APPLE FLESH-COLLAPSE OR BROWN-HEART.

CONTROL MEASURES FOR ORCHARD AND COOL STORE.

R. WATERS, Biological Laboratory, Wellington.

INTRODUCTION.

THE demand for the best-known means of controlling apple flesh-collapse requires at once that a definite stand shall be taken as to the cause of the disease. While, however, sufficient evidence is forthcoming to justify such a stand being taken for practical purposes, our knowledge of this subject must still be regarded as incomplete. The following authorities may briefly be quoted :—

(1.) Mr. A. H. Ashbolt, the present Agent-General for Tasmania in London, and Sir Henry Jones, experimenting at Hobart some years ago, propounded the theory that brown-heart was due to suffocation. (2.) The Department of Scientific and Industrial Research, in London and at Cambridge, reporting upon the damaged cargoes of Australian apples in 1922, stated that they thought they were "safe in concluding quite definitely that the cause of the damage to these shipments is lack of oxygen combined with a high percentage of carbon dioxide in the holds; in other words, the apples are suffocated." (3.) Dr. Charles Brooks, Pathologist to the United States Department of Agriculture, is reported as saying that he thinks the disease is largely due to the accumulation of gases given off by the apples. (4.) Professor McAlpine, Australian Commonwealth Investigator of Fruit-disease, says brown-heart is caused by lack of oxygen and excess of carbon dioxide. (5.) Drs. Ballard, Magness, and Hawkins, of the United States Department of Agriculture, say that internal browning (as they term this disease) appears to be brought about by certain conditions within the fruit itself. (6.) We in New Zealand have shown that no organism is to be found that would account for the disease, and, further, that apples submerged in water or confined in an airtight vessel eventually sustain an internal injury indistinguishable from flesh-collapse. In these experiments, moreover, it was noteworthy that in the absence of oxygen a greater or lesser portion of the flesh of the apple (Sturmers) was injured but not browned. Only after subsequent exposure to the air did such injured tissues discolour in a manner characteristic of flesh-collapse.

From the foregoing there appears a considerable concurrence of opinion as to the main cause of flesh-collapse. Despite this, however, it must not be forgotten that when a case of apples is subjected to a deficiency of oxygen and an excess of carbon dioxide all the apples in that case do not become uniformly injured by flesh-collapse as a rule. This suggests that there are differences in the susceptibility of individual apples, and this suggestion is borne out by the maturity experiments conducted by the New Zealand Department of Agriculture. In these experiments the riper Sturmers suffered more from flesh-collapse than did the greener ones. Apart, therefore, from the suffocation of the apples through a deficiency of oxygen, we must recognize