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STOMATAL RESPONSES TO CHRONIC AIR POLLUTION

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This paper presents the variation in stomatal density and stomatal dimensions observed at three different sites affected by chronic air pollution.

Keywords : Air pollution; Stomata.

Stomates represent the main route of gas exchange between the plant and the atmosphere. The degree of stomatal opening is under biological control and represents one of the ways by which plants related to environmental change[1]. Subsequently, the subject of variation in stomatal frequency/ density and size has been investigated by several workers as reviewed by Ahmad et *al.*[2]

Plant material was collected from the compound of Sun Flag Iron & Steel Co. Ltd. located about 11 km north of Bhandara town (Maharashtra). Monthly data of air pollution levels was available for three sites. Although the pollution levels varied from month to month, the descending order of pollution in three sites was always in the order __maintenance workshop > officer's colony > pump house. Leaves were collected from these three sites between 1200 to 1300 hrs in the month of February, the air pollution monitoring data for the same period is given in Table 1.

Table 1. Data on ambient air quality for February.

S. No.	Parameters	Maintenance workshop	Officer's colony	Pump house
1.	Temperature			
	max (^{0}C)	34	34	34
	min (^{0}C)	16	16	16
2.	Relative humidity			
	max	87	87	87
	min	50	50	50
3.	Wind velocity km/h	8	8	8
4.	SPM (μ g/Nm^3)	217	162	74
5.	SO2 (μg/Nm^3)	27	16	8
6.	Nox (μg/nM^3)	17	11	7

Table 2. Variation in stomatal density (SD) and effective opening (EO)*

S. No.	Name of plant	Maintenance workshop		Officer's colony		Pump house	
		SD	EO	SD	EO	SD	EO
1.	*Melia azedarach*	90.8	8.4	50.0	13.4	64.0	11.4
2.	*Mangifera indica*	68.7	6.7	90.3	12.1	57.5	19.2
3.	*Ficus religiosa*	30.0	25.2	26.8	13.4	54.0	18.5
4.	*Polyalthia longifolia*	51.5	13.4	56.5	13.4	47.1	20.6
5.	*Eucalyptus globulus*	34.5	16.8	30.8	14.5	42.2	14.1
6.	*Leucana leucocephala*	32.5	15.1	35.7	15.1	22.5	15.1
7.	*Acacia auriculiformis*	70.5	11.8	58.5	14.5	60.5	14.5
8.	*Dalbergia sissoo*	54.0	13.4	34.2	11.8	48.7	13.8
9.	*Eugenia cuminii*	57.5	16.8	78.8	14.5	70.5	16.8

Table 3. Variation in major axis* (MaA) and minor axis (MiA)*

S. No.	Name of plant	Maintenance workshop		Officer's colony		Pump house	
		MaA	MiA	MaA	MiA	MaA	MiA
1.	*Melia azedarach*	20.6	13.4	21.8	18.5	20.8	15.1
2.	*Mangifera indica*	16.8	16.8	18.8	16.8	21.8	12.8
3.	*Ficus religiosa*	25.2	16.8	25.5	13.4	24.5	12.8
4.	*Polyalthia longifolia*	16.8	10.8	17.8	8.7	24.5	15.1
5.	*Eucalyptus globulus*	25.2	19.8	24.5	16.8	21.8	13.4
6.	*Leucana leucocephala*	21.8	15.1	23.5	15.1	23.8	15.1
7.	*Acacia auriculiformis*	20.2	10.1	23.5	14.5	17.8	9.1
8.	*Dalbergia sissoo*	18.5	10.1	23.5	13.4	20.5	13.8
9.	*Eugenia cuminii*	23.5	15.1	21.2	15.1	23.9	16.8

There was a heavy deposition of particulate matter on leaves collected from maintenance workshop, but chlorosis and necrosis were not observed in any sample. This indicates that the existing levels of pollution were less than the threshold value for tissue necrosis.

Stomatal dimensions (major axis, minor axis and effective opening) bear no relation to the pollution trends (Table 2,3). Stomatal density also does not appear to be correlated with existing pollution levels.

It can be inferred from the observations that below the threshold (for necrosis) values, stomatal density and stomatal dimensions are not functions of atmospheric pollution in the species studied. It is possible that the variation encountered is the natural variation of populations.

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