Abstract Submitted
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Microjets of citrus fruit NICHOLAS SMITH, ANDREW DICKERSON, University of Central Florida — The rupture of oil glands in the citrus exocarp is a common experience to the discerning citrus consumer. When peeled, oil cavities housed with the citrus exocarp often rupture outwardly in response to externally applied bending stresses. Bending of the peel compresses the soft material surrounding the glands, the albedo, increasing fluid pressure. Ultimately, the fluid pressure exceeds the failure strength of the outermost membrane, the flavedo. The ensuing high-velocity discharge of oil and exhaustive emptying of oil glands creates a novel method for jetting small quantities of the aromatic and volatile oil. We compare the jetting behavior across five citrus hybrids through high-speed videography and material testing of exocarps. The jetting oil undergoes an initial acceleration surpassing 5,000 gravities, reaching velocities in excess of 10 m/s. Film of citrus jets and mimicking jets in the lab reveal their high level of instability is caused by irregular and non-circular orifice geometry. Through material characterization and bending simulations, we rationalize the combination of material properties necessary to generate the internal gland pressures required for explosive dispersal.

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