Pecans (*Carya Illinoinensis*) are an important crop in the United States, particularly in Georgia, New Mexico, and Texas, with a total yearly value of nearly half a billion dollars. Despite the crop's high value, few efforts have applied mathematical modeling and image processing techniques to improve production. Pecan processors have recently identified pecan nut cracking as one of the most important processes in their facilities, but few authors have explicitly studied dynamic loading on pecans. Furthermore, there has been little research on the effect of pecan nut impactor material and geometry on the efficacy of pecan nut cracking and shelling. In the present work, a drop test rig was developed to perform the experiments, and through the use of a tuned mathematical calibration function $\Gamma(e_0, e_1)$, a pecan meat integrity estimation process was developed to quantify how much the cracking process damages the pecan meat. After experimental data was collected, LOWESS (Locally Weighted Scatterplot Smoothing) surfaces were fit to pecan integrity (Ψ) and shellability (Ξ) metrics. Impactors were then ranked, with the 30° impactor made of durable resin performing the best. Additionally, a hardware triggered slow-motion camera was used in tandem with the data acquisition system to characterize the three main regions of a prototypical impact curve: initial crack, crack propagation, and compression. By cross-referencing with Ψ, the data suggest that crack energy for a pecan is independent of impactor velocity and energy.