



An image-based automated pipeline for maize ear and silk detection in a highthroughput phenotyping platform

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IDT6-013 | Correlated response of various morpho-physiological and biochemical traits with yield under heat stress condition in chickpea (*Cicer arietinum* L.)

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Chickpea is a temperate, cool season legume often experiences increasing high temperature stress with advancing stages of crop growth and results in significant yield reduction. Temperature of 35 °C and above are said to be critical in differentiating heat-tolerant and heat-sensitive genotypes in chickpea under field conditions. In the present study, forty nine chickpea genotypes comprising released varieties and advance breeding lines from central zone were used and phenotyped in order to understand correlated response of morpho-physiological and biochemical traits with yield under variable natural environmental condition in respect to temperature. The genotypes were sown during three different late sown conditions viz., first week of November 2015, first week of December 2015 and first week of January 2016. Amongst the

various morphological parameters, canopy temperature depression (CTD) and amongst the various biochemical parameters, activity of enzyme ascorbate peroxidase (APX) was found to be significantly correlated with yield in all the three different durations of sowing. On the basis of mean performance of yield/plot recently released variety Phule G 08108 was found to be less fluctuating genotype in response to heat stress than others and exhibited high total leaf chlorophyll, high CTD, low thermal stress index, high relative leaf water content and high APX content under all growing periods. The results reveal that high total leaf chlorophyll, high CTD, high RLWC with low TSI, and/ or enzymatic activities like APX can effectively be used to identify genotypes performing better under heat stress conditions.

IDT6-014 | An image-based automated pipeline for maize ear and silk detection in a high-throughput phenotyping platform

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Water deficit strongly impacts silk growth and silk emergence in maize (*Zea mays* L.), which in turn determines the final number of ovaries developing grains (Turc *et al.* 2016, Oury *et al.* 2016). However, phenotyping silk growth and silk expansion is difficult at throughput needed for genetic analyses. We have developed an image-based automated pipeline for maize ear and silk detection in a high-throughput phenotyping platform. The first step consists of selecting the best whole plant side images containing maximum information for each plant and day as that containing the most leaves and whole stem, based on top view images. In the second step, the best side images are segmented and skeletonized, and potential ear positions are determined based on

changes in stem widths. The x, y, z ear position identified in this way serves to pilot the movement of a mobile camera able to take a detailed picture taken at 30 cm from the ear, with the final aim of determining silk emergence and silk growth duration. These methods were tested at the PhenoArch plant phenotyping platform (www6.montpellier.inra.fr/lepse/M3P) in a panel of 300 maize hybrids. First results showed that in >80% of cases, ears were successfully detected before silking and duration of silk expansion significantly correlated with visual scores. The image pipeline presented here opens up the way for large-scale genetic analyses of control of reproductive growth to changes in environmental conditions in reproductive structures.