



**No matter what,  
play on**

# No matter what play on

Consistency Flexibility Versatility

## The Treatment

A prescribed Stressgard solution is applied to prevent or address biotic and abiotic stresses.

## Stress mitigation begins

Positive impact to the chloroplasts in plant cells leads to improved photosynthesis.

## Long term colour sets in

Plant begins to exhibit healthier canopy colour as a result of improved chlorophyll stability.

## Benefits continue

With sustained plant processes leading to improved rooting, better turf density and resiliency.

## High performing turf

Turf remains protected and delivers consistency in density, colour and quality.

## → Benefits Beyond Disease Control

Over the past 25 years, one technology has helped shape an entire category of plant protection products for golf course superintendents. Envu Stressgard fungicides offer plant health benefits that go beyond disease control to mitigate abiotic stresses across the golf course.

The physiological benefits of Stressgard have been proven in the laboratory, controlled environments, university field trials, and real-world golf course demonstration trials.

## → A New Era of Turf Health Research

Envu continues to explore the beneficial effects of Stressgard with research projects across the globe. One commonality across trials is that Stressgard fungicides consistently outperform other pigments and plant health products when it comes to overall turf quality and mitigating stresses like traffic, heat, shade, and drought. The remaining question after years of research is exactly how Stressgard works physiologically.

Now, by partnering with leading turfgrass physiologists and using modern advances in biochemical research, we've taken a deeper look into the underlying mechanisms that drive plant health to answer the question, How?

A 2019 research trial by Dr. Bingru Huang at Rutgers University investigated, in the absence of any disease pressure, the influence of Signature Xtra Stressgard and other phosphonate-based products and pigments on factors involved in turfgrass stress responses. These factors included:

- > Chlorophyll-related enzymes: Chlorophyll is built and destroyed in a cyclical pattern. Individual components of this process can be influenced by various abiotic stresses (heat, drought, traffic etc.). We can measure the enzymes associated with chlorophyll synthesis (the builders) and degradation (the destroyers) to gain a better understanding of what's going on during plant stress.
- > Chlorophyll content: Chlorophyll is the machinery in the plant which carries out photosynthesis and builds energy reserves. Direct measurements of chlorophyll via extraction are most indicative of the health of the photosynthetic systems in the plant.
- > Membrane stability: Measured via electrolyte leakage, membrane stability is a hallmark of stress response in intact plant cells and is widely used as a measure of plant stress tolerance.





A powerful turf fungicide which delivers fast and thorough disease control leading to visibly healthier turf. Contains a unique combination of contact and mesostemic action to prevent, cure and eradicate diseases such as dollar spot, brown patch and fusarium.



Provides outstanding broad-spectrum disease control, turf quality and application flexibility. Contains a unique SDHI active ingredient as well as new Leaf-Cote technology to improve spray droplet coverage and retention, as well as reduce dry time on the leaf.



A proven active ingredient in an innovative formulation offering contact and protectant control of dollar spot and brown patch in turf. Ideal as a cost-effective option to incorporate in a Stressgard program.



An innovative Signature formulation with new and improved Stressgard Formulation Technology components and an optimized active ingredient that delivers improved control of pythium and anthracnose as well as plant health performance and application flexibility for turf managers.



The first DMI fungicide with Stressgard Formulation Technology, it offers strong control of tough, soil-borne and foliar fungal diseases. Proven to have low growth regulatory impact on both cool and warm-season turf, it can be used confidently for early-season applications targeting Fairy Ring, as well as mid-season application against diseases such as anthracnose, brown patch and dollar spot.

Product/ Disease	Anthrachnose	Brown Patch	Dollar Spot	Fairy Ring	Fusarium	Gray Leaf spot	Helminthosporium	Pythium	Rust	Take-All Patch
Exteris Stressgard		+	+		+	+	+		+	
Interface Stressgard		+	+		+	+	+		+	
Reserve Stressgard		+	+							
Signature Xtra Stressgard	+							+		
Dedicate FORTE Stressgard	+	+	+	+	+	+	+		+	

### → Best Practice Guidelines

- > Stressgard works proactively. Photosynthesis is enhanced if the turf is treated preventatively before the onset of leaf stress. Preventative treatment also allows for chlorophyll levels to be maintained, carbohydrate reserves to be built up and for root systems to become strengthened.
- > Begin applications prior to onset of stress and continue through stress period.
- > Choose the Stressgard products that provide efficacy against the target diseases at your facility and manage resistance.
- > Follow label directions for each product.



NDVI\* imagery, taken 25th March, comparing the turf on the 17th green treated with a Signature Xtra Stressgard program versus the 2nd green with a standard program. The results show turf in the Signature Xtra Stressgard treated green is healthier and more consistent.

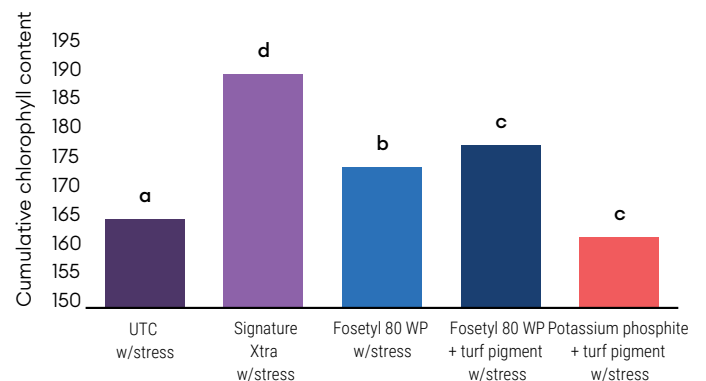
\*NDVI = normalised difference vegetation index.

## → The Results

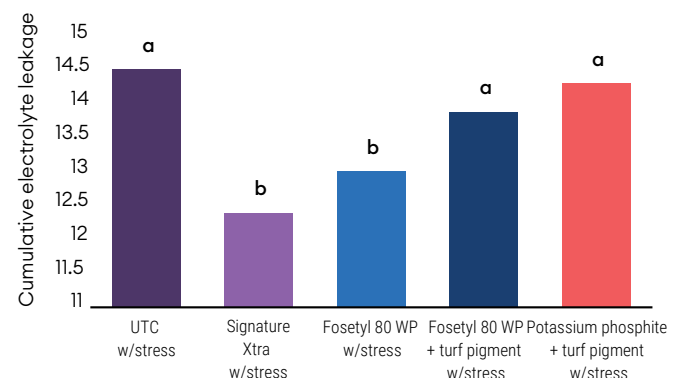
Though previous research has shown the positive effects of Stressgard on chlorophyll and photosynthesis under heat stress, this new research further confirms stress mitigation through the maintenance of chlorophyll and membrane stability with Signature Xtra Stressgard. Under heat stress conditions, when compared to the untreated control and other competitive products, turf treated with Signature Xtra Stressgard resulted in:

1. **Significantly HIGHER levels of chlorophyll** indicating healthier photosynthetic systems during stress (Figure 1).
2. **Significantly LOWER chlorophyll degrading enzyme activity** indicating protection or mitigation of chlorophyll destruction during stress.
3. **Significantly LOWER electrolyte leakage** indicating greater membrane stability during stress (Figure 2).

**Conclusion:** Photosynthesis is the driver of all plant energy production and subsequent processes. The protection and maintenance of chlorophyll with Stressgard ultimately improves the turf's ability to photosynthesize, which is beneficial to all turfgrass under any stress condition. Two decades of research has continued to support the unique and unparalleled effects that Stressgard fungicides deliver beyond disease control.



**Figure 1.** Cumulative chlorophyll content before, during and after 42 days of heat stress. Note significantly higher chlorophyll content in Signature Xtra Stressgard treatment.



**Figure 2.** Membrane stability as indicated by cumulative electrolyte leakage throughout the duration of the stress study. Note significant reduction in membrane leakage with Signature Xtra Stressgard treatment, signifying a more stable membrane.

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## Benefits of using Stressgard

Stressgard® is an advanced formulation technology developed by Bayer, proven in independent research to mitigate stress and deliver consistent turf quality for a better playing experience. Stressgard isn't just one product, but a whole portfolio that gives you flexibility and versatility to deliver consistent, high quality playing surfaces under any conditions.

Envi Stressgard fungicides enhance plant processes such as photosynthesis and chlorophyll production. They work on the outside and inside of the plant to protect turf from fungal attack, heat, drought, shade, traffic and excess solar radiation, so you can play on, no matter what.

## Stressgard benefits provide: Versatility; Consistency; and Satisfaction

### Versatility

- Stressgard is available in a portfolio of fungicides spanning 6 different active ingredients across 6 different mode of action groups.
  - > The portfolio allows you to choose the right product for the right time of year based on agronomic need (biotic and abiotic stresses).
  - > Since Stressgard products do not rely on a single active ingredient or class of chemistry to deliver results, the portfolio can be incorporated into any program, minimising concerns about resistance management and minimising the likelihood that diseases not currently expressing themselves reappear.
- Stressgard programs go beyond disease control to improve turf health and alleviate abiotic stresses including heat, drought, traffic, shade and excess solar radiation.

### Consistency

- Stressgard programs deliver the consistent playing conditions your customers want and the day-to-day reliable turf quality you deserve.
  - > The proven proprietary pigment in Stressgard products delivers immediate aesthetic improvement and consistent, natural colour across the treated areas of your facility.

- > Longer-term, Stressgard works to enhance chlorophyll content and improve plant physiological functions, especially in stressful environments. This means a greener, healthier turf surface better able to withstand the unpredictable tests of Mother Nature.
- Stressgard products are formulated specifically for turf applications and are effective in all environmental conditions with no phytotoxicity concerns.

### Satisfaction

- Playing conditions are the primary driver of player satisfaction
  - > Stressgard programs deliver extraordinary turf quality beyond traditional fungicides. The mitigation of abiotic stresses including foot and mechanical traffic results in better playing conditions
- Turf managers using Stressgard have reported spending less time on tasks like hand watering and scouting, lower irrigation run times, less fertilisation requirements and more confidence with plant growth regulators throughout the season.
  - > With Stressgard, you can worry less about turf performance through those high stress periods.



**Your success,  
our science**



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