graphs of forming cell plates in particular, many elements of ER and vesicular components, which heretofore had escaped detection in these cells, are easily observed (Fig. 3).

In *Gibasis*, some cells show the specific NE–ER staining reaction, with stain accumulation in the cisternal space and little contrast in the other cell membranes (Fig. 4). A 10-fold increase in the cutinase concentration does not seem to increase the percentage of cells that show the specific staining reaction. Curiously, in *Tradescantia* stamen hair cells we have not observed a single one exhibiting the specific staining reaction; rather, almost all cells show the general increased staining of all cell membranes, with only a few showing no increase in membrane contrast over conventional staining techniques.

Although the lack of consistent specific NE–ER staining due to OsFeCN in cutinase-treated stamen hair cells and in some single wall-less cells tested (Hepler 1981; Jackson and Doyle 1982) remains puzzling, the technique does allow a much clearer visualization of cell components that otherwise remain only faintly stained and in some cases completely obscured. The use of cutinase clearly allows the penetration of solutions that otherwise could not pass the cuticular barrier. The procedure we have described here is simple and may be applicable to a wide range of epidermal tissues in which the cells are coated by a cuticle.

**Strengthening increment corer extractors**

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Increment borer extractors often buckle when being pushed into the corer to retrieve a core. A graph gives the buckling pressure for extractors with varying amounts of length exposed from the corer. From this graph, two methods are given for reducing the possibility of extractors buckling: grip the extractor so that no more than 7 cm are exposed and strengthen the end 3 cm of the extractor.


Les capteurs des carottiers à segments souvent se déforment lorsqu’ils sont introduits dans le cylindre afin d’en retirer l’échantillon. Un graphique présente la pression de déformation des capteurs en relation avec les différentes longueurs exposées du cylindre. Pantant de ce graphique, deux moyens permettant de réduire la possibilité de déformation sont donnés: prendre le capteur de façon à ce que plus de 7 cm soient exposés et consolider le bout (3 cm) du capteur.

[Traduit par la revue]

**Introduction**

With proper care, most increment borers need only occasional sharpening (see Bauck and Brown 1955; Cantara 1983). However, even experienced users will break the more fragile core extractor. Breakage usually results when the extractor is being pushed into the corer to retrieve a core. Experience quickly indicates that extractors must be fed into the corer by gripping the extractor only a short distance from the corer and pushing. Gloves are best worn for this since extractor edges are surprisingly sharp. However, when the extractor is almost all of the way into the corer, there comes a point where it is not long enough for a good hand grip. At this point, the temptation is to push the extractor from the end. If the extractor is too far out of the corer, it will buckle (Fig. 1).

The purpose of this note is to determine, given normal hand pressure, the critical length at which the extractor must stick out before buckling is likely. Given this critical length, we then suggest how far and by what means the end of the extractor can be strengthened to add a margin of safety against buckling.

**Extractor buckling**

We will take an empirical approach to determining the buckling load’s relationship to the length of the extractor sticking out of the corer. This approach is not as general as one based on an understanding of inelastic theory, but is simpler to use. For a discussion of buckling and the terms used in this section, see Bodig and Jayne (1982).

To derive the relationship between unit buckling load ($P_{CA}$; force $P$, cross-sectional area $A$) and exposed extractor length...
Figure 1. Photograph showing buckling in an extractor.

Figure 2. Empirical curve of buckling pressure for exposed part of an increment borer extractor.

(L), a series of extractors were placed in a corer and held firm at varying depths. The exposed end of the extractor was then subjected to an axial load until buckling occurred. Extractors were made of 0.5 mm thick steel.

Figure 2 gives the results of six tests. The unit buckling loads or pressures are plotted against the slenderness ratios \((L/R)\). Slenderness ratio is the exposed extractor length divided by the radius of gyration \((R)\), which in this case is \(R = \sqrt{I/A}\), for \(I = \pi r^4/4\), where \(I\) is the moment of inertia, \(t\) is the thickness of the extractor, and \(r\) is its radius to the midpoint of \(t\). The radius of gyration for increment core extractors of \(r = 2.25\) mm, \(t = 0.5\) mm is 2.53 mm. Since the radius of gyration is constant, the slenderness ratio is dependent only on exposed extractor length. Hence, the exposed extractor length is given along with the slenderness ratio in Fig. 2. The line on Fig. 2 gave the best fit to the data over the range of lengths and test arrangement.

Preventing buckling

From the buckling curve in Fig. 2, the following suggestions are proposed to prevent buckling. First, the extractor should always be gripped so that less than 7 cm is exposed. This is based on hand pressure never exceeding 90 N mm\(^{-2}\) or load never exceeding 316 N (71 lb). Experiments with different individuals indicate that this is a reasonable upper limit of normal hand pressure on an extractor.

Second, in pushing the extractor the last 7 cm into the corer, the hand can no longer be used easily since very little of the extractor is exposed to grip. The temptation at this point is to use the palm of the hand to push the extractor. Given the flexibility of the extractor, the possibility for administering an eccentric loading is great. Buckling in the last few centimeters of exposed extractor seems to result mostly from this eccentric loading which greatly reduces the hand pressure needed to cause failure. Our suggestion to overcome this is to strengthen the final 3 cm of extractor by either filling the spoon with braze
or welding a hollow steel tube in the spoon.

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**References**

