TIMING EXPRESSION PROFILE OF CAROTENOIDS PATHWAY GENES IN MAIZE GRAINS FOR CHARACTERIZATION OF LANDRACE GERMOPLASM FROM SOUTH BRAZIL

Galli, V[2*]; Messias, RS[1]; Pillon, CN[1]; Silveira, CAP[1]; Schirmer, MA[2], Silva, SDAE[1]

[1]Embrapa Clima Temperado, Pelotas, RS, 96010-971;
[2]Universidade Federal de Pelotas, Pelotas, RS, 96001-970

[*]*E-mail: vane.galli@bol.com.br*

Keywords: Landrace maize, carotenoids, germoplasm characterization, gene expression, grain

Maize, a multipurpose crop, is one of the three major crops in the world, responsible for supplying 15% of protein and 20% of calories in the world diet and even used to produce and provide various other products from the textile to the pharmaceutical industry. Due to its importance, great efforts have been made to enhance nutritional compounds in which maize is unfortunately deficient for the humam metabolic needs, such as carotenoids provitamin A. The low levels of b-carotene found in its grains turns this compound a target for biofortification studies. In this context, the previosly knowledge of expression profile from genes that regulate carotenoid metabolic pathway is an important step to characterize the large genetic variability found in maize. Thus, the expression profile of genes coding to the enzymes of this pathway, like phytoene synthase (PSY), a key enzyme of this metabolic pathway, carotenoid ε-hydroxylase (CYP97C), directly envolved in lutein synthesis, and β-carotene hydroxylase (HYD3), which show almost 80% correlation with β-carotene and zeaxanthin levels, was measured during maize grain development (0, 10, 13, 16, 19, 22, 25 and 30 days after pollination – dap), in order to better characterize the carotenoid transcription levels of fifteen landrace maizes from southern Brazil, contained in the collection of Embrapa Temperate Agriculture (Brazilian Agricultural Research Corporation) at Pelotas / RS. The results of gene expressions in real time PCR, normalized with the housekeeping gene ubiquitin showed that the expression levels of PSY declined at 10 dap and increased gradually until 22 dap. On the other hand, HYD3 and CYP97C genes increased their expression at 10 dap, decreased sharply until 16 dap, and increased again at 19 dap when stabilized transcriptional levels. PSY, HYD3 and CYP97C showed 81.6%, 45.2% and 15.5% correlation with total carotenoids in these grains, respectively. Moreover, HYD3 expression showed 84.9% correlation with CYP97C expression. 'Tupi Laranja' landrace showed the highest PSY expression levels among landraces evaluated and, together with 'Argentino' and 'Roxo Índio' landraces, showed the highest HYD3 and CYP97C expression levels. This study contributed to understand the expression profile of carotenoid genes and select promising landraces for biofortification. Due to the large amount of maize landraces available, others will be analyzed regarding its expression profile and correlation with carotenoid compounds.