

Determination of carotenoids in Sweet Potato by HPLC Chromatogram

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Abstract

Five varieties of sweet potato, Bonita, Covington, Beauregard (B94-14), Beauregard (B63), and a purple sweet potato (Stokes) were investigated for B-carotene, lutein, zeaxanthin and violaxanthin, the most common carotenoids in plants. Separation and identification were conducted using HPLC and spectroscopic properties of each carotenoid. Five varieties happen to contain varying concentrations of one or more of the four carotenoids. B-carotene appears to be more frequent for the five varieties, a larger concentration of zeaxanthin occurs in only Bonita. While Lutein and Violaxanthin appear trace concentration in all five varieties.

Introductions

Carotenoids are indispensable to plants and play a critical role in human nutrition and health as well. They have long been recognized as essential nutrients and important health beneficial compounds. As humans are unable to synthesize carotenoids, they have to depend on plants for these essential products. β -carotene, largely known as a "Pro-vitamin A" carotenoid, serves as the primary dietary source of vitamin A. The deficiency of vitamin A is one of the most noticeable nutritional problems in many parts of the world. Over recent years there has been considerable increase of interest in the study of dietary carotenoids with respect to their potential in alleviating age-related diseases in humans. Food biofortification with enhanced pro-vitamin A carotenoids offers a sustainable way to combat vitamin A deficiency in developing countries. It has been known that food sources of carotenoids include carrots, sweet potatoes, spinach, kale, collard greens, and tomatoes.

Sweet potato is well known as health food for human being. It can be as direct cooking food or for food processing material. The determination of Carotenoids in sweet potato is very useful and helpful in people's daily life.

Materials and Methods

Five varieties of sweet potato were used in this study. Samples were taken from the sweet potato project in UAPB. The carotenoids from the sweet potato were extracted and analyzed according to Norris et. al. (1995), with slight modifications. Briefly, 0.1g of the dried samples were ground with mortar and pestle in 0.8ml of 80% acetone. The homogenates were transferred into a 2.2 ml centrifuge tube, extracted with 0.5ml ethyl acetate by vortexing for 30 seconds. This was followed by centrifuging at high speed for 5 minutes, after adding 0.5 ml of water. The carotenoid containing upper phase was transferred into a new tube and dried under nitrogen gas.

The dried samples were re-suspended in 200 μ l of ethyl acetate. Separation and identification of carotenoids were carried out on a Hitachi Lachrom Ultra C18 column (5 μ m particle size, 4.6mm I.D X 150mmL) using a Hitachi Elite LaChrom High Performance Liquid Chromatograph, equipped with a diode array detector, Model (Hitachi L-2455), monitored at 450nm. The pigments were separated by a linear gradient between solvent A(made of 90% solution of acetonitrile:H2O:triethylamine at 9:1:0.01, 10% ethyl acetate) and solvent B(80% ethyl acetate, 20% solution of acetonitrile: H2O: triethylamine at 9:1:0.01) over 30 minutes at a flow rate of 1.0 ml per minute. The elution program used was: 0 minutes at 100% A, 0% B; 1-25 minutes with linear gradient to 0%A and 100% B; 25-30 minutes at 0% A, 100% B. Identification and quantification of each component was based on the comparison of the retention times and spectroscopic properties of the unknown with that of the standards.

Purple Stokes



Bonita



Covington



Beauregard B94-14



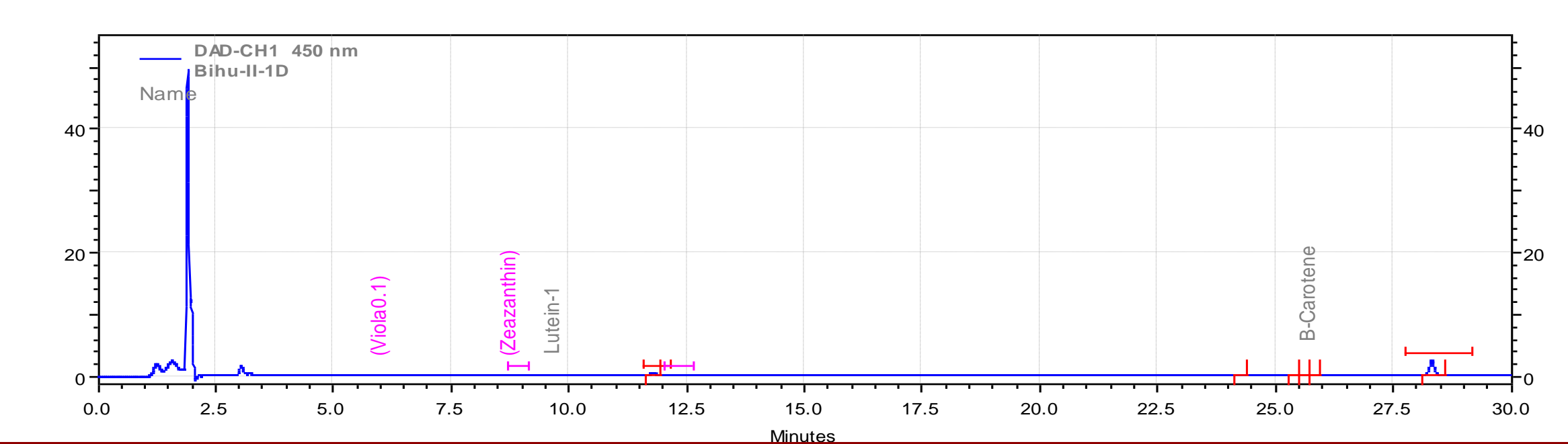
Beauregard B63



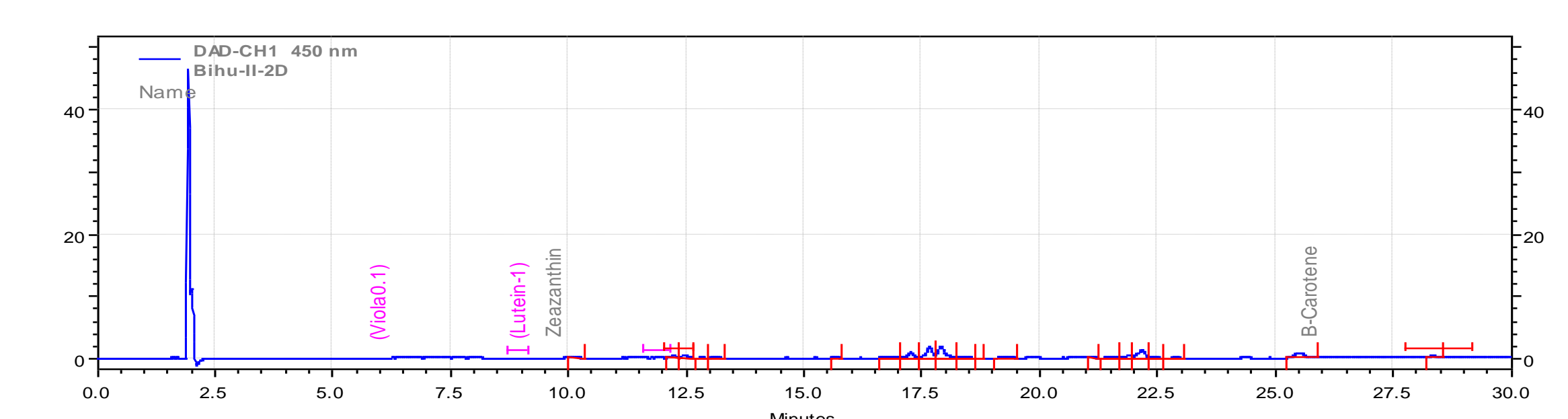
Table 1. Carotenoids contents in Sweet Potato

Varieties	ug Carotenoids/ g wt materials			
	B-Carotene	Zeaxanthin	Lutein	Violaxanthin
Purple (Stokes) sweet potato	7.275	<0.25	<0.25	<0.25
Bonita sweet potato	1.075	31.175	<0.25	<0.25
Covington sweet potato	47.2	<0.25	0.28	<0.25
Beauregard (B94-14)sweet potato	40.45	<0.25	<0.25	<0.25
Beauregard (B63)	99.95	<0.25	<0.25	<0.25

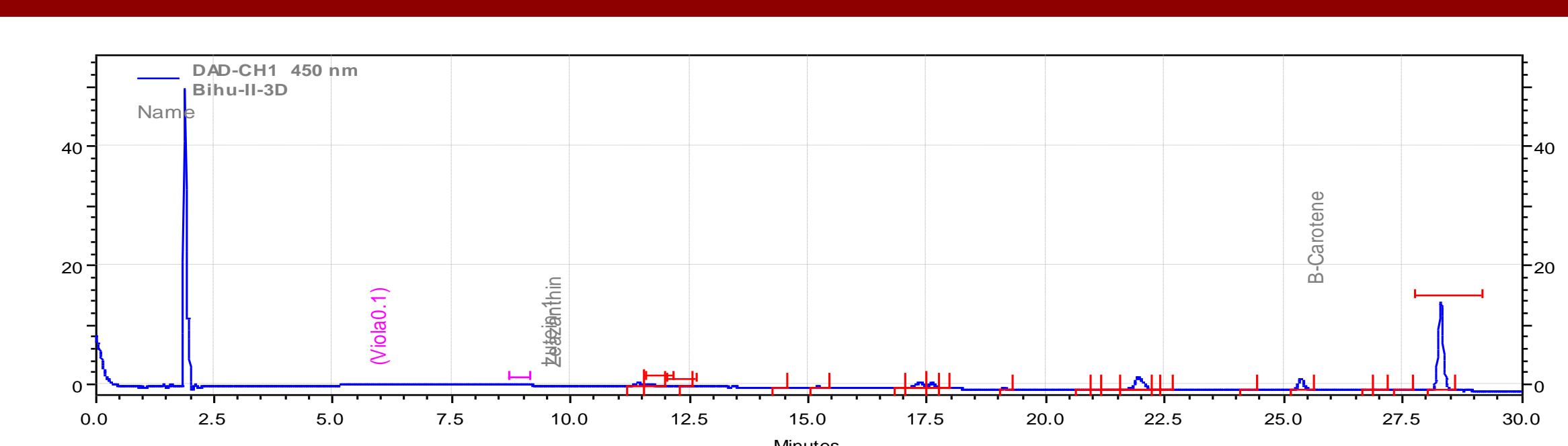
HPLC Chromatogram for Purple (Stokes) sweet potato



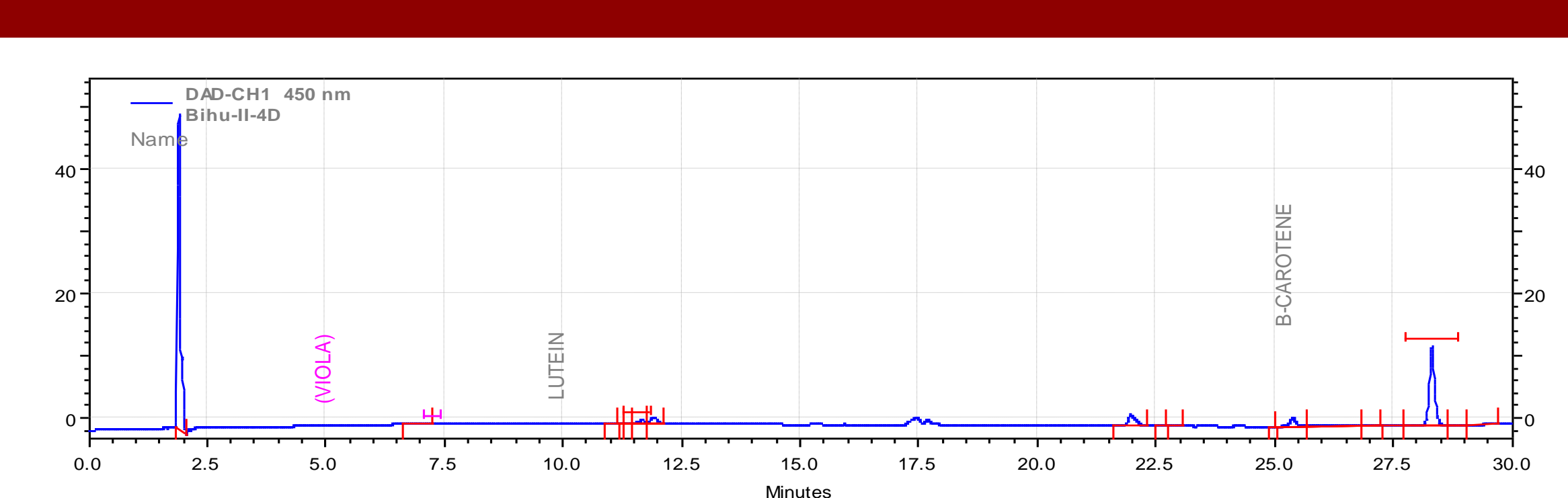
HPLC Chromatogram for Bonita sweet potato



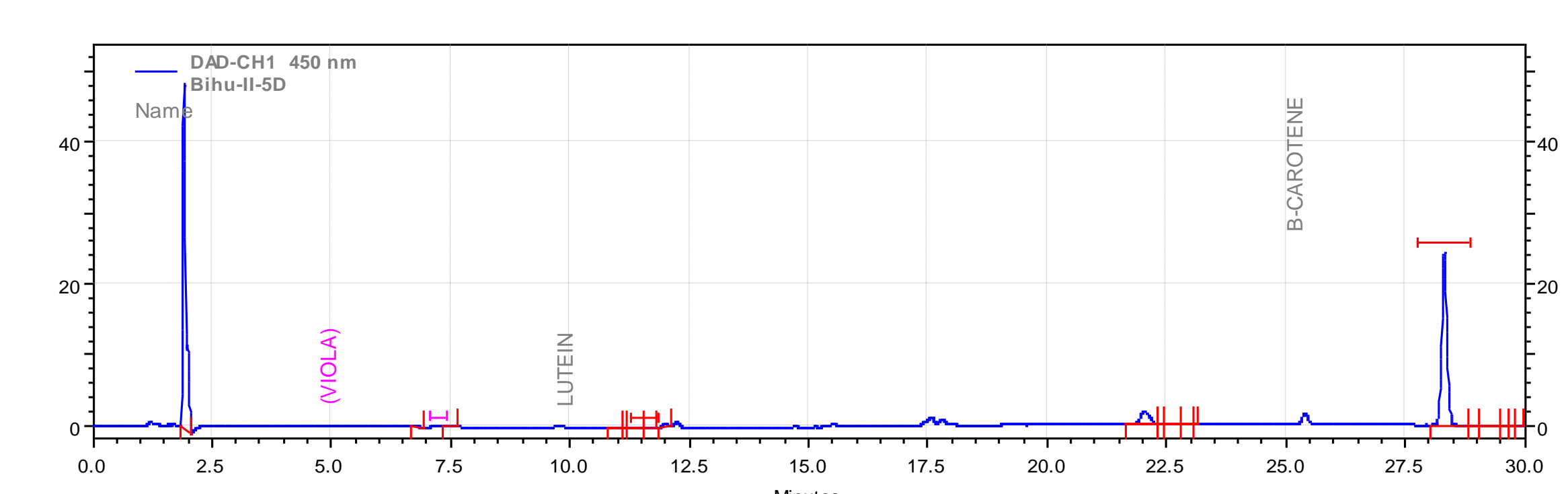
HPLC Chromatogram for Covington sweet potato



HPLC Chromatogram for Beauregard (B94-14)sweet potato



HPLC Chromatogram for Beauregard (B63) sweet potato



Discussions and Conclusions

The carotenoid content of the five sweet potato are presented in Table 1. As could be seen from the Table, the preliminary investigation of the all five varieties of sweet potato Stokes, Bonita, Covinton, Beauregard B94-14, and Beauregard B63 appear to have a B-Carotene content of 7.275, 1.075, 47.2, 40.45, and 99.95 ug per gram tissue, respectively. Bonita contains 31.175 ug Zeaxanthin per gram tissue. Covington contains 0.28 ug Lutein per gram tissue. The Zeaxanthin, Lutein and Violaxanthin appear less than 0.25 ug per gram tissue for the rest of varieties.

Carotenoids have long been recognized as essential nutrients and important health beneficial compounds. "Pro-vitamin A" carotenoids, such as β -carotene, provide the primary dietary sources of vitamin A. The deficiency of vitamin A is one of the most noticeable nutritional problems in many parts of the world. In fact, the high economic value of carotenoids arises from their ability as a source of vitamin A, and other health-promoting compounds taken as food components. The indispensable role of carotenoids in plants and the increasing interest in their health benefits to humans have prompted a significant effort to gain a better understanding of carotenoid biosynthesis in plants. Sweet potato is an excellent source of provitamin A carotenoids and is believed by some to play a positive role in preventing cancer.

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