Calcium is one of the most limiting nutrients in the production of peanuts, and deficient seed calcium concentration is known to cause reductions in seed quality and germination. However, little research has been done to investigate the possibility of improving the Ca concentration by traditional breeding. In order to investigate the genetic control of seed Ca concentration a series of experiments were conducted. Seeds of 44 commercial varieties and 7 breeding lines differing in maturity, seed vigor, and resistance to leaf spot were sampled from yearly variety tests conducted in 2005 through 2008 at two locations (Marianna, FL and Gainesville, FL). Calcium and potassium concentrations were measured for 10 seeds per sample by inductively coupled plasma spectroscopy. These data were analyzed using Proc MIXED to calculate variance components, which were then used to determine broad sense heritability. Grade data were also collected for these varieties and compared with the calcium and potassium data using Proc CORR to determine whether a correlation existed between seed characteristics and seed calcium and potassium concentrations. The calculated broad-sense heritability was 0.33, which indicates the potential for peanut breeders to develop cultivars with higher seed calcium concentration. However, potassium concentration was affected to only a small degree by either environmental or genetic factors. Calcium concentration was correlated with various grade components, in particular those related to seed and pod size, as well as hull percentage. Potassium concentration was not correlated with any grade components.