



An approach to study the effect of automobile exhausts on the leaf epidermal features of some members of Family Apocynaceae

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Received: 05-05-2010

Revised: 11-07-2010

Accepted: 27-08-2010

Abstract

In the present investigation an effect of automobile exhausts on the leaf epidermal features of some members of family Apocynaceae was studied. In the present experimental study the Stomatal Frequency, Stomatal Index, Length, Breadth and Epidermal Frequency for both surfaces i.e. Abaxial (Lower) and Adaxial (Upper) surface for both side i.e. Garden and Road side species were recorded. Selected plant species are *Alstonia scholaris* (L.) R.Br, *Catharanthus roseus* (L.) G.Don Variety (Pink), *Catharanthus roseus* (L.) G.Don Variety (White), *Carissa carandas* (L.), *Nerium oleander* (L.) Variety (Light pink), *Nerium oleander* (L.) Variety (Pink), *Nerium oleander* (L.) Variety (White), *Plumeria alba* (L.), *Tabernaemontana divaricata* (L.) R.Br, *Thevetia neriifolia* Juss.

Keywords: Automobile, Epidermis, Stomata, Stomatal index, frequency, plant species

Introduction

Development of science and technology during the past century has transformed the conditions and qualities of human life. There is a great problem of "Automobile pollution" and the pollution from automobiles is actually coming from only a small group of "grossly polluting". Newer cars, however, as about 10% of cars on the road are accounting for 50% of all harmful emissions put out by automobiles.

Sharma and Roy (1995) described the length and breadth of stomata, stomatal frequency and stomatal index, number and size of epidermal cells of leaves studied in leaf samples from polluted and non polluted atmosphere in rainy, winter and summer seasons. Rangarajan *et al.* (1995) studied the dust deposition on the adaxial surface of the leaves, was found more than on the abaxial surface. Shamnughavel (1995) studied abnormalities such as stomata with a single guard cell, stomata with 4-5 subsidiary cell and giant stomata. Chattopadhyay (1996) studied the effects of air pollution on leaves of twenty three species

in Calcutta. Chandrawat and Raghuvanshi (2007) also studied epidermis of *Delonix regia*. Thakur and Patil (2007) studied epidermal structure in family Euphorbiaceae.

Materials and Method

The plants were collected from August to December for the study of the foliage part of plants i.e. leaf. Plant were identified with the help of flora of gangetic plain (Duthie, 1903-1929), Hutchinson (1959), Hooker (1872-97), Upadhyaya and Singh (1969). Peelings were procured either mechanically from fresh leaves or leaf segments were placed in 1:1 glacial acetic acid and 40 volumes H_2O_2 over night in an oven at 60°C temperature and then the epidermis was gently peeled off. The epidermal peelings were stained either with aqueous saffranin solution or with dalafield haematoxylin and were mounted in 4% glycerol. Stomata were measured by micrometry technique, using Ocular meter and stage micrometer. The numerical data were analysed statistically. The stomatal index was calculated by the following formula.

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$$SI = \frac{S}{e + S} \times 100$$

Where,

SI = Stomatal index

S = Stomata

e = Epidermal cell

Results and Discussion

Automobile pollution is a great problem in the world. In the present experimental study we recorded the effect of automobile pollution on the leaf epidermal features *i.e.* stomatal frequency, stomatal index, length, breadth and epidermal frequency for both surfaces *i.e.* Abaxial (Lower) and Adaxial (Upper) surface for both side *i.e.* Garden and road side species. It has been observed that the leaves respond to pollution and undergo

Table 1. Showing the frequency of stomata, epidermal cells, stomatal index (per mm²) and size of stomata of garden side species.

S.No	Name of Species	Stomata				Epidermal Cell
		S.F.(No.)	S.I (per mm ²)	L.(μ)	B. (μ)	E.F (No.)
1.	<i>A. scholaris</i>	-	-	-	-	1743 ± 58.37
2.	<i>C. roseus</i> (variety Pink)	33.95 ± 16.97	4.00 ± 2.21	240 ± 13.4	218 ± 28.86	812.9 ± 65.88
3.	<i>C. roseus</i> (variety White)	32.57 ± 14.23	3.85 ± 1.85	240 ± 0.00	201 ± 27.00	812.9 ± 65.88
4.	<i>C. carandas</i>	-	-	-	-	982.97 ± 27.77
5.	<i>N. oleander</i> (variety Pink)	-	-	-	-	878.1 ± 71.95
6.	<i>N. oleander</i> (variety White)	-	-	-	-	959.97 ± 102.75
7.	<i>N. oleander</i> (variety Light Pink)	-	-	-	-	930.9 ± 57.03
8.	<i>P. alba</i>	-	-	-	-	1790.3 ± 76.86
9.	<i>T. divaricata</i>	14.16 ± 0.00	1.91 ± 0.105	252 ± 14.69	183 ± 31.32	726.59 ± 49.90
10.	<i>T. nerifolia</i>	-	-	-	-	902.2 ± 47.00

Table 2. Showing the frequency of stomata, epidermal cells, stomatal index (per mm²) and size of stomata of garden side species.

S.No.	Name of Species	Stomata				Epidermal Cell
		S.F.(No.)	S.I (per mm ²)	L. (μ)	B. (μ)	E.F (No.)
1.	<i>A. scholaris</i>	339.95 ± 26.88	17.97 ± 1.60	189 ± 33.0	153 ± 9.00	1550.9 ± 76.87
2.	<i>C. roseus</i> (variety Pink)	246.40 ± 23.8	32.10 ± 3.95	237 ± 09.0	216 ± 26.15	521.2 ± 77.26
3.	<i>C. roseus</i> (variety white)	246.07 ± 22.65	33.08 ± 2.78	231 ± 13.7	177 ± 21.00	509 ± 40.05
4.	<i>C. carandas</i>	385.20 ± 53.6	34.60 ± 4.60	207 ± 09.0	165 ± 20.12	728 ± 78.42
5.	<i>N. oleander</i> (variety Pink)	031.15 ± 16.51	03.54 ± 1.81	195 ± 15.0	143 ± 18.85	846.9 ± 35.13
6.	<i>N. oleander</i> (variety White)	015.93 ± 14.91	01.76 ± 1.65	186 ± 12.0	153 ± 21.00	885.21 ± 96.34
7.	<i>N. oleander</i> (variety Light Pink)	015.57 ± 13.36	01.84 ± 1.42	192 ± 19.8	174 ± 12.00	830.49 ± 31.53
8.	<i>P. alba</i>	315.82 ± 37.50	21.35 ± 2.70	240 ± 18.9	160 ± 14.50	1161.43 ± 106.63
9.	<i>T. divaricata</i>	130.27 ± 28.19	12.89 ± 1.56	246 ± 18.0	159 ± 19.20	1009.8 ± 157.80
10.	<i>T. nerifolia</i>	230.84 ± 27.62	33.08 ± 2.78	207 ± 09.0	153 ± 28.30	1447.5 ± 106.90



Table. 3: Showing the frequency of stomata, epidermal cells, stomatal index (per mm²) and size of stomata in road side species

Adaxial surface

S.No.	Name of Species	Stomata				Epidermal Cell
		S.F.(No.)	S.I (per mm ²)	L. (μ)	B. (μ)	E.F (No.)
1.	<i>A.scholaris</i>	-	-	-	-	1705.3 ±87.59
2.	<i>C. roseus</i> (variety Pink)	33.9 ±14.42	4.16 ± 1.92	234 ± 12.00	201± 27.0	812.9 ±65.8
3.	<i>C. roseus</i> (variety White)	33.98 ± 16.99	3.94 ± 2.14	240± 0.00	198 ± 27.49	827.15± 79.91
4.	<i>C. carandas</i>	-	-	-	-	968.8 ±41.6
5.	<i>N.oleander</i> (variety Pink)	-	-	-	-	875.3 ±73.55
6.	<i>N. oleander</i> (variety White)	-	-	-	-	959.97± 102.75
7.	<i>N.oleander</i> (variety Light Pink)	-	-	-	-	880.97 ± 64.24
8.	<i>P. alba</i>	-	-	-	-	1770.5± 97.5
9.	<i>T. divaricata</i>	14.16± 0.00	1.95± 1.46	249 ± 13.74	168 ±24.0	711.02± 48.17
10.	<i>T. neriiifolia</i>	-	-	-	-	895.12 ±48.99

Table. 4: Showing the frequency of stomata, epidermal cells, stomatal index (per mm²) and size of stomata in road side species.

Abaxial surface

S.No.	Name of Species	Stomata				Epidermal Cell
		S.F.(No.)	S.I (per mm ²)	L. (μ)	B. (μ)	E.F (No.)
1.	<i>A. scholaris</i>	331.4 ±29.86	17.71 ± 1.89	201± 27.0	153 ±9.00	1539.6 ±69.00
2.	<i>C. roseus</i> (variety Pink)	226.5 ±46.9	30.88± .678	231 ± 14.4	180 ±22.15	507.04± 96.8
3.	<i>C. roseus</i> (variety White)	246.41± 23.86	32.70± 3.95	228± 14.69	174 ±22.44	507.04± 57.29
4.	<i>C. carandas</i>	371.08± 40.96	33.08 ±3.92	207 ± 9.0	171 ±19.20	750.67 ±64.00
5.	<i>N. oleander</i> (variety Pink)	25.49 ± 10.59	2.97 ±1.51	198± 14.69	144 ±18.00	831.3 ±65.21
6.	<i>N. oleander</i> (variety White)	14.16 ± 11.56	1.678± 1.10	180 ± 14.14	153.3± 26.24	829.3 ±70.03
7.	<i>N. oleander</i> (variety Light Pink)	12.75 ±14.79	1.50± 1.29	189 ±13.74	171 ± 13.74	835.6± 42.48
8.	<i>P. alba</i>	307.31± 41.57	26.61 ± 2.76	234 ± 12.0	159 ±13.74	1147.2 ±95.01
9.	<i>T. divaricata</i>	123.19 ±27.64	11.05 ±1.70	243 ±21.00	165.0± 20.12	991.45±163.6
10.	<i>T. nerifolia</i>	218.1± 23.86	12.87 ± 2.45	207 ± 9.00	150 ±28.30	1447.5±106.9

S.F. – Stomatal Frequency, E.F = Frequency of epidermal cell, S.I = Stomatal Index, L = Length, B = Breadth
Values are in mean ± S.D.



quantitative changes in varying degree in a number of leaf surface micromorphological characters. Such leaf surface characters can be used as bioindicators and biomonitors of air pollution data indicated that the stomatal frequency, stomatal Index, length and breadth of stomata and epidermal cell increasing in garden

side plant species and decreased in road side plant species.

Acknowledgement

The author present heartiest thankfulness to Mr. Manish Arora who helped me during field work.

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