

A New Hue

A guide to using colorants to enhance the color and growth of fine turfgrass in the southwestern U.S.

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In the desert Southwest, golf course industry professionals know the majority of their annual revenue is generated between October and April, when warm temperatures and sunny skies lure out-of-town golfers seeking lush, green golf courses. Historically, many in the industry assumed that overseeding with cool-season grasses was the primary method to achieve such conditions. That business model is changing, due in large part to the ability of the new ultradwarf bermudagrasses to perform exceptionally well during the winter months without overseeding, and the growing trend and acceptance of artificially coloring putting greens.

In the southeastern region of the country, coloring greens has become a widely accepted practice, but in the Southwest anything other than overseeding to achieve a green hue was simply unimaginable, at least until recently. Thanks to a growing number of pioneering superintendents and research conducted by the USGA and the University of Arizona, artificially coloring greens is catching on. It is catching on at high-end private clubs, at resort courses competing for the discerning traveler, and at daily-fee facilities. In fact, the popularity of colorants is growing at such a fast pace that new products seem to appear in the market monthly. Consequently, there is a need for research and field trial demonstrations to compare and evaluate the new colorants and to determine how these products could be best applied for optimal performance in the unique southwestern environment.

Although research on colorants has been performed in the Southeast (1,3,5,6), very little work has been done to evaluate colorant use in the desert Southwest, where the bermudagrass dormancy period is typically shorter



Colorants applied Dec. 3, 2009, faded after six weeks. When reapplied, less product was required to achieve the desired result.



Colorants were applied using a CO₂-powered backpack sprayer with a hand-held three-nozzle boom with TwinJet™ 8008 flat fan nozzles spaced 20 inches apart.

and often intermittent when compared to other regions. For example, turf managers in the Southeast often report that only two or three colorant applications are needed to maintain an attractive, green hue throughout the dormancy period. The key is that bermudagrass enters dormancy in November and does not resume growth until mid-March of the following spring. In other words, once the colorants are applied, very little product is removed by mowing. In contrast, during the months of December through February in the desert Southwest, temperatures will intermittently be high enough to produce bermudagrass growth, albeit only minimal. Consequently, turf growth occurs and mowers remove the colorant. With this in mind, the colorant strategies employed in the Southeast may not necessarily furnish desirable effects in the Southwest.

Previous articles have identified the benefits of not overseeding and instead utilizing colorants or “tinting” as a strategy to provide green color during the bermudagrass dormancy period. This article will not reiterate this position; rather, it will summarize recent research on colorants completed by the USGA in conjunction with the University of Arizona, as well as offer a summary of lessons learned from this research.

RESEARCH RESULTS — INITIAL RESEARCH 2009–10

During the winter of 2009-10, research was conducted on three ultradwarf putting greens (two MiniVerde and one TifEagle) at the Arizona State University Polytechnic campus practice golf facility. Colorants were initially applied on semi-dormant bermudagrass in early December 2009.

Five products were evaluated to color the greens: Green Lawngr™, Match Play™, Ultradwarf Super™, Match Play Ultradwarf Plus™, Wintergreen™, and Turf Dye Southwestern™. Products were applied once or twice during the winter dormancy period. Green Lawngr™ and Wintergreen™ were less viscous compared to the Match Play™ products and yielded an easier spray and subsequent cleanup. The more viscous products required

more agitation of the spray tank, resulted in nozzle clogging, and required more effort to clean up.

Surface temperatures were measured with an infrared thermometer on Feb. 4, 2010. All products except Wintergreen™ tended to enhance surface temperatures when compared to the nontreated area (Figure 1).

The following were the most important lessons learned from this initial study:

- Most of the colorant products tended to warm the surface when compared to untreated areas.
- When applied after turf color loss had already occurred, two to three times more product was required to achieve the desired appearance.
- These colorants must be applied using a diaphragm or roller pump due to the product thickness and binding agents and detrimental effects on the seals of centrifugal pumps.
- In the Southwest, one to two applications were not sufficient to consistently maintain an aesthetically attractive surface throughout the winter and into spring.
- In retrospect, the colorants were applied too late, as the turf had lost

much of its green color, a lesson that would prove valuable in subsequent years. Colorants applied to turf with little background color (i.e., dormant turf) required substantially more product to achieve the desired effect.

RECENT RESEARCH 2011–12

Building upon the lessons learned from the initial study and motivated to educate ourselves and turf managers about new products on the market, a second series of studies was initiated in November 2011. The first location was Whirlwind Golf Club in Chandler, Arizona. Superintendent Mick Twito offered a TifEagle putting green that was not overseeded. The second green was located at Paradise Valley Country Club, Paradise Valley, Arizona, where superintendent Rob Collins provided his non-overseeded Champion bermudagrass nursery green, which was five years old.

WHEN DID THE STUDY BEGIN?

The first applications were made Nov. 17, 2011, prior to the onset of winter dormancy. The turfgrass at both sites retained its green color when the study began. The goal was to provide attractive surfaces that meet or exceed

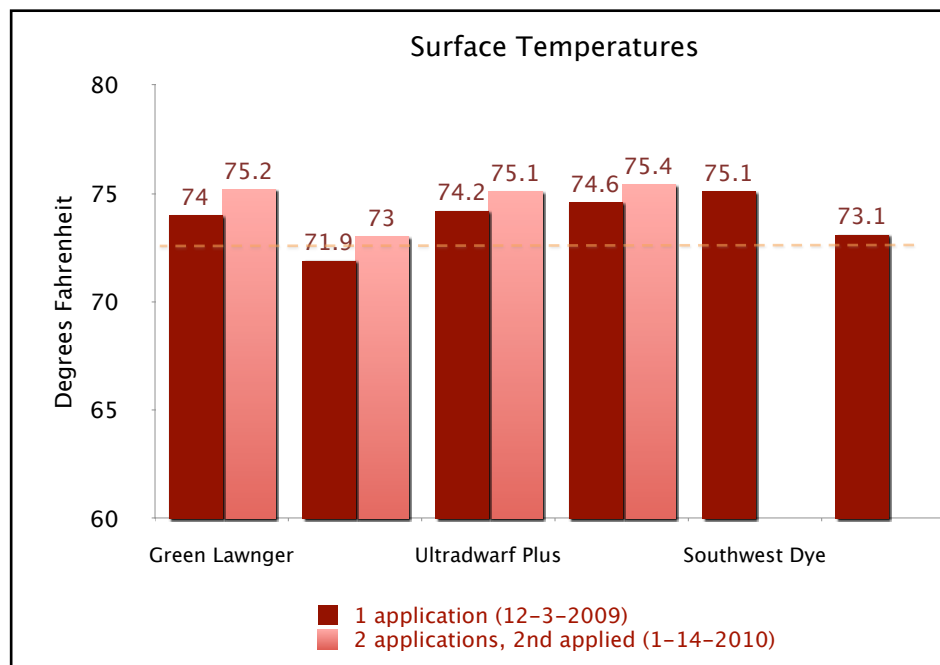


Figure 1. Surface temperatures on Nov. 4, 2010, of a putting green established with Miniverde bermudagrass and treated with one application (12-3-2009) or two applications (12-3-2009 and 1-14-2010) of five different turf colorants and an untreated area.



The products containing binding agents generally produced a darker color (left) and, consequently, warmer soil and surface temperatures. Lower-viscosity colorants (right) were easier to spray and clean up and tended to enhance surface temperatures when compared to the nontreated area.

golfer expectations typical in the Southwest on a daily basis.

EQUIPMENT

Colorants were applied using a CO₂-powered backpack sprayer with a hand-held three-nozzle boom outfitted with TwinJet™ 8008 flat fan nozzles spaced 20 inches apart. Products were sprayed in a single direction in two passes (10 feet plot width) to represent the method used by most turf managers in the region. Two directions in a cross pattern may offer more enhanced and thorough coverage; however, many turf managers do not have time to spray more than one direction during a time of year when the course is busy and day length is short.

PRODUCT RATES AND FREQUENCY

A total of 11 colorants were applied weekly or every other week, depending on the appearance of the turf. From Nov. 17, 2011, through Feb. 16, 2012, colorants containing binding agents (often referred to as paints, including GreenLawnger™, WinnerPlay™, Color2Grass™, and Turf Dye Southwestern™) were applied on seven occasions. Binding agents form a film on the painted surface (in this case the turfgrass leaf) to increase product longevity. Colorants with a lesser concentration of binding agents or none at

all (e.g., Par™, Foursome™, Pigment Green™, Sarge™, and Green Toes™) were applied more frequently (nine applications during the same time period). Rates varied widely among the products (Table 1). After the fourth or fifth treatment, depending on the product, rates were reduced (these rates are listed in Table 1 in the column

labeled Part 2). Rates were reduced due to two factors:

Cold weather offers the opportunity to reduce colorant rates and continue to achieve desirable turf appearance. In cold weather, where less than five heat units accumulate per day (as measured and computed by AZMET, 86/55 model, <http://ag.edu/azmet/>),

Colorant Application Rate for Part I and Part II of the Research Study from November 2011 Through February 2012 at Paradise Valley CC and Whirlwind Golf Club				
Treatments	Title	Product: Water	Rate/acre (Part 1)	Rate/acre (Part 2)
1	Winnerplay	1:40	6.5 gal/acre	1.6 gal/acre
2	Green Lawnger	1:40	6.5 gal/acre	1.6 gal/acre
3	Green Lawnger + US Specialty Colorants	1:40	6.5gal/acre (each)	1.6 gal/acre (each)
4	Green Toes		65.3oz/acre	32 oz Green Toes + 0.5 gal Warmup/acre
5	PAR		20oz/acre	10 oz/acre Par + 1.6 gal Gr. Lawnger/acre
6	Foursome		20oz/acre	10 oz/acre Foursome + 0.5 gal Warmup/acre
7	Pigment Green		20oz/acre	10 oz/acre Griggs + 0.5 gal Warmup/acre
8	PAR + Warm Up		16oz/acre Par + 2gal Warmup/acre	10 oz/acre Par + 0.5 gal Warmup/acre
9	US Specialty Colorants	1:40	6.5gal/acre	1.6 gal/acre
10	Sarge		40oz/acre	20 oz/acre Sarge + 0.5 gal Warmup/acre
11	Color2Grass	1:40	6.5gal/acre	1.6 gal/acre

Table 1. Colorant application rates during Part 1 and 2 of the 2010-11 study.

there is very little or no bermudagrass growth and, as a result, mowing does not remove colorant from the turfgrass leaves.

After the fourth or fifth (or sooner), a foundation color is established and only “touch up” applications are necessary, assuming that the colorant is not removed by mowing.

Did the colorants have an effect on soil and/or surface temperatures?

Soil and surface temperatures were measured throughout the study using a temperature probe and infrared thermometer at three locations within each treatment plot. Soil temperatures were measured at the 1-inch depth. In general, products containing binding agents (e.g., Green Lawnger™, Turf Dye Southwestern™, Color 2 Grass™, and WinnerPlay™) exhibited warmer soil and surface temperatures than colorants with lesser concentration or no binding agents (Tables 2 and 3). Although no statistical analysis was performed on these results, the trend showed that all products increased soil and turf surface temperatures. In fact, on more than one occasion, heavy frost occurred at the colder Whirlwind Golf Club site and the ice that formed melted faster in the treated plots.

Which colorants lasted the longest?

GreenLawnger™, TurfDye Southwestern™, Color2Grass™, and WinnerPlay™ retained color longest in this study. Although these products last longer (up to four to eight weeks in cold weather), they are also more difficult to apply as a function of their higher viscosity. Such a characteristic may not necessarily be desirable, at least not on putting greens, because regular applications are required to maintain a high level of aesthetics. For this reason, turf managers in the Southwest prefer to apply a product that can be easily added to their weekly liquid fertilizer applications. Although products such as Par™, Foursome™, Sarge™, Pigment Green™, and Green Toes™ did not last more than 10 to 14 days in this study, they all performed well when applied on a regular, frequent schedule.

Did the colorants impact soil moisture? Soil moisture was measured throughout the study with a port-

able moisture meter fitted with 3-inch probes. Given the trend to warm the soil and surface, it was expected that the colorants may result in soil drying. In this study the colorants did not impact soil moisture, but turf managers are strongly encouraged to monitor soil moisture during the winter dormancy period.

Which colorant exhibited the best color? As one might expect, the answer to that question lies in the eye of the beholder. We can safely say

that any of the products utilized in this research can be used to successfully enhance the color and growth of putting greens in the Southwest. However, it was clear that some of the products exhibited a bluer hue than others. We are communicating with manufacturers in an effort to improve the color of the products.

Did the colorants rub off on clothing or golf balls? Most colorants tested were rainfast within one hour of application. One treatment, Green

Paradise Valley CC – Average Surface and Soil Temperatures			
Average Surface Temperature F	Treatment	Average Soil Temperature F°	Treatment
64.6	Non Treated	57.9	Non Treated
66.4	Green Toes	58.6	Foursome
67.1	Color2Grass	58.7	PAR
67.1	PAR	58.9	Pigment Green
67.4	Foursome	59.0	Green Toes
67.5	Pigment Green	59.2	Color2Grass
67.6	Sarge	59.4	Sarge
68.8	PAR + Warm Up	59.7	PAR + Warm Up
68.9	Green Lawnger	59.9	Green Lawnger
70.0	US Specialty Colorants	60.3	Green Lawnger + US Specialty Colorants
70.5	Green Lawnger + US Specialty Colorants	60.4	US Specialty Colorants

Table 2. Average surface and soil temperatures measured between Nov. 17, 2011, and Feb. 16, 2012, on a Champion bermudagrass nursery green at Paradise Valley CC in Paradise Valley, Arizona.

Whirlwind Golf Club – Average Surface and Soil Temperatures			
Average Surface Temperature F°	Treatment	Average Soil Temperature F°	Treatment
48	Non Treated	44.0	Non Treated
49	Green Toes	45.0	PAR
49	PAR	45.0	Green Toes
49	Color2Grass	45.3	Pigment Green
50	Pigment Green	45.5	Foursome
50	Foursome	45.6	Green Lawnger
50	Sarge	45.6	PAR + Warm Up
51	PAR + Warm Up	45.8	Sarge
51	Winnerplay	45.8	Winnerplay
51	Green Lawnger	45.8	US Specialty Colorants
52	US Specialty Colorants	45.8	Color2Grass
53	Green Lawnger + US Specialty Colorants	46.0	Green Lawnger + US Specialty Colorants

Table 3. Average surface and soil temperatures measured from Nov. 17, 2011, through Feb. 16, 2012, on the Tifeagle bermudagrass north practice putting green at Whirlwind Golf Club in Chandler, Arizona.

Toes™, did rub off, even the day after. If applying the morning before play, it is best to allow the colorant to dry for an hour prior to golf.

What might you expect to pay to color greens for an entire season?

On a per-acre basis during the period from mid-November through mid-February, costs ranged from as little as \$220 per acre for Pigment Green™ to as high as \$2,400 per acre for the combination of GreenLawnger™ plus Turf Dye Southwestern™. The average cost per season (during the entire study period) of all colorant treatments at the Whirlwind site was \$781 per acre (Table 4) and \$964 per acre for Paradise Valley CC, where one additional application was made. A comparison in costs to overseeding is difficult due to the wide variance in overseeding inputs, such as cost per labor hour, water costs, seeding rate, turf variety, overseeded acreage, and costs associated with treating for disease. In the end, the decision to forgo overseeding is not often motivated by economics; rather, golf facilities make the choice to achieve improved playability for more golfing days.

TOP 10 LESSONS LEARNED FROM THE 2011–12 STUDY

When to initiate colorant. Colorant applications should begin in the fall when temperatures and growth have decreased, but color has not diminished. For optimum appearance, the first should begin approximately two to three weeks prior to the first frost. Given that the turf is still growing following this, turf managers may want to add a growth regulator to the spray mixture to limit growth and colorant removed by mowing. Beginning the colorant program early rather than late will produce a seamless transition from summer color to artificially colored turf.

How often to apply? In the Desert Southwest, colorants should be applied frequently to provide an attractive green appearance on a daily basis. Depending on the product, achieving such a goal may require weekly applications. Products containing binding agents may last several weeks or up to several months in colder regions. In

Treatments	Colorant	Gal/Acre per Study period	Gal of Warmup Added	Gal of Green Lawnger added	Cost/Gallon \$ (as of 4-2012)	Cost per Acre per Study Period
1	Winnerplay	26			50	\$688
2	Green Lawnger	26			50	\$1,271
3	Green Lawnger + US Specialty Colorants	26			50/42.99	\$2,409
4	Green Toes	2.8	2		100/300	\$333
5	PAR	0.9		6.4	150/50	\$522
6	Foursome	0.9	2		150/300	\$224
7	Pigment Green	0.9	2		150/300	\$222
8	PAR + Warm Up	0.9	10		150/300	\$695
9	US Specialty Colorants	26			42.99	\$1,138
10	Sarge	1.9	2		150/300	\$265
11	Color2Grass	20			45	\$819

Table 4. Colorant costs per acre for the entire research study (November 2011 through February 2012) at Whirlwind Golf Club in Chandler, Arizona.

the southwest region, however, some growth is likely, so more frequent applications are necessary to achieve the desired appearance.

What products can most easily be sprayed on a frequent schedule?

Products with little or no binding agents, such as Par™, Foursome™, Pigment Green™, Sarge™, and Green Toes™ can be applied in combination with a liquid fertilizer with ease. In communications with several turf managers in this region, they prefer to use products that are easy to spray, especially when applying on a weekly schedule.

What rate is best to start with?

Unfortunately, the recommended label rates for many products are not particularly helpful. The recommended rate may serve as a starting point, with trial and error being the best way to learn how much to apply on your course. If using a product mentioned in this article, start with the rate displayed in Part I in Table 1. If using any other product, consult with the manufacturer representative or seek advice from local turf managers who have experience with the product. Remember that the rate will depend on the turf background (or existing turf color), the type of turf, and, ultimately, the desired

effect that will impress your golfing customers.

Will colorants hide imperfections in the greens, such as old hole scars, thin turf, and ball marks?

Although the colorants do appear to reduce the visibility of superficial surface imperfections such as ball marks, they do not hide thin turf or other surface irregularities such as grain.

Given that colorants warm the soil and surface, what impact does this have on the winter dormancy period?

Although we were not able to directly quantify the colorant effect on turf growth, it was apparent that all the treated areas resumed growth and achieved green color prior to nontreated areas in February 2012. It was estimated that the colorants may have reduced the winter dormancy period by as many as 14 to 20 days.

What is the biggest mistake to avoid? Do not be afraid to make the putting surfaces green and keep them green. Green coloring programs that have not performed well in the past were most likely a result of applications being too light or applied too infrequently.

How much should you expect to pay for colorants during the winter



In mid-November when the colorants were first applied, the TifEagle bermudagrass green at the Whirlwind Golf Club site retained its natural green color.

A research trial was initiated in November 2011 to evaluate colorant technology and various strategies on two ultradwarf bermudagrass putting greens.

months? Based on the average costs from this study, expect to pay \$800 to \$1,000 per acre if applying regularly from November through February. Of course, costs vary widely and some may only spend \$250 per acre, while other programs may cost as much as \$2,500 per acre.

What is the best approach to starting a colorant program? Start now. Do not wait until cold temperatures arrive. Begin your own trials with a few locally available products and become familiar with the ease of handling, which nozzle configuration performs best for you, and which color you and your golfers prefer.

What methodology is best? Turf managers in the Southwest have been successful applying colorants with a traditional self-contained boom sprayer or walking spray boom. If a hand-held spray wand is used, the rate often skyrockets, with little to no improvement in appearance. Medium to large orifice flat fan or twin flat fan nozzles such as TwinJet™ 8008 are most commonly used.

WHAT'S NEXT?

In the fall 2012, we will continue to investigate new products introduced to the market this summer and compare the performance with already proven colorants. The project will focus on identifying products that can be mixed with liquid fertilizer, growth regulators, and/or pesticide applications. The primary goal will be to educate turf

managers in the desert Southwest about the pros and cons of various colorants and how this technology can be successful for improving putting green performance during limited growth months.

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