Abstract

A previously un-described storage disorder of Cox's Orange Pippin apples was observed in the early 1990's and has become a significant commercial problem in the UK in recent years. An investigation into the cause of the disorder referred to as 'Diffuse Browning Disorder' (DBD) began in 2002. The first objective was to determine any influence of the storage environment on the development of the disorder in fruit from orchards identified as high risk of DBD. The disorder was first seen after only 2 months of CA storage and reached a maximum incidence by February. Transfer of fruit from CA to air storage prompted development but temperature after transfer had little effect. DBD was aggravated by lower than recommended storage temperatures and although development appeared earlier in traditional CA (2 kPa O_2<1 kPa CO_2) than in ULO CA (1.2 kPa <1 kPa CO_2) final levels were similar at the end of storage. It was clear that the disorder was related to orchard site and could not be ameliorated by modification of storage conditions. The second objective was to identify pre-harvest factors responsible for inducing susceptibility to DBD. There was circumstantial evidence that DBD was promoted by low light levels during fruit development and that the application of gibberellins inhibitors such as paclobutrazol for control of shoot growth in orchards was also implicated. A hypothesis was developed that low light conditions and use of gibberellins inhibitors may be reducing gibberellins levels in fruits resulting in heightened susceptibility to senescence in localised areas of the fruit. It was observed previously that samples that develop DBD in CA storage are highly susceptible to senescent breakdown in air storage. The possible involvement of light was tested in shading trials where nets were used to reduce photosynthetically active radiation by 50% and reflective mulch was laid in the alleyways to reflect light into the trees. The possible involvement of gibberellins inhibitors was tested in a replicated field experiment at EMR and in 2 commercial orchards of high DBD risk. Circumstantial evidence that DBD is encouraged by low light conditions was supported by the low incidence of the problem in commercial fruit produced in the 'high-light' year of 2003. However, shading trees to reduce light availability did not exacerbate DBD although increasing reflected light by the use of reflective mulch tended to reduce the percentage of fruit affected. In one of the high-risk commercial orchards the development of DBD was restricted to fruit from areas sprayed with paclobutrazol. In contrast no DBD occurred in fruit from another high-risk commercial orchard or in the experimental orchard at EMR irrespective of paclobutrazol application. In year 3 (2004-5) of the investigation work has continued on the effects of shading and paclobutrazol

application on DBD development and, in addition, the effects of foliar application of gibberellic acid are being evaluated. DBD was a particularly serious problem in the 2004. Cox crop and progress in identifying the cause of the disorder will be discussed.