

Supplementary Materials

Article

Taxonomic implication of leaves morphological, anatomical, and chemical attributes of eight Apocynaceae taxa

Ahmed M. El-TaHER¹, Abd El-Nasser G. El Gendy², Jawaher Alkahtani³, Abdelsamed I. Elshamy⁴, and Ahmed M. Abd-ElGawad^{5*}

¹ Department of Agricultural Botany, Faculty of Agriculture, Al-Azhar University, Cairo, Egypt; El.TaHER69@yahoo.com

² Medicinal and Aromatic Plants Research Department, National Research Center, 12622, Dokki, Giza, Egypt; aggundy_5@yahoo.com

³ Department of Botany and Microbiology, College of Science, King Saud University, Riyadh 11451, Saudi Arabia; jsalqahtani@ksu.edu.sa

⁴ Department of Natural Compounds Chemistry, National Research Center, 12622, Dokki, Giza, Egypt; elshamynrc@yahoo.com

⁵ Plant Production Department (Plant Ecology), College of Food and Agriculture Sciences, King Saud University, P.O. Box 2460, Riyadh 11451, Saudi Arabia; aibrahim2@ksu.edu.sa

* Correspondence: aibrahim2@ksu.edu.sa, Tel.: +966562680864 (A.M.A-E.)

Table S1. List of different characters of the eight studied Apocynaceae plants.

Character	<i>A. obesum</i>	<i>D. boliviensis</i>	<i>N. oleander</i>	<i>A. curassavica</i>	<i>C. procera</i>	<i>A. oblongifolia</i>	<i>C. carandas</i>	<i>T. nerifolia</i>
MACRO-MORPHOLOGICAL CHARACTERS:								
I. Shape of leaves:								
1	Spathulate, present (1)/ absent (0)	1	0	0	0	0	0	0
2	Ovate, present (1)/ absent (0)	0	1	0	0	0	0	0
3	Oblong lanceolate, present (1)/absent (0)	0	0	1	0	0	0	0
4	Lanceolate, present (1)/ absent (0)	0	0	0	1	0	0	0
5	Obovate, present (1)/ absent (0)	0	0	0	0	1	0	0
6	Elliptic, present (1)/ absent (0)	0	0	0	0	0	1	0
7	Linear, present (1)/ absent (0)	0	0	0	0	0	1	0
II. Leaf base shapes:								
8	Attenuate, (1)/ rounded (0)	1	0	1	1	0	1	0
III. Leaf apex shapes:								
9	Mucronate, present (1)/ absent (0)	1	0	0	0	0	0	0
10	Acuminate, present (1)/ absent (0)	0	1	0	0	1	0	1
11	Acute, present (1)/ absent (0)	0	0	1	1	0	0	1
12	Obtuse, present (1)/ absent (0)	0	0	0	0	0	1	0
IV. Characters of leaf venation:								
13	Reticulate, (1)/ parallel (0)	1	1	1	1	1	0	1
14	Distinct (1)/ indistinct [0]	1	0	0	1	5	0	0
15	White (1)/ green [0]	1	0	1	1	1	1	0
MICRO-MORPHOLOGICAL CHARACTER:								
V. Shape of epidermal cells:								
16	Hexagonal-shaped, present (1)/ absent (0)	1	0	0	1	1	0	1
17	Pentagonal-shaped, present (1)/ absent (0)	1	0	0	1	0	1	1
18	Irregular-shaped, present (1)/ absent (0)	0	1	1	0	1	1	1
19	Polygonal-shaped, present (1)/ absent (0)	0	0	0	1	0	1	0
20	Oblong-shaped, present (1)/ absent (0)	0	0	0	0	1	1	1
21	Square-shaped, present (1)/ absent (0)	0	0	0	0	1	1	1
VI. Characters of epidermal cell walls:								
22	Thin and warty with reticulated ornamentation, present (1)/ absent (0)	1	0	0	0	0	0	0
23	Thick and warty with reticulated and undulated ornamentation, present (1)/ absent (0)	0	2	0	0	0	0	0
24	Thick and warty with tuberculated ornamentation, present (1)/ absent (0)	0	0	1	0	0	0	0
25	Smooth and thin, present (1)/ absent (0)	0	0	0	1	0	0	0
26	Thick and straight with favulariated ornamentation,	0	0	0	0	1	0	1

	present (1)/ absent (0)							
27	Thick and straight, present (1)/ absent (0)	0	0	0	0	0	1	1
28	Thick and warty with verricated ornamentation, present (1)/ absent (0)	0	0	0	0	0	0	1
VII. Characters of stomata:								
29	Tricytic, present (1)/ absent (0)	1	0	I.	1	0	0	1
30	Paracytic, present (1)/ absent (0)	1	1	I.	0	1	0	0
31	Amphihemiparacytic, present (1)/ absent (0)	1	0	I.	0	1	1	0
32	Pentacytic, present (1)/ absent (0)	1	1	I.	0	0	0	0
33	Cyclocytic, present (1)/ absent (0)	1	0	I.	0	1	1	0
34	Parallel-shaped, present (1)/ absent (0)	1	1	I.	0	0	0	1
35	Anisocytic, present (1)/ absent (0)	1	1	I.	1	0	1	1
36	Tetracytic, present (1)/ absent (0)	1	1	I.	0	0	0	1
37	Hemiparacytic, present (1)/ absent (0)	0	1	I.	1	1	0	1
38	Hexacytic, present (1)/ absent (0)	0	1	I.	1	0	0	1
39	Actinocytic, present (1)/ absent (0)	0	1	I.	1	1	0	0
40	Associated with middle lamella, present (1)/ absent (0)	0	1	I.	0	0	1	0
41	Associated V-shaped, present (1)/ absent (0)	0	1	I.	0	0	1	0
VIII. Stomatal levels:								
42	Semi depressed, present (1)/absent (0)	1	0	I.	1	0	0	0
43	Raised, present (1)/absent (0)	0	1	I.	0	0	0	0
44	Superficial, present (1)/absent (0)	0	0	I.	0	0	0	1
45	Depressed, present (1)/absent (0)	0	0	I.	0	1	0	0
46	Semi-raised, present (1)/absent (0)	0	0	I.	0	0	1	0
IX. Characters of trichomes:								
IX.1. Non-glandular:								
47	Papillae, present (1)/absent (0)	0	I.	1	0	0	1	0
48	Unicellular with acute apex, present (1)/absent (0)	0	I.	0	0	0	0	0
49	Unicellular with hooked apex, present (1)/absent (0)	1	0	1	0	0	1	0
50	Bicellular with rounded apex, present (1)/absent (0)	1	0	1	1	1	0	0
51	Multicellular with bent apex, present (1)/absent (0)	1	0	1	1	1	0	1
52	Multicellular with rounded apex, present (1)/absent (0)	1	0	1	1	1	0	1
IX.2. Glandular hairs:								
53	Unicellular, present (1)/ absent (0)	1	0	1	0	1	1	0
54	Bicellular, present (1)/ absent (0)	1	0	0	1	0	1	1
55	Multicellular, present (1)/ absent (0)	1	0	1	0	1	1	1
X. Character of leaf-blade anatomy, epidermal layers:								
56	Simple (1)/ multiple (0).	1	0	0	1	1	1	1
57	Smooth with thin cuticle layer (1)/ rough with thick cuticle layer [0].	1	1	0	1	1	0	1
XI. Characters of mesophyll tissue:								
XI.1. Palisade tissue:								
58	Monolateral with one continuous row, present (1)/ absent	1	0	0	0	0	0	1

	(0)								
59	Monolateral with more than continuous row, present (1)/ absent (0)	0	1	0	0	1	1	0	0
60	Bilateral with more than separated row, present (1)/ absent (0)	0	0	1	0	0	0	0	0
61	Monolateral with more than separated row, present (1)/ absent (0)	0	0	0	1	0	0	0	0
62	Mucilage cells, present (1)/ absent (0)	0	1	0	0	0	0	1	1
63	Rosette crystals, present (1)/ absent (0)	0	1	1	1	0	1	1	0
64	Prismatic crystals, present (1)/ absent (0)	0	0	1	0	0	1	1	0
65	Resin canals, present (1)/ absent (0)	0	0	1	1	0	0	0	1
XI.2. Spongy tissue:									
66	Armed parenchyma tissue, present (1)/ absent (0)	1	1	1	0	0	1	1	0
67	Aerenchyma tissue, present (1)/ absent (0)	0	1	1	0	0	1	1	0
68	Rosette crystals, present (1)/ absent (0)	0	0	1	1	1	1	1	1
69	Laticifer tissue, present (1)/ absent (0)	1	0	1	1	1	1	1	1
70	Secretory cells, present (1)/ absent (0)	0	1	1	0	0	0	1	0
XII. Characters of midrib zone:									
XII.1. Upper surface									
71	Convex, present (1)/ absent (0)	1	1	0	0	0	0	0	0
72	Concave, present (1)/ absent (0)	0	0	1	1	0	1	1	0
73	Straight, present (1)/ absent (0)	0	0	0	0	1	0	0	1
XII.2. Lower surface									
74	Concave, (1)/ semi straightness (0)	1	0	1	1	1	1	1	1
XII.3. Contained:									
75	Collenchyma tissue, present (1)/ absent (0)	1	1	1	1	1	0	1	1
76	Aerenchyma tissue, present (1)/ absent (0)	0	0	1	0	0	1	1	1
77	Rosette crystals, present (1)/ absent (0)	1	0	1	1	0	1	1	1
78	Prismatic crystals, present (1)/ absent (0)	0	1	1	1	1	0	1	1
79	Secretory cells, present (1)/ absent (0)	0	0	0	0	0	0	1	0
XIII. Shape of vascular bundles:									
80	Crescent, (1)/ slightly concavity (0)	1	1	1	1	1	1	0	1

*I.: Indistinct.

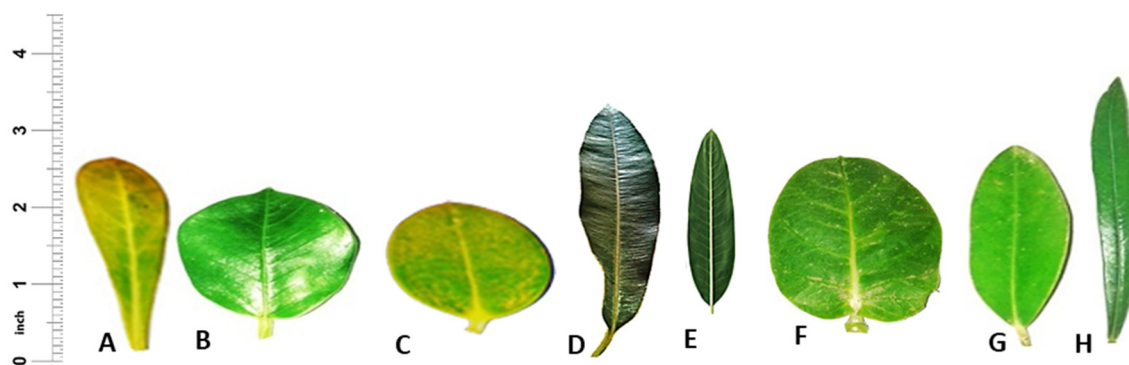


Figure S1. Leaf morphology of the studied Apocynaceae plants. A: *A. obesum*, B: *D. boliviensis*, C: *C. carandas*, D: *N. oleander*, E: *A. curassavica*, F: *C. procera*, G: *A. oblongifolia*, and H: *T. neriifolia*.