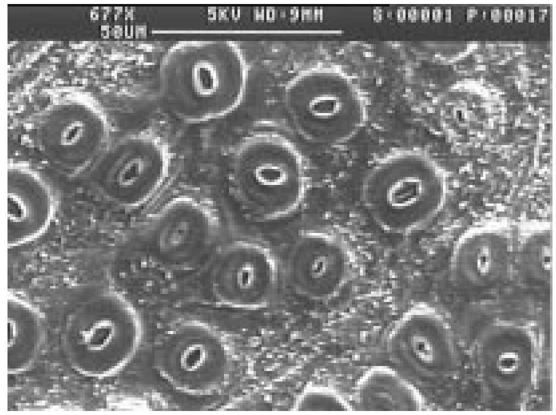
LEAF CHARACTERISTICS (WAX CHARACTER AND LEAF ANGLE)

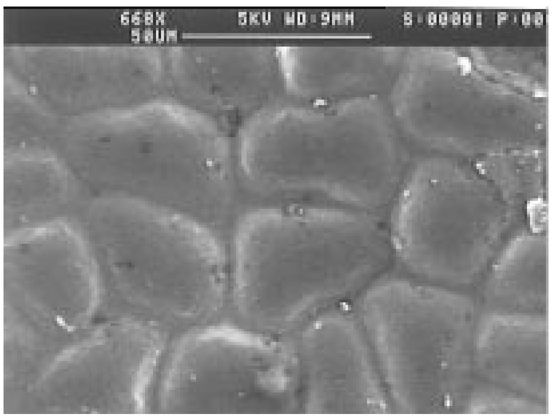
Figure 18 shows the adaxial and abaxial leaf surfaces of the nursery grown red oak (a,b), sweetgum (c,d) and red maple (e,f) as they appear from scanning electron microscopy (SEM). Stomates can be observed on the abaxial surface of each species. The adaxial surfaces are astomatous. It can be seen that there are large differences both among species and between the adaxial and abaxial leaf surface of each species. The adaxial surface of red maple (e) has waxy ridges and is very different from the adaxial surfaces of both red oak (a) and sweetgum (c) which appear much smoother, with sweetgum appearing the smoothest. The adhesion results gave the order from highest adhesion to be: adaxial surface, red oak > adaxial surface, red maple > adaxial surface sweetgum > all abaxial surfaces. Although this order was statistically significant, in practical terms there was little difference among the adaxial surfaces (mean adhesion ranging from 81.2%-85.9%). One might have assumed from the SEM pictures that the adaxial surface of red maple ought to have given the least adhesion of the adaxial surfaces. The abaxial surface of red maple is by far the roughest, with the stomates covered with wax. The abaxial surface of red oak appears less rough than red maple but rougher than sweetgum. This agrees with the adhesion results which showed that the abaxial surface of red maple was the most difficult surface for a droplet to adhere to. The adaxial surface of sweetgum appears to have the same order of roughness as the abaxial surface. The abaxial surface of red oak appears rougher than the adaxial surface. Adhesion results showed that adhesion to the abaxial surface of each species was lower than adhesion to the adaxial surface. Both the adaxial and the abaxial surface of red maple appear to be very rough. From the adhesion results it must be concluded that the microcrystalline wax platelets observed on the abaxial surface of red maple must have a greater negative affect on adhesion than the waxy ridges of the adaxial surface.

This shows that the microroughness of the leaf surface can be used as a guide to explain adhesion results, which is in agreement with published literature (Hartley and Brunskill, 1958; Anderson *et al.*, 1987; De Ruiter *et al.*, 1990; Wirth *et al.*, 1991).

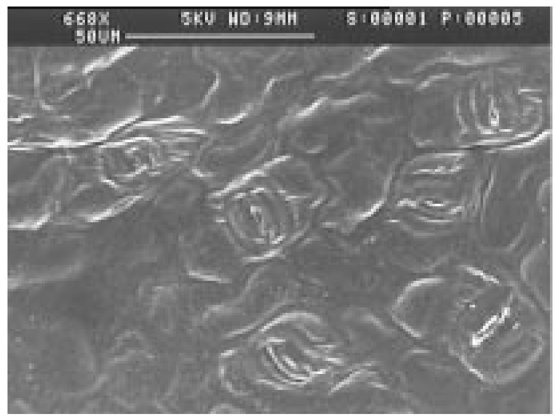
a. Adaxial leaf surface of red oak



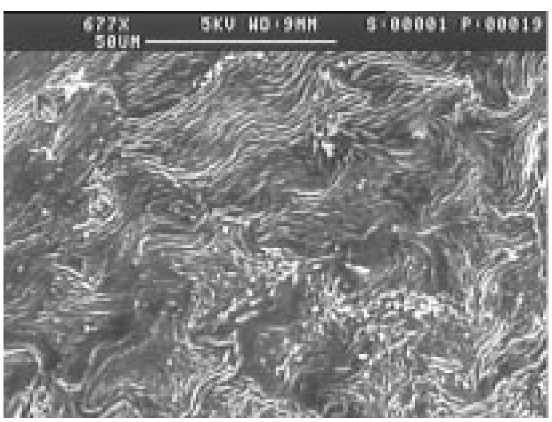
b. Abaxial leaf surface of red oak



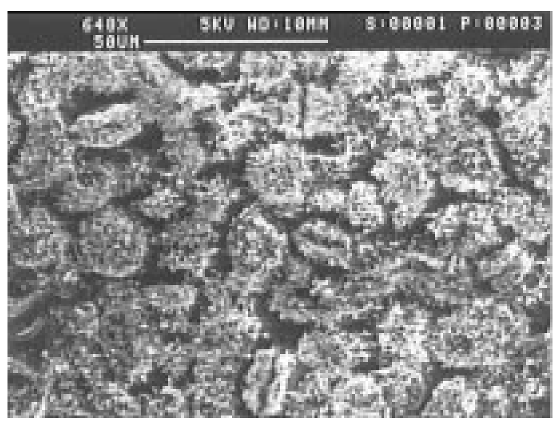
c. Adaxial leaf surface of sweetgum



d. Abaxial leaf surface of sweetgum



e. Adaxial leaf surface of red maple



f. Abaxial leaf surface of red maple

Figure 18: SEM views of the adaxial and abaxial leaf surfaces of red oak (a,b), sweetgum (c,d) and red maple (e,f).

The leaves of red oak ranged in angle from 30° above the horizontal to 30° below the horizontal with the majority of the leaves lying in the horizontal plane.

Sweetgum leaves ranged in angle from 60° below the horizontal plane to 100° below the horizontal plane. Sweetgum had no leaves pointing at an angle above the horizontal plane. The average angle was approximately 80° below the horizontal.

Red maple leaves ranged in angle 10° above the horizontal plane to 90° below the horizontal plane. The average was approximately 30° below the horizontal plane.

For the mono-size droplet adhesion / retention study only three angles ie. horizontal, 22.5° and 45° were considered. This covers the average leaf angles of red maple and red oak, but not sweetgum. If only the adaxial surface is considered, all formulations studied in the field trial gave 100% retention in the droplet generator study. Hence, one would not expect any significant difference in total deposition among the species (unless sweetgum, at an average angle of 80° gave considerably less retention) which was the case. This is assuming that it was the adaxial leaves which were facing the impacting spray in the field study, which was not actually always the case, as the heat seemed to turn some of the leaves over. One would expect the formulations containing organosilicone to be able to spread and wrap-around to the under-surface of the leaf. This was seen to be the case, and was also borne out in the results of the field study where the abaxial ratio was higher for the formulations containing organosilicone. From the droplet generator study, we would have expected there to be close to 100% retention in the field study, which was far from the case. It must be said that single droplets hitting the veins of the leaves did bounce, but such occurrences were not counted in the droplet generator study. There may have been some run-off by the formulations containing organosilicone. Another consideration is whether the spray from the radiarc was in fact falling vertically and at terminal velocity, when it impacted the leaf surface. Spraying did not begin until the leaves were completely dry, so this should not have been an issue, however it is quite possible that reflection from pre-wetted leaf surfaces could have been an issue when spraying at 140 l/ha, especially with organosilicones in solution. If the leaves had dust / dirt on them, this would have reduced the retention.