passage. But on p. 155 an entirely different version is given. There his voyages "were hardly in search of a passage round North America even if it be correct to suppose that his second attempt led him up Davis Strait". Later still (p. 475), we are told that he "may have been in search of a passage round America by the north-west in 1497 . . . and still more likely in 1498". Little is known of the beliefs of John Cabot; but it is almost certain that he was unaware of the existence of North America. What then was the point of trying to sail around it, when he almost certainly thought he had discovered part of the coast of Asia or some islands off that coast?

It is possible to find other small points of criticism. The treaty of Tordesillas should be mentioned in the chapter on Magellan; Henry the Navigator was not an explorer; James Cook was not a Yorkshire farmer. All this goes to show that the publishers have overstated their case when they claim that "there has been no book like this before because no one with Dr. Stefansson's knowledge of the subject has ever devoted himself to such a vast undertaking".

On the other hand, the book has the great merit of including many first-hand narratives of explorers. At a rough guess, seven-eighths of this book is of this nature. Some are not particularly useful—the description of Scott's journey in 1902 could profitably have been shortened—but for the most part they cover a wide field and contain much of great interest. This work will therefore be of considerable value as a source-book.

J. N. L. BAKER

SEED TREATMENT FOR CONTROL OF FLAX DISEASES

The Diseases of the Flax Plant (*Linum usitatissimum* Linn.)

By Prof. Arthur E. Muskett and Dr. John Colhoun. Pp. 112. (Belfast: The Bursar, Queen's University, 1947.) 21s.

MOST of the flax cultivated in Great Britain is grown in Northern Ireland, which provides fibre for the linen made in Ulster. In normal times the supply of home-grown fibre is inadequate, and most of that used in the British linen industry has been imported from Belgium, Holland and the U.S.S.R. In both World Wars, when outside sources of supply were cut off, the acreage under flax increased greatly, reaching peaks of about 110 and 124 thousand acres in Northern Ireland in 1918 and 1944 respectively, the peace-time average for 1936–39 being about 22 thousand acres. Though often highly profitable, it has been an uncertain crop. Unaccountable failures and fluctuations in yield revealed the need for a much better understanding of the troubles encountered in flax growing. It was for this reason that, at the request of the Flax Development Commission, Prof. A. E. Muskett, Dr. J. Colhoun and their colleagues of the Ministry of Agriculture at the Queen's University, Belfast, undertook a study of the pathological problems involved. This book is an outcome of their work on the identification and control of flax diseases.

Some sixteen diseases caused by fungi are simply and clearly described, with advice on their control, explaining why one measure succeeds against one disease and is ineffective against another. Bacterial, virus and deficiency diseases, and one caused by a higher parasitic plant *Cuscuta Epilinum*, are similarly

described. There are references to the more important literature with relevant observations on the behaviour of these diseases and their control in other countries. A generous supply of excellent photographs, many in colour, show symptoms on the host and the appearance of the infecting fungi in pure culture, with photomicrographs showing their spores. With the aid of the admirably clear descriptions and illustrations in this book, most of the diseases likely to be encountered on flax in Great Britain should be easily identified. Attention is primarily devoted to the varieties of flax grown for fibre; but the occasional differences in reaction of those grown for the oil in the seed (linseed) are recorded.

The workers in Northern Ireland found that disease spores carried on the seed were among the most frequent cause of unsatisfactory crops. They did not always prevent germination, but often developed some time later and attacked the growing plant. The investigators made a very important contribution to disease control by devising and standardizing a rapid and inexpensive method whereby large numbers of samples of seed can be examined for disease contamination, a method which might well be adapted for use with other crops. During three of the war years they examined annually some 3,000–4,000 samples of seed, the whole of the flax seed output of Great Britain and Northern Ireland. They showed the urgent need for seed disinfection and threw light on the distribution of seed-borne parasites.

This group of workers compared and evaluated different methods of seed disinfection and obtained large increases in yield. Thus in one experiment, the yield of fibre of 3.1 cwt. per acre obtained from untreated seed was increased to 5.9 cwt. per acre by seed treatment and the consequent elimination of seedling blight. It was chiefly due to their work that by 1941 'Nomersan' and later 'Arasan', preparations containing tetramethylthiuram disulphide as the active constituent, were being used to disinfect all the flax seed sown in Britain. The treatment controlled such serious diseases as seedling blight, *Colletotrichum linicola*, and stem-break and browning, *Polyspora Lini*.

No method of seed disinfection, however, gave a complete control of a foot-rot caused by *Phoma* sp., which became very troublesome in 1944 in wetter districts, particularly in Scotland. The disease is often carried on the seed, and so the use of tested disease-free seed is recommended. It is also carried on crop residues, and a long rotation is the next line of defence against this and certain other diseases such as rust *Melampsora Lini* and wilt *Fusarium Lini*. A space of six to seven years without flax is recommended after crops infected with these diseases. Measures for controlling other flax diseases include the use of resistant varieties, crop hygiene, freeing both seeds and crop from infected crop residues, and clean farming so that weeds do not preserve a damp atmosphere favourable to fungi around the plant bases.

The book is admirably produced on good paper with large clear type. It records a considerable achievement in the war-time control of disease, is a notable contribution to our existing knowledge, and provides long-needed information which should eliminate many of the hazards encountered in flax-growing. It will be of great value to the flax-grower, to the plant pathologist and to other agricultural scientists.

MARY D. GLYNNE