Root Nodules of Bog Myrtle or Sweet Gale (*Myrica Gale* L.)

PREVIOUS investigations[1] on the root nodules which commonly occur on *Myrica* spp. have referred chiefly to the structure and cytology of the nodules and to the identification of the endophyte. Little attention appears to have been paid to the possibility of fixation of nitrogen being associated with the nodules. Bottomley[2], after visual comparison of the growth made by plants (some with nodules, some without) transplanted from the natural habitat into a nitrogen-deficient soil, concluded that fixation of nitrogen had occurred. This finding deserves confirmation and amplification.

Satisfactory germination has been obtained with bog myrtle seed pre-treated by exposure in moist peat to a temperature of 2° C. for six weeks. Afterwards it was noted that this agreed with the experience of Barton[3] using seed of *M. carolinensis*. Seedlings were transplanted in May to water culture in Crone's solution (nitrogen-free formula, *p*H initially 5·0) and inoculated with a suspension of crushed nodules from field plants. Nodules appeared in three to four weeks. Seedlings not so inoculated did not develop nodules and showed very little growth, whereas all nodulated plants grew strongly (see photograph). Eight nodulated plants harvested after sixteen weeks growth in water culture showed a mean dry weight of 245 mgm. and a total nitrogen content of 7·3 mgm. per plant. Corresponding means for five non-nodulated plants were 6 mgm. and 0·1 mgm. respectively. These data strongly suggest that fixation of atmospheric nitrogen is associated with nodulated plants.

Young nodules developing under the above conditions show a red colour identical in hue with the pigmentation (presumably anthocyanin) which also appears in the hypocotyl of the seedling. A curious feature is that the roots which, in *Myrica* spp., develop from the tips of the nodules grow upwards (see photograph) and eventually project from the surface of the culture solution. The other roots display normal orientation. A parallel seems to be presented by the observations of McLuckie[4] on the tubercle roots of *Macrozamia*, which also exhibit upward growth.

Plants of bog myrtle (sweet gale) after twelve weeks growth in nitrogen-free water culture: left-hand plant with nodules, right-hand plant without nodules. × ½

This investigation, to be continued, is associated with work on leguminous root nodules which is receiving support from the Agricultural Research Council.

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Preparing for the Occurrence of New Races of Rust

IN Australia within the last eight years there have been two important cases of the breakdown of resistance to rust in wheat. The first was in 1942 when Eureka 2, a variety which, up to that time, had been highly resistant, suddenly became susceptible. This new stem rust has, on account of its close relationship with race 126, been designated as race 126*B* (unpublished data). The second case was in 1945, when Gabo was attacked by leaf rust (*P. triticina*) for the first time in Australia. This is also a rust unlike those previously present.

Eureka 2 and Gabo have proved particularly popular with growers, for under rust-free conditions in northern New South Wales, both are capable of high yields, they have a good straw and give a flour of satisfactory quality. The incorporation of leaf-rust resistance into Gabo is receiving immediate attention, and despite the big reduction in acreage sown to Eureka, we are endeavouring to add stem-rust resistance to it. These programmes will not be completed for some years yet and serious losses from rust may occur in the interim. Moreover, changes in the rust flora may render Gabo susceptible at any time.

It seems that when such satisfactory varieties have been bred, steps should be taken to prepare them for the possible occurrence of new races of rust. Although it is impossible to breed for resistance to specific races until they appear, we are working to a programme which it is hoped will give reasonable assurance of having, in a few years, a series of varieties equal to Gabo and Eureka 2 in yielding ability, and comprising certain ones resistant to new races of rust when they arise.

The problem of adding stem-rust resistance to Eureka 2 is a simple one, and already we have obtained from a back-cross of Gabo × Eureka 2 three resistant lines that seem the equal of the recurrent parent. However, it is considered unwise to concentrate solely on the one source of resistance, as there is no certainty that Gabo will continue to be resistant in the event of another rust culture greater in its parasitic capabilities than race 126*B*. To prepare for such an eventuality, we are using, in addition to Gabo, a diverse collection of varieties for crossing with Eureka 2. Varieties in this collection are known to have a fairly comprehensive stem-rust resistance under Australian conditions and include the following: Hofed, Fedweb, Celebration, Charter, *T. Timopheevi* × Steinwedel, Kenya 117*A*, wheat × rye, Khapli Emmer × Steinwedel and *Triticum* × *Agropyron*. These and others are being crossed individually