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AMINO ACIDS AND SUGARS FROM FLORAL NECTARS OF SOME LOCAL PLANS

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Amino acids and sugars from floral nectars of 25 plants belonging to 12 families was detected by paper chromatography. As many as eight amino acids were detected from nectar of *Crinum latifolium*. Nectar of *Thunbergia erecta* showed seven amino acids. Only one of amino acid was detected from *Rauwolffia serpentina, Rivea hypocrateriformis* and *Cytranthera pohliana*. Glutamic acid was found to be most common amino acid. Fructose was found more common amongs sugars.

Keywords : Amino acids; Nectars; Sugars.

Introduction

The chemistry of nectar is quite complex[1]. In addition to sugars, many nectars contain a variety of essential amino acids. It is an aqueous solution of sugars, and it often contains small amounts of other substances, such as amino acids, proteins, alkaloids, phenols antioxidants, lipids, saponins, dextrins and vitamins. The sugars and amino acids in nectar were studied by several workers[2-5]. There are certain varietal differences in the nectar secretions and composition which could be an important factor in pollination mechanism. Therefore, we made the attempt to study nectars of some local taxa.

Material and Methods

For detection of amino acids and sugars from floral nectaries, twenty five wild and cultivated plant species belonging to twelve families were selected (Table 1) . Flowers of *Butea superba, Careya arborea, Leonotis nepetifolia, Anisomelis indica* were collected from Melghat forest and other species were collected from gardens of various educational and research stations in Amravati district of Maharashtra (20.32° to 24.46° N and 76.31° to 78.27° E).

Flowers were collected at proper time of the day from each species when nectar quantity was found to be optimum. Nectars were drawn out from flowers with the help of micropipette if possible and stored in isopropanol. For the qualitative study the most suitable method of paper chromatography (PC) was employed[6]. For sugar detection sufficient quantity of nectar was required therefore it was possible to detect the sugars from the nectars of 14 species only.

For amino acid detection one directional and two directional paper chromatography method was employed. Sugars present in nectar was detected by using one directional paper chromatography[6].

A chromatogram for 22 known available amino acids was developed as a standard for identification. The colour characters and Rf values were used to identify the amino acids present in the samples. Sucrose, fructose and glucose was used as reference material for sugars and were loaded on the same strips used for sugar chromatography.

Results and Discussion

Sufficient amounts of nectar for quantitative determination of amino acids in twenty five species and sugars in fourteen species were obtained. The results for each species are presented in Table 2, 3 and 4. As many as eight amino acids were detected from the nectar of *Crinum latifolium*. The nectar of *Rauwolffia serpentina, Rivea hypocrateriformis* and *Cytranthera pohliana* showed the presence of single amino acid. About 13 species showed 5 to 8 types of amino acids and about 12 species showed less than 5 amino acids. DL-alanine, glutamic acid and glycine were found to be a more common component of nectar

Table 1. Plant species studied.

S. No.	Plant species	Family
1	*Butea superba* Roxb.	Leguminosae
2	*Careya arborea* Roxb.	Lecythidiaceae
3	*Pereskia aculeata* Mill.	Cactaceae
4	*Morinda tomentosa* Heine ex Roth.	Rubiaceae
5	*Mussaenda luteola* Delile	Rubiaceae
6	*Manilkara zapota* (L.) Van Royen	Apocynaceae
7	*Rauwolffia serpentina* (L.) Benth	Apocynaceae
8	*Cordia sebestena* L.	Apocynaceae
9	*Rivea hypocraterifomis* Choisy	Convolvulaceae
10	*Ipomoea dasysperma*	Convolvulaceae
11	*Convolvulus arvensis* L.	Convolvulaceae
12	*Cestrum diurnum* L.	Solanaceae
13	*Tecoma undulata* G. Don.	Bignoniaceae
14	*Peristrophe bicalyculata* (Retz.) Nees	Acanthaceae
15	*Cytranthera pohliana*	Acanthaceae
16	*Thunbergia erecta* var. *alba* Hort.	Acanthaceae
17	*T. laurifolia* Lindl.	Acanthaceae
18	*Gmelina asiatica* L.	Verbenaceae
19	*Salvia splendens* Ker-Gawl.	Labiatae
20	*Leonotis nepetifolia* (L.) R.Br.	Labiatae
21	*Anisomelis indica* (L) O. Ktze.	Labiatae
22	*Heliconia angustifolia* Hook.	Labiatae
23	*Haemanthus kalbreyeri* Baker	Amaryllidaceae
24	*Crinum latifolium* L.	Amaryllidaceae
25	*Amaryllis belladona* L.	Amaryllidaceae

Table 2. List of standard amino acids and those detected in the nectars of plants studied with their respective serial numbers and symbols used.

Amino Acid	Sr. No. used	Amino Acid	Sr. No. used
DL-Alanine	1	Nor-Leucine	18
Alanyl Glycine	2	Lysine Monohydrochloride	19
B-Alanine	3	DL-Methionine	20
DL-2 Amino-n-butyric acid	4	Ornithine	21
Arginine monohydrochloride	5	DL-B phenyl	22
Aspartic acid	6	L-proline	23
Asparagine	7	Serine	24
L-Cystine monohydrochloride	8	Threonine	25
L-r diaminobutyric acid	9	Tryptophan	26
DL-Dopa	10	Tyrosine	27
Glutamic acid	11	Valine II	28
Glycine	12	DL- Valine	29
Histidine	13	Unknown 1	30
Hydroxy proline	14	Unknown 2	31
Isoleucine	15	Unknown 3	32
Lanthionine	16	Unknown 4	33
L-Leucine	17	Unknown 5	34

Table 3. Amino acids detected from nectars of plants.

S. No.	Species	Serial Number of Amino acids																																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	Total
1	*Butea superba*	+				+												+	+	+													+	+		5
2	*Careya arborea*																	+	+	+					+		+									5
3	*Pereskia aculeata*	+										+	+																							3
4	*Morinda tomentosa*				+						+	+				+											+					+				6
5	*Mussaenda luteola*																										+				+					2
6	*Manilkara zapota*																								+	+		+								3
7	*Rauwolffia serpentina*																	+																		1
8	*Cordia sebestena*					+										+							+				+		+							5
9	*Rivea hypocraterifomis*												+																							1
10	*Ipomoea dasysperma*	+				+					+										+					+			+							6
11	*Convolvulus arvensis*	+																		+														+		3
12	*Cestrum diurnum*	+										+	+						+							+										5
13	*Tecoma undulata*															+			+							+						+				4
14	*Peristrophe bicalyculata*								+																+									+			3
15	*Cytranthera pohliana*																					+														1
16	*Thunbergia erecta*								+			+				+												+					+	+	+	7
17	*Thunbergia laurifolia*	+										+	+											+					+							5
18	*Gmelina asiatica*					+																+			+								+			5
19	*Salvia splendens*		+																+					+												3
20	*Leonotis nepetifolia*												+								+			+	+											4
21	*Anisomelis indica*																							+			+				+	+		+	+	6
22	*Heliconia angustifolia*						+					+												+				+						+	+	6
23	*Haemanthus kalbreyeri*						+					+	+					+			+			+												6
24	*Crinum latifolium*	+							+		+					+				+			+			+						+				8
25	*Amaryllis belladona*											+	+																	+		+				4
	Total	7	1	-	1	4	2	-	3	-	3	8	7	-	-	5	-	3	4	2	3	2	2	6	4	5	5	4	2	2	2	4	4	5	3	

Table 4. Sugars detected from the nectars of species.

S. No.	Species	Sucrose	Glucose	Fructose
1	*Butea superba*			+
2	*Careya arborea*			+
3	*Pereskia aculeata*	+		
4	*Morinda tomentosa*	+		
5	*Mussaenda luteola*		+	
6	*Cordia sebestena*		+	+
7	*Ipomoea dasysperma*			+
8	*Convolvulus arvensis*			+
9	*Cestrum diurnum*			+
10	*Thunbergia erecta*	+		
11	*Cytranthera pohliana*			+
12	*Leonotis nepetifolia*			+
13	*Haemanthus kalbreyeri*	+		+
14	*Amaryllis belladona*			+

(Table 3). Among the sugars, fructose was found more common constituent of nectar (Table 3).

Amongst different modes of cross pollination, entomophily played a decisive role in evolution of angiosperms. The anemophilous insects must have played an important role in the transformation of a gymnospermic strobilus into the angiospermic flower[7]. Insect visitors visit the flower in response of different floral rewards. A blossom-visitor relationship is established by means of an intractant[8]. Pollinators is successful in many plant species because of fact that pollinators seek different types of floral rewards. Nectar is most common floral reward for pollinators[1]. Nectar serves as the chief attractant for insects and so the rapid evolution of angiosperms went hand in hand with the rapid evolution of the important pollinating insects during the tertiary period[9]. The sugars and amino acids in nectar were studied by Percival[2]. According to Faegri and Pijl[8], while in the evolution of plants pollen is an organ with a long history, nectar is appearantly something new, and is peculiar to angiosperms.

Amino acid and sugar types may be one of the several factors, probably affect attractiveness of plants to pollinators. However, Hainsworth and Wolf[10] and Inouye and Waller[11] stated that no convincing evidence has yet been presented indicating that the pollinator species can detect levels of amino acids typically found in floral nectars. From the qualitative analysis of amino acids from studied species most comman were found to be DL-alanine, glutamic acid and glycine reported from the nectar of 7-8 species. Among the sugars fructose was found to be dominent sugar. This data on amino acids and sugar may found helpful for the study of pollinator visitors in plant species studied.

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