Storage and Market Diseases of Fruit. IX

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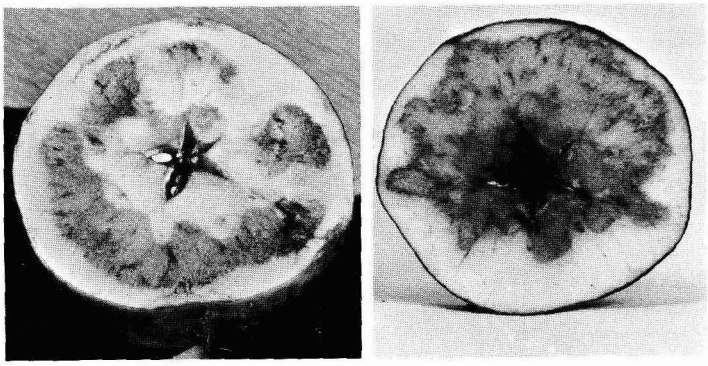
BROWN HEART OF APPLES AND PEARS

This disorder first appears as firm, brown, moist, sharply defined areas of breakdown within the flesh, usually at first in the mid-cortex (Figs. 33*L*, 35). It is often associated with the main vascular tissues and the core area may also be involved (Fig. 33*R*). In more severe forms or advanced stages external symptoms appear, the fruit may have a dull dark or even water-injected appearance and a resilient, spongy feel. Brown heart commonly appears early in storage and the lesions usually later dry out to leave characteristic cavities in the flesh which may be quite large, especially in pears (Fig. 36). Externally such fruit is often consequently deformed due to collapsing of the flesh.

Brown heart in apples is initially similar to low-temperature breakdown but is more localized and defined. Further, concentrations of carbon dioxide below the critical levels for brown heart, which may be as high as 10%, commonly aggravate low-temperature breakdown in apples so that at low storage temperatures, the two disorders may be confused, especially in varieties such as Sturmer and Cox which are very susceptible to both disorders.



33

Brown heart of apples. *L*, in *Jonathan*; *R*, in Sturmer Pippin.

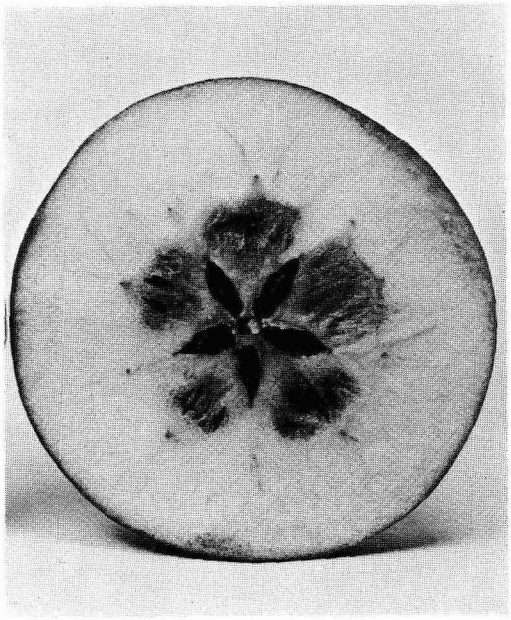
In the Granny Smith, Statesman, and Cleopatra varieties of apples levels of carbon dioxide greater than about 3% induce a dark, often severe type of core flush (Fig. 34 and also Fig. 16, Suppl. No. IV, 1970). When such lesions age they may dry out to produce a series of small radially lenticular cavities (Fig. 34).

Sturmer Pippin is the most susceptible variety of apple followed by Cox's Orange Pippin, Cleopatra, Tasman's Pride, and Jonathan, while Winter Cole and Winter Nelis are the common varieties of pears more sensitive to carbon dioxide.

To avoid brown heart, the level of carbon dioxide in cool stores and similar storage spaces holding apples or pears, in which the storage atmosphere is nominally air, should not exceed 1%. Warm fruit produces more carbon dioxide than cool fruit so that special care must be taken when large masses of fruit are being cooled in a closed space. In controlled-atmosphere (C.A.) storage higher levels of carbon dioxide are used only when more tolerant varieties are involved.

Of the principal varieties of apples Granny Smith, Delicious (Red and Golden), Jonathan, Democrat, Crofton, and Rome Beauty can be stored in the normal C.A. storage atmosphere of 2–3% CO_2 and 2–3% O_2 without risk of brown heart occurring. Williams, Packham's Triumph, Beurre Bosc, and

Brown heart of apples. Core flush type, with cavities, var. Granny Smith.



34

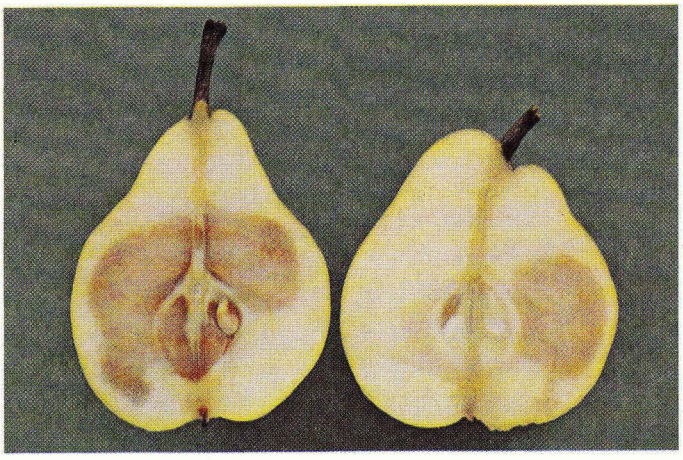
Josephine pears are also safe in such atmospheres. However, for Sturmer, Cleopatra, and Cox's apples and Winter Cole and Winter Nelis pears, the carbon dioxide content should be kept below 1% to be safe.

When apples or pears are stored in sealed plastic bags and the fruit is packed hot, or cooling is delayed or slow, damaging levels of carbon dioxide are likely to occur in the bags and the fruit is likely to develop brown heart.

Further reading

Carne, W. M. (1948).—The non-parasitic disorders of apple fruits in Australia. Bull. Coun. scient. ind. Res., Melb. No. 238.

Roberts, E. A., Scott, K. J., and Wills, R. B. (1964).—The effects of composition of the atmosphere and length of storage on the development of brown heart in Williams Bon Chrétien pears held in polyethylene bags. *Aust. J. exp. Agric. Anim. Husb.* **4**, 371–5.



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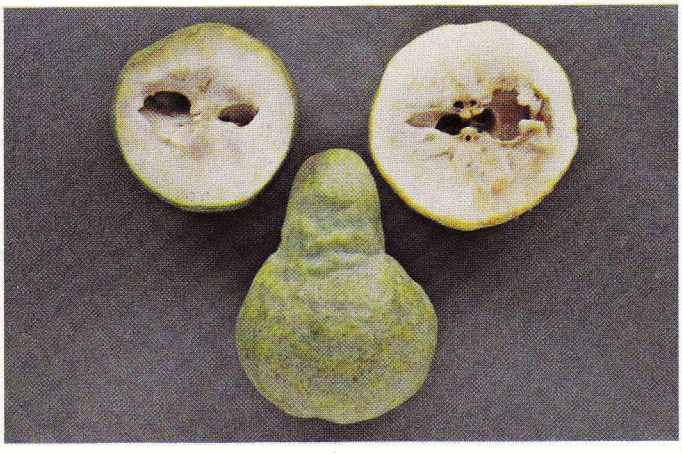
Brown heart of pears—young lesion, var. Packham's Triumph.

Brown heart of pears—old lesion with cavities, var. Packham's Triumph.



36