J. Natn. Sci. Coun. Sri Lanka 1979 7(2) : 119—121

SHORT COMMUNICATION

Chemical Characterization of Winged Bean, *Psophocarpus tetragonolobus* (L.) DC and related *P. Palustris* Desv.

Y. D. A. SENANAYAKE AND MALINI PONNADURAI.
Department of Crop Science, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka.

(*Paper accepted :* 07 *November* 1979).

Systematic and evolutionary studies on a wide variety of plants have been made on the basis of chemical constituents.[2,7] In one line of investigations, paper chromatographic maps of leaf phenolic compounds have been used for biochemical documentation of plant species and for the identification of hybrids.[1,3,4,7,8,9]

The winged bean *Psophocarpus tetragonolobus* has evinced much interest during the last few years as a potentially important legume for the developing tropics because of its high protein content and amino acid composition which are comparable to the better known soybean *Glycine max* (L). Merr.[6] The natural range of distribution of winged bean is the tropical belt of south and south-east Asia. Papua-New Guinea is suspected to be its native habitat. Of the few species in the genus *Psophocarpus*, only winged bean and *P. palustris* are cultivated. The latter however compared to winged bean is a less vigorous creeper, bears smaller fruits and seeds and is native to West Africa.[10] Due to the wide separation of native habitats of the two species, an investigation was begun to study their relationship through interspecific hybridization and distribution of phenolic constituents on paper chromatograms. This report identifies differences that were observed in the chromatograms of the two species.

Leaves of the two species harvested from plants grown in the field were used for the study. 2*g* of fresh leaves were heated in methanol for 10 mts, then homogenized in a Waring blendor and extracted in a Soxhlet for 8—10 hrs. in methanol.

The extractant was concentrated in a vacuum at room temperature and the final volume was prepared in the proportion of 1 ml for every 0.07*g* fresh weight of leaves. The extracts were spotted on Whatman No. 1 paper at 400λ and 450λ after preliminary tests ranging from 50λ to 450λ revealed these to be the best concentrations. Descending chromatography was used by running the papers in the first direction in butanol-acetic acid-water (4 : 1 : 2.2 v/v/v) and in the second direction in 2% acetic acid.

The dried papers were examined in visible light and under ultra violet light (254mμ and 360 mμ) before and after spraying with 10% sodium carbonate. They were next examined after spraying with sulphanilic acid (9 *g* sulphanilic acid + 90 *ml* cone. HCl in 1l of water) and 4% sodium nitrate in the ratio of 1 : 5).

The combined chromatogram of the two species is shown in Figure 1 and the detection methods and the appearance of the compounds are given in Table 1. In this study the spots were not identified. The chromatogram shows that there are spots common to both species (1, 2, 5, 9, and 10) even though the two species are widely separated geographically suggesting a common origin in their evolution. Spots specific to the two species were also found. For example while spots 11, 12 and 18 were found only in *P. tetragonolobus*, spots 3, 6, 8 13, 14, 16, 17, 19, 20, 21, 22 and 24 were specific to *P. palustris*. The larger number of species specific spots in *P. palustris* and the prominent colours of some of them (3, 6, 8, 13, 14, 17) after spraying with Na_2CO_3 (Table 1) would be helpful in identifying this species and hybrids derived from it. 75% of the spots were not common to the two species. Such a wide difference is suggestive of a long period of isolation of the two species which could contribute to reproductive barriers. Preliminary studies on interspecific hybridization between the two species (Senanayake, unpublished) suggests that such barriers exist.

TABLE 1. Colour reaction of spots on dry paper chromatograms of *P. tetragonolobus* and *P. palustris*

Detection procedure	Appearance	Spot Number
Visible light	None	None
UV light-(254 mμ)	White	1
	Light purple	9, 10, 11, 14
	Purple	2
	Light blue	22
	Light green	17
	Bluish green	5
UV light (360 mμ)	White	1
	Pink	2
	Light blue	17, 22
	Blue	14
	Light green	20
	Light purple	8
	Dark purple	9, 10, 13
After Na_2CO_3 Spray		
Visible light	Yellow	9, 10, 13
UV light- (254 mμ)	Light blue	12
	Blue	14, 19, 20, 21
	Purple	16, 26
	Light brown	2
	Brownish yellow	4
	Light yellow	5, 8, 11
	Greenish yellow	1, 6, 13
	Dark yellow	9, 10
UV light- (360 mμ)	Brownish yellow	1
	Pink	2
	Blue	12, 14, 17, 18, 19
	Purple	24
	Light yellow	3, 5, 8
	Dark yellow	9, 10, 13
	Light green	6
After sulphanilic acid Spray		
Visible light	Light brown	2, 13.

Acknowledgement

This study was supported by a research grant No. 2/RG/76/4 of the National Science Council of Sri Lanka to the senior author which is gratefully acknowledged.

References

1. ALSTON, R. E. & TURNER, B. L. (1962). *Proc. Nain. Acad. Sci.* U.S.A. **48** : 130.
2. ALSTON, R. E. & TURNER, B. L. (1963), *Biochemical Systematics. Prentice Hall. Inc. New York*, 404 pp.
3. ALSTON, R. E. & TURNER, B. L. (1963*b*) *Am. J. Bot.*, **50**: 159.
4. ALSTON, R. E., TURNER, B. L., LESLER, R. N. & Horne, D., (1962) *Science*, **37**: 1048.
5. DASS, H. C., RANDHAWA, G. S. & KAUR, M. (1967). Plant Breeding Abstr. 46 No. 9372.
6. N.A.S. (1975). *The Winged Bean : A High Protein Crop for the Tropics, Nat, Acad. Sci. Washington D.C.*
7. SWAIN, T. (1963). *Chemical Plant Taxonomy, Academic Press, New York*, 543 pp.
8. FROST, S. & HOLM G., (1975). *Hereditas*, **80**: 167.
9. PARKS, C. R. EXELL, W. L., WILLIAMS D. E. & DREYER, D. L. (1975). *Bull. Torrey Bot. Club*, **102**: 350.
10. ZEVEN, A. C. & ZHUKOVSKY, P. M. (1975). *Dictionary of Cultivated Plants and their Centres of Diversity*. 219 *pp. Centre for Agricultural Publishing and Documentation. Wageningen.*