

a difference in the ability of apples to cope with these circumstances. Furthermore, the matter of temperature would appear to have a bearing. Drs. Ballard, Magness, and Hawkins state definitely that internal browning develops to a far greater extent in fruit held at 32° F. than in that kept at 36° to 40°, and its occurrence to an extent sufficient to be important commercially can be largely prevented by storing the Pajaro Valley apples (Yellow Newtons) at 36° to 38°.

For practical purposes the factors contributing to flesh-collapse, so far as we know them, may be summarized as follows:—

(1.) Apples supplied with an insufficiency of oxygen in a short time are liable to suffer internal injury, not necessarily marked at once by the discoloration characteristic of flesh-collapse.

(2.) In "airtight" apple-stores such insufficiency of oxygen is accompanied by an excess of carbon dioxide, for the apples convert the former into the latter in the process of respiration.

(3.) Subsequently, in the presence of a sufficiency of oxygen, the tissues where previously injured commence to discolour, producing the browned symptom characteristic of flesh-collapse.

(4.) Varieties, lines, and even individual apples in the same case vary considerably in their susceptibility to flesh-collapse, some exhibiting immunity under conditions that are most productive of the disease. One of the main causes, if not the main cause, of this susceptibility is overmaturity for the conditions with which the fruit has to contend in cool storage. There is, however, every reason for believing that certain improvements in cool-storage conditions will enable the fruit to be stored at a more advanced stage of maturity than would otherwise be possible.

(5.) Temperature has also been suggested as having a bearing upon the prevalence of flesh-collapse.

With this outlook it is now proposed to approach the question of apple-preservation from the orchard through the cool store to the market, referring, as the subject is proceeded with, to any knowledge that may be applied at any stage as a preventive of flesh-collapse.

#### ORCHARD CONDITIONS.

In a report made in November, 1920, I stated that the field conditions rendered satisfactory cool storage not impossible but more difficult than in certain past years. Locality, weather, cultivation, manurial treatment, age of trees, maturity of fruit, method of packing for storage, cases, and time elapsing between picking and delivery to cool store, all doubtless have to some extent a bearing upon the final power of the apple to stand up to the cool-storage conditions that are available to the orchardist at present.

#### *Locality.*

Ballard, Magness, and Hawkins state that internal browning is most prone to occur in Yellow Newtons from the floor of the lower Pajaro Valley, where conditions of low temperature and high humidity during the growing season are coupled with very fertile soil; but that even in this valley there are certain seasons in which little browning