Development of an experimental procedure for determination of hydroxycinnamic acids in sugar cane samples

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Hydroxycinnamic acids account for a significant part of the aromatic compounds found in grasses. Even total lignin, determined by the Klason procedure, contains significant amounts of these compounds owing to condensation reactions taking place during acid hydrolysis. Studies involving the digestibility of grasses indicate an inverse correlation for the hydroxycinnamic acid contents and the grass digestibility. In the present work, 11 experimental hybrids of sugar cane plus a reference sugar cane bagasse sample were analyzed for the hydroxycinnamic acids contents. Part of the total hydroxycinnamic acids were released by a mild alkaline treatment (1 M NaOH/30^{o}C/24h). This fraction corresponds to hydroxycinnamic acids that are ester linked to arabino-methylglucurono-xylans but are not etherified to lignin. The rest of the hydroxycinnamic acids that are linked to lignin through ether linkages were released only by a severe alkaline treatment (4 M NaOH/170^{o}C/2h). Released acids were analyzed by HPLC. External calibration was performed using authentic p-coumaric and ferulic acids standards. To correct for partial degradation of hydroxycinnamic acids during the reaction, two calibration curves were built using the same reaction procedures described before. Under severe reaction conditions, decomposition of hydroxycinnamic acids was significant and this calibration procedure enabled the exact determination of their contents in the samples. P-coumaric acid predominated in all samples whereas ferulic acid was detected in lower amounts. The presence of ferulic and p-coumaric acids in the alkaline extracts was confirmed by GC/MS. Total amounts of hydroxycinnamic acids varied from 5.4 to 8.3% in the samples. The same samples were digested by a mixture of cellulases giving cellulose conversion levels varying from 15 to 33%. The levels of cellulose conversion seem to decrease with the increased contents of total hydroxycinnamic acids. However, a linear model correlating this data presented a low r^2 value of 0.30.

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