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Tapping cassava leaves as source of proteins by enzymatic detoxification to complement unbalanced cassava starch diets

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Summary

During this project some preliminary studies were made to analyze processed cassava leaves and roots from the exotic food shop (Stuttgart, Germany) and fresh leaves obtained from the cassava plants grown in the university greenhouse. A simple and efficient linamarin extraction method was developed and a modified protocol for liquid chromatography-mass spectroscopy (LC-MS) was established for identification and quantification of linamarin by using standard linamarin. The results were presented in an international conference '6th International Symposium on Recent Advances in Food Analysis' held in November 5-8, 2013 at Prague, Czech Republic. A description about these findings has been provided from page 3 to 10.

Moreover, the available literature on cassava leaves as food was searched and the whole data was compiled as a review article entitled 'Potential of cassava leaves in human nutrition: a review'. The article is under review in a peer reviewed journal 'Trends in Food Science and Technology'. A hard copy of this review article is attached with this report.

Linamarin in cassava leaves and roots: Analysis by LC-MS

1. Abstract

Cassava (*Manihot esculenta* Crantz) leaves and roots are consumed in various parts of the world as a source of protein and starch. However, both cassava leaves and roots contain high amount of toxin called "linamarin", a cyanogenic glucoside, which causes various diseases or even may cause death to the consumer in severe cases. Cassava leaves and roots are readily available in the exotic shops and are typically consumed as vegetables by African and Asian migrants living in Germany.

A simple and efficient linamarin extraction method was developed and a modified protocol for LC-MS was established for identification and quantification of linamarin by using standard linamarin. As a preliminary study, processed cassava leaves and roots from the exotic food shop (Stuttgart, Germany) and fresh leaves obtained from the cassava plants grown in the university greenhouse were analyzed for linamarin by using LC-MS method. No linamarin was detected in the processed cassava leaves (from Vietnam and Cameroon) while a reasonable amount of linamarin (13.12 µg/g on fresh weight basis, FWB) was found in peel of the cassava root obtained from the exotic food shop (Stuttgart, Germany). A high amount of linamarin (127.8 µg/g FWB) was detected in the fresh cassava leaves obtained from the greenhouse.

To the best of our knowledge, no previous report is available on the linamarin analysis in cassava leaves and roots available in Germany. There is a dire need to analyze all cassava based products for antinutrients and toxins in order to make sure that these are within the safe a limit and these products have been properly processed before getting into the market.

Keywords: *Cassava leaves, roots, linamarin, LC-MS*

Potential of cassava leaves in human nutrition: a review

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Abstract

Cassava is mainly grown for its roots whereas leaves are mostly considered as a byproduct. Cassava leaves are a rich source of protein, minerals, and vitamins. However, the presence of antinutrients and cyanogenic glycosides are the major drawbacks in cassava leaves which limit its human consumption. These antinutrients and toxic compounds of cassava leaves cause various diseases depending on the consumption level. Hence these antinutriens and toxic potential of cassava leaves should be addressed during cassava leaves processing (CLP) before human consumption. Several CLP have been developed but every method has its own limitations. Some CLP successfully detoxify cassava leaves but on the other hand destroy the nutrients. Efforts have also been made for cassava leaves protein extraction in the form of cassava leaves protein concentrate (CLPC) but protein recovery was very low. This review summarizes the nutrient, antinutrient and toxic composition of cassava leaves, CLPC, different CLP, human consumption and diseases caused by cassava leaves.

KEY-WORDS:

Cassava leaves, Protein, Nutrients, Antinutrients, Detoxification, Human consumption

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