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NOTE

Studies of Amino Acids in Redrot Disease Infected Sugarcane (*Saccharum officinarum* L.) by HPLC

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An attempt has been made to detect and estimate a few amino acids present in both resistant and redrot disease infected sugarcane of different varieties using HPLC. Five amino acids namely tyrosine, methionine, isoleucine, leucine and lysine play an important role in sugarcane crops. A possible correlation between the variation of free amino acids and diseased conditions have been discussed.

Key Words: Sugarcane, Redrot disease, HPLC, Amino acids.

Sugarcane is a commercially important crop in the country. This crop is found to be attacked by a number of fungal diseases, namely redrot, smut, wilt and yellow spot[1]. Besides these fungal diseases sugarcane is found to be affected by redrot which is the most serious fungal disease of sugarcane on a worldwide scale. The pathogen affects the economically valuable stalk tissues leading to crop loss and reduction in juice quality[2]. The role of amino acids in sugarcane suggests a decisive position in determining the sugarcane yield and quality. Amino acids are the building blocks of protiens. There have been a number of reports[3–5] regarding qualitative and quantitative assessment of free amino acids in cane juice; very little attention has been paid to determine the amino acid composition of sugarcane tissues. HPLC is a well-developed technique for the separation of amino acids in biological samples. Rao and Asokan[6] indicated about the accumulation of amino acids in sugarcane crops affected by this disease. Changes of amino acid content in sugarcane crops infected with redrot has been reported by Meon *et al.*[7]. Bird and Hird[8] have reported the uptake of amino acids by carrot slices. Effects of some amino acids on growth of plant virus tumour tissues have been reported by Nickell[9].

In the present study, twleve varieties of sugarcane (Co 86249, CoG 93076, Co 86032, CoC 99061, CoSi 95071, Co 85019 (resistant), CoC 671, CoC 90063, CoC 98061, Mc 707, CoV 92102 and Co 6304 (redrot infected)) crops at the age of eight months were collected from different fields in the sugarcane growing area of EID Parry(India) Limited, Nellikuppam, Cuddalore District, Tamil Nadu, India. Samples were collected fieldwise by adopting standard procedure[10, 11]. The quantitative study of amino acids present in both resistant and redrot disease

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infected sugarcane are analysed by 1100 series model HPLC available in the Department of Biochemistry at Sankara Nethralaya, Chennai.

The given sample (100 mg) was weighed and dissolved in boiled and filtered distilled water and kept overnight at room temperature for extraction of free amino acids. The volume of the extract was 0.8 mL. The supernatant was used for precipitating with equal volumes of 10% trichloro acetic acid. This was centrifuged and the obtained supernatant was filtered and stored and used for free amino acid analysis.

The quantity of amino acid present in both resistant and redrot disease infected sugarcane is found by injecting the extract into the HPLC and the peak area is integrated.This peak area is used to calculate the amount of amino acid present in the sample.

The concentration of amino acids present in both resistant and redrot disease infected sugarcane is shown in Tables 1 and 2. From Table-1, we observe that the amino acids like tyrosine, methionine, isoleucine, leucine and lysine are decreasing in resistant variety sugarcane. But in redrot disease infected sugarcane the concentration of the above mentioned amino acids are increasing. The five amino acids, namely, tyrosine, methionine, isoleucine, leucine and lysine play an important role in the redrot disease infected sugarcane. Plant proteins mostly contain 2–4% tyrosine. In isolated cases such zein[12] or the protein of an amylase from *Aspergillus oryzae*[13] up to 10% has been found. It contributes 12–18% to the synthesis of botulinus type A toxin[14]. In certain seed proteins methoinine has been found in higher concentrations[15, 16]. High concentrations of isoleucine have been found particularly in large amounts in subtilin (15.5%), oxyhemoglobin (20%), zein (25%) and insulin (30%)[17, 18]. Particularly high concentration (12.3%) of lysine has been found in antibiotic subtilin[19]. All the above observations strongly indicate that certain specific amino acids like tyrosine, methionine, isoleucine, leucine and lysine are providing the conducive atmosphere for the disease to multiply vigorously. If by some mechanism the amount of the above needed amino acids is decreased and eliminated, then the redrot infection may reduce considerably.

TABLE-1
FREE AMINO ACIDS CONTENT IN NANOMOLES PER mg OF RESISTANT VARIETY SUGARCANE

Amino acid	Concentration of free amino acid in nm/mg of sugarcane					
	Co 86249	CoG 93076	Co 86032	CoC 99061	CoSi 95071	Co 85019
Tyrosine	0.053	0.007	0.006	0.024	0.018	0.040
Methionine	0.019	0.012	0.010	0.013	0.007	0.019
Isoleucine	0.009	0.011	0.010	0.008	0.007	0.004
Leucine	0.015	0.013	0.010	0.014	0.011	0.025
Lysine	0.024	0.028	0.010	0.017	0.028	0.022

TABLE-2
FREE AMINO ACIDS CONTENT IN NANOMOLES PER mg OF REDROT DISEASE INFECTED SUGARCANE

Amino acid	Concentration of free amino acid in nm/mg of sugarcane					
	CoC 671	CoC 90063	CoC 98061	Mc 707	CoV 92102	Co 6304
Tyrosine	0.069	0.060	0.079	0.072	0.105	0.092
Methionine	0.042	0.033	0.036	0.025	0.053	0.031
Isoleucine	0.054	0.014	0.025	0.017	0.019	0.024
Leucine	0.039	0.046	0.037	0.032	0.026	0.043
Lysine	0.090	0.038	0.053	0.075	0.033	0.029

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