Amino Acid and Carbohydrate Composition of Stem Bark of some Cultivars of *Mangifera indica* (Mango)

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Mango bark has pharmaceutical applications[1]. The free amino acid (FAA) contents of some cultivars have been investigated[2]. The protein contents and the amino acids in the bark of juvenile and mature mango plants have been studied at the time of flower initiation[3]. We investigated that the levels of protein contents, and bound and unbound amino acids differed considerably in fruits of different mango cultivars[4]. Stem barks of three popular cultivars of *Mangifera indica* were subjected to chemical examination and charcterisation of free and bound amino acids and carbohydrates forms the subject matter of the present communication.

Amino acids : The aqueous extracts of coarsely powdered barks responded positively to all tests of proteins, carbohydrates and free amino acids. Ten, thirteen and six coloured spots were detected on paper chromatogram in barks of *Desi*, *Chausa* and *Dusehri* cultivars, respectively. Alanine, cysteine, threonine, glycine, aspartic acid, glutamic acid, leucine, phenylalanine, serine and methionine were the widely distributed unbound amino acids.

Desi variety contains the highest number of bound amino acids while their amounts were least in *Dusehri*. The concentration of the amino acids was highest in *Chuesa* protein. Histidine, lysine and tryptophan were present only in *Desi* protein hydrolysate while glutamic acid was detected only in *Dusehri* protein. Alanine and arginine were found to be the constituents of all proteins under investigation.

The concentration of free amino acids present in the stem barks of three cultivars under study ranged between 0.017 and 0.359% of bark. *Chausa* variety contains the maximum number of amino acids. The *Desi* variety does not possess lysine and valine in the free state. Similarly, the protein isolated is devoid of aspartic acid, glutamic acid, histidine, isoleucine, leucine, threonine, tyrosine and serine. Phenylalanine, which was present in maximum quantity in *Desi* and *Dusehri* varieties, was found to be in trace amount in *Chausa* cultivar. The levels of alanine, aspartic acid, glutamic acid, glycine, leucine, methionine, proline, serine and threonine were maximum in *Chausa* stem bark

while other two varieties contained small amounts. All mango cultivars have less concentrations of cysteine and leucine (0.023—0.079%) in all barks. In general the levels of essential amino acids were low (Table 1).

TABLE 1—FREE AND BOUND AMINO ACIDS OF STEM BARKS OF *Mangifera indica* CULTIVARS

Amino acids	Free amino acids (%)			Protein-bound amino acid (%)		
	Desi	*Chausa*	*Dusheri*	*Desi*	*Chausa*	*Dusehri*
Alanine	0 099	0.342	0.067	0.046	0.198	0.475
Arginine	0.024	0.163	—	0.092	—	0.047
Aspartic acid	0.060	0.114	0.067	—	—	—
Cysteine	0.045	0.052	0.048	0.021	0.045	0.147
Glutamic acid	0.172	0.356	0.148	—	0.104	0.093
Glycine	0 051	0.112	0 073	0.051	0 431	0.249
Histidine	0.046	0 119	—	—	0.532	—
Isoleucine	0.024	0.074	—	—	—	—
Lysine	—	0.023	—	0.021	0.104	0.044
Leucine	0.023	0.079	0 041	—	—	0.028
Methionine	0 030	0.100	0 034	0.069	0.028	0.165
Phenylalanine	0.219	0.021	0.359	0.563	0.624	0.612
Proline	0.025	0.103	0.028	0.025	35.086	0.275
Serine	0.047	0.092	0.041	—	0.016	—
Threonine	0.176	0.313	0 067	—	0 295	0.105
Tyrosine	0.026	0.027	—	—	0.093	0.210
Valine	—	0.017	—	—	0.036	0.055

The levels of protein-bound amino acids present in various stem barks ranged between 0 015 and 35.08% Alanine, cysteine, glycine, lysine, methionine, phenylalanine and proline were present in all stem bark extracts. Histidine and serine were only present in *Chausa* variety stem bark. Leucine was found in *Dusehri* cultivar (0.028%) extract only. Similarly, glutamic acid, threonine, tyrosine and valine were detected in the range 0.015—0.294% in *Chausa* and *Dusehri* barks. Proline, which could not be detected on paper chromatogram, occurred in maximum concentration in *Chausa* bark while it was present in small amount in *Desi* bark. The level of amino acids was low in *Desi* bark. The *Chausa* variety did not contain arginine but in other cultivars the concentration of this amino acid varied between 0.047 and 0.092%.

In general, the levels of essential amino acids were very low. The amino acids, aspartic acid. DOPA, hydroxyproline, isoleucine, norleucine, ornithine and tryptophan could not be detected in free state in any extract (Table 1).

Sugars: From paper chromatographic study it was observed that the sugars apiose, glucuronic acid, mannose and fructose were present in aqueous extracts of the barks. *Chausa* bark contains three monosaccharides identified as glucuronic acid, apiose and mannose. Apiose and fructose were detected in the barks of *Desi* and *Dusehri* varieties, respectively.

Acid-hydrolysate of the precipitated portion of aqueous extracts of the barks showed the presence of fructose, ribose, glucose, galactose and xylose. Like free sugars, the maximum number of bound sugars found in *Chausa* cultivar, were characterised as ribose, fructose, glucose and galactose. None of the sugars present in free state were detected in bound form, except fructose.

Experimental

Stem barks of three varieties of mango, *Desi*, *Chausa* and *Dusehri* were collected locally in September 1991. The concentrated aqueous extracts of dried and pulverised bark samples (100 g each) were used for the qualitative evaluation of unbound amino acids and carbohydrates by paper chromatography[4,5].

The proteins and polysaccharides were precipitated by addition of ethanol (95%) to each bark extract (20 ml) which were hydrolysed to get bound amino acids and sugars as described earlier[4].

A Technicon Sequential Multi-Sample amino acid analyser was employed for quantitative analysis of amino acids[6].

References

1. The "Wealth of India, A Dictionary of Indian Raw Materials and Industrial Products: Raw Materials", C.S I.R., New Delhi, 1962, Vol. 6, p. 265; R. N. CHOPRA, S. L. NAYAR and I. C. CHOPRA, "Glossary of Indian Medicinal Plants", C.S.I.R., New Delhi, 1965; K. M. NADKARNI, "Indian Materia Medica", Popular Prakashan, Bombay, 1976, p. 764.
2. H. I. EL-SISSI and N. A. M. SALEH, *Planta Med.*, 1964, 12, 421; 1965, 13, 346; 1970, 73, 185.
3. E. K. CHACKE and T. V. ANANTHANARAYANAN, *Z. Pflanenphysiol.*, 1982, 281.
4. K. KOHLI, J. S QADRY and M. ALI, *J. Food Sci. Agric.*, 1987, 39, 247.
5. M. ALI and J. S. QADRY, *J. Indian Chem. Soc.*, 1986, 63, 918; 1987, 64, 230.
6. D. H. SPACKMAN, W. H. MOORE and S. MOORE, *Anal. Chem.*, 1958, 30, 1190.