Peanut production can be significantly impacted due to the duration or severity of drought in rainfed fields or limited water availability when plants need water the most, even in irrigated fields. Selection of drought resistant or tolerant variety can be very challenging due to location or year to year variability. Determining plant response to water deficit at different development stages may give us clues as the mechanism of drought resistance or tolerance, and the comparison of these responses across different peanut genotypes may indicate what plant mechanism was selected based on environmental challenge. In this experiment, five different runner peanut genotypes were evaluated for both mid- and late-season drought. These five tested genotypes were characterized by 400 SSR markers for an estimation of genetic similarity. Specific physiological measurements were conducted to confirm plant water stress. Leaves were collected from plants under different stages of water stress for gene expression study to determine possible mechanism of drought resistance. Understanding molecular response in different peanut genotypes will help in the development of peanut genotypes that will have superior drought tolerance.