

# Anthocyanin Content in Seeds, Leaves, and Flowers of *Lablab purpureus*

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## Abstract

*Lablab purpureus* contains bioactive phytochemicals with potential to be utilized in the nutraceutical markets. Ninety four *Lablab purpureus* accessions are curated at the USDA, ARS, Plant Genetic Resources Conservation Unit, Griffin, GA. Anthocyanins are responsible for leaf, stem, flower, seed color and can inhibit colon cancer cells. The objectives of this study are to determine the amount of anthocyanin and flavonoid compounds including quercetin and kaempferol from leaves, flowers and seeds of *Lablab purpureus*. Leaf anthocyanin indexes ranged from 3.6 – 44.1 while seed coat anthocyanin indexes ranged from 1.2 – 56.9 for these *L. purpureus* accessions. Quercetin and kaempferol ranged from 0.54 to 1.50 mg/g and 0.16 to 0.46 mg/g of leaf tissue respectively. These accessions can serve as potential new sources of high anthocyanins, quercetin and kaempferol to be introduced into breeding lines or cultivars and/or used as a nutraceutical crop in the southeastern U.S.

## Materials and Methods

An Opti Sciences CCM-200 chlorophyll content meter was converted to an experimental hand-held anthocyanin meter. The 655 nm light emitting diode (LED) of the CCM was replaced with a 520 nm LED in order to measure absorbance near the wavelength at which free anthocyanin aglycones, cyanidin and pelargonidin monoglucosides absorb. Anthocyanin indexes were recorded from each of three leaves, flowers and seed coats, using this anthocyanin meter on 17 June, 15 July, and 12 August, 2008. For HPLC analysis, 0.5 g of ground plant tissue from each species was measured into a 5 ml tube and an 80% HPLC grade methanol with 1.2 M HCl solvent was added to each. After vortexing, samples were incubated at 80° C for 2 hrs., centrifuged, diluted 1:1 in water, filtered for injection. Separations performed by RP-HPLC using a Zorbax Eclipse, C18 column at 40° C on Agilent 1100. Sample injection volume was 10 µl and analytes monitored with a diode array detector at 254 and 370 nm absorbance. Quercetin and kaempferol standards were purchased from Sigma and used to generate a standard curve for peak identification and quantitation.

## Accession origins

2	Atlanta market
PI 164772	India
PI 183451	India
PI 338341	Zambia
PI 388003	Australia
PI 388017	Australia
PI 419086	China
PI 439586	Brazil
PI 481694	Bhutan
PI 481695	Bhutan
PI 509114	India
PI 596358	U.S.
PI 639277	China

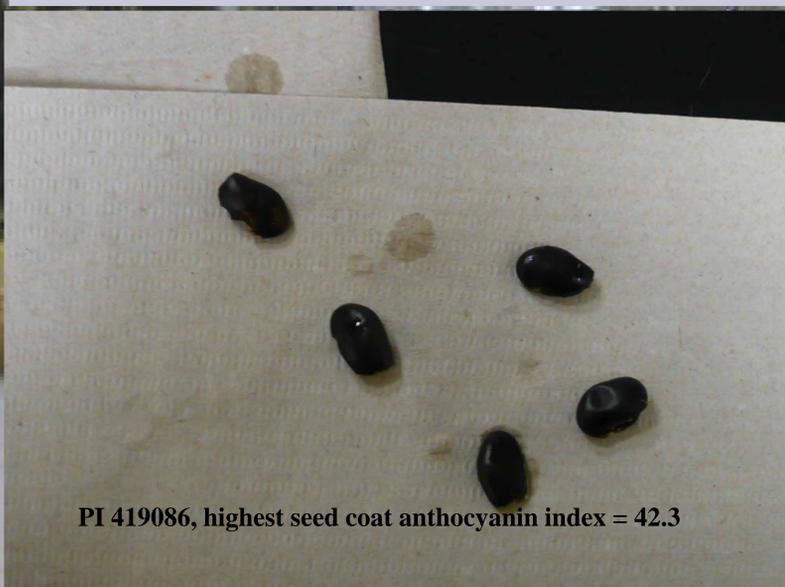
## Results

### Preliminary anthocyanin indexes from *L. purpureus* seed coats, 16 January, 2008

Accession (PI)	Range	Index mean	Seed coat color
419086	37.8-43.6	42.3 a	Black
639277	1.9-56.9	21.3 b	Brown, black
439586	9.6-21.9	17.7 bc	Black
481694	10.6-24.6	14.7 bcd	Brown, black
388017	2.2-29.1	13.8 bcd	Brown, black
481695	6.9-16.4	11.0 bcde	Brown, black
509114 (control)	3.9-11.6	8.9 cde	Brown
338341	3.5- 6.5	4.8 de	Tan
596358	1.7- 6.8	3.6 de	Brown
164772	1.1- 2.6	1.7 e	Buff, brown
183451	1.4- 1.6	1.5 e	Buff
388003	1.3- 1.4	1.4 e	Buff
2	1.2- 1.6	1.4 e	Buff

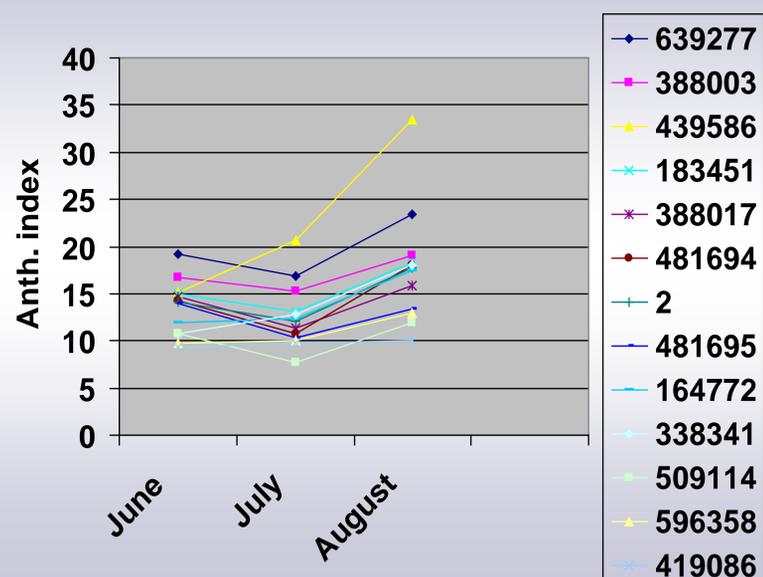
### Quercetin and kaempferol content in *L. purpureus* (mg/g of leaf tissue)

Accession (PI)	Quercetin	Kaempferol
639277	1.50 a	0.46 a
439586	1.27 b	0.22 fg
2	1.14 c	0.25 e
509114 (control)	1.13 c	0.21 g
481695	1.12 c	0.38 b
481694	1.12 c	0.36 c
419086	0.84 d	0.23 f
164772	0.69 e	0.16 h
596358	0.67 e	0.23 f
388003	0.59 f	0.16 h
388017	0.54 f	0.28 d



Quercetin has clinically shown to reduce blood pressure in hypertensive people (Edwards et al. 2007. J. Nutr. 137:2405-2411). In addition, quercetin significantly reduced upper respiratory tract infections in cyclists after intense exercise (Nieman et al. 2007. Med. Sci. Sports Exerc. 39:1561-1569). Both quercetin and kaempferol has been clinically proven to have a preventive effect on pancreatic cancer especially for current smokers (Nothlings et al. 2007. Am J. Epidemiol. 166:924-931). Based on our data, PI 419086 has a black seed coat with the significantly highest anthocyanin index mean of 42.3 when compared to all *Lablab purpureus* accessions. *Lablab purpureus* accessions differed significantly in leaf anthocyanin indexes during June, July, and August, 2008. Leaf anthocyanin indexes for both PI 439586 and PI 338341 increased over time while all other *L. purpureus* accessions decreased in anthocyanin index on 15 July, 2008 and increased on 12 August, 2008. We did not analyze anthocyanin indexes from flowers since all accessions were not flowering. Both quercetin and kaempferol differed significantly among *L. purpureus* accessions, however 2 – 6 times more quercetin was produced than kaempferol.

## Leaf anthocyanin indexes over time



## Conclusion

Since *Lablab purpureus* is a vegetable, it will provide the public with health enhancing nutraceuticals including anthocyanins, quercetin, and kaempferol. *Lablab purpureus* is also a forage crop and could provide these same health enhancing compounds to farm animals including cattle.

