Flavonoid Concentration Diversity of 3 Different Species in the Phaseoleae Tribe

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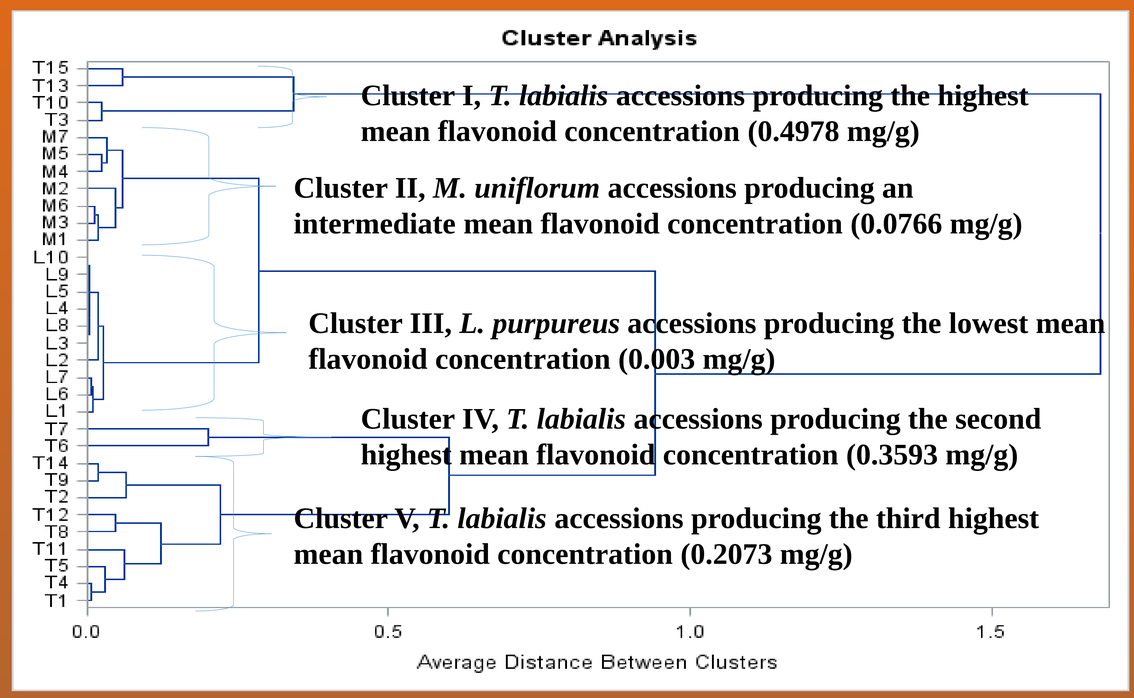
Abstract

The functional vegetable species including *Lablab purpureus* L. Sweet, *Macrotyloma uniflorum* (Lam.) Verdc., and *Teramnus labialis* (L.f.) Spreng are in the *Phaseoleae* tribe. Seeds from 10 *L. purpureus* and 7 *M. uniflorum* accessions originated from the field during 2009 and 2009 to 2010, respectively at Griffin, GA. However, seeds from 15 *T. labialis* accessions originated from greenhouse grown plants because of photoperiod sensitivity. Flavonoids have been shown to have anti-cancer potential. The flavonoid data from all three species were subjected to an ANOVA, mean separation, cluster, and principal component analysis. Significant flavonoid concentrations were identified from all species. Overall, *T. labialis seeds* produced significantly more quercetin (ranging from 0.616 – 2.12 mg/g) than the other 2 species. The cluster analysis showed 5 distinct clusters for flavonoid content in the 3 species. The *Teramnus labialis* accessions showed 3 clusters with the highest flavonoid concentrations (ranging from 0.2073 to 0.4978 mg/g). The *M. uniflorum* accessions produced an intermediate concentration of flavonoids (0.0766 mg/g), and the lowest flavonoid concentrations were observed in the *L. purpureus* accessions (0.0030 mg/g). The principal component analysis showed that the first and second components accounted for 70 and 28% of the total variation. *Teramnus labialis* and *L. purpureus* were high in principal component 1 with coefficients of 0.6659 and 0.6626, respectively. However, *M. uniflorum* was high in principal component 2 with a coefficient of 0.9393. The *T. labialis* accessions produced superior flavonoid concentrations relative to the other two species. Separate clusters for *L. purpureus* and *T. labialis* were observed in principal component 1. A common cluster for *M. uniflorum* was observed in principal component 2.



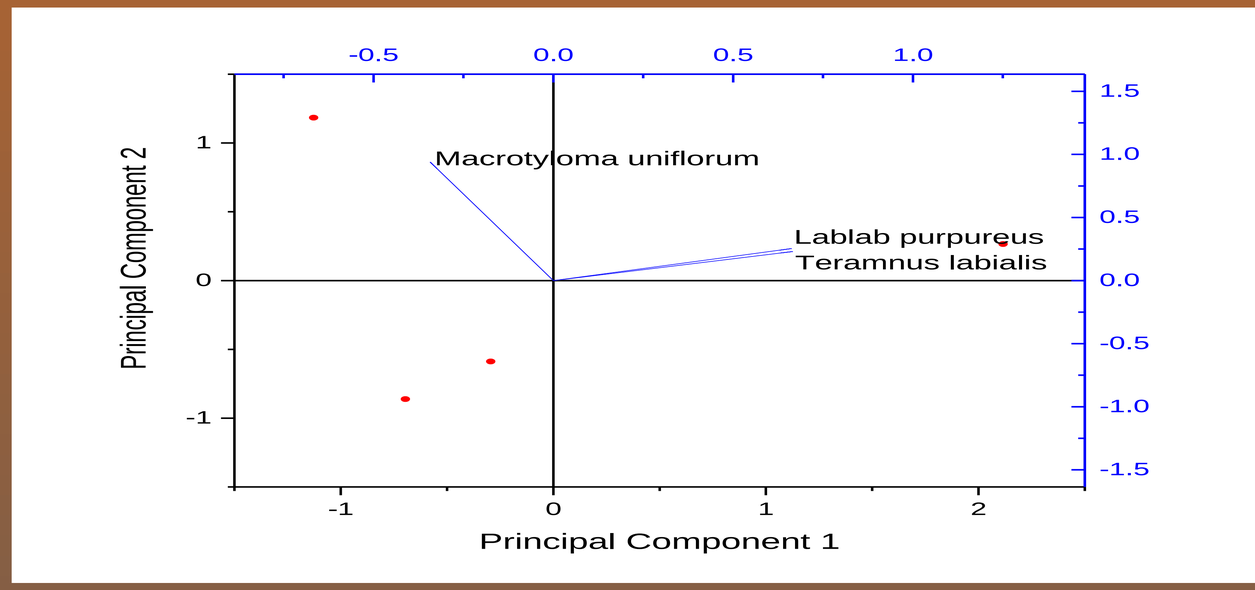
Dendrogram of the distance between clusters based on flavonoid concentration differences. Species are given on the y-axis (T, M, and L represent *Teramnus labialis*, *Macrotyloma uniflorum*, and *Lablab purpureus*, respectively). Values on the x-axis indicate average flavonoid distances between the species. 5 clusters for flavonoid concentrations can be distinguished.

Materials and Methods

17 accessions of *Lablab purpureus* L. Sweet and *Macrotyloma uniflorum* (Lam.) Verdc. were grown in the field from 2009 to 2010. However, 15 *Teramnus labialis* (L.f.) Spreng accessions were grown in the greenhouse during 2009 because of photoperiod sensitivity. All seeds were harvested at maturity. Dry and mature seeds from each genera and accession were analyzed for flavonoid content using a similar reverse phase HPLC technique. See Morris et al., 2013a, 2013b, and 2014 for details. Published data from (Morris 2013a, 2013b, and 2014) was re-analyzed using mean separations from ANOVA as well as principal component and cluster analysis to identify which taxon produced superior flavonoid content.

Results and Discussion

Flavonoid	*L. purpureus* (n=10)	*M. uniflorum* (n=7)	*T. labialis* (n=15)
	Range (mg/g)		
Myricetin	0c – 0.0194b	0c – 0.036a	Not detected
Quercetin	0g – 0.0284a	0g – 0.0272ab	0.616fg – 2.12fg
Kaempferol	0d – 0.00742d	0.2403c – 0.3155a	0d – 0.07d
Isorhamnetin	Not detected	Not detected	0b – 0.086a



	Eigenvalue	Percentage of Variance	Cumulative
1	2.10491	70.16%	70.16%
2	0.85323	28.44%	98.60%
3	0.04186	1.40%	100.00%

	Coefficients of PC1	Coefficients of PC2
Teramnus labialis	0.66597	0.23062
Lablab purpureus	0.66261	0.25399
Macrotyloma uniflorum	-0.34269	0.93931

References

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