

The Effect of an Anti Transpirant on Transpiration and Photosynthesis of Cotton

A.K. Dobrenz, B.B. Taylor, Carl Michaud, and T. Peoples

Cotton plants were established in ten liter size pots and grown outside of the greenhouse for a period of 6 weeks. Plants were then sprayed with different rates of a hydrophilic polymer anti transpirant which included 1) control, 2) anti transpirant for one second, 3) anti transpirant for 2 seconds, 4) anti transpirants for 4 seconds and 5) the entire plant was completely covered with the anti transpirant material. The weight of the pots was recorded immediately after the spray was applied at 8:00 a.m. and pots were then weighed at 6:00 p.m. each day. The leaf area of the cotton plants was determined and transpiration rates were calculated by dividing the amount of water loss due to transpiration by the total leaf area of each plant.

Results: The first series of treatments in Table No. 1 did not include a surfactant. The transpiration rate expressed as $\text{g H}_2\text{O dm}^{-2} \text{ hr}$ showed that there was a slight reduction in the amount of water lost from the leaves when the entire plant was covered with the anti transpirant. However the range in transpiration rates was similar to those for the other 4 treatments. The data presented in Table 2 represents the transpiration and photosynthetic rates of cotton with a surfactant included with all treatments. The average rate of photosynthesis for the anti transpirant treatments was not significantly different from the control. The photosynthetic rates ranged from 19 to 30 $\text{ml dm}^{-2} \text{ hr}$. Transpiration rates were not different from the control when cotton plants received the anti transpirant at 4 different rates. The results of this experiment indicate that the anti transpirant material was not effective in reducing the water loss from cotton leaves at the suggested rate of application. The information indicates that a more effective compound will have to be developed in order to significantly control the transpiration rate of cotton in Arizona.

Table 1. Transpiration per pot and transpiration rate ($\text{g dm}^{-2} \text{ hr}^{-1}$) of cotton.

Treatment	Transpiration			Leaf Area cm^{-2}	7 hrs. transpiration	
	Loss pot in gm				$\text{g/dm}^{-2} \text{ hr}^{-1}$	Range
	3 July	3-5 July	6 July			
1	183	415	92	654.78	2.00	1.71 2.38
2	123	300	94	650.76	2.00	1.46 2.44
3	133	354	110	677.76	2.31	2.18 2.54
4	118	332	93	673.55	1.91	1.69 2.29
5	127	295	74	572.80	1.85	1.47 2.46

Table 2. The apparent photosynthesis and transpiration rate of cotton plants treated with surfactant (1); anti-transpirant for 1 sec. (2); anti-transpirant for 2 sec. (3); anti-transpirant for 4 sec. (4); and complete plant coverage with anti-transpirant (5). These values are an average of 15 observations per treatment over a three day period after application 7/10, 7/11 and 7/12.

Treatment	Apparent photosynthesis $\text{mg CO}_2 \text{ dm}^{-2} \text{ hr}^{-1}$		Transpiration rate $\text{Grams dm}^{-2} \text{ hr}^{-1}$	
	Mean	Range	Mean	Range
1	23.3	21.6-25.9	3.71	3.22-4.58
2	22.4	19.8-25.0	3.69	3.29-3.93
3	25.0	21.7-30.0	3.80	3.43-4.60
4	21.4	19.7-23.1	3.48	3.11-3.69
5	20.5	19.0-22.1	3.36	3.08-3.55