Investigating the Efficiency of an Anti-evaporation Fabric to Control Evaporation from Surface Water Supplies.

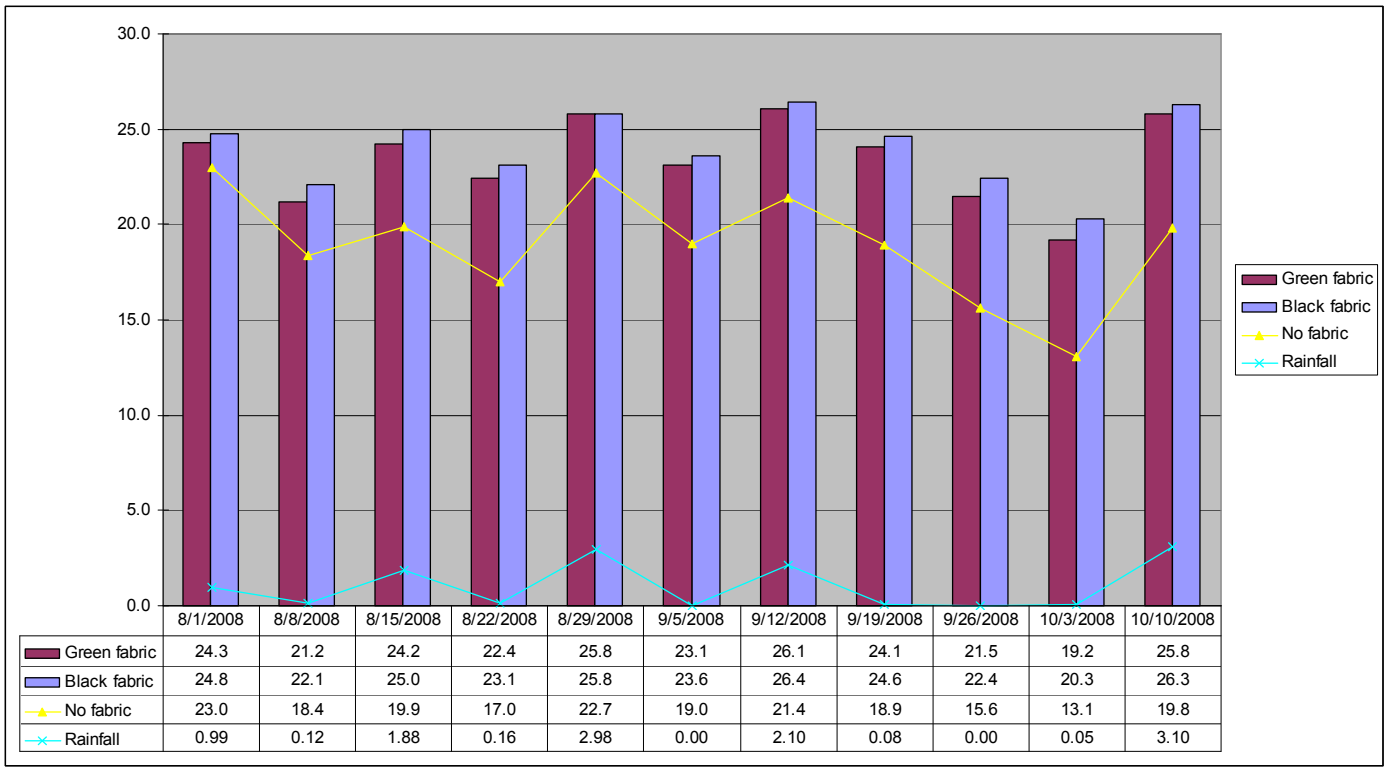
Drs. Matthew Chappell and Marc van Iersel

Irrigation water is an increasingly valuable commodity in Georgia and the Southeast. It is crucial that the nursery industry use the available water resources as efficiently as possible for the industry to remain economically viable. One potential area for water savings that has received practically no attention is evaporative water loss from irrigation ponds. Evaporative water loss from a pond can be almost 2" per week in summer, which equates to 45,000 liters (over 11,000 gallons) per week for a pond with an area of 10,000 square feet (or 1.1 gallon/ft2/week). Reducing this evaporative water loss would increase the amount of water available for crop production.

TenCate Geosynthetics (Almelo, Netherlands) is a company that has developed two special fabrics that purportedly reduce evaporative water loss from ponds up to 99%. These double woven synthetic fabrics allow rainfall and any runoff collected from the nursery to pass through, but reduce evaporation by preventing sunlight from reaching the water surface. By not allowing sunlight to reach the water, the fabrics also reduce algal growth in retention ponds that can clog intake pipes when water is re-used and lead to eutrophic conditions in the pond ecosystem.

The experiment included three treatments, each consisting of five- 56.78 liter galvanized steel tubs. Treatments one and two consisted of the two TenCate anti-evaporation fabrics and treatment three was a control with no anti-evaporation fabric. Individual tubs were filled with 52.58 liters of water (25 cm depth) on July 25th. Measurement of depth of water in cm was taken weekly beginning August 1 and ending October 10. Weekly rainfall data was also collected to calculate total evaporation with and without rainfall inputs.

Figure 1. Graphical representation of water levels over 11 weeks beginning July 25 and ending October 10.



	8/1/2008	8/8/2008	8/15/2008	8/22/2008	8/29/2008	9/5/2008	9/12/2008	9/19/2008	9/26/2008	10/3/2008	10/10/2008
Green fabric	24.3	21.2	24.2	22.4	25.8	23.1	26.1	24.1	21.5	19.2	25.8
Black fabric	24.8	22.1	25.0	23.1	25.8	23.6	26.4	24.6	22.4	20.3	26.3
No fabric	23.0	18.4	19.9	17.0	22.7	19.0	21.4	18.9	15.6	13.1	19.8
Rainfall	0.99	0.12	1.88	0.16	2.98	0.00	2.10	0.08	0.00	0.05	3.10

When considering all treatments; Figure 1 graphically represents mean water levels from all three treatments over all test dates. Both fabrics (bars) were statistically equivalent (Table 1) in the level of water drop due to evaporation and significantly reduced evaporative water losses compared to the control with no fabric (yellow line).

Table 1. Mean water depth from each treatment for each week of the study, including mean separation based on least significant difference (LSD) at P>0.05 and significance of test based upon ANOVA.

	8/1/2008	8/8/2008	8/15/2008	8/22/2008	8/29/2008	9/5/2008
	Mean (cm)	Mean (cm)	Mean (cm)	Mean (cm)	Mean (cm)	Mean (cm)
2^Z	24.8 A	22.1 A	25 A	23.1 A	25.8 A	23.6 A
1^Y	24.3 A	21.2 B	24.2 B	22.4 A	25.8 A	23.1 A
3^X	23 B	18.4 C	19.9 C	17 B	22.7 B	19 B
Pr>F	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

	9/12/2008	9/19/2008	9/26/2008	10/3/2008	10/10/2008
	Mean (cm)	Mean (cm)	Mean (cm)	Mean (cm)	Mean (cm)
2^Z	26.4 A	24.6 A	22.4 A	20.3 A	26.3 A
1^Y	26.1 A	24.1 A	21.5 A	19.2 A	25.8 A
3^X	21.4 B	18.9 B	15.6 B	13.1 B	19.8 B
Pr>F	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

z- Fabric 1 (Black) y- Fabric 2 (Green Fabric) x- Control (No Fabric)

When extrapolating water loss from the tubs (surface area= 2.7 square feet) to a one acre surface area (43,560 square feet), water losses/gains are staggering (Table 2). Including rainfall in the model, the two fabric coverings actually had a net increase in water level of 7,169 and 11,652 gallons. However, with no cover there

was a net loss of 46,608 gallons. This equates to a weekly loss of 4,237 gallons. If rainfall is excluded from the model, all treatments lost significant amounts of water via evaporation. Both fabrics lost roughly 180,000 gallons over an eleven week period per acre, or 16,363 per week. The control had a substantially higher estimated water loss of 237,519 gallons or 21,592 gallons per week. Comparing the three treatments, the fabrics reduced evaporative 80- 87% when the real world model including rainfall is used.

Table 2. Extrapolated water gain or loss from each treatment to a one acre surface area over the 11 week period between July 25 and October 10. Parenthesis indicate a net loss.

Including Rainfall		Excluding Rainfall	
Treatment	Per Acre Gallon Change	Treatment	Per Acre Gallon Change
Fabric 2	7168.64	Fabric 2	(183742.29)
Fabric 1	11652.24	Fabric 1	(179258.70)
Control	(46608.96)	Control	(237519.90)

This research speaks to the broad steps and new ideas that the green industry will need to implement to remain competitive at a national scale and fend off political pressure at the local and state level to reduce 'visible' water use. While these two fabrics are in the research and development stage, their use could lead to reduced water cost and consumption while eliminating algal growth that causes increased equipment and labor cost.

Special thanks to TenCate Geosynthetics & Industrial Fabrics for supplying fabric and Mike McCorkle for upkeep of the study and data collection during this study.