Texture is critical to consumer acceptability of many products including peanuts. Texture is a complex sensory experience that primarily relates to the way a product feels in the mouth; however, audio and visual inputs are also important. Limited data is available regarding peanut texture as a function of processing, genetic and/or environmental factors. Accordingly, texture sensory data was collected for a range of commercially available peanuts processed under different conditions including dry roasting, oil roasting and water blanching/oil roasting among others. Select cultivars grown in different environments and subsequently processed equivalently were also tested. Two instrumental methods to quantify mechanical properties of the peanuts were also used to characterize samples. The first method involved individual compression testing of multiple split cotyledons whereas the second test utilized a Kramer shear cell (KSC) for simultaneous compression testing of multiple peanuts from a given sample. Moisture, oil, protein, sugar, density, and color data complemented sensory and mechanical data. Equivalent data was also collected for other common oilseeds including almonds, cashews and hazelnuts for comparison. Dry roasting or oil roasting generally decreased “hardness” while increasing sensory perception of “crunchiness” for peanuts and other oilseeds. Good correlations among oil and moisture contents were observed with sensory texture terms and mechanical measures. Instrumental relationships to sensory texture data are of particular interest due to the costs and time needed for collecting sensory data. In a comparison of 35 products, KSC peak force values linearly correlated with product hardness (R²=.74). Poorer correlations were observed in instrumental data and panel scores of “crunchiness” or “crispiness”. These terms, unlike “hardness”, which only accounts for perceived force during chewing, also account for perceived sound during chewing. This suggests the importance of collecting and quantifying audio data instrumentally to better predict and understand peanut and oilseed texture.