Potato (Solanum tuberosum L.) is a drought-sensitive crop due to a sparse and shallow root system that needs soil water to be maintained constantly for maximum yield and quality. Understanding the relative responses of different potato genotypes to drought stress can ensure efficient potato yield and minimize quality losses due to water shortage. Water use efficiency (WUE), allows for increased plant production per unit water used (“more crop per drop”) and is often considered an important determinant of yield under drought stress.

We performed a controlled greenhouse experiment to determine the responses to water deficit (WD) of fifteen (15) potato genotypes from CIP’s advanced breeding population. Throughout the experiment, we measured a large number of morphological and physiological parameters such as chlorophyll content (SPAD), relative water content, height, leaf area, transpiration rate, and yield, among others. To rank the genotypes as tolerant, we used the transpiration rate and the number of days needed for the plants to deplete water from soil.

Our results showed that four genotypes, CIP397077.16, CIP398208.620, CIP720088, CIP392797.22, were able to maintain a high WUE compared to the control plants, as well as to achieve higher harvest index under WD conditions. Regression analysis between biomass and total transpiration ($R^2 = 0.8409$) also showed these four genotypes as good candidate for drought tolerance.

This study showed that the relationship between yield and WUE deserves more attention as it may help to increase food production by helping to identify potato genotypes able to use water more efficiently under limited conditions.