 14.b; 15.d; 16.a (but in some cases, e!)

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Keeping residential landscapes weed-free

by Evert Burt, Wayne Currey and John Burt

The most desirable features of weed control programs in landscape sites are all the practices and procedures that have a positive impact on plant growth in the landscape and a negative impact on weeds.

The encroachment of weeds into a turf is usually the result of a poor turf rather than the basic cause. Weeds commonly establish where the turf is thin and weak. Thin turf usually results from poor species selection for the specific site and improper maintenance practices.

Consider the level of maintenance that will be provided. Although bermudagrasses are considered the most attractive in Florida, they require the highest level of maintenance to look their best. If not properly maintained, bermudagrass will not provide as attractive a turf as St. Augustinegrass. In other words, a well-maintained St. Augustine lawn will provide a better and more attractive turf than will a poorly-maintained bermudagrass.

When selecting a turfgrass, consider the following factors:

● **Shade.** Some turfgrasses, such as St. Augustine, will grow well under moderate shade conditions, while others such as bermudagrass, will not.

● **Soil Conditions.** Turfgrasses vary in their ability to grow in different soils. St. Augustinegrass tolerates high salt; bahiagrass doesn't. Some turfgrasses grow little or not at all on poor, acid soils while others grow much better under the same conditions.

Other environmental factors such as soil texture, the presence of a hardpan, and the degree of slope may influence the selection of turf species.

● **Climate.** Temperature, degree of shade, and air drainage can greatly influence turfgrass growth. Tolerance to these various influences should be considered in the selection process.

Proper cultivar selection

Choosing cultivars not adapted to the particular site usually results in weak, thin turf that is soon followed by the appearance of weeds. Use high quality seed, sod, plugs or sprigs from the outset.

Seed or vegetative material should be planted in soil that is free of perennial weeds. If such weeds are present, consider using a total vegetation control such as glyphosate or fumigate the site prior to planting.

A lawn that is cut too short will eventually thin out and require adjustments in fertilization practices.

Determine the level of maintenance. One cannot achieve putting green quality at a roadside maintenance level. An important consideration in turfgrass selection is the turf manager's ability and willingness to supply the appropriate maintenance to keep the grass in a healthy condition. A dense, healthy stand of grass can be maintained best by adhering to good horticultural practices of mowing, watering, fertilization and pest control.

Mowing is the most basic and universal practice for maintaining a healthy, vigorous and attractive turf.

Reacting to weeds by applying a herbicide usually does not solve the problem. A wiser, more practical approach is to determine why the turf is thin and weedy. Correcting the basic problems of unhealthy turf is a vital part of a sound weed control program that will help prevent future weed problems. Healthy turf is more tolerant of herbicides than is a weak turf. At the same time, healthy weeds are easier to kill.

The common cause

Lack of proper maintenance is the most common cause of weedy turf. Mowing is the most basic and universal practice for maintaining a healthy, vigorous and attractive turf, but it is frequently done improperly.

It is important to realize that all the primary cultural practices—mowing, irrigation and fertilization—are interrelated. If one of the cultural practices is done incorrectly, it will affect the others.

For example, by mowing the turf too short, the grass develops a shallow root system, which will require more irrigation. A lawn cut too short will eventually thin out and require adjustments in fertilization practices. Before changing cultural practices, consider what effects the action will have on total maintenance. **LM**

Evert Burt, Wayne Currey and John Burt are ornamental horticulture consultants based in Ft. Lauderdale, Fla.

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JOBTALK

Supers find conservation, efficiency in PGRs

In the never-ending challenge to maintain healthy, good-looking turf, many golf course superintendents are searching for new and more efficient ways to promote and maintain quality turf while conserving water and using labor more efficiently.

Brae Burn C.C.

Dennis Flynn, superintendent at Brae Burn Country Club in Purchase, N.Y., recently began using Elanco's Cutless 50W plant growth regulator.

Flynn first tried Cutless on his 10th fairway, which was thick with *Poa annua* and needed much watering. After several years' use, he now estimates that water use has been reduced by about 10 percent. The turf transpires less, he says, which reduces turfgrass water use so irrigation frequency can be reduced.

Middle Bay C.C.

Growth regulators can can also reduce mowing frequency.

"With Cutless, we probably reduced our clippings by about 50 percent during the four to five weeks of growth suppression in the spring," says Flynn. "We were able to ease off our regular seven-day mowing schedule and only cut three times a week." Flynn has also lowered the mowing height from 3/4- to 1/2-inch because of the increased amount of bentgrass on the fairways. As a result, equipment use and labor have been reduced, especially in the spring, when workers are better employed cleaning up the course, working on bunkers and getting the course ready for play.

Conserving water

New projects at the Middle Bay Country Club in Oceanside, N.Y. have included application of growth regulators on bentgrass fairways. Superintendent John Carlone selected two fairways to treat because of their contrasting locations. "One was inland and the other was along the ocean," Carlone explains. "The links portion of our course gets a lot of sea breeze and has a sandy soil profile. I applied Cutless on both areas to see if there was any difference in its activity. I haven't seen any significant differences in its effectiveness or growth reduction capabilities in either area. It seems to work well under all the conditions here."

Both Carlone and Flynn mention reduced watering as a great benefit of using Cutless. Carlone has been able to use less water every time he irrigates treated fairways. He says that before using a growth regulator, it was not uncommon for him to water each fairway 20 to 25 minutes per night. That time has been reduced to 12 to 15 minutes. Areas adjacent to the ocean still require more due to drying effects.

Bentgrass thrives

Flynn says his fairways contain more bentgrass now than before he used Cutless. He estimates a 50 percent increase in bentgrass population, and a shorter, denser turf in fairways.

By using Cutless in conjunction with lightweight mowing, proper aerification, overseeding and verticutting, Carlone says he has improved the bentgrass/*Poa* ratio to about 60/40 on the ninth fairway and 70/30 on the 16th fairway. Four years ago, he was looking at a mere 10 percent bentgrass population.

Carlone and Flynn report a slight yellowing of the turf immediately after treating it with Cutless. This is a temporary side-effect, as the growth regulator soon takes effect and the bentrass gradually becomes denser. **LM**