

**Production:** GRAPES

**Objective:** Measurement of skin puncture strength of grapes by penetrating with a 2mm Cylinder Probe

**Type of action:** Penetration test

**Test mode settings:**

Speed	Test mode	Trigger	Target	Hold
1 mm/s	Distance (c)	5 gf	6 mm	0 sec

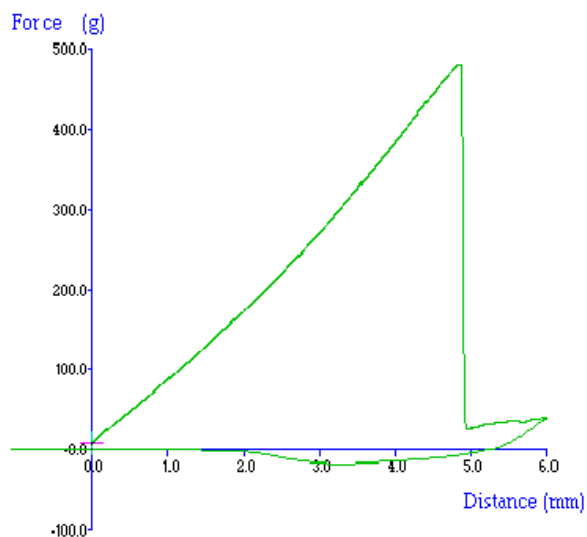
**Accessory:**

φ 2 mm cylinder probe, Platform

**Test Set-Up:**

Secure the Heavy Duty Platform to the base of the machine. Insert the blank plate into the platform. Place a grape on the blank plate and position it centrally under the probe. Commence the penetration test around the mid-region of the fruit.

**Typical plots:**



The above curve was produce from a ripe Napolean grape, tested at 20C.

**Observations:**

Once a trigger force of 5g has been achieved the probe proceeds to move down onto the grape and a rapid rise in force is observed. During this stage the sample is deforming under the applied force but there is no puncturing of the tissues. This stage ends abruptly when the probe punctures through the skin and begins to penetrate into the sample flesh, often called the "bio yield point". The bio yield point occurs when the probe begins to penetrate into the fruit, causing irreversible damage. The force profile after this point signifies penetration into the underlying flesh of the fruit and indicates that this is substantially softer than the skin. It is usually desired that, whilst being ripe, the fruit still maintains a high degree of mechanical strength to protect the fruit from damage, such as bruising, during transport and handling. The level of damage suffered by the crop during harvesting and handling can considerably affect its marketable life. Whilst the force applied to the fruit in this test indicates the 'ripeness', the distance that the penetration test continues before skin rupture commences is also important. For instance, in the example above the skin does not rupture until the probe has moved down onto the sample for 5mm, indicating a good degree elasticity.

**Data Analysis:**

☒Max Force

☒Peak Distance

**Notes:**

- It may be necessary to hold the fruit so that it does not move during the test as this could cause erroneous results.
- Because the ripening process itself varies from fruit to fruit, a large variation in firmness may sometimes be found among individual fruits in the same containers or harvested at the same time.
- When attempting to optimize test settings it is suggested that the first tests are performed on the hardest samples to anticipate the maximum testing range required and ensure that the force capacity allows testing of all future samples.