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ALLELIC VARIATION IN HCT1 GENE EXPRESSION IS ASSOCIATED WITH LIGNIN CONTENT IN SORGHUM

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High production of renewable sources of energy from plant biomass are important for increasing use of bioenergy worldwide. Plant biomass composition is a key factor for achieving high efficiency in converting biomass into energy. However, lignin, a major cell wall component, has a negative effect on biomass conversion to cellulosic ethanol. Nevertheless, lignin increases the calorific value of biomass, which is desirable for electricity cogeneration. Interestingly, sorghum genotypes show a wide variation regarding lignin content and they can provide quality feedstock for both end purposes. In a previous study, a diversity panel of 100 sorghum genotypes was evaluated for lignin content to identify genotypes showing high biomass production and varying lignin content. Expression of genes involved in lignin biosynthesis was evaluated to identify potential targets for sorghum breeding. Only expression levels for the *HCT1* gene, which codes for a hydroxycinnamoyl transferase that acts at the beginning of several phenylpropanoid pathways, showed a significant correlation ($p < 0.01$; $r = 0.58$) to lignin content. Thus, the aim of this work was to identify *HCT1* allelic variants associated with lignin content in sorghum and develop molecular markers for breeding purposes. To identify SNPs that could be used in assisted selection programs, several primers were designed to amplify the potential promoter region and the entire *HCT1* gene.Twelve contrasting genotypes for lignin content and *HCT1* expression levels were selected from our previously studied panel to identify SNPs and INDELs potentially involved in differences in *HCT1* gene expression. After genomic DNA extraction, amplification, and sequencing, 12 SNPs/INDELs were found. Following correlation analysis, only an INDEL was associated with lignin content and *HCT1* expression levels. To confirm these results, another nine genotypes showing high and intermediate expression levels for the *HCT1* gene were also sequenced. Together with the previous results, a t-test was applied and it showed significant associations between the INDEL allelic variation and *HCT1* expression ($p=0.014$), as well as with lignin content ($p=0.005$). INDEL specific 5´ fluorescent-labeled primers were designed and will be used to screen the whole sorghum panel in order to validate the identified *HCT1* INDEL as an efficient molecular marker for assisted selection in breeding programs involved in the development of bioenergy sorghum.

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