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Antitranspirant Effects on Leaf Water Potential and Winter Injury of Holly[1,2,3]

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Abstract. **Three of 6 antitranspirants significantly reduced winter injury 1 of 5 years when applied 1 and 2 times to *Ilex* X *attenuata* Ashe 'Foster's No. 2'. No reduction of winter injury was observed during 1979 and 1980 even though leaf water potentials recorded during winter stress periods indicated that Exhalt 4-10, Vapor Gard, Wilt Pruf, Folicote, and Foligard significantly reduced transpirational loss of water in midwinter. Two applications of Folicote and Exhalt 4-10 increased water potential more than the single fall application, but did not reduce winter injury significantly. Clear Spray did not increase leaf water potential and appeared to crack and peel within 3 weeks after application. Scanning electron micrographs indicated better coverage of leaf surfaces by dipping them by spraying and verified the rapid cracking of Clear Spray.**

Desiccation of evergreens in winter occurs when transpirational loss exceeds the uptake of water from frozen soil, although "winter burn" as distinguished by White and Weiser (12) can also be caused by rapid fluctuations in temperature. The use of antitranspirants to alleviate moisture loss during stress periods has been suggested by various authors (2, 3, 4, 10), but results have been inconsistent.

There are conflicting reports on the effectiveness of antitranspirants in reducing desiccation injury to ornamentals (2, 3, 5, 6, 7, 9, 10). The lack of consistent results plus the development of new products indicate a need to re-evaluate the effectiveness of these film forming chemicals as aids to winter protection of broadleaf evergreens.

Kansas climate is characterized by sudden temperature changes, drying winds, and little snow cover in winter, all ideal conditions for desiccation injury. Although few hollies are adapted to the main campus at Manhattan (USDA zone 5) (1), many survive at Wichita (zone 6) where damage is more often attributed to desiccation rather than low temperatures (8). Therefore, the objective of this experiment was to evaluate the effectiveness of 6 antitranspirants in reducing winter desiccation of *Ilex*.

Materials and Methods

In preliminary tests, 6 antitranspirants were applied to 3 species of holly in the fall of 1975 and repeated on one half the plants during the winter to examine the effectiveness of 1 and 2 applications. Hollies treated were *Ilex* X *attenuata* Ashe 'Foster's No. 2', *I. aquifolium* L. 'Boulder Creek', and *I. cornuta* Lindl. & Paxt. 'Burfordi'. Fifty cm tall plants were planted in the field at the Wichita Horticulture Research Center on April 25, 1975, in a randomized complete block design. Six antitranspirants (Exhalt 4-10, Vapor Gard, Folicote, Wilt Pruf, Foligard, and Clear Spray) were applied to the foliage with a 11.4 L compressed air sprayer at a pressure of 3.5 kg/cm^2 to the point of run-off on December 2, 1975, and again to one half of the plants on January 21, 1976. Control plants were sprayed with water. There were a total of 252 plants with 14 treatments and 6 blocks. All subsequent treatments during 1976–1980 were made to 'Foster's No. 2' only. For the next 3 winters only 1 application was used, in early to mid-December, because preliminary results indicated no difference between 1 or 2 applications. During the 1979–80 winter with a mild

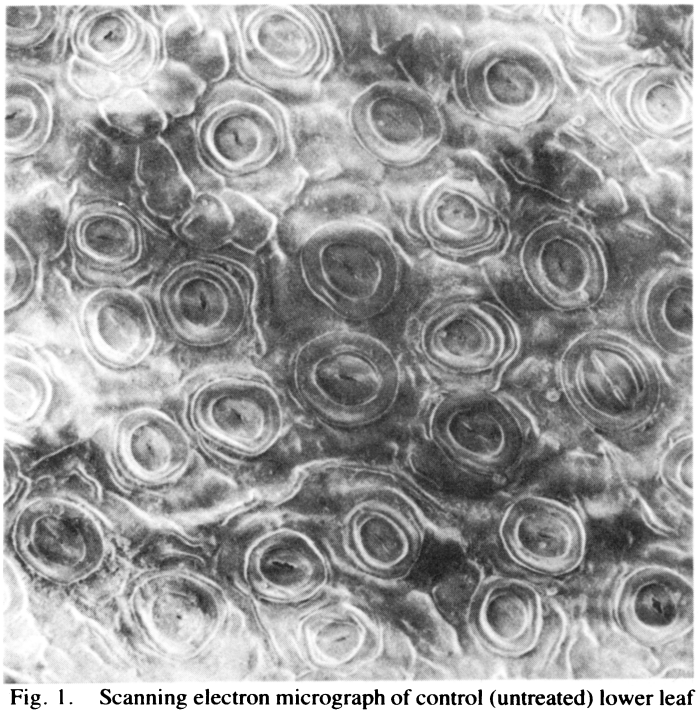

Fig. 1. Scanning electron micrograph of control (untreated) lower leaf surface of 'Foster's No. 2' holly (× 300).

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[3]Sources of antitranspirants are gratefully acknowledged: a wax emulsion Plant Pat. 3410678 (Folicote), Crystal Soap and Chemical Co., Landscale, Penn.; an acrylic copolymer (Foligard), E-Z Flo Chemical Co., Lansing, Michigan; a polyethelene-polyterpine Plant Pat. 4058409 (Exhalt 4-10), PBI/Gordon Corp., Kansas City, Kansas; a polymerized block polymer latex (Clear Spray), W.A. Cleary Corp., New Brunswick, N.Y.; and different concentrations of di-l-p-menthene, a beta pinene polymer (Vapor Gard), Miller Chemical and Fertilizer Co., Hanover, Penn. and (Wilt Pruf), Wilt-Pruf Products, Inc., Greenwich, Conn.

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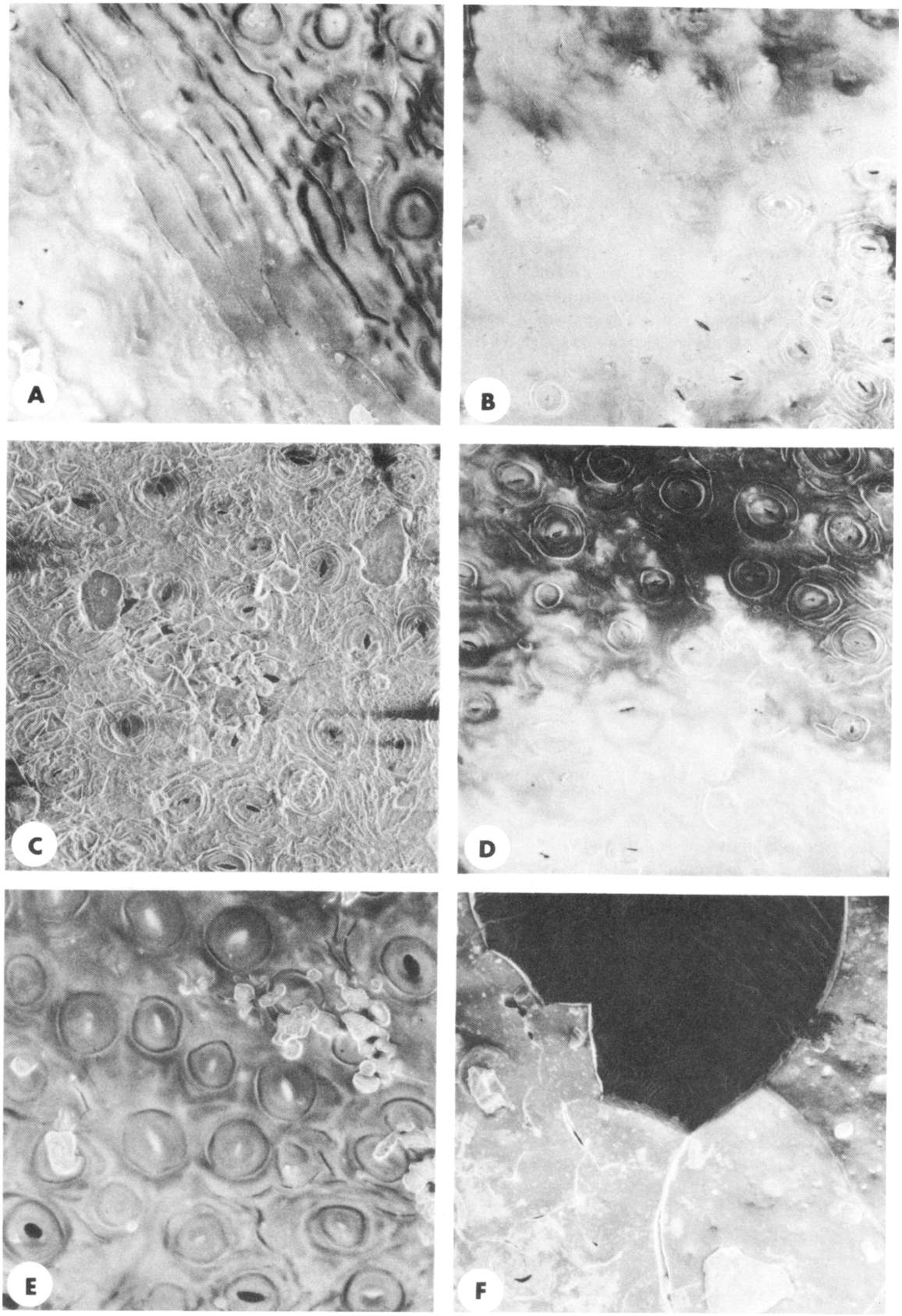

Fig. 2. Scanning electron micrographs of lower leaf surfaces sprayed with the following anti-transpirants: A) Exhalt 4-10 (× 300), B) Vapor Gard (× 300), C) Folicote (× 300), D) Wilt Pruf (× 300), E) Foligard (× 300) and F) Clear Spray (× 300).

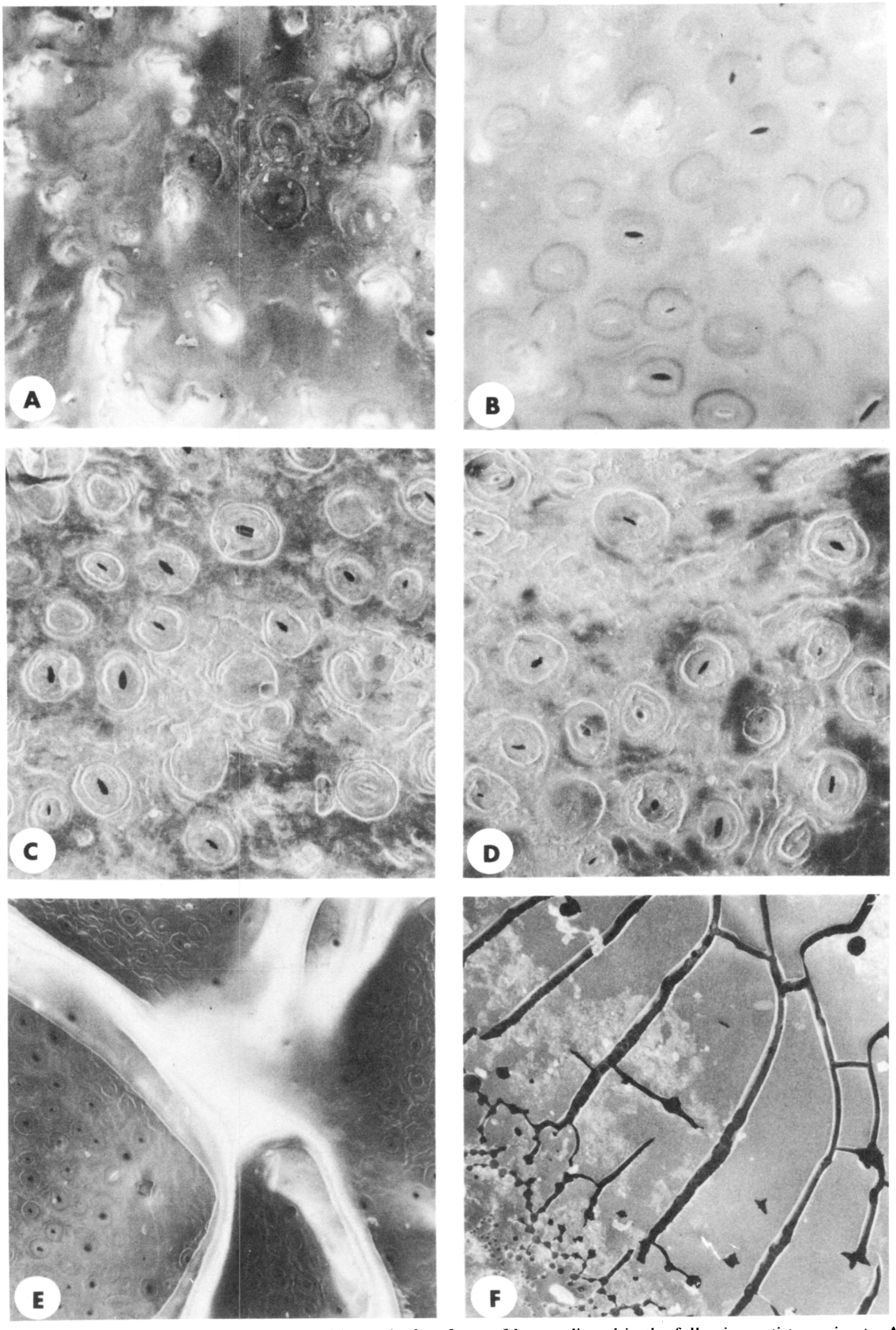

Fig. 3. Scanning electron micrographs of lower leaf surfaces of leaves dipped in the following anti-transpirants: A) Exhalt 4-10 (× 300), B) Vapor Gard (× 300), C) Folicote (× 300), D) Wilt Pruf (× 300), E) Foligard (× 300) and F) Clear Spray (× 100).