

# Estimation of Amino Acid Contents from Some Medicinal Tree Species of Nagaur District of Rajasthan

Renu Bansal\*, B.B.S. Kapoor

(\*Department of Botany, Maharani College for Women, Bikaner, Retired Professor of Botany, Dungar College, Bikaner, Rajasthan)

## ABSTRACT

Evaluation of Amino acid contents of stems, leaves and fruits from four selected medicinal trees like *Acacia tortilis*, *Prosopis cineraria*, *Salvadora persica* and *Tecomella undulate* growing in, Nagaur district of Rajasthan was carried out from three different sites of study area for analysis. Among all the four plant species the maximum number of free amino acids was found, 12 in fruits of *Salvadora persica* and while minimum number were found 7 in leaves of *Acacia tortilis* and *Tecomella undulata*. Maximum total amount (56.5 mg/g.d.w.) of free amino acids was found in the stems of *Acacia tortilis* while minimum (11.7 mg/g d.w.) in the stems of *Salvadora persica*. Maximum amount (35.5 mg/g.d.w.) of the total bound amino acid was observed in the fruits of *Tecomella undulata* followed by fruits of *Acacia tortilis* (33.5 mg/g.d.w.) while minimum (9.0 mg/g.d.w.) in the leaves of *Salvadora persica*. Thus the medicinal trees of this arid region of Rajasthan are good source of free and bound amino acids.

**Keywords:** Free Amino acid contents, Medicinal tree species, Nagaur district, Rajasthan

## Introduction

Rajasthan is the largest state situated in the north western part of India which is segregated in several specific regions. Shekhawati is one such significant region. The region fully or partly covers three districts, viz. Churu, Jhunjhunu and Sikar. Jhunjhunu district, a part of Shekhawati region is covering 5,928 sq. km total geographical area and is endowed with treasure of flora such as *Acacia tortilis*, *Prosopis cineraria*, *Salvadora persica* and *Tecomella undulate* *Acacia nilotica*, *Salvadora oleoides*, *Zizyphus nummularia*, *Zizyphus xylopyrus* and *Acacia senegal* which are commonly found in this area

The importance of plants lies in their biological active compounds, which are the real healer in the process of medication. Phytochemicals are basically divided into two groups, *i.e.* primary and secondary constituents according to their functions in plant metabolism. Primary constituents comprise common sugars, **amino acids**, proteins and chlorophyll, while secondary constituents consists of alkaloids, terpenoids, saponins, phenolic compounds flavonoids, tannins and so on. These phytoconstituents work with nutrients and fibres to form an integrated part of defense system against various diseases and stress conditions. These compounds are also sources of pharmaceuticals, pesticides, flavoring agents, fragrances and food additives.

Plant amino acids have an important impact on functioning of various systems and organs of human body. In addition, they possess a wide range of pharmacotherapeutic properties, improve the digestion and potentiate the activity of biologically active compounds present in plants. Thus, the search of plant species that contain a large complex of plant amino acids and are used as food is of current interest. Amino acids are organic molecules that are part of proteins, playing a key role in most biological processes. There are also many other non-protein amino acids with physiological and metabolic functions. The amino acids in plants are synthesized from the nitrogen absorbed by the roots, through a process that involves a high energy expenditure

## Materials and Methods

The present investigation deals with evaluation of free amino acid contents of stems, leaves and fruits of four selected medicinal tree species growing in Nagaur district of Rajasthan like *Acacia tortilis*, *Prosopis cineraria*, *Salvadora persica* and *Tecomella undulata*. The stems, leaves and fruits of all the four selected plant species taken for present investigation were collected from three different sites Alaye, Khinvsar and Merta areas of Nagaur district. Plant parts were collected in polythene bags. The samples were dried, powdered and then used for the estimation of free amino acid content.

## Extraction Procedure

About 5 gm powdered material from each of the sample (stems, leaves and fruits) was macerated with 80% ethanol in a Waring blender. To each of these mixtures 80% ethanol was added to make up the volume up to 250 ml in each case and left overnight at room temperature. Each of the mixtures was filtered and the residue was washed thrice with 80% ethanol. All the washings were pooled along with the filtered. To the filtrate chloroform (1:3 v/v) was added, shaken thoroughly and aqueous layer separated in a separating funnel [1]. The step was repeated thrice and the resulting aqueous layers from each of the samples were pooled and dried in a vacuum desiccator. Each of the residue thus obtained was dissolved in 10 ml 50% ethyl alcohol, dried, dissolved in 10% isopropanol and stored at 2°C.

## Protein Bounded amino acids

Each of the residues (of original mixture in 80% ethanol) left after the extraction of free amino acids was hydrolysed with 6-N HCl (30ml), [4,11] at 100°C for 24 hour using a stoppered sealed tube. The mixture was filtered and the filtrate dried in a vacuum desiccator. The dried mass was dissolved in 10% isopropanol and stored at 2°C for further studies.

The qualitative composition of the free amino acids have been studied by the methods of One dimensional paper - chromatography, Two dimensional thin layer chromatography (TLC) and the quantitative content with the high-performance liquid chromatography

## 3. Results and Discussion

Concentration of the free amino acid contents in the various parts (stems, leaves and fruits) of all the plant species i.e. *Acacia tortilis*, *Prosopis cineraria*, *Salvadora persica* and *Tecomella undulate* collected from three different sites i.e. Alaye, Khinvsar and Merta sites of Nagaur are presented in Table 1. and depicted in figure.1

Out of total twenty two amino acids, total fourteen types of amino acids were detected in various plant samples tested. The maximum number of free amino acids was found twelve in fruits of *Salvadora persica* ( Table-1,Figure 1) .

Maximum total amount (56,5 mg/g.dw.) of free amino acids was found in the stems of *Acacia tortilis* while minimum (11.7 mg/g d.w.) in the stems of *Salvadora persica*. The amount of individual amino acid, however, showed considerable variation. The individual amount of Threonine and Phenyl alanine was found maximum i.e. 10.8 mg/g.dw. and 10.1 respectively in the stems of *Acacia tortilis* among all of the free amino acid detected in selected plant species while, (Table 1,Figure 1). Some parts of selected plants under study were devoid of many amino acids as shown in the table.

The total no. of free amino acids were highest in fruits of *Salvadora persica* i.e. 12 but it was lowest in leaves of *Acacia tortilis* and *Tecomella undulate* i.e. 7.

The over all total no. of free amino acid contents as a whole in all the parts of a single plant is highest in *Salvadora persica* (10 stems,11 leaves and 12 in fruits). Whereas total free amino acid contents contents as a whole in all the parts of a single plant was found maximum in *Acacia tortilis*, followed by *Prosopis cineraria*, *Tecomella undulate* and *Salvadora persica*.

Maximum amount (35.5 mg/g.d.w.) of the total bound amino acid was observed in the fruits of *Tecomella undulata* followed by fruits of *Acacia tortilis* (33.5 mg/g.d.w.) while minimum (9.0 mg/g.d.w.) in the leaves of *Salvadora persica*. The individual amount of alanine was found maximum (6.0 mg/g.d.w.) in the stem of *Acacia tortilis* among all the bound amino acids detected in selected plant species while minimum (0.6 mg/g.d.w.) threonine in the stem of *Salvadora persica* .Some parts of selected plants under study were devoid of many amino acids as shown in the Table 2 and Figure2.

The total no. of bound amino acids were highest in fruits of *Tecomella undulata* i.e. 10 but it was lowest in stems of *Acacia tortilis* and *Tecomella undulata* i.e. 7.

The over all total no. of bound amino acid contents as a whole in all the parts of a single plant is highest in *Tecomella undulata* (8 stems,8 leaves and 10 in fruits) followed by *Salvadora persica*, *Prosopis cineraria*, and *Acacia tortilis*.

However, the amount of amino acids is different in different parts of a plant *due* to various biochemical reactions going inside. In the present investigation number of bound amino acids were more in all the samples. Higher amounts of bound amino acids in the intact plant parts may be due to storage of proteins in these organs.

A number of workers have done the quantitative and qualitative estimation of amino acids, [ 3-8 and 14 -20] have reported amino acids from a number of terrestrial plant species. Free and bound amino acids from various plant parts (roots, shoots and fruits) of some arid zone plants have been reported by many workers [12-17].

## Conclusion

The medicinal tree species growing in Nagaur district of Rajasthan are potential source of free amino acid contents. The present study thus indicates that medicinal trees of this arid region of Rajasthan are good source of free and bound amino acids may be due to storage of proteins in these parts, so these can be used as a source of protein in livestock feed specially in famine conditions.

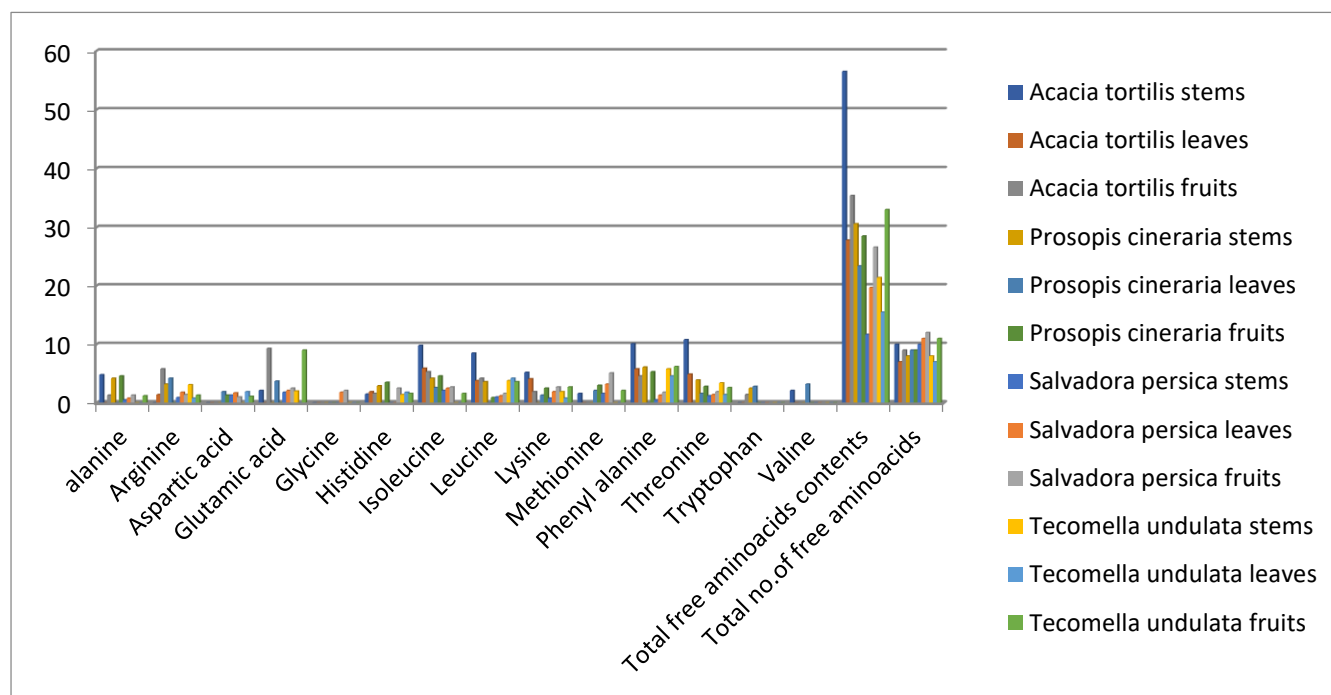
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**Table no.1 Free amino acids contents (mg/g.d.w.)of various plant parts**

S.no.	Amino acids	Rf (x100)	<i>Acacia tortilis</i>			<i>Prosopis cineraria</i>			<i>Salvadora persica</i>			<i>Tecomella undulata</i>		
			stems	leaves	fruits	stems	leaves	fruits	stems	leaves	fruits	stems	leaves	fruits
1.	alanine	28	4.8	0.0	1.3	4.2	0.0	4.6	0.5	0.8	1.3	0.0	0.0	1.2
2.	Arginine	14	0.0	1.4	5.8	3.2	4.2	0.0	0.9	1.8	1.4	3.1	0.8	1.3
3.	Aspartic acid	25	0.0	0.0	0.0	0.0	1.9	1.3	1.3	1.7	1.0	0.0	1.9	1.1
4.	Glutamic acid	35	2.1	0.0	9.3	0.0	3.7	0.0	1.8	2.1	2.5	2.0	0.0	9.0
5.	Glycine	19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	2.1	0.0	0.0	0.0
6.	Histidine	13	1.5	1.9	1.6	2.9	0.0	3.5	0.0	0.0	2.5	1.4	1.8	1.6
7.	Isoleucine	71	9.8	5.9	5.3	4.2	2.6	4.6	2.1	2.5	2.7	0.0	0.0	1.6
8.	Leucine	72	8.5	3.8	4.2	3.6	0.0	0.9	1.0	1.2	1.6	3.8	4.2	3.6
9.	Lysine	11	5.2	4.1	1.9	0.0	1.3	2.5	0.8	1.9	2.7	1.9	0.8	2.7
10.	Methionine	51	1.6	0.0	0.0	0.0	2.1	3.0	1.6	3.2	5.1	0.0	0.0	2.1
11.	Phenylalanine	65	10.1	5.8	4.6	6.1	0.0	5.3	0.5	1.3	1.8	5.8	4.6	6.2
12.	Threonine	24	10.8	4.9	0.0	3.9	1.6	2.8	1.2	1.4	1.9	3.4	1.4	2.6
13.	Tryptophan	62	0.0	0.0	1.4	2.5	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14.	Valine	58	2.1	0.0	0.0	0.0	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total free amino acids contents		56.5	27.8	35.4	30.6	23.4	28.5	11.7	19.7	26.6	21.4	15.5	33
	Total no.of free amino acids		10	7	9	8	9	9	10	11	12	8	7	11

**Figure.1: Free amino acids contents (mg/g.d.w.)of various plant parts****Table no.2 Bound amino acids contents (mg/g.d.w.)of various plant parts**

S.n o.	Amino acids	Rf (x1 00)	<i>Acacia tortilis</i>			<i>Prosopis cineraria</i>			<i>Salvadora persica</i>			<i>Tecomella undulata</i>		
			stem s	leav es	fruit s	ste ms	leav es	fruit s	ste ms	leav es	fruit s	stem s	leav es	fruit s
1.	Alanine	28	6.0	0.0	0.0	2.9	1.4	3.0	0.0	1.2	1.8	0.0	0.0	0.0
2.	Arginine	14	1.9	2.2	0.0	3.0	2.0	3.4	0.9	1.0	2.0	2.2	1.8	0.0
3.	Aspartic acid	25	0.0	0.0	3.9	1.0	0.7	0.0	1.2	1.0	1.5	0.0	0.0	3.9
4.	Glutamic acid	35	3.4	0.0	4.0	0.0	1.2	0.9	1.6	1.4	3.4	0.0	2.4	4.0
5.	Histidine	13	0.0	2.2	3.6	1.8	2.4	0.0	0.0	1.1	1.7	2.5	2.9	3.7
6.	Isoleucin e	71	6.4	0.0	4.8	0.0	2.6	3.0	1.6	1.5	2.8	0.0	1.8	3.8
7.	Leucine	72	2.1	3.5	4.0	0.0	0.0	0.0	1.2	1.0	1.6	2.8	3.2	4.0
8.	Lysine	11	3.3	3.0	3.1	1.2	0.0	0.8	0.0	0.0	0.0	0.0	2.2	5.0
9.	Methioni ne	51	0.0	0.0	0.0	2.0	3.7	3.0	0.0	0.0	0.0	3.2	2.4	4.2
10	Phenyl alanine	65	2.1	3.0	3.2	0.0	1.1	0.0	1.1	0.0	0.0	3.0	2.6	3.1

1	Praline	27	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.7	0.0	0.0	0.0
12	Serine	33	0.0	3.6	4.8	0.0	0.0	0.0	0.0	0.8	0.0	3.6	0.0	2.2
13	Threonine	24	3.8	4.9	1.8	0.0	1.6	3.7	0.6	0.0	1.2	4.7	0.0	1.6
14	Tryptophan	62	0.0	4.8	0.0	1.6	0.0	1.9	0.0	0.0	0.0	4.5	0.0	0.0
	Total bound amino acids contents		29.0	27.2	33.2	13.5	16.7	19.7	9.3	9.0	16.7	26.5	19.3	35.5
	Total no.of bound amino acids		7	9	9	7	9	8	8	8	9	8	8	10

**Figure no.2 Bound amino acids contents (mg/g.d.w.)of various plant parts**

