Food Quality and Chemical Composition

Evidence of Proteolytic Enzyme Activity in Taro, Calocasia esculenta (L.) Schott

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ABSTRACT

A substrate for the assay of proteolytic activity, Azocoll, was used to demonstrate presence of protease in taro. Using 10 g samples of taro corms and 100 mg of Azocoll in 10 ml 0.05 m tris-HCl buffer incubated for 30 min at 37°C, differences in degree of proteolytic enzyme activity in some taro cultivars were detected. Due to relative speed and ease of the procedure, its development as a possible chemical method in quantification of proteolytic enzyme activity in taro and other aroids is suggested.

Introduction

The acrid or itchy principle found in members of the family Araceae has attracted attention of various workers (Walter and Khanna, 1972; Tang and Sakai, 1983; Sakai, 1979). Various theories have been advanced to explain this property of the aroids (Tang and Sakai, 1983; Walter and Khanna, 1972, Middendorf, 1982). Among the speculations on the possible cause of aroid acridity is the presence of proteolytic enzyme such as dumbcain in Dieffenbachia (Walter and Khanna, 1972). The presence of calcium oxalate crystals, especially in the genera Colocasia and Xanthosoma have been well documented (Sunell and Healey, 1979; Sakai, 1979) and implicated as playing a role in the acridity of these crops (Sakai, 1979; Middendorf, 1982).

Following the lead of Walter and Khanna (1972) and the proteolytic nature of some snake venoms, a substrate, Azocoll, was used to determine the presence of protease(s) in some taro cultivars at the University of Hawaii germplasm collection in the Island of Kauai.

Materials and Methods

The following procedure was used for this work:

Reagents. Azocoll (Calbiochem) used without purification.
Tris-HCl, 0.05 m, pH 9.0

Procedure. Place 10 g sliced taro corm in a beaker containing 10 ml Tris-HCl buffer. Add 100 mg Azocoll and incubate at 37°C for 30 minutes. Filter off solid components and read absorbance of filtrate at 520 nm in a colorimeter. Run blanks with each determination to account for pigment, starch and other interferences.

Results and Discussion

Using the procedure described, absorbance of six taro cultivars was obtained:

Cultivars	A at 520 nm
Aa'aa	0.92
Apuwai	0.86
Bun-long	0.43
Kalpao	0.42
Lehua Maoli	0.79
Miyako	0.52

All taro samples gave positive reaction to Azocoll indicating the presence of proteolytic enzyme(s). A listing of the cultivars used in the experiment based on known and alleged level of acridity follows closely the absorbance values of the samples. Bun-long is currently used in making taro chips in Hawaii due to its low level of acridity compared to Apuwai and Lehua Maoli which are used for making "poi," the Hawaiian staple food. Lehua Maoli and Apuwai can also be made into taro chips, but the corms must be boiled or steamed prior to slicing and frying into taro chips. Miyako is a dasheen cultivar grown for vegetable and of moderate acridity. The cultivar Aa'aa is more acrid than any of the materials used (Anderson, 1983). The acridity level of the cultivars based on current uses is:

Bun-long, Kalpao < Miyako < Apuwai, Lehua Maoli < Aa'aa.

The coincidence of the above listing to the absorbance obtained with Azocoll tends to add support to the possible role of proteolytic enzyme(s) in the acridity of taro and other aroids. Taro corm samples boiled for 30 minutes gave negative reaction to the substrate confirming the enzymic nature of the principle being investigated. For want of a name, "taroin" is suggested to refer to the protease in taro, Colocasia esculenta (L.) Schott until further investigation has elucidated its nature and other characteristics. The method needs to be further investigated to confirm the role of the enzyme in the acridity of taro. If this role of "taroin" can be confirmed, the method can be used as a rapid and simple technique for determination of acridity levels of taro and possibly the other aroids.

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