

In September of last year a Rototiller 5 horse-power motor-cultivator was purchased. This has proved a most satisfactory implement, and enabled the rank growth of weeds during the spring to be kept under control. It is an implement which might well find a place in commercial phormium nurseries, and should be worth trying even for cross-cultivating in plantations.

Yellow-leaf Investigation.—On account of the financial position, Mr. Meadows is bringing his work to a close. The time that had been devoted to the work was too short for any final result to be expected as to the cause of yellow-leaf. Some of the plants inoculated with extracts or fungus from diseased plants may yet provide information as to the cause. Mr. Meadows' final report is not yet finished.

In an attempt to breed a pure line of yellow-leaf-resistant seedlings from S.S., a number of our seedlings of that variety have been planted in a badly infested area, usually in gaps from which diseased and dying plants were removed. As controls, a number of seedlings of a susceptible strain were planted in the same area.

Manurial Trials.—In May of last year an area of 4 acres was laid down in trial plots of manures, on the property of the Australian and New Zealand Investments, Ltd., Gordonton, Waikato. This land is deep peat. The total area of such trials is now 9 acres, in four localities. Up to the present time no significant results have been shown by any of the manured plots.

The Pollination of Phormium.—It has been very generally accepted that phormium flowers must be cross-pollinated. This view was taken by Dr. B. D. Cross (1911), whose work on phormium was considered to lead to this conclusion. Actually the view depended on negative evidence of an unsatisfactory nature. To enclose a flower in a paper or cloth bag is very likely to prevent it from setting seed, because of the abnormal conditions. Yet the fact that such flowers did not set seed has been commonly accepted as proof of the need for cross-pollination.

The lines of pedigree seedlings grown at the college were grown largely to study this matter of pollination, which is a most important one in any breeding programme.

The pedigree seedlings comprise, roughly, 120 different strains, and, as a rule, five pods from each strain have been sown pod by pod. From a preliminary study of these thousands of seedlings it at once can be said that, in phormium, self-pollination is the rule and cross-pollination the exception.

To further test the view that self-pollination is usual in phormium, during the past summer some experiments were carried out on two inflorescences of Ngaro. These were growing in the main area, and no other phormium was allowed to flower there.

For a period of two or three weeks no pollen was allowed to remain in any flowers on these plants. Before the flowers opened, the stamens were cut out with fine scissors. Of twenty-eight flowers allowed to open without pollen, none set seed. They all fell within three or four days of opening. Having found in this way that no foreign pollen was being carried to the Ngaro plants, forty-six more flowers were treated in the same way except that pollen of S.S. was placed in them every day. Twenty-seven of the forty-six set seed, proving that injury of removing stamens had not been the cause of failure to set seed on the part of the twenty-eight which were not pollinated. The twenty-seven pods should produce nearly two thousand hybrids between S.S. and Ngaro.

Using the same Ngaro plants, a further test was made to see whether each flower could set seed when only the pollen from the same flower was available for pollination. This has been considered improbable by Dr. Cross and others, because the pollen is considered to ripen and be shed before the flower is ready for pollination. In the experiment only one flower on the Ngaro was allowed to be open at the one time. All others were cut off before opening. Each day pollen was dabbed from the stamens to the stigma of the solitary flower; when that flower withered another was allowed to open, and treated in the same way. Each flower required a period of approximately one week before another could be safely allowed to open. The low total of four flowers treated in this way will be easily understood. Each of these flowers set normal seed. As a result of this work we may safely conclude that—(1) No foreign pollen was reaching either of these Ngaro plants; (2) over 60 per cent. of successes can be obtained in crossing Ngaro by S.S.; (3) that Ngaro flowers are quite capable of setting seed when self-pollinated by pollen from the same flower.

Other results of work on Ngaro concern the seedlings grown from ten different Ngaro bushes, some of which were growing sixty or more miles apart. Many thousands of seedlings were grown from these bushes; and there appears to be no difference in the mixtures of coloured and green seedlings obtained from the different sources. Other bushes which at a casual glance appear to be similar to Ngaro produce seedlings either with a slightly different colour, or the coloured ones and the green ones are not in the same ratio as in Ngaro. This is taken as indicating that all of the ten bushes collected as Ngaro have been reproduced by fans from one original Ngaro bush.

A number of well-grown two-year-old Ngaro seedlings are being grown as quickly as is possible in order to quickly develop inbred, pure-breeding strains of this variety. The same thing is being done with seedlings of S.S. and 13K and two or three other promising strains.

Experimental work on crossing different varieties has been extended somewhat, and yearling hybrids include Ngaro \times S.S., S.S. \times Ngaro, Paritaniwha \times S.S., Paritaniwha \times Ngaro, and several others.

Most of these crosses were made by kind permission of Mr. A. Seifert and Mr. B. B. Wood on bushes of these varieties growing in their private nurseries.

A number of genetical facts have emerged from study of the hybrids and pedigree seedlings. The main conclusions are:—

- (1) Brown or black edge of leaf is dominant to orange edge. From this it follows that black-edged plants may (and in fact nearly always do) throw a certain number of orange-edged seedlings. Orange-edged plants, however, appear never to throw any black-edged seedlings, unless crossed by a black-edged variety.