FINAL REPORT

HEALTH OF GREENERY IN BRIHAN MUMBAI AREA OF MUMBAI METROPOLITAN REGION

Submitted to

MMR - Environment Improvement Society,
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By

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Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.6

Location : St. Colomba School Lane, Gamdevi.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	12.01	39.17	Coriaceous	+	-	-	LB/FB	-	IB	-	IB	L	H	L	Footpath	No
Ficus benghalensis	12.01	75.79	Glabrous	+	-	LB	LB	-	-	-	-	L	L	NP	Footpath	No
Polyalthia longifolia	7.50	17.00	Glabrous	+	-	LB	LB	LB	-	-	TB	L	H	L	Normal	No
Mangifera indica	7.50	10.01	Coriaceous	+	-	LB	FR	-	-	-	-	H	H	NP	Normal	No
Thespesia populnea	9.00	26.11	Glabrous	+	-	LB	LB	LB	-	-	-	L	L	NP	Normal	No
Erythrina indica	16.51	34.71	Coriaceous	+	-	FB/FR	-	LB	-	-	IB	L	L	NP	Red Soil	No
Peltophorum pterocarpum	15.01	54.16	Glabrous	+	-	FB	FB	FB/FR	-	-	-	NP	NP	NP	Footpath	No
Syzygium cuminii	10.01	34.39	Glabrous	+	-	LB	FR	LB	-	-	IB	H	L	NP	Red Soil	Yes
Ficus elastica	3.80	14.54	Glabrous	+	-	LB	LB	LB	-	-	-	H	H	NP	Red Soil	Yes
Butea monosperma	8.50	20.52	Glabrous	+	-	FR	FR	FR	-	-	-	H	H	NP	Red Soil	Yes

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present.

1 INTRODUCTION

1.1 Urban Ecosystem

There is considerable apprehension at present about civilized humans, through urbanization and industrialization, release a large quantity of pollutants in the atmosphere. These damage the environment through its impact on life, vegetation, materials and also interference with climate. Urban ecosystem as a completely man-made one, has emphasis on human welfare. Plants are cultivated mainly because of man's natural affinity to them and also for a number of benefits plants offer to man. Trees have been important to people since dawn of civilization and in India trees are worshipped as well. However industrialization and urbanization have led to reducing their numbers. Conservation of trees is once again gaining importance in urban areas, since people have realized the importance of trees not only for aesthetics but also for maintaining environmental health.

1.2 Advantages due to urban plants

1.2.1 Aesthetic

Trees and shrubs provide inherent beauty in all settings and impart an unique pattern in landscape. Plants are important habitat for birds and animals which further adds to the aesthetic and cultural value. Trees like pipal, neem, kata shivar etc. attract birds by their flowers and fruits and also provide shelter to them.

1.2.2 Production

Plants are the main source of fruits, flowers, wood and leaves, which are edible as well as have medicinal and other uses. Edible fruits are obtained from trees like mango, banana, jackfruit, jamun, guava, chikoo etc. and are relished by society at large. Flowers are used for making bouquets and for decoration purposes and often in food preparation and medicines as well. Most importantly flowers are used in places of worship for garlands, offerings and decoration of deities in temples and other places of worship. Woods of various trees such as teak, ain, ebony, rosewood, silver oak etc. are source for making posts, pillars, planks etc. and for making furniture. Bamboos are used for various purposes, especially in paper industry. Leaves are a part of diet for man as vegetables. Animals graze tree leaves as well. Other uses include thatching of houses, for making fibers and also for decoration.

1.2.3 Environmental

A tree with good canopy gives shade a cooling effect and maintains humidity. Apart from functioning as pollutant sinks, green belts provide other benefits like aesthetic improvement, habitat for birds and animals, thus recreating hospitable nature in an otherwise drab urban industrial scene. Urban greenery is effective in a scenario where plants form a surface capable of sorbing air pollutants and forming sinks for pollutants. Leaves with their vast area in a tree crown absorb pollutants and effectively reduce their concentration in the ambient air. They remove air pollutants like HF, SO_2, CO_2, compounds of photochemical reactions, as well as capture dust and particulate matter on their surfaces.

1.3 Places where trees and shrubs are planted

Normally trees and shrubs are planted in residential premises, roadsides, playgrounds, institutional premises, industrial premises, parks, gardens and recreational centres. (Photographs 1.1 – 1.13).

1.4 Choice of the trees

1.4.1 Indigenous

The choice of tree for plantation depends on the place of plantation. Accordingly, we can select indigenous trees like mango, neem, shirish, jamun, banyan etc.

1.4.2 Exotics

Exotic trees include Australian acacia, Subabhul, Eucalyptus, *Delonix, Peltophorum*. Raintree, African tulip tree, *Thespesia,* etc.

1.4.3 Self regenerating (Rare)

In addition to indigenous and exotics a few self-regenerating trees like Casuarina, Subabhul are also required to be planted at specific locations.

1.5 Urban Forests:

The concept of urban forest as large areas in cities under natural or almost natural growth of plants is evident at Sanjay Gandhi National Park at Borivali, Aarey colony at Goregaon, mangroves at Thane creek and Mahim Nature Park at Dharavi. Maintaining urban forests is of

vital importance since it improves microclimate, aesthetics, provide habitat for avifauna and reduces pollution load.

To summarize, trees and shrubs provide:

- Beauty in all settings
- Unique patterns in landscape
- Shelter to population.
- Habitat for avifauna
- Complement to architectural designs
- Improvement of microclimate, through absorption of solar radiation and increase in humidity
- Sorbtion of pollutants leading to cleaner and healthier environment.

1.6 Nature of urban stresses affecting health of plants

1.6.1 Air pollution

Many industrial activities, particularly energy generation, material production and vehicular traffic have increased the atmospheric industrial pollution significantly .It is known that plants differ considerably in there responses towards pollutants, some are highly sensitive and show immediate injury symptoms, while others are hardy and tolerant (Roa, D. N. et al., 1985) . An important aspect of greenery is that plants are living organisms with limits to their tolerance towards air pollutants. As a result, crossing the tolerance limits of plants in terms of pollution load would lead to injury to plants causing death of tissue and reducing their absorption potential.

1.6.2 Compaction of soil

Trampling causes soil compaction. Compacted soil suffers from lack of aeration and movement of water, which leads to poor formation of root system, This results in stunted growth of plants. Due to compaction, water holding capacity of soil reduces, and penetration to roots becomes more difficult. This affects absorption of nutrients by root system. Thus, plants under stress showed reduction in growth in the form of phytomass, height of shoot, length of roots and general depletion in vegetative and reproductive growth.

1.6.3 Concrete structures

When concrete structures are constructed at the ground level, very close to the trunk of a tree, it obstructs aeration and irrigation of the root system, which in turn reduces nutrition absorption capacity and in turn affects the growth of the plant. These often cause abnormal shoot system

and canopy shapes which in turn affect beautification of the area, since the crown shows sickly appearance.

1.6.4 Water quality and quantity.

Trees planted near drainage system often get soaked with water which is infested with nematodes, bacteria, insect larvae etc.which may infect plants. An excessively eutrophic condition disturbs the reproductive and vegetative balance of the plants, which in turn upset the flowering and fruiting as well. Insufficient quantity of water also affects the general health of plants in the form of yellowing of leaves, which in turn affects their aesthetic value, as well as productivity..

1.6.5 Trimming

Trimming of trees to facilitate urban activities like vehicular traffic and human movements also puts lot of stress on plants if proper trimming procedure is not adopted.

1.6.6 Plant response to stress

Whenever environmental factors are beyond tolerance range of plants and become limiting, the plant responds with abnormal growth patterns and or exhibit injury symptoms. The symptoms may be striking and clearly visible, e.g. leaf yellowing, necrosis, and scorching etc. or subtle ones like poor growth and primary production of plants.

Every plant has its own characteristic expression indicating an underlying disorder. The plant response indicates the wrong and may also reveal the cause of the same. The four basic categories are growth response, reproductive effects, chlorosis and necrosis of leaves (Treshaw, 1970).

1.7 Present Work

There is paucity of places for growing trees in this populous, commercial and industrial city and the prevailing urban conditions are not congenial for plant growth, hence it is suspected that their role in improving environment is not satisfactory. Verification of this suspicion is done through following investigations in the Brihan Mumbai city.

I) Sample survey of greenery in Mumbai,
II) Health assessment of different plants,
III) Assessment of stress, and
IV) Based on the above-mentioned studies, some suggestions are made for improvement of health of trees and consequently their ecological role in the city.

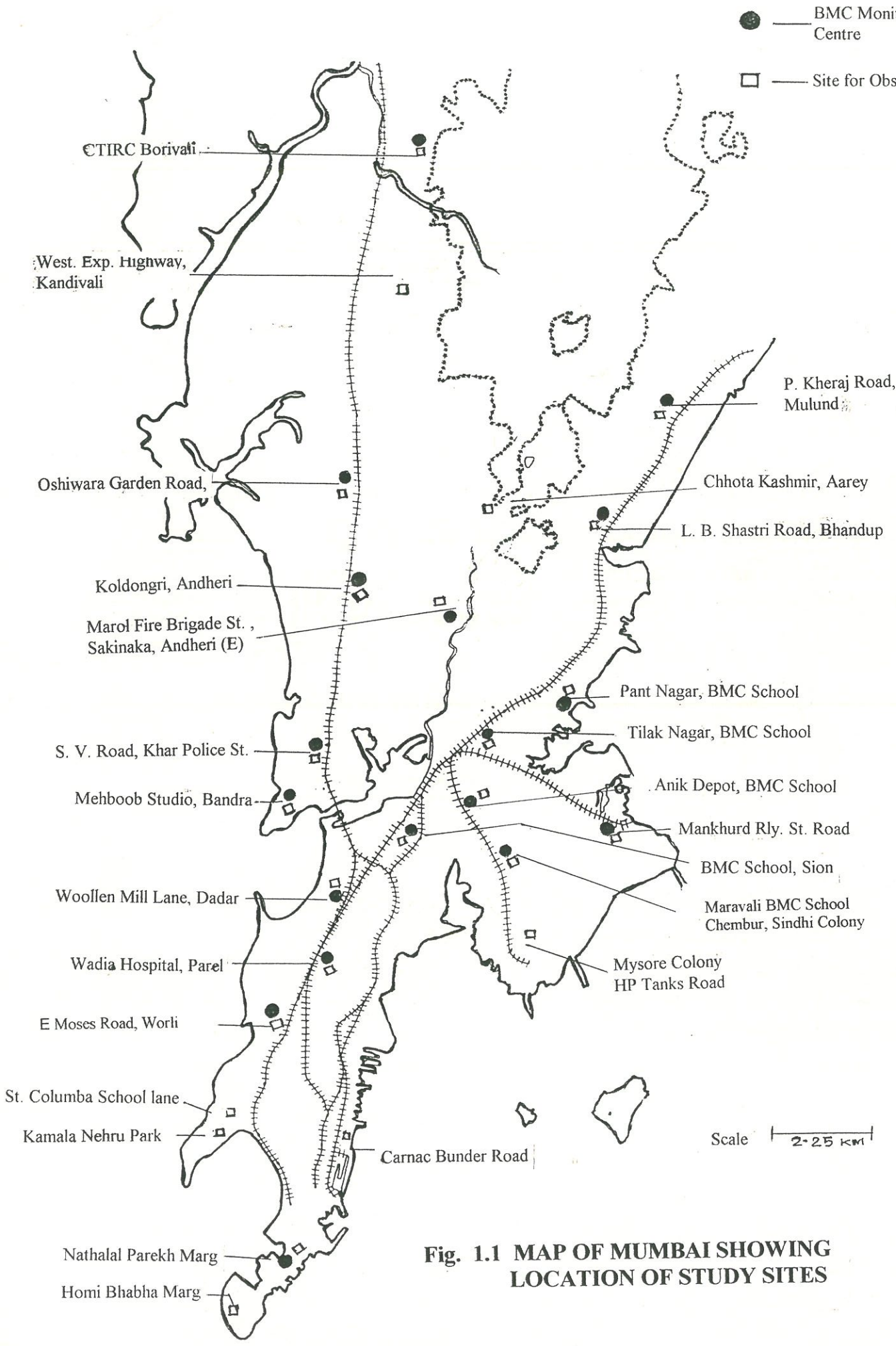


Fig. 1.1 MAP OF MUMBAI SHOWING LOCATION OF STUDY SITES

1.1 Asupalav,at Chhota Kashmir, Aarey Colony (Goregaon)

1.2 Rain Tree,umbrella shaped canopy (Bhandup)

3

1.3 Rain Trees, beautiful avenue on P. Khemraj Marg, Mulund.

4

1.4 Gulmohar in flull bloom at Shivanand, Parle (E).

1.5 Amaltas in full bloom Western Express Highway, Malad (E)

!.6 Sonmohar Tree, at Central Avenue, Chembur.

1.7 Bhendi, on foot-path, Central Avenue Road, Chembur

1.8 Mahua Tree, near Mehboob Studio, Bandra (W)

5

1.9 Banyan Tree, Homi Bhabha Marg, Navy Nagar, Colaba

1.10 Avenue near G. S. Medical College, Parel

1.11 Narikel (*Pterygota alata*) a roadside tree at Aarey Colony

1.12 Gulmohar and Rain tree, avenue at Chembur

1.13 Asupalav inside premises of factory at Kandivali

(7)

1.14 White chicked bulbul on *Salvadora – ziziyphus* bushes at Andheri (W)

(8)

1.15 Little cormorant at Lokhandwala Complex, Andheri (W)

1.16 Flocks of rosy pastors on Subabhal at Lokhandwala Complex, Andheri (W)

1.17 Himalayan Red Breasted parakeet in Andheri (E)

2 METHODS OF WORK

After informal survey of plants in the city of Greater Mumbai, as many as 25 sites distributed over the city, were selected for detailed periodic studies. Of these 25 sites, 20 are common to the Air Quality Monitoring sites of the Brihan Mumbai Municipal Corporation.(BMC).(Fig.1.1). Tree species at these sites were listed (Table No. 3.1) and the species common to several sites (Table No. 3.2) were selected for further detailed investigations.

2.1 Sites selected for studies are listed below.

1. Nathalal Parikh Marg (Near BEST House) Colaba *
2. Homi Bhabha Marg , Colaba
3. Carnak Bunder, P. D' Mello Road *
4. Gamdevi,
5. Kamala Nehru Park
6. E. Moses Road, Worli. *
7. Wadia Hospital , Parel. *
8. Woollen Mill Compound , Dadar *
9. Mehboob Studio, Bandra (W). *
10. Khar Police Station, S. V. Road Khar. *
11. Garware House, Kol Dongri, Andheri (E). *
12. Marol Fire brigade station, Andheri – Kurla Road. *
13. " S " Ward Office, L. B Shastri Marg, Bhandup. *
14. Kalidas Natyagriha Mulund (West). *
15. BMC School, Vidya Vikas, Pant Nagar. *
16. Tilak Nagar , Chembur. *
17. Dyanvikas School, Koliwada Sion .*
18. Anik BEST Depot. *
19. Maravali Municipal school,Sindhi, Colony Chembur *
20. H.P. Colony, Mahul.
21. BMC school, Mankhurd *
22. Chhota Kashmir , Aarey Colony,Goregaon.
23. CTIRC , Borivali (East). *
24. Mahindra & Mahindra Factory, Kandivali. *
25. Oshiwara Municipal school , Jogeshwari' *

(* Also, sites of air monitoring, of BMC)

2.2 Tree species selected for studies are given below,

Pipal	*Ficus religiosa* Linn.
Banyan	*Ficus benghalensis* Linn.
Bhendi	*Thespesia populnea* Soland . ex correa.
Asupalav	*Polyalthia longifola* (Sonnr.) Thw.
Mango	*Mangifera indica* Linn.

2.3 Parameters of study

Following parameters were studied for each of the tree selected, for physical, phenological and agronomical observations from sampling sites during three seasons. Results are given in Table Nos. 3.3 to 3.27.

2.3.1 Canopy shapes

2.3.2 Periodicity of defoliation / refoliation

2.3.3 Visible leaf injury

2.3.4 Deposition of dust on leaves.

Three leaves of a tree of each species were collected and placed carefully in polythene bags. All the samples were stored for laboratory work. Dust on leaves was transferred to dishes using water, and then filtered. Dust collected on the filter paper was dried and weighed carefully. Leaf area was measured using graph paper. Formula given by Lal & Rao (1950) was used for calculation. Particulate deposition was expressed as mg of dust per cm^2 for particular leaf species. Observations were carried out in triplicate for each tree species at each site, where the species were available. Average dust load on leaves at each site, of five species studied for three season, are given in Table No.3.28 and presented graphically in Figs 3.2 & 3.3.

2.3.5 Lead on leaves (Dust and Leaf tissue).

In addition to the above observations, two plant species, *Ficus beghalensis* (Banyan) and *Polyalthia longifolia* (Asupalav), were selected for determining amount of lead deposition on leaves and its absorption by leaf tissue in May and October.Four different sites with heavy traffic were selected for the study, namely, Carnak Bunder, Kandivali, Parel and Mankhurd. Lead was estimated quantitatively from leaf tissue as well as from dust on the same leaf by Wet Digestion Method using Atomic Absorption Spectrophotometer (Model GBC 932 AA). The concentration of lead was computed by using standard calibration curve in ug/gm (Table No. 3.29).

2.3.6 Improvement of plant health: An experiment.

A month-long experiment was carried out on hedge plants on a divider of a very busy road, considering heavy traffic of all types of vehicles, like trucks, tempos, tankers, cars, rickshaws, motorbikes etc. The hedge formed by dense plantation of Boganvel, (*Bougainvillea spectabilis*) was selected for the foliar spray experiment. Four blocks of hedge measuring approximately 4 square meter area each, were marked for the study. Four treatments were given to the plants by spraying them with i) Distilled water (D) ii) Urea (1.3 %) (U). iii) Ascorbic acid (0.02M aquatic solution) (A) and iv) Control (C) without treatment, once a week for four weeks. The plants were examined in the fifth week. Results are given in Table No.3. 30.(Photograph 4.5 and 4.6

2.4 Data collection from other sources

Data was collected from official sources for use as background information for the present work, as - Brihanmumbai Municipal Corporation Laboratory at Khar, and NEERI for air pollution data and, Regional Meteorological Centre, Colaba for information on climate. Data obtained is presented in Table Nos. 3.31 to 3.45.

2.4.1 Air pollution situation in Brihan Mumbai

Mumbai has some specific air quality problems mainly attributed to heavy industrialization and increasing motorization. On the positive front, planning enforcement measures, such as the relocation of industries and increased stack heights, together with the introduction of natural gas by some industries, have proved to be helpful in slowing the decline in air quality. Scrubbing effect of the monsoon helps to reduce overall ambient concentrations of pollutants in the city, during and soon after monsoons.

2.4.2 Suspended particulate matter (SPM)

Suspended particulate matter emissions have increased significantly in recent years and are projected to continue rising into the next century (Fig.3.3) Domestic emissions have remained relatively constant in the past and are forecast to remain stable despite the projected increase in population. This is due to switch from biofuels for example wood, animal dung and coal to liquid petroleum gas (LPG) and kerosene. (NEERI, 1991 a).

However, suspended particulate emissions attributable to transport have increased greatly. Recent estimates suggest that transportation, especially motor vehicles, account for approximately 35 % of particulate emissions in the Greater Mumbai Area. Diesel vehicles and very old vehicles are the main source of particulate in the transport sector (NEERI, 1991 a).(Fig. 3.6 &3.7) But during monsoon SPM concentration is considerably lower.

2.4.3 Carbon monoxide (CO).

A combination of traffic congestion, high-rise buildings, slow wind, high humidity and near isothermal conditions throughout the year, aggravate the effects of vehicular carbon monoxide emissions. (Fig,3.3). Motor vehicle transport is estimated to be responsible for 89% of total CO emissions in 1990,(NEERI, 1991a).

2.4.4 Sulphur dioxide

Fig.3.3 shows that industrial sources account for nearly all SO_2 emission in Mumbai. Monitoring conducted in the Air Pollution Survey of Greater Bombay 1970-1973 indicates that SO_2 levels first started to decrease in the 1970 s, probably due to planning measures such as the relocation of industry and increased stack height. (NEERI, 1991a).

2.4.5 Oxides of Nitrogen

Detailed vehicular emissions inventories produced by the Indian Department of the Environment (NEERI, 1991 a) indicate that diesel vehicles (predominantly trucks) are the dominant source of motor vehicle derived NOx in Mumbai.

2.4.6 Present scenario

A comparison of the average levels of pollutants in January 2000 and corresponding finding this year shows that certain pollutants have increased in several localities (Table 3.41, Source-BMC and MPCB –Times of India Mumbai dated 22-4-2001).The most important of these, suspended particulate matter (SPM), has risen sharply at Mahim, Andheri and Sion. SO^2 levels were higher this year in Andheri and CO levels at Sion & Mulund as compared to the year 2000. BMC officials state that the increased levels are probably due to an increase in number of vehicles (there are more than 12 lakh vehicles in the city, with an average 10% increase every year). The steep increase of SPM at Mahim, they suggest, is likely because of the construction and digging works currently going on in the area.

3 RESULTS

Table No 3.1 Species present(+) for observations at different sites

Sr.	Name of the Plants	1 Nathalal Parikh Rd. BEST,Colaba	2 Homi Bhabha Rd. Colaba	3 Carnac Bunder	4 Gamdevi	5 Kamala Nehru Park	6 E. Moses Rd.	7 Wadia Hospital	8 Woolen Mill Lane, Dader	9 Mehboob Studio, Bandra	10 S. V. Road, Khar	11 Koldongri, Andheri (E)	12 Marol Fire St., Sakinaka	13 Bhandup	14 P.Kherej Road, Mulund	15 Pant Nagar, Gatkopar	16 Tilak Nagar, Chembur	17 Dnyanvikas School, Sion	18 Anik Dept., Chembur	19 Sindhi Camp, Chembur	20 Maravali BMC School	21 Municipal School, Mankhurd	22 Chota Kashmir, Aarey Colony	23 CTRIC Office, Borivali	24 West. Exp. Highway, Kandivali	25 Oshivara Municipal. School
1	*Adenanthera pavonia* Linn.					+																				
2	*Adhatoda vasica* Nees.									+																
3	*Alstonia scholaris* R.Br.				+																			+		
4	*Artocarpus heterophyllus* Lamk.					+					+								+					+		
5	*Azadirachta indica* A. Juss.										+															
6	*Barringtonia racemosa Roxb.*		+																							
7	*Bougainvillea spectabilis* Willd.	+			+					+		+					+	+	+				+	+		
8	*Butea monosperma* (Lamk.) Taub.				+									+												
9	*Careya arborea* Roxb.																								+	
10	*Cassia siamea* Lamk.						+				+		+	+								+				+
11	*Ceiba pentandra (Linn.)* Gaertn.																			+						
12	*Cordia dichotoma* Forst.								+																	
13	*Delonix regia* (Hook.) Rafin.	+	+			+	+	+	+	+	+	+						+	+	+		+				+
14	*Ervatamia divaricata (Linn.)* Alston.									+					+											
15	*Erythrina indica* Lamk.		+		+			+				+			+		+	+			+	+		+		
16	*Ficus benghalensis* Linn.		+	+			+		+	+				+		+		+		+			+			
17	*Ficus elastica* Roxb.				+					+				+	+											
18	*Ficus glomerata* Roxb.																		+			+		+		
19	*Ficus religiosa* Linn.		+	+			+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				+
20	*Gliricidia sepium* (Jacq.) Walp.								+							+										
21	*Hibicus rosa-sinensis* Linn.									+				+			+							+		
22	*Holoptelea integrifolia* Roxb.																								+	
23	*Ixora coccinea* Linn.									+																

Cont..

Sr.	Name of the Plants	1 Nathalal Parikh Rd. BEST,Colaba	2 Homi Bhabha Rd. Colaba	3 Carnac Bunder	4 Gamdevi	5 Kamala Nehru Park	6 E. Moses Rd.	7 Wadia Hospital	8 Woolen Mill Lane, Dader	9 Mehboob Studio, Bandra	10 S. V. Road, Khar	11 Koldongri, Andheri (E)	12 Marol Fire St., Sakinaka	13 Bhandup	14 P.Kherej Road, Mulund	15 Pant Nagar, Gatkopar	16 Tilak Nagar, Chembur	17 Dnyanvikas School, Sion	18 Anik Dept., Chembur	19 Sindhi Camp, Chembur	20 Maravali BMC School	21 Municipal School, Mankhurd	22 Chota Kashmir, Aarey Colony	23 CTRIC Office, Borivali	24 West. Exp. Highway, Kandivali	25 Oshivara Municipal. School
24	*Lagerstroemia speciosa* Pers.				+																				+	
25	Leucaena leucocephala (Lamk.) Dewit															+			+						+	
26	*Mangifera indica* Linn.	+	+			+	+			+			+	+			+	+			+		+	+	+	
27	*Manilkara achras* (Mill.) Fosberg																						+			
28	*Morinda citrifolia* Linn.										+															
29	*Murraya paniculate* (Linn.) Jack													+	+											
30	*Peltophorum pterocarpum* Baker	+	+	+	+	+	+	+	+	+	+	+	+	+		+		+		+		+	+	+		+
31	*Pithecellobium dulce* (Roxb.) Benth.														+											
32	*Polyalthia longifolia* Var. Pendula (Sonner.)	+	+	+			+		+	+	+	+	+	+	+		+	+	+	+			+	+		+
33	*Pongamia pinnata* (Linn.) Pierre							+								+						+	+	+	+	
34	*Putranjiva roxburghii* Wall.							+	+			+	+													
35	*Samanea saman* (Jacq.) Merr.						+	+		+	+				+	+		+			+	+	+	+		+
36	*Sterculia foetida* Linn.														+			+								
37	*Syzygium cuminii* (Linn.) Skeels	+			+												+	+	+					+	+	
38	*Tamarindus indica* Linn.									+														+		
39	*Terminalia catappa* Linn.							+					+				+	+			+			+		+
40	*Thespesia populnea* Soland. ex-Correa	+		+				+	+				+	+		+		+	+	+		+	+			+
41	*Thevetia peruviana* (Pers.) Merrill		+														+									
42	*Ziziphus mauritiana* Lamk.													+			+	+								

Table No.3.2 Occurrence of plant species at different sites.		
Name of the Plants	**Available at sites**	**Rank**
Peltophorum pterocarpum Baker	20	1
Ficus religiosa Linn.	19	2
Polyalthia longifolia Var. Pendula (Sonner.)	18	3
Delonix regia (Hook.) Rafin.	14	4
Mangifera indica Linn.	13	5
Thespesia populnea soland. ex-correa	13	6
Samanea saman (Jacq.) Merr.	12	7
Ficus benghalensis Linn.	11	8
Bougainvillea spectabilis Willd.	9	9
Erythrina indica Lamk.	9	10
Syzygium cuminii (Linn.) Skeels	7	11
Terminalia catappa Linn.	7	12
Cassia siamea Lamk.	6	13
Pongamia pinnata (Linn.) Pierre	6	14
Artocarpus heterophyllus Lamk.	4	15
Ficus elastica Roxb.	4	16
Hibicus rosa-sinensis Linn.	4	17
Putranjiva roxburghii Wall.	4	18
Ervatamia divaricata (Linn.) Alston.	3	19
Ficus glomerata Roxb.	3	20
Leucaena leucocephala (Lamk.) Dewit	3	21
Ziziphus mauritiana Lamk.	3	22
Alstonia scholaris R.Br.	2	23
Butea monosperma (Lamk.) Taub.	2	24
Gliricidia sepium (Jacq.) Walp.	2	25
Lagerstroemia speciosa Pers.	2	26
Murraya paniculata (Linn.) Jack	2	27
Sterculia foetida Linn.	2	28
Tamarindus indica Linn.	2	29
Thevetia peruviana (Pers.) Merrill	2	30
Adenanthera pavonia Linn.	1	31
Adhatoda vasica Nees.	1	32
Azadirachta indica A. Juss.	1	33
Barringtonia racemosa Roxb.	1	34
Careya arborea Roxb.	1	35
Ceiba pentandra (Linn.) Gaertn.	1	36
Cordia dichotoma Forst.	1	37
Holoptelea integrifolia Roxb.	1	38
Ixora coccinea Linn.	1	39
Manilkara achras (Mill.) Fosberg	1	40
Morinda citrifolia Linn.	1	41
Pithecellobium dulce (Roxb.) Benth.	1	42

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.3
Location : Nathalal Parekh Marg, B.E.S.T. marg, Colaba.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	18.0	-	Coriaceous	+	-	LB/ FB	FB/ FR	LB	-	-	IB	L	L	NP	Red Soil	Yes
Ficus benghalensis	12.0	101.91	Glabrous	+	-	LB	LB	LB	TB/IB	-	IB	L	L	L	Red Soil	Yes
Polyalthia longifolia	12.0	21.33	Glabrous	+	-	LB	LB	LB	TB	-	TB	L	L	L	Normal	No
Mangifera indica	6.00	12.73	Coriaceous	+	-	-	FR	LB	-	-	IB	L	H	L	Red Soil	Occasionally
Thespesia populnea	7.50	25.15	Glabrous	+	-	-	FB/ FR	LB/LB	-	-	IB	L	L	NP	Normal	No
Erythrina indica	10.51	15.92	Coriaceous	-	+	-	-	LB	B	-	-	L	L	L	Footpath	No
Delonix regia	12.01	34.71	Glabrous	+	-	LB	-	LB/FB	-	-	-	NP	NP	NP	Normal	No
Syzygium cuminii	12.01	29.93	Glabrous	+	-	LB	FB	LB	-	-	_	L	L	L	Normal	No
Peltophorum pterocarpum	9.00	28.34	Glabrous	+	-	LB/ F	FB/FR	LB	B	-	IB	NP	NP	NP	Footpath	No
Samanea saman	9.05	97.52	Glabrous	+	-	LB	FB/FR	LB/FB	-	-	-	NP	NP	NP	Red Soil	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present.

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.4

Location : Homi Bhabha Marg, Colaba.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	15.01	123.24	Coriaceous	+	-	-	LB/FR	LB	IB	-	IB	L	L	NP	Tar Road	No
Ficus benghalensis	15.01	-	Glabrous	+	-	-	LB/FR	LB	TB	-	IB	H	L	L	Red Soil	No
Polyalthia longifolia	12.01	11.46	Glabrous	+	-	-	FR	LB	TB	-	TB	L	L	L	Footpath	Occasionally
Mangifera indica	15.01	65.92	Coriaceous	+	-	LB/FB	LB/FR	LB	TB	TB	IB	L	L	L	Normal	No
Thespesia populnea	7.50	21.97	Glabrous	+	-	-	LB/FB	LB/FB	-	-	IB	NP	L	NP	Red Soil	No
Erythrina indica	12.01	52.54	Coriaceous	-	+	-	-	LB	-	-	-	NP	L	L	Normal	No
Delonix regia	15.01	34.71	Glabrous	+	-	-	FB	LB/FB	-	-	-	L	NP	NP	Normal	No
Syzygium cuminii	12.54	36.43	Glabrous	+	-	-	-	LB	-	-	_	L	L	L	Normal	No
Peltophorum pterocarpum	15.01	95.54	Glabrous	+	-	LB	FB/FR	LB	-	-	IB	NP	NP	NP	Footpath	No
Barringtonia recemosa	10.51	52.54	Glabrous	+	-	-	-	LB	-	B	B/IB	L	H	NP	Footpath	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present.

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.5
Location : Carnak Bunder

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	7.50	16.87	Coriaceous	-	+	-	FB	LB/FR	TB	-	TB	L	L	NP	Tar road	Yes
Ficus benghalensis	10.51	16.87	Glabrous	+	-	LB	-	-	-	-	IB	H	H	H	Normal	Yes
Polyalthia longifolia	9.00	15.92	Glabrous	-	+	LB	-	LB	-	-	IB	L	L	H	Normal	No
Mangifera indica	5.21	15.65	Coriaceous	+	-	-	-	LB	-	-	TB	H	H	L	Normal	Occasionally
Thespesia populnea	8.40	19.74	Glabrous	+	-	LB	-	LB	-	-	TB/IB	H	H	L	Tar road	No
Peltophorum pterocarpum	10.51	32.16	Glabrous	-	+	LB	FB/FR	FB/FR	-	-	-	NP	L	L	Footpath	No
Nerium indica	2.40	3.80	Glabrous	+		LB	-	LB/FB	-		-	H	H	H	Normal	No
Delonix regia	7.50	24.84	Glabrous	+	-	LB	FR	-	-	-	B	L	L	L	Footpath	No
Syzygium cumini	9.00	31.52	Glabrous	+	-	LB	FB	LB	-	-	B/IB	H	L	L	Footpath	No
Azardirachta indica	7.50	35.00	Glabrous	-	+	LB	-	LB	-	-	-	L	H	L	Normal	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present.

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.7
Location : Kamla Nehru Park, Malabar Hill.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	15.01	201.27	Coriaceous	+	-	LB	-	LB	IB	-	IB	L	NP	NP	Red Soil	Yes
Polyalthia longifolia	15.01	28.34	Glabrous	+	-	-	LB	LB	-	-	IB	NP	NP	NP	Red Soil	Yes
Mangifera indica	15.01	35.24	Coriaceous	+	-	LB/FB	FR	LB	TB	-	TB	L	L	NP	Red Soil	Yes
Thespesia populnea	12.01	32.48	Glabrous	+	-	LB	FB/FR	FB/FR	TB	-	TB	L	L	NP	Red Soil	Yes
Erythrina indica	10.21	66.87	Coriaceous	+	-	FB	-	LB	-	-	-	L	L	NP	Footpath	Yes
Peltophorum pterocarpum	12.00	28.00	Glabrous	+	-	LB		FB/FR	-	-	-	NP	NP	NP	Red Soil	Yes
Delonix regia	15.01	53.18	Glabrous	-	+			LB	B	-	TB	NP	NP	NP	Red Soil	Yes
Artocarpus heterophyllus	7.50	32.48	Glabrous	+	-	-	FB	LB	-	-	-	H	L	NP	Red Soil	Yes
Lagerstroemia speciosa	4.50	26.50	Glabrous	+	-	LB		LB	TB	-	TB	L	L	NP	Red Soil	Yes

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present.

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.8
Location :. E. Moses Road, Worli.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	12.01	79.29	Coriaceous	+	-	LB	-	LB	B	-	B	L	L	L	Footpath	Yes
Ficus benghalensis	6.00	51.59	Glabrous	-	+	LB	LB	LB/FR	-	-	IB	H	H	H	Redsoil	No
Polyalthia longifolia	9.00	14.98	Glabrous	+	-	-	-	LB	TB	-	TB/IB	L	L	H	Redsoil	No
Mangifera indica	10.51	54.45	Coriaceous	+	-	FB	LB/FR	LB/FB		-	IB/B	L	H	L	Redsoil	Occasionally
Thespesia populnea	7.50	45.85	Glabrous	+	-	FR	FB/FR	FB/FR	-	-	-	L	L	L	Footpath	No
Samanea saman	9.00	85.98	Glabrous	+	-	LB	-	LB	-	-	-	L	NP	L	Footpath	No
Erythrina indica	7.50	48.72	Coriaceous	+	-	FB	-	LB	-	-	IB	L	L	NP	Redsoil	Occasionally
Delonix regia	7.50	24.00	Glabrous	-	+	-	-	LB/FB	-	-	-	L	L	L	Redsoil	Yes
Cassia siamea	4.50	28.25	Glabrous	+	-	FB/FR	FB/FR	FB/FR	-	-	-	L	L	NP	Redsoil	No
Peltophorum pterocarpum	7.50	25.00	Glabrous	+	-	FB	FB/FR	LB/FB	-	-	-	L	L	NP	Redsoil	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present.

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.9
Location : B.J. Wadia Hospital Road, Parel.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	9.00	96.17	Coriaceous	+	-	FB	FB	-	-	-	IB	L	L	L	Footpath	No
Ficus benghalensis	12.01	105.41	Glabrous	+	-	-	FR	FR	IB	-	IB	L	H	L	Footpath	No
Polyalthia longifolia	15.01	32.16	Glabrous	+	-	LB/FB	LB	-	IB	-	-	H	H	L	Redsoil	No
Mangifera indica	15.01	85.03	Coriaceous	+	-	FB	FR	-	-	-	IB	L	H	L	Redsolil	Yes
Thespesia populnea	6.00	26.43	Glabrous	+	-	LB	FB/FR	FB/FR	-	-	-	L	L	L	Footpath	No
Samanea saman	15.01	107.32	Glabrous	+	-	LB/FB	FB/FR	-	-	-	-	L	L	L	Redsoil	No
Delonix regia	7.50	24.84	Glabrous	+	-	LB	FR	-	-	-	-	L	NP	NP	Footpath	No
Peltophorum pterocarpum	7.50	22.92	Glabrous	+	-	FB	FR	FR	-	-	-	L	L	L	Footpath	No
Pongamia pinnata	6.00	25.15	Glabrous	+	-	-	-	-	-	-	IB	L	NP	NP	Footpath	No
Putranjiva roxburghii	9.00	63.69	Glabrous	+	-	FB/FR	LB	FR	-	-	-	L	H	NP	Footpath	No
Terminalia catappa	9.00	32.00	Coriaceous	+	-	FR	FR	-	-	-	-	L	L	NP	Redsoil	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present.

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.10
Location : Wollen Mill Compound, Municipal Secondary School, Dadar (W).

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	10.51	172.92	Coriaceous	+	-	LB	LB	FB	-	-	IB/B	L	L	L	Footpath	No
Ficus benghalensis	4.50	11.46	Glabrous	+	-	-	FR	FR	-	-	IB	H	H	L	Footpath	No
Polyalthia longifolia	12.01	32.16	Glabrous	+	-	LB	LB	LB	-	-	IB	L	L	H	Redsoil	Yes
Mangifera indica	6.00	15.60	Coriaceous	+	-	-	LB	LB	-	-	IB	L	H	NP	Redsoil	Yes
Thespesia populnea	7.50	35.73	Glabrous	-	+	LB	FB/FR	FB	-	-	-	L	L	L	Footpath	No
Peltophorum pterocarpum	12.01	28.02	Glabrous	+	-	LB	FR	FB	-	-	-	L	H	NP	Footpath	No
Delonix regia	10.51	52.22	Glabrous	+	-	FR	FB	LB	-	-	-	N	NP	NP	Footpath	No
Terminalia catappa	9.00	31.80	Glabrous	+	-	LB	FB/FR	FR	IB	-	IB	L	H	L	Footpath	No
Putranjiva roxburghii	5.40	29.50	Glabrous	+	-	-	-	-	-	-	-	L	L	L	Footpath	No
Cordia dichotoma	4.50	26.00	Glabrous	+	-	LB	LB	FB	-	-	-	L	L	L	Footpath	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present.

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.11
Location : Supari Tank Municipal School, Near Mehboob Studio, Bandra (W).

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	10.51	60.50	Coriaceous	+	-	LB	LB/FR	-	IB	-	TB	L	H	L	Red soil	Yes
Ficus benghalensis	4.50	22.61	Glabrous	-	+	LB	LB	-	IB	-	IB	H	H	H	Red soil	Yes
Polyalthia longifolia	12.01	32.80	Glabrous	+	-	LB	LB	-	-	TB	-	H	H	L	Red soil	Yes
Mangifera indica	10.51	68.47	Coriaceous	+	-	FB/FR	FR	LB	-	-	-	H	H	L	Red soil	Yes
Thespesia populnea	7.50	24.20	Glabrous	+	-	FR	FB	FB/FR	IB	-	-	H	H	H	Footpath	No
Samanea saman	12.01	87.26	Glabrous	+	-	LB/FR	FB	FB	-	-	-	NP	L	L	Red soil	Yes
Delonix regia	15.01	53.18	Glabrous	+	-	LB/FR	LB	-	-	-	-	L	H	NP	Red soil	Yes
Peltophorum pterocarpum	9.00	39.17	Glabrous	+	-	FR	FB/FR	FB/FR	-	-	-	L	L	NP	Red soil	Yes
Syzygium cumiini	9.00	31.52	Glabrous	+	-	FB	FR	-	-	-	-	L	L	H	Footpath	No
Artocarpus heterophyllus	12.00	65.45	Glabrous	+	-	-	-	-	-	-	-	L	H	L	Red soil	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present.

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.12
Location : S V Road, Khar Police Station, Khar.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	9.00	94.26	Coriaceous	+	-	LB/FR	-	-	IB	-	IB	H	NP	L	Redsoil	Ocassionally
Ficus benghalensis	6.00	28.98	Glabrous	-	+	-	-	-	B	-	TB	H	NP	L	Redsoil	Yes
Polyalthia longifolia	12.01	29.61	Glabrous	+	-	LB	-	-	-	-	-	L	L	NP	Footpath	No
Mangifera indica	4.50	13.69	Coriaceous	-	+	-	-	-	-	-	-	L	L	L	Redsoil	Yes
Thespesia populnea	7.50	-	Glabrous	+	-	-	-	FB/FR	-	-	-	L	NP	NP	Redsoil	Yes
Samanea saman	15.01	98.40	Glabrous	+	-	LB	FB	FR	-	-	-	L	L	L	Footpath	No
Artocarpus heterophyllus	12.01	70.06	Glabrous	-	+	LB	LB	-	-	-	-	H	H	L	Footpath	No
Azardirachta indica	7.50	36.94	Glabrous	+	-	LB	LB	-	-	-	-	L	L	NP	Footpath	No
Cassia siamea	7.50	26.11	Glabrous	+	-	LB	FB/FR	FB/FR	-	-	-	L	L	NP	Footpath	No
Peltophorum pterocarpum	9.00	30.57	Glabrous	+	-	LB	FB/FR	FB/FR	-	-	-	L	NP	NP	Redsoil	Yes

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present.

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.13
Location : Samarth Night School, Nityanand Marg, Koldongri, Andheri.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	6.00	25.47	Coriaceous	-	+	LB	LB/FR	-	-	-	IB/B	L	L	NP	Redsoil	No
Ficus benghalensis	6.00	131.21	Glabrous	+	-	LB	LB/FR	-	-	-	IB	H	H	L	Red soil	No
Polyalthia longifolia	12.01	38.85	Glabrous	+	-	LB	LB	LB	-	-	IB	L	L	L	Road side	No
Mangifera indica	12.01	53.50	Coriaceous	-	+	FB/FR	FR	-	-	-	-	L	L	L	Red soil	Yes
Thespesia populnea	6.00	11.78	Glabrous	+	-	LB	-	LB	-	-	-	L	L	L	Road side	No
Samanea saman	12.01	68.78	Glabrous	+	-	LB	FB	-	-	-	-	L	L	NP	Road side	No
Delonix regia	9.00	47.45	Glabrous	+	-	LB	LB	-	-	-	-	L	L	NP	Red soil	No
Erythrina indica	12.01	42.67	Glabrous	-	+	FR	LB/FR	LB	-	-	-	L	L	NP	Red soil	Yes
Peltophorum pterocarpum	7.50	23.56	Glabrous	+	-	LB	FB/FR	FB/FR	-	-	-	L	L	NP	Red soil	Yes
Putranjia roxburghii	12.01	82.80	Glabrous	+	-	LB	LB	-	-	-	-	L	L	NP	Red soil	Yes

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No.3.14
Location : Municipal U.P. School, Marol Fire station, Saki Naka, Andheri.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	12.01	73.24	Coriaceous	+	-	LB	FB	FB	TB	-	IB	L	L	L	Redsoil	Yes
Ficus benghalensis	7.50	77.07	Glabrous	+	-	LB	LB/FB	FR	IB	-	IB	H	H	L	Redsoil	Yes
Polyalthia longifolia	7.50	19.74	Glabrous	+	-	LB	-	LB	-	-	-	L	L	H	Redsoil	Yes
Mangifera indica	7.50	26.75	Coriaceous	+	-	FB	LB/FR	-	IB	-	-	H	L	L	Redsoil	Yes
Thespesia populnea	6.00	41.40	Glabrous	+	-	FB/FR	LB	FB/FR	IB	-	-	L	L	L	Redsoil	Yes
Cassia siamea	4.50	28.98	Glabrous	+	-	FB	FR	FB/FR	-	-	-	L	H	L	Footpath	No
Peltophorum pterocarpum	7.50	25.79	Glabrous	+	-	LB/FB	FR	FB/FR	-	-	-	L	L	L	Footpath	No
Putranjia roxburghii	9.00	25.15	Glabrous	+	-	LB	-	LB	-	-	-	L	L	H	Footpath	No
Terminalia catappa	6.00	12.00	Glabrous	+	-	LB	-	LB	-	-	-	L	L	L	Footpath	No
Azardirachta indica	7.50	35.00	Glabrous	+	-	-	-	-	-	-	-	L	L	L	Footpath	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP=Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.15
Location : L.B.Shastri Marg, Bhandup.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	10.01	64.33	Coriaceous	+	-	LB/FB	LB/FB	FB/FR	IB	-	-	H	L	L	Redsoil	No
Ficus benghalensis	10.01	75.47	Glabrous	-	+	LB	LB	-	IB	-	IB	H	H	H	Footpath	No
Polyalthia longifolia	6.00	18.15	Glabrous	+	-	LB	-	-	-	-	-	L	NP	L	Redsoil	Occasional
Mangifera indica	6.00	13.69	Coriaceous	+	-	LB	FB	-	-	-	-	H	H	L	Footpath	No
Thespesia populnea	6.00	35.05	Glabrous	+	-	LB	-	FB	-	-	-	L	H	L	Redsoil	Near gutter
Samanea saman	12.01	105.09	Glabrous	+	-	LB	FB	-	-	-	-	L	H	L	Footpath	No
Erythrina indica	7.50	44.90	Glabrous	-	+	LB/FB	LB/FR	-	-	-	-	L	L	NP	Redsoil	No
Peltophorum pterocarpum	7.50	26.11	Glabrous	+	-	LB/FR	FB/FR	FR	-	-	-	L	NP	L	Footpath	No
Cassia siamea	6.00	18.78	Glabrous	-	+	LB	-	FB/FR	-	-	-	L	NP	L	Footpath	No
Ziziphus mauritiana	6.00	41.71	Coriaceous	+	-	LB	-	FB	-	-	-	H	H	L	Footpath	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.16
Location : Muncipal School, P.Kheraj Marg, Mulund (W).

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	15.01	89.49	Coriaceous	+	-	LB	FB	-	-	-	IB	L	L	NP	Footpath	No
Ficus benghalensis	7.50	50.63	Glabrous	+	-	LB/FR	LB	-	-	-	-	L	L	NP	Redsoil	Yes
Polyalthia longifolia	12.01	19.10	Glabrous	+	+	LB	-	-	-	-	-	L	L	NP	Redsoil	Near gutter
Mangifera indica	7.50	19.74	Coriaceous	+	-	LB/FB	FB/FR		-	-	-	L	L	NP	Redsoil	Yes
Thespesia populnea	7.50	28.98	Glabrous	-	+	LB/FR	LB/FR	FB	-	-	-	H	L	L	Redsoil	Near gutter
Samanea saman	15.01	54.77	Glabrous	+	-	LB	FB	FB	-	-	-	L	L	NP	Redsoil	No
Erythrina indica	7.50	39.80	Glabrous	+	-	LB/FR	FR	-	IB/B	-	-	L	L	NP	Redsoil	No
Pongamia pinnata	6.00	35.35	Glabrous	+	-	LB	FR	-	-	-	-	H	L	NP	Redsoil	Near gutter
Pithecellobium dulce	12.01	61.14	Coriaceous	+	-	LB/FB	FB	-	-	-	-	L	L	NP	Redsoil	Near gutter
Peltophorum pterocarpum	6.00	24.20	Glabrous	+	-	LB/FB	FB/FR	FB	-	-	-	L	L	NP	Redsoil	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP=Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.17
Location : BMC School No.2, Opp. Sindhudurga Building, Pant Nagar, Ghatkopar.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	9.00	31.21	Coriaceous	-	+	LB	-	LB/FR	-	-	IB	L	L	NP	Redsoil	Yes
Ficus benghalensis	9.00	93.94	Glabrous	+	-	LB	-	-	-	-	-	H	H	H	Road side	No
Polyalthia longifolia	7.50	10.82	Glabrous	+	-	LB	-	LB	IB	TB	-	L	L	NP	Redsoil	Yes
Mangifera indica	6.00	9.87	Coriaceous	-	+	LB	-	-	B	B	TB	NP	L	H	Redsoil	No
Thespesia populnea	7.50	30.25	Glabrous	+	-	LB	-	LB	-	-	IB	L	L	NP	Footpath	No
Samanea saman	9.00	69.42	Glabrous	+	-	LB	-	-	-	-	TB	NP	NP	NP	Redsoil	No
Erythrina indica	12.01	51.59	Glabrous	+	-	FB	LB/FR	LB	-	-	-	L	L	NP	Redsoil	Occasionally
Pongamia pinnata	6.00	35.03	Glabrous	-	+	-	LB/FR	-	-	-	IB/B	L	NP	NP	Redsoil	No
Terminalia catappa	6.00	12.73	Coriaceous	+	-	FR	LB/FR	-	-	-	-	L	H	L	Redsoil	Occasionally
Syzygium cumini	6.00	26.11	Glabrous	+	-	LB	-	-	-	-	B/IB	H	H	L	Redsoil	Yes

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No.3.18
Location : Tilak Nagar, Muncipal Primary School, Chembur.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	10.51	68.15	Coriaceous	+	-	LB	FB	FB/FR	IB	-	TB	L	H	L	Redsoil	No
Ficus benghalensis	10.51	100.95	Glabrous	+	-	LB	LB	-	-	-	-	H	L	L	Redsoil	No
Polyalthia longifolia	10.51	16.56	Glabrous	+	-	LB	-	-	-	-	-	H	H	L	Redsoil	No
Mangifera indica	9.00	45.22	Coriaceous	-	+	-	LB	-	-	-	TB	L	NP	L	Tar road	Yes
Thespesia populnea	6.00	17.51	Glabrous	+	-	LB/FB	FR	-	-	-	-	L	NP	L	Redsoil	No
Samanea saman	9.00	40.44	Glabrous	+	-	LB/FB	-	-	-	-	-	NP	NP	NP	Redsoil	Yes
Erythrina indica	9.00	38.85	Glabrous	+	-	LB	LB	-	IB	-	TB	L	H	NP	Redsoil	Yes
Syzygium cumini	15.01	54.77	Glabrous	-	+	LB	LB	FR	-	-	IB	NP	H	NP	Redsoil	Yes
Peltophorum Pterocarpum	9.00	31.52	Glabrous	+	-	LB	FB/FR	FR	-	-	-	NP	L	NP	Redsoil	Yes
Delonix regia	9.00	41.40	Glabrous	+	-	LB	FR	LB	-	-	-	L	NP	NP	Redsoil	Yes

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.19

Location : Dnyan Vikas School, Bhandar Wada, Koli wada, Sion.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	9.00	32.16	Coriaceous	+	-	LB	-	FR	-	-	IB	NP	NP	NP	Redsoil	No
Ficus benghalensis	16.51	115.60	Glabrous	-	+	FR	FR	-	-	-	IB	H	H	L	Redsoil	No
Polyalthia longifolia	15.01	21.97	Glabrous	-	+	LB	LB	-	-	-	-	L	H	L	Footpath	Occasionally
Mangifera indica	9.00	15.28	Coriaceous	+	-	FB	LB/FB	LB	-	-	IB	H	H	L	Redsoil	Yes
Thespesia populnea	5.40	17.51	Glabrous	-	+	-	LB/FB	FB	-	-	-	L	H	NP	Footpath	Occasionally
Samanea saman	12.01	66.56	Glabrous	+	-	LB/FB	FB	FB	-	-	-	NP	L	NP	Redsoil	Occasionally
Erythrina indica	7.50	33.43	Glabrous	+	-	LB	-	-	IB	-	-	L	L	NP	Redsoil	No
Delonix regia	9.00	36.62	Glabrous	+	-	-	-	LB	-	-	-	L	NP	NP	Redsoil	No
Terminalia catappa	12.01	33.12	Coriaceous	+	-	LB/FB	FR	FR	IB	-	-	L	L	NP	Redsoil	Yes
Peltophorum pterocarpum	12.01	37.57	Glabrous	+	-	LB	-	FB/FR	-	-	-	NP	NP	NP	Tar road	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No.3.20
Location : Anik Nagar,Chembur(W).

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	9.00	48.08	Coriaceous	+	-	LB	LB	LB	IB/B	IB/B	IB/TB	L	NP	L	Road side	No
Ficus benghalensis	9.00	43.63	Glabrous	-	+	-	LB	-	IB/B	-	-	H	H	L	Road side	No
Polyalthia longifolia	6.00	12.10	Glabrous	+	-	LB/FR	LB	-	-	-	-	L	L	L	Redsoil	Yes
Smanea saman	12.01	46.17	Coriaceous	+	-	LB/FR	-	-	-	-	-	NP	NP	NP	Road side	No
Thespesia populnea	7.50	26.11	Glabrous	+	-	FR	FB	LB/FR	B	-	IB	NP	L	L	Road side	No
Delonix regia	7.50	53.82	Glabrous	+	-	LB	FB	-	IB/B	-	-	L	L	NP	Road side	No
Azardichata indica	7.50	36.94	Glabrous	+	-	FB	FR	-	-	-	-	NP	NP	NP	Redsoil	Yes
Pongamia pinnata	9.00	36.30	Glabrous	+	-	FB	FR	FR	TB	-	IB/TB	L	L	L	Road side	No
Luceana leucocephala	3.00	12.35	Coriaceous	+	-	-	-	FR	-	-	-	NP	NP	NP	Redsoil	Yes
Artocarpus heterophyllus	7.50	32.48	Coriaceous	+	-	-	FR	-	-	-	-	NP	L	L	Road side	

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning ,IB= Insects Bit
L= Light, H= Heavy, NP= Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.21
Location : Marvali Municipal School, Sindhi Camp, Chembur.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	12.01	61.46	Coriaceous	+	-	-	-	LB/FB	IB	-	TB/IB	L	NP	NP	Road side	No
Ficus benghalensis	10.51	55.41	Glabrous	+	-	FR	LB	FB/FR	IB	-	TB/IB	H	H	L	Road side	No
Polyalthia longifolia	10.51	21.65	Glabrous	+	-	LB	-	LB	-	-	-	L	H	L	Redsoil	Yes
Cassia siamea	7.50	27.38	Coriaceous	+	-	FB	FR	FB/FR	-	-	-	NP	NP	NP	Redsoil	Yes
Thespesia populnea	9.00	47.13	Glabrous	-	+	LB	FR	FB/FR	IB	-	B/TB	H	H	L	Footpath	No
Delonix regia	9.00	24.20	Glabrous	+	-	LB	-	FB/FR	-	-	-	NP	NP	NP	Road side	No
Terminalia catappa	7.50	13.37	Glabrous	+	-	LB/FR	LB	FR	-	-	IB	H	H	L	Road side	No
Peltophorum pterocarpum	9.00	42.35	Glabrous	+	-	LB/FB	FB	FB/FR	-	-	-	L	L	NP	Footpath	No
Ceiba pentandra	6.50	19.50	Coriaceous	+	-	FB	FR	-	-	-	-	NP	L	NP	Road side	No
Azardirachta indica	7.50	36.94	Glabrous	-	+	FB	FR	-	-	-	-	NP	L	NP	Road side	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning, IB= Insects Bit
L= Light, H= Heavy, NP= Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.22
Location : Mysore Colony, H.P. Colony, Chembur.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	6.00	35.03	Coriaceous	-	+	LB	FB	-	-	-	B/IB	L	L	L	Road side	No
Ficus benghalensis	3.50	17.51	Glabrous	+	-	LB	LB	-	-	-	B/IB	H	H	H	Road side	No
Polyalthia longifolia	4.50	10.24	Glabrous	+	-	LB	-	-	-	IB	IB	L	L	L	Road side	No
Mangifera indica	10.51	37.89	Coriaceous	+	-	LB/FB	FR	LB	-	IB	-	L	L	L	Redsoil	Yes
Thespesia populnea	6.00	31.21	Glabrous	+	-	LB	FR	FB.FR	-	-	B/IB	L	L	L	Road side	No
Erythrina indica	8.40	13.37	Glabrous	+	-	LB	LB	FR	-	-	IB/B	L	L	L	Road side	No
Samanea saman	12.01	73.88	Glabrous	+	-	LB	LB	FR	-	-	IB	NP	L	L	Road side	No
Terminalia catappa	11.41	25.47	Glabrous	+	-	LB/FB	FB/FR	-	-	-	IB/TB	L	L	L	Road side	No
Peltophorum pterocarpum	15.01	26.43	Glabrous	+	-	LB	FB/FR	FB/FR	-	-	-	L	L	L	Redsoil	Yes
Artocarpus heterophyllus	7.50	20.06	Glabrous	+	-	-	FR	-	-	-	IB	L	L	L	Road side	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning, IB= Insects Bit
L= Light, H= Heavy, NP= Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.23
Location : BMC Primary School, Mankhurd Station Road, Mankhurd.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	13.81	-	Coriaceous	+	-	LB/FB	FB	-	IB	-	IB	NP	L	NP	Road side	No
Ficus benghalensis	9.00	89.80	Glabrous	+	-	-	-	-	-	-	IB	H	H	L	Road side	No
Polyalthia longifolia	5.40	4.77	Glabrous	+	-	LB	-	-	-	-	IB	L	NP	NP	Redsoil	Yes
Mangifera indica	9.00	28.02	Coriaceous	+	-	FB/FR	FR	-	-	-	IB	H	L	NP	Redsoil	Yes
Thespesia populnea	9.00	47.13	Glabrous	-	+	LB	FB	FB/FR	-	-	IB	L	L	NP	Footpath	No
Samanea saman	9.00	63.69	Glabrous	+	-	LB/FB	LB/FB	FB	-	-	IB	NP	L	NP	Road side	No
Peltophorum pterocarpum	9.00	45.85	Glabrous	+	-	LB/FB	FB/FR	LB/FR	-	-	-	NP	NP	NP	Footpath	No
Ficus glomerata	6.00	44.26	Glabrous	-	+	LB	LB	LB	-	-	-	H	NP	NP	Road side	No
Cassia siamea	10.51	28.34	Glabrous	+	-	FB	FR	FB/FR	-	-	-	L	L	NP	Redsoil	No
Pongamia pinnata	9.00	36.30	Glabrous	+	-	-	LB/FB	FB	-	-	IB	NP	L	NP	Footpath	No
Delonix regia	7.50	34.71	Glabrous	+	-	-	LB	-	-	-	IB	NP	L	NP	Footpath	No

1st = February 2000 (winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning, IB= Insects Bit
L= Light, H= Heavy, NP= Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.24
Location : Chotta Kashmir, Aarey Colony, Goregoan.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	6.00	13.69	Coriaceous	+	-	-	LB	LB	IB	-	-	L	L	NP	Road side	No
Ficus benghalensis	15.01	199.04	Glabrous	+	-	-	-	-	IB	-	IB	L	H	NP	Road side	No
Polyalthia longifolia	9.00	20.38	Glabrous	+	-	LB	-	LB	IB	-	-	L	L	NP	Redsoil	Yes
Mangifera indica	10.01	100.00	Coriaceous	+	-	LB	LB	-	IB	-	-	NP	H	NP	Road side	No
Samanea saman	10.01	39.49	Glabrous	+	-	LB	-	-	-	-	-	NP	NP	NP	Road side	No
Erythrina indica	10.01	45.22	Glabrous	+	-	LB	-	-	-	-	-	L	NP	NP	Road side	Occasionally
Pongamia pinnata	6.00	27.70	Glabrous	+	-	FR	FR	-	-	-	IB	NP	NP	NP	Road side	No
Peltophoram pterocarpum	12.01	57.64	Glabrous	+	-	LB	FB/FR	-	-	-	-	NP	NP	NP	Redsoil	No
Delonix regia	12.01	62.10	Glabrous	+	-	LB	FB/FR	FR	-	-	-	NP	L	NP	Redsoil	Yes
Lagerstroemia speciosa	6.00	29.61	Coriaceous	+	-	LB/FB	FR	FB/FR	-	-	-	NP	NP	NP	Road side	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning, IB= Insects Bit
L= Light, H= Heavy, NP= Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No. 3.25
Location : C.T.I.R.C. Office Complex, Abhinav Nagar, Borivali (W).

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	6.00	26.75	Coriaceous	+	-	LB	-	-	-	-	IB	L	L	NP	Redsoil	No
Peltophorum pterocarpum	7.50	35.03	Glabrous	+	-	LB	FB	FR	-	-	-	NP	L	NP	Road side	Occasionally
Polyalthia longifolia	12.01	27.38	Glabrous	+	-	-	LB	LB	-	-	-	L	L	NP	Redsoil	No
Mangifera indica	3.00	4.45	Coriaceous	+	-	-	FR	-	-	-	-	L	H	NP	Redsoil	No
Thespesia populnea	6.00	31.21	Glabrous	+	-	LB	-	-	-	-	-	L	L	NP	Redsoil	No
Samanea saman	12.01	73.88	Glabrous	+	-	FR	-	-	-	-	-	NP	NP	NP	Redsoil	No
Cassia siamea	7.50	27.38	Glabrous	+	-	LB	FB/FR	-	IB	-	-	NP	L	NP	Redsoil	No
Ficus glomerata	7.50	38.21	Glabrous	+	-	LB	FR	-	-	-	-	NP	L	NP	Redsoil	No
Syzygium cumini	4.00	19.85	Glabrous	+	-	FB	FR	-	-	-	-	L	L	H	Footpath	No
Hibiscus rosasinensis	3.00	13.05	Coriaceous	+	-	FB	FB	FB	-	-	-	NP	L	NP	Redsoil	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning, IB= Insects Bit
L= Light, H= Heavy, NP= Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three season in a year :-

Table No.3.26
Location : Western Express Highway, opposite Mahiendra & Mahiendra, Kandivali.

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	6.00	35.03	Coriaceous	+	-	LB	-	-	IB	-	IB	H	L	H	Road side	No
Ficus benghalensis	3.50	17.51	Glabrous	-	+	-	LB	LB	-	-	IB	H	H	H	Road side	No
Polyalthia longifolia	7.50	16.56	Glabrous	+	-	LB	-	-	-	-	-	L	H	NP	Redsoil	Yes
Mangifera indica	6.00	38.53	Coriaceous	+	-	-	-	LB	TB	-	-	H	H	L	Red soil	Occasionally
Thespesia populnea	6.00	27.07	Glabrous	+	-	FB/FR	FB/FR	-	-	-	-	H	H	NP	Redsoil	No
Samanea saman	7.50	57.00	Glabrous	+	-	LB/FB	-	-	-	-	-	H	L	NP	Road side	No
Peltophorum pterocarpum	6.00	39.49	Glabrous	+	-	LB/FB	FB/FR	-	-	-	-	L	L	NP	Road side	No
Syzygium cumini	10.01	34.39	Glabrous	+	-	-	LB/FB	-	-	-	IB	L	H	NP	Road side	No
Delonix regia	10.01	31.21	Glabrous	+	-	FR	-	-	-	-	-	NP	NP	NP	Road side	No
Cassia siamea	6.00	22.61	Glabrous	+	-	FB/FR	FB/FR	FR	-	-	-	L	L	NP	Road side	No

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning, IB= Insects Bit
L= Light, H= Heavy, NP= Not Present

Observations on morphological and physical characters of Trees in Brihan Mumbai area, for three seasons in a year: -

Table No. 3.27
Location : New Municipal School, Oshivara Garden Road, Jogeshwari(W).

Name of Plants	Height of Tree (mts)	DBH (cms)	Texture of Leaf	Canopy		Stage of Growth			Visible Leaf Injury			Visible Dust Load			Habitat	Irrigation Practices
				Normal	Abnormal	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Ficus religiosa	7.50	49.68	Coriaceous	+	-	LB/FB	FB	FB	-	-	IB	NP	L	NP	Road side	No
Ficus benghalensis	6.00	48.40	Glabrous	+	-	LB/FR	LB	LB	-	-	-	H	H	L	Road side	No
Polyalthia longifolia	3.01	6.36	Glabrous	+	-	LB	-	-	-	-	-	H	L	L	Redsoil	No
Mangifera indica	6.00	38.85	Coriaceous	+	-	-	-	FB/FR	-	-	-	NP	H	L	Redsoil	No
Samanea saman	7.50	51.91	Glabrous	+	-	LB/FR	-	FB	-	-	-	L	NP	NP	redsoil	Yes
Terminalia catappa	6.00	13.05	Glabrous	+	-	LB	LB/FR	-	-	-	IB	H	H	NP	Road side	No
Delonix regia	6.00	42.03	Glabrous	+	-	LB/FR	-	-	-	-	-	NP	L	NP	Road side	No
Cassia siamea	6.00	32.80	Glabrous	+	-	LB	-	FB/FR	-	-	-	L	L	NP	Road side	No
Peltophorum pterocarpum	7.50	41.40	Glabrous	+	-	LB/FR	-	FB/FR	-	-	-	L	L	NP	Redsoil	No
Artocarpus hetrophyllus	7.50	57.83	Glabrous	+	-	LB	-	-	-	-	-	H	NP	NP	Road side	Yes

1st = February 2000 (Winter), 2nd = May 2000 (Summer), 3rd = October 2000 (Post monsoon).
LB = Leaf Bud, FB = Flower Bud, FR = Fruit.
TB= Tip Burning, B= Burning, IB= Insects Bit
L= Light, H= Heavy, NP=Not Present

Table No. 3.28 Dust load on leaves (mg\cm2) of 5 tree species at 25 sites during Feb, May and Oct-2000 (ave. of three ± sd).

		Ficus religiosa →						*Thespesia populnea*					
Sr. No.	Location	Feb		May		Oct		Feb		May		Oct	
		Ave.	± sd	Ave.	± sd	Ave.	± sd(x10^{-5})	Ave.	± sd	Ave.	± sd	Ave	± sd(x 10^{-5})
1	BEST Colaba	1.49	± 0.42	2.88	± 0.54	7.84	± 3.69	1.06	± 0.23	1.50	± 0.94	9.98	± 8.66
2	Homi Baba Marg, Colaba	0.95	± 0.36	0.46	± 0.03	19.20	± 3.77	0.55	± 0.19	0.59	± 0.12	12.50	± 4.77
3	Carnak Bunder	0.49	± 0.28	1.02	± 0.31	7.86	± 1.45	1.80	± 1.10	2.23	± 2.00	29.60	± 2.54
4	Gamdevi	2.53	± 0.49	1.48	± 0.58	1.87	± 3.84	0.91	± 0.08	1.07	± 0.53	3.15	± 1.98
5	Kamala Nehru Park	0.10	± 0.06	0.65	± 0.15	13.10	± 6.17	0.99	± 0.68	1.25	± 0.45	10.70	± 4.93
6	E Moses Road	0.61	± 0.49	0.38	± 0.11	21.40	± 9.48	0.55	± 0.20	0.81	± 0.35	33.10	± 42.90
7	Wadia Hospital	0.45	± 0.05	0.65	± 0.39	40.20	± 13.50	0.80	± 0.32	0.88	± 0.34	32.10	± 7.39
8	Woolen Mills Comp. Dadar	0.71	± 0.77	0.81	± 0.44	10.08	± 3.13	0.69	± 0.21	0.80	± 0.31	5.02	± 2.49
9	Mehboob Studio, Bandra	1.59	± 1.11	1.40	± 0.37	52.50	± 10.80	1.34	± 1.03	0.71	± 0.19	27.80	± 17.00
10	Khar Police Station	3.03	± 0.79	2.34	± 1.11	5.39	± 1.95	0.37	± 0.17	0.71	± 0.19	10.90	± 4.26
11	Koldongri, Andheri	1.21	± 0.38	0.73	± 0.27	23.60	± 7.12	1.32	± 0.94	1.05	± 0.60	49.00	± 12.30
12	Marol, Andheri	0.45	± 0.21	0.41	± 0.04	16.50	± 8.70	0.56	± 0.06	0.77	± 0.23	43.00	± 5.83
13	Bhandup	4.32	± 1.62	2.00	± 0.79	51.90	± 12.10	1.08	± 0.41	0.85	± 0.27	42.20	± 54.30
14	Mulund	0.47	± 0.36	0.82	± 0.46	19.20	± 4.25	0.58	± 0.41	1.43	± 1.18	18.70	± 9.63
15	Pant Nagar Ghatkopar	1.84	± 1.01	0.44	± 0.13	4.26	± 3.28	1.27	± 0.43	1.43	± 0.20	1.34	± 2.32
16	Tilaknagar Chembur	0.07	± 0.05	1.87	± 1.00	77.30	± 12.30	0.31	± 0.05	1.26	± 0.41	65.40	± 15.80
17	Koliwada Sion	0.02	± 0.01	0.67	± 0.34	5.99	± 1.84	0.62	± 0.28	0.89	± 0.20	7.36	± 4.52
18	Anik Depot	0.57	± 0.17	0.82	± 0.31	28.70	± 6.76	1.27	± 0.13	0.39	± 0.12	16.90	± 1.51
19	Sindhi Colony Chembur	1.46	± 0.85	0.60	± 0.12	44.78	± 22.70	0.90	± 0.82	1.40	± 0.28	65.08	± 27.20
20	H. P. Colony, Mahul	-	-	1.82	± 0.78	14.30	± 7.70	-	-	1.42	± 0.25	13.75	± 9.99
21	BMC School, Mankhurd	0.33	± 0.17	0.68	± 0.27	42.20	± 16.60	0.77	± 0.74	1.21	± 0.36	14.20	± 2.34
22	Aarey Colony, Goregaon	0.62	± 0.17	0.59	± 0.07	4.50	± 43.60	-	-	-	-	-	-
23	CTRIC, Borivali	0.54	± 0.46	0.34	± 0.06	37.00	± 22.50	0.38	± 0.09	0.78	± 0.14	41.50	± 11.90
24	Mahindra & Mahindra, Kandivali	1.63	± 0.45	1.95	± 0.37	77.10	± 17.01	0.98	± 0.17	1.09	± 0.38	34.20	± 10.20
25	Oshiwara, Jogeshwari	1.51	0.74	0.31	± 0.11	21.31	± 4.60	-	-		-	-	-
	AVERAGE	**1.13**	**± 0.3939**	**1.04**	**± 0.2964**	**25.92**	**± 9.95**	**0.87**	**± 0.33**	**1.07**	**± 0.425**	**25.54**	**± 11.51**

Table No. 3.28 Dust load on Leaves (mg\cm^2) of 5 tree species at 25 sites during Feb, May and Oct-2000 (ave. of three ± sd)

Sr. No	Location	*Ficus benghalensis*			*Polyalthia longifolia*		
		Feb	May	Oct	Feb	May	Oct
		Ave ± sd	Ave. ± sd	Ave. ± sd (x 10^{-6})	Ave ± sd	Ave. ± sd	Ave. ± sd(x 10^{-6})
1	BEST Colaba	1.04 ± 0.14	0.42 ± 0.10	15.90 ± 5.15	2.16 ± 1.88	1.03 ± 0.13	9.35 ± 1.64
2	Homi Baba Marg, Colaba	1.37 ± 0.26	0.41 ± 0.08	30.50 ± 6.15	1.30 ± 0.16	1.90 ± 1.04	35.10 ± 9.36
3	Carnek Bunder	1.88 ± 1.34	4.10 ± 2.00	61.90 ± 37.20	0.52 ± 0.15	0.70 ± 0.20	19.80 ± 1.39
4	Gamdevi	0.96 ± 0.33	- -	- -	1.81 ± 0.40	1.96 ± 0.56	4.67 ± 2.71
5	Kamala Nehru Park	0.38 ± 0.26	- -	- -	0.38 ± 0.26	1.00 ± 0.24	29.10 ± 7.74
6	E Moses Road	1.38 ± 0.67	1.84 ± 0.81	91.10 ± 27.20	0.80 ± 0.40	1.49 ± 0.23	69.50 ± 27.80
7	Wadia Hospital	1.11 ± 0.21	2.37 ± 0.38	49.90 ± 7.81	1.46 ± 1.12	1.12 ± 0.26	56.60 ± 11.50
8	Woolen Mills Comp. Dadar	1.18 ± 0.10	1.48 ± 0.22	22.90 ± 9.73	0.87 ± 0.08	1.28 ± 0.37	37.10 ± 34.20
9	Mehboob Studio, Bandra	1.09 ± 0.35	3.22 ± 0.37	14.50 ± 56.40	1.83 ± 0.68	1.66 ± 0.38	38.70 ± 5.53
10	Khar Police Station	1.34 ± 0.89	1.83 ± 0.76	16.80 ± 6.05	1.08 ± 0.21	1.89 ± 0.40	23.10 ± 4.72
11	Koldongri, Andheri	1.59 ± 1.25	1.27 ± 0.12	52.40 ± 29.90	1.20 ± 0.46	1.34 ± 0.42	12.90 ± 33.80
12	Marol, Andheri	1.80 ± 0.53	3.05 ± 1.95	35.50 ± 10.30	1.39 ± 0.17	1.14 ± 0.06	57.70 ± 5.55
13	Bhandup	5.77 ± 2.00	2.15 ± 0.56	68.60 ± 21.30	1.26 ± 0.71	1.10 ± 0.15	41.10 ± 20.60
14	Mulund	0.54 ± 0.18	0.38 ± 0.09	8.14 ± 7.28	1.41 ± 0.29	1.86 ± 0.44	49.90 ± 20.50
15	Pant Nagar Ghatkopar	1.80 ± 0.88	2.55 ± 0.39	14.10 ± 7.98	0.76 ± 0.26	0.68 ± 0.11	7.57 ± 5.53
16	Tilaknagar Chembur	1.13 ± 0.76	1.31 ± 1.00	58.10 ± 15.50	0.68 ± 0.23	1.10 ± 0.61	49.30 ± 7.10
17	Koliwada Sion	1.50 ± 0.57	1.12 ± 0.38	73.50 ± 39.80	1.18 ± 0.72	1.22 ± 0.28	57.10 ± 16.40
18	Anik Depot	3.73 ± 2.42	4.39 ± 3.32	53.40 ± 5.95	0.86 ± 0.83	1.76 ± 0.70	60.30 ± 15.20
19	Sindhi Colony Chembur	2.16 ± 0.14	2.72 ± 0.54	44.51 ± 16.00	0.73 ± 0.22	1.79 ± 0.66	60.60 ± 21.50
20	H. P. Colony, Mahul	- -	1.04 ± 0.29	194.10 ± 177.50	0.68 ± 0.38	1.68 ± 0.41	10.50 ± 3.51
21	BMC School, Mankhurd	1.62 ± 0.29	0.83 ± 0.44	31.80 ± 3.16	0.47 ± 0.05	0.77 ± 0.13	70.70 ± 14.60
22	Aarey Colony, Goregaon	0.43 ± 0.18	0.72 ± 0.11	14.40 ± 1.99	0.58 ± 0.16	0.54 ± 0.10	7.60 ± 5.58
23	CTRIC, Borivali	- -	- -	- -	0.73 ± 0.18	1.12 ± 0.54	57.80 ± 14.10
24	Mahindra & Mahindra, Kandivali	4.22 ± 2.42	4.68 ± 1.10	77.00 ± 39.90	0.69 ± 0.11	0.90 ± 0.06	12.55 ± 16.60
25	Oshiwara, Jogeshwari	1.21 ± 0.58	1.41 ± 0.65	32.50 ± 10.50	1.40 ± 0.69	1.08 ± 0.32	60.90 ± 14.80
	AVERAGE	**1.71 ± 0.7081**	**1.97 ± 0.78966**	**48.25 ± 24.67**	**1.05 ± 0.41**	**1.28 ± 0.24**	**37.58 ± 12.88**

Table No. 3.28 Dust load on Leaves (mg\cm^2) of 5 tree species at 25 sites during Feb, May and Oct-2000 (ave. of three ± sd)

Sr. No	Location	*Mangifera indica*								
		Feb			May			Oct		
		Ave.	±	sd	Ave	±	sd	Ave.	±	sd (x10^{-3})
1	BEST Colaba	0.79	±	0.22	1.02	±	0.35	5.34	±	4.33
2	Homi Baba Marg, Colaba	1.59	±	0.25	1.78	±	0.26	18.10	±	2.51
3	Carnak Bunder	-		-	0.96	±	0.45	7.78		4.44
4	Gamdevi	1.15	±	0.39	-		-	-		-
5	Kamala Nehru Park	1.51	±	0.57	1.77	±	0.50	23.00	±	8.21
6	E Moses Road	2.55	±	0.79	1.57	±	0.67	38.60	±	14.90
7	Wadia Hospital	1.19	±	0.14	2.51	±	1.10	33.30	±	11.80
8	Woolen Mills Comp. Dadar	1.49	±	0.63	2.46	±	0.95	8.68	±	11.10
9	Mehboob Studio, Bandra	2.11	±	0.45	2.71	±	0.90	33.10	±	25.50
10	Khar Police Station	2.38	±	2.13	2.07	±	1.05	27.50	±	20.60
11	Koldongri, Andheri	0.53	±	0.26	1.02	±	0.27	37.90	±	13.40
12	Marol, Andheri	1.61	±	0.59	1.96	±	1.29	7.94	±	5.25
13	Bhandup	3.82	±	0.40	2.21	±	0.91	53.00	±	28.00
14	Mulund	1.18	±	0.65	0.74	±	0.42	13.10	±	4.81
15	Pant Nagar Ghatkopar	1.07	±	0.32	1.62	±	0.50	4.02	±	5.26
16	Tilaknagar Chembur	0.35	±	0.27	1.36	±	0.45	49.70	±	7.52
17	Koliwada Sion	1.67	±	0.76	1.60	±	1.01	30.80	±	3.18
18	Anik Depot	-		-	-		-	-		-
19	Sindhi Colony Chembur	-		-	-		-	-		-
20	H. P. Colony, Mahul	0.14	±	0.11	1.26	±	0.45	25.40	±	4.50
21	BMC School, Mankhurd	1.04	±	0.19	1.15	±	0.27	35.80	±	3.56
22	Aarey Colony, Goregaon	0.72	±	0.19	1.47	±	0.68	19.00	±	3.42
23	CTRIC, Borivali	0.94	±	0.18	0.66	±	0.36	40.60	±	13.00
24	Mahindra & Mahindra, Kandivali	4.20	±	0.48	2.33	±	1.03	11.50	±	19.90
25	Oshiwara, Jogeshwari	1.39	±	0.49	1.42	±	0.23	59.80	±	7.80
	AVERAGE	**1.52**	±	**0.42**	**1.62**	±	**0.33**	**26.54**	±	**10.14**

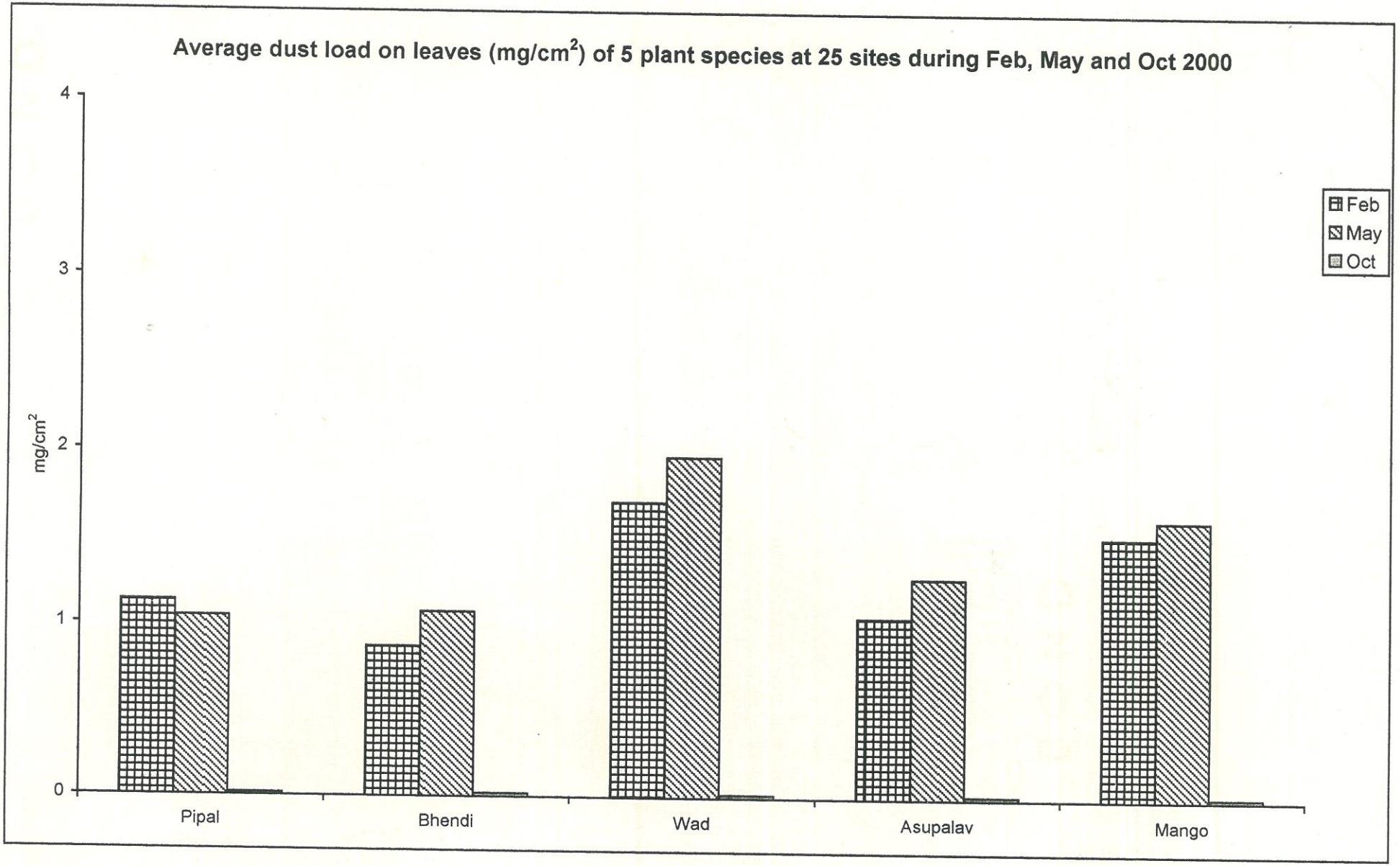
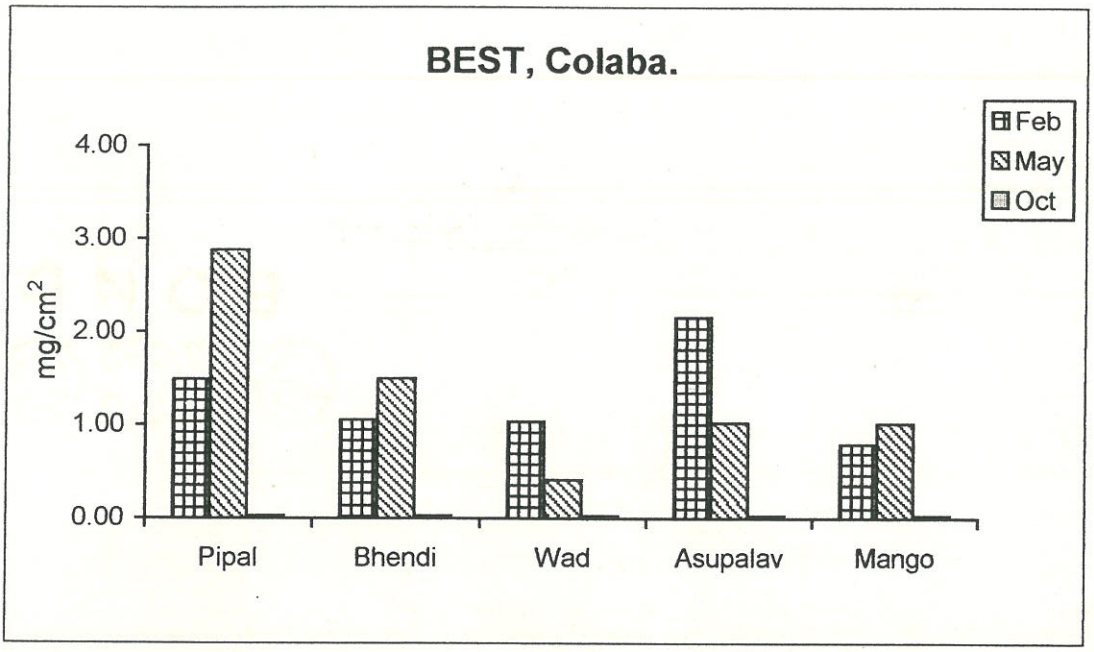

Average dust load on leaves (mg/cm2) of 5 plant species at 25 sites during Feb, May and Oct 2000
4
3
2
1
0
mg/cm2
Feb
May
Oct
Pipal
Bhendi
Wad
Asupalav
Mango

Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites



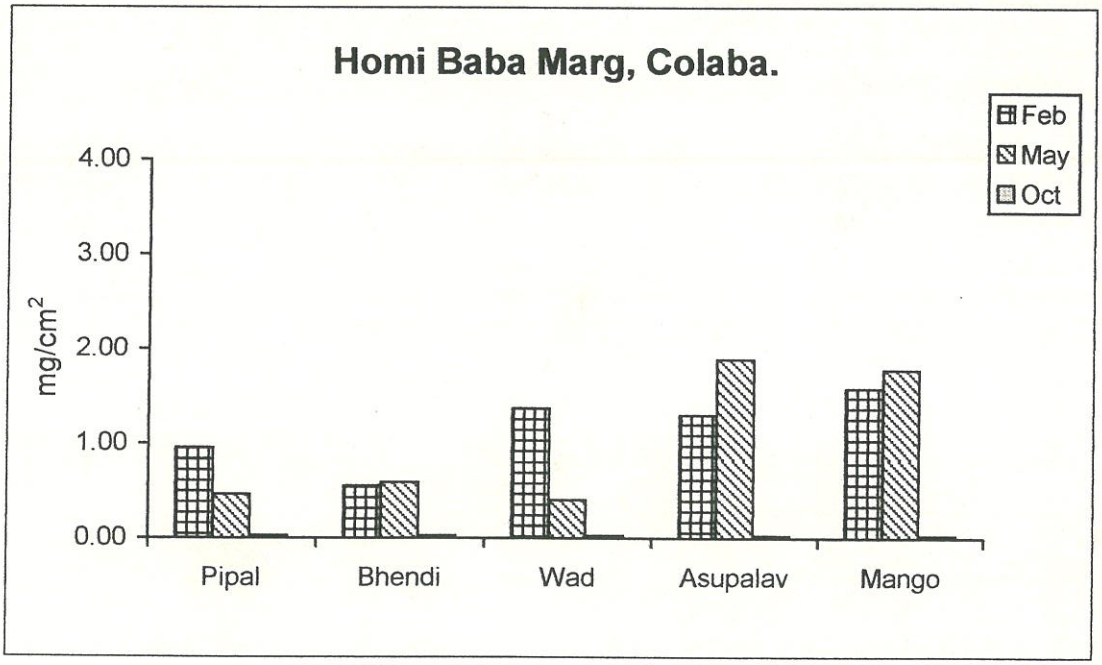
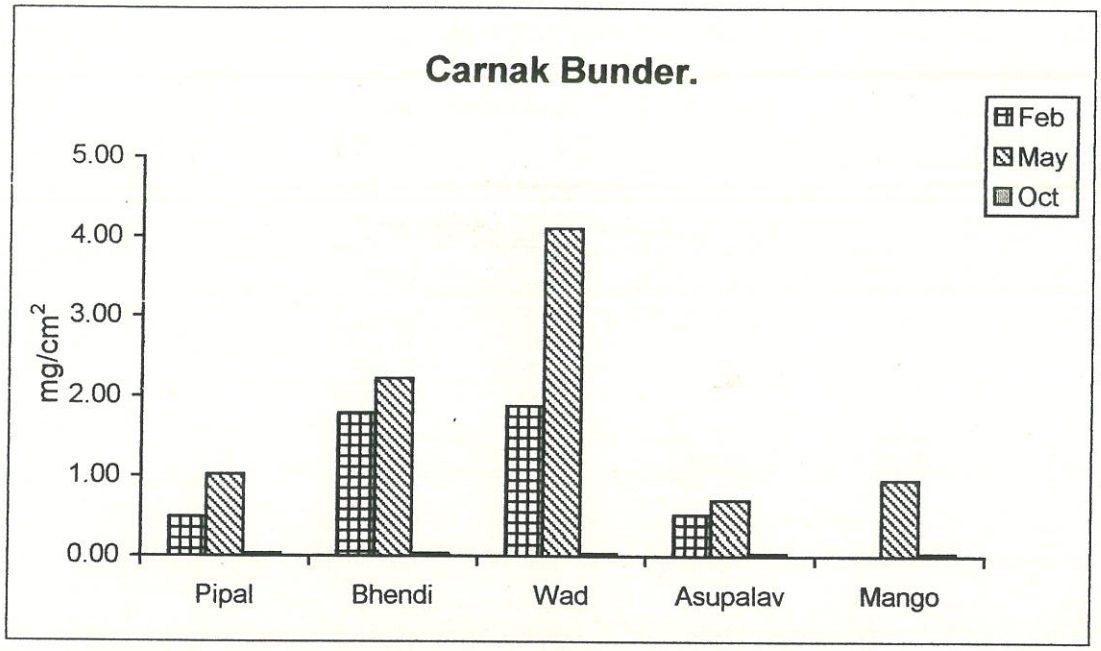


Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites



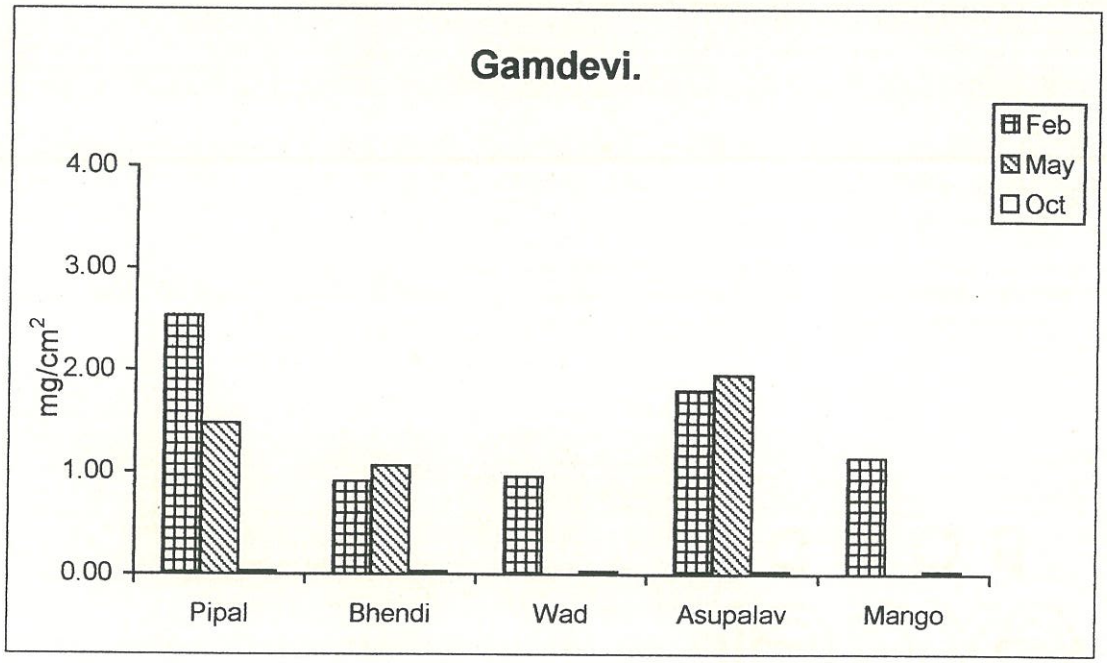
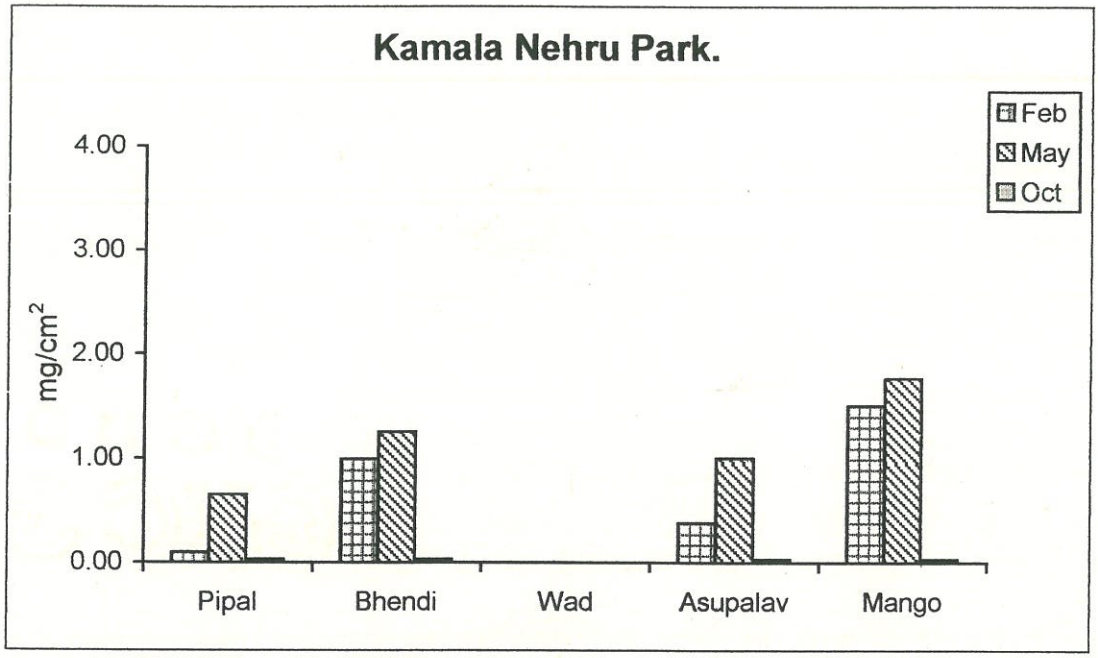


Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites



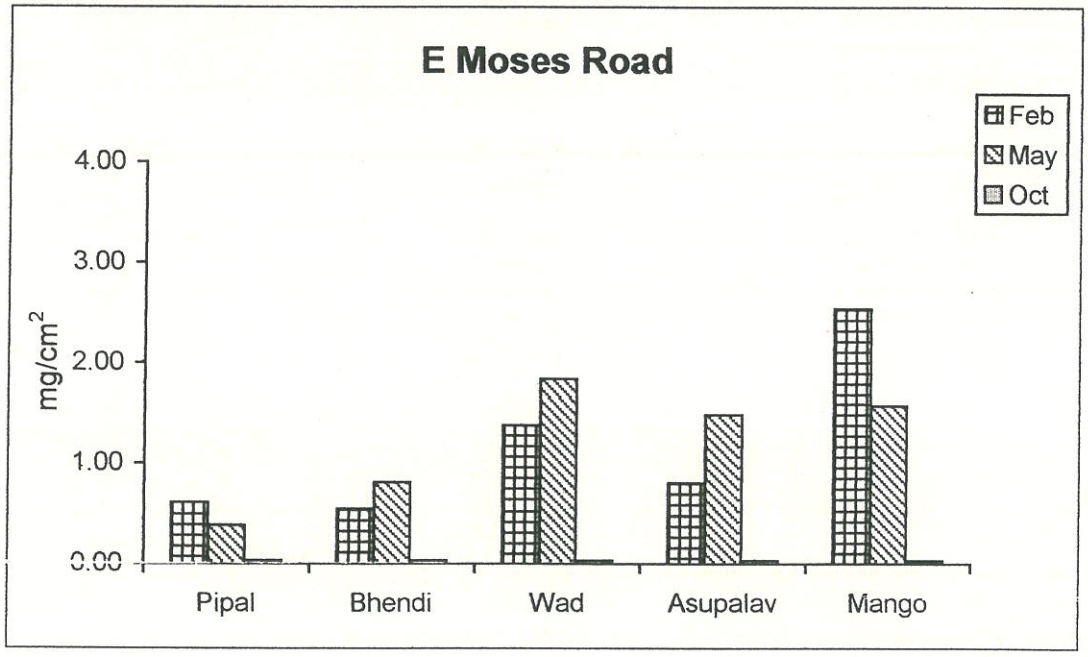
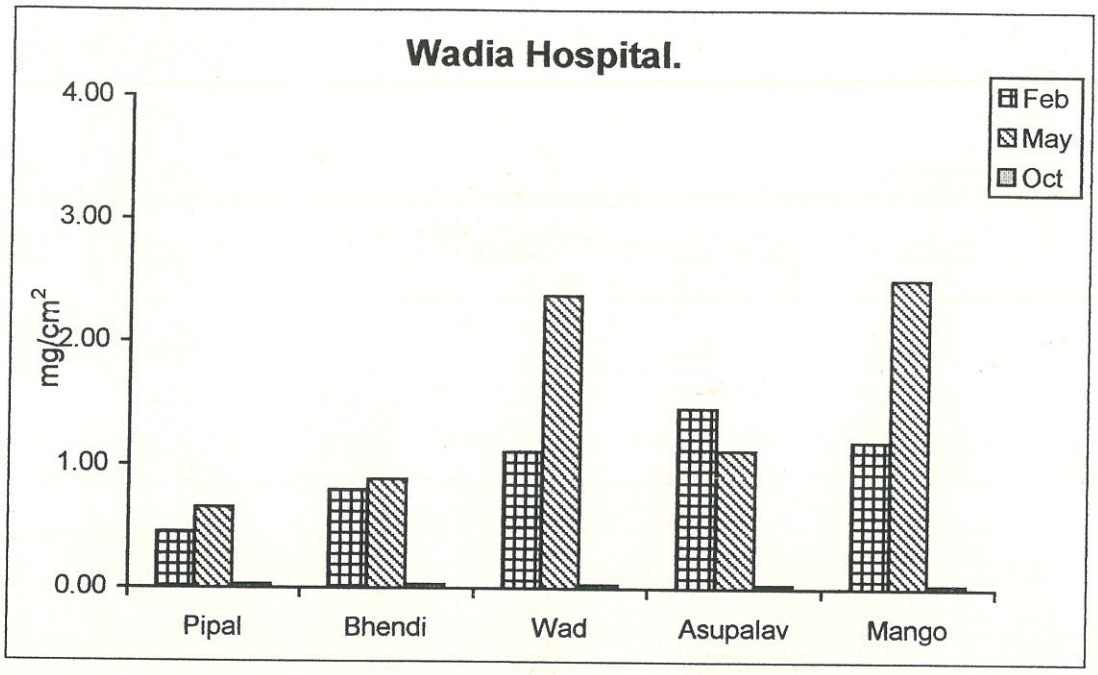


Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites



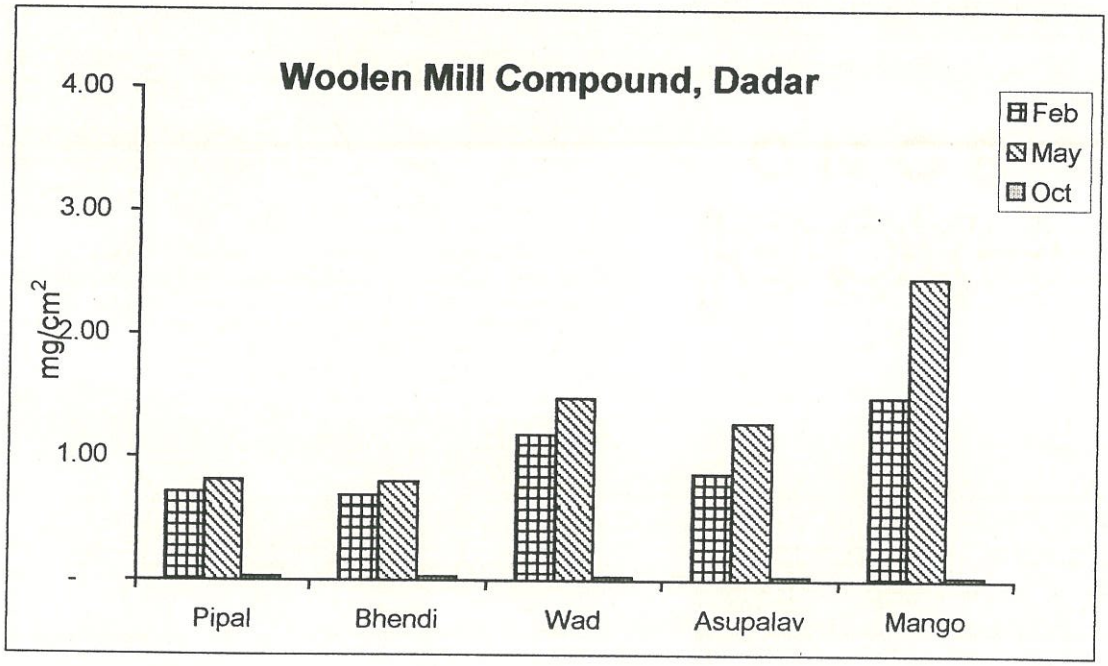
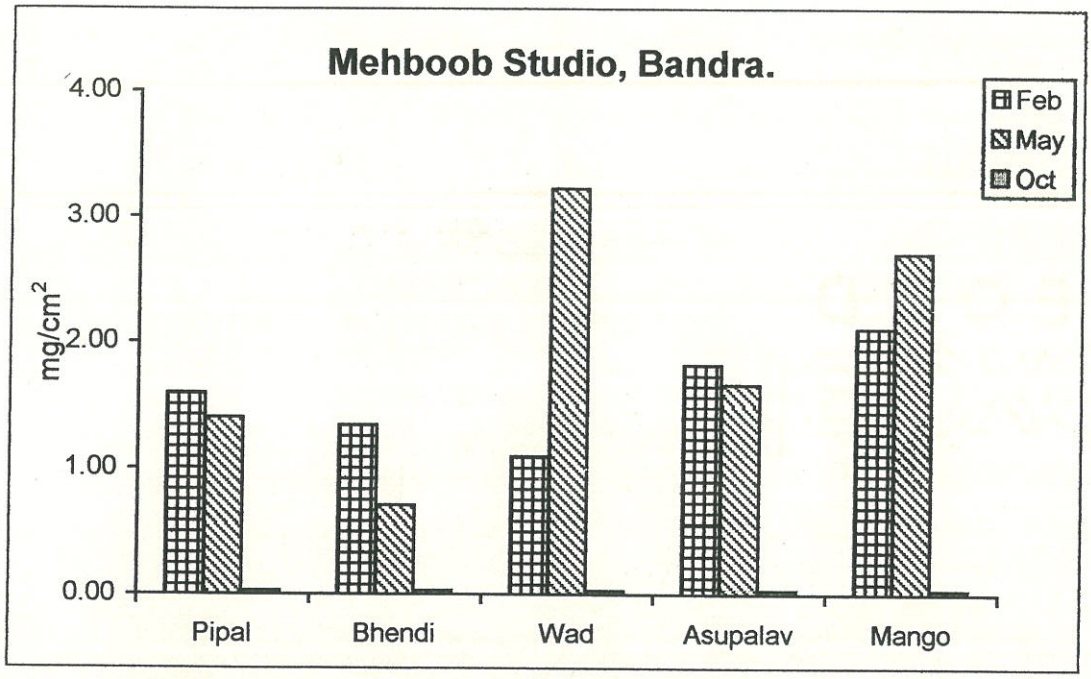


Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites



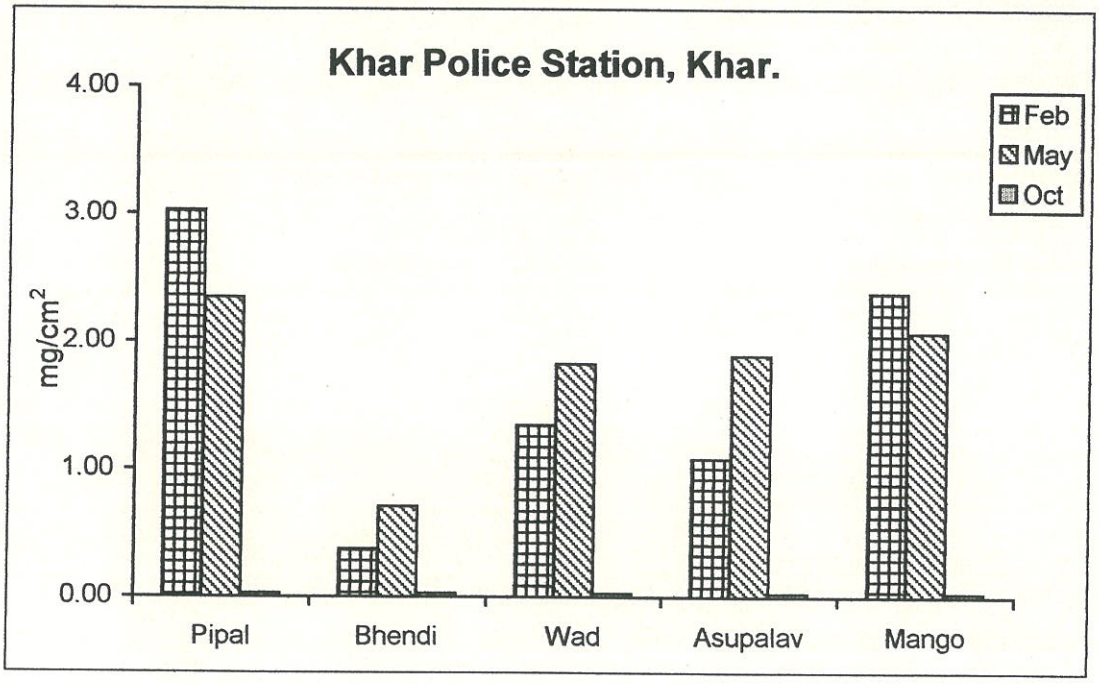
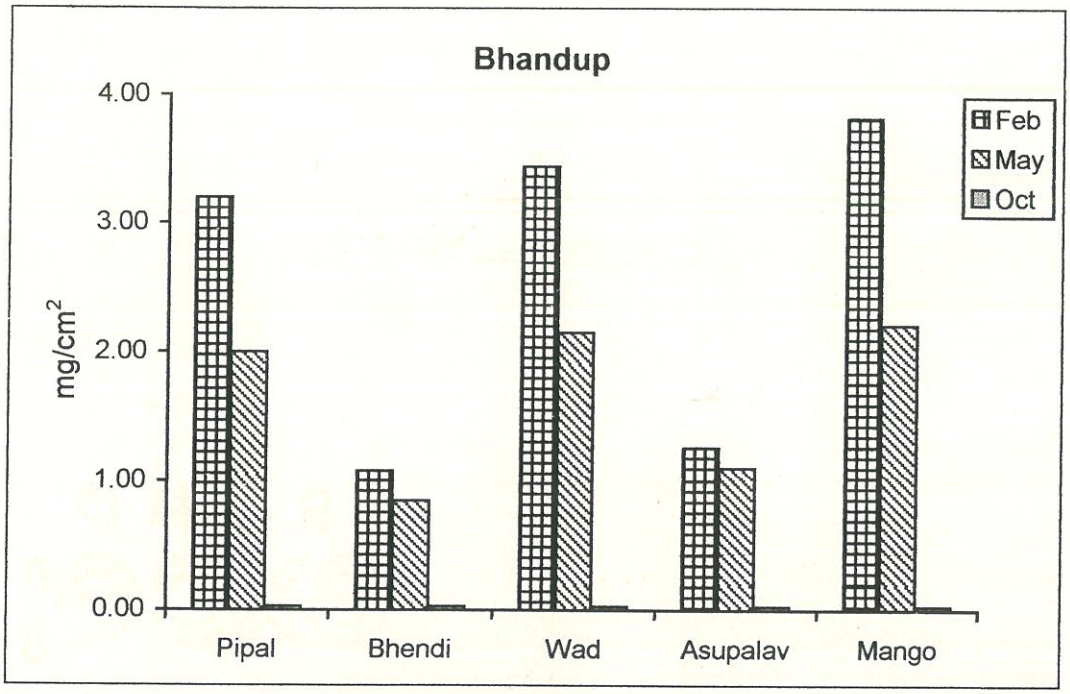


Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites



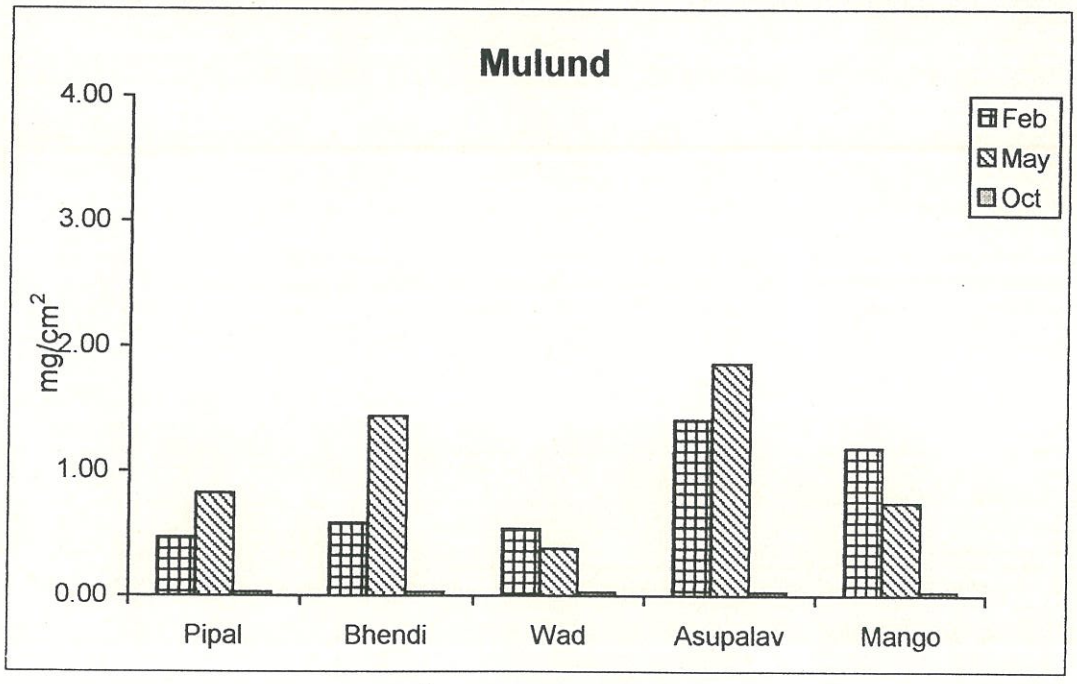
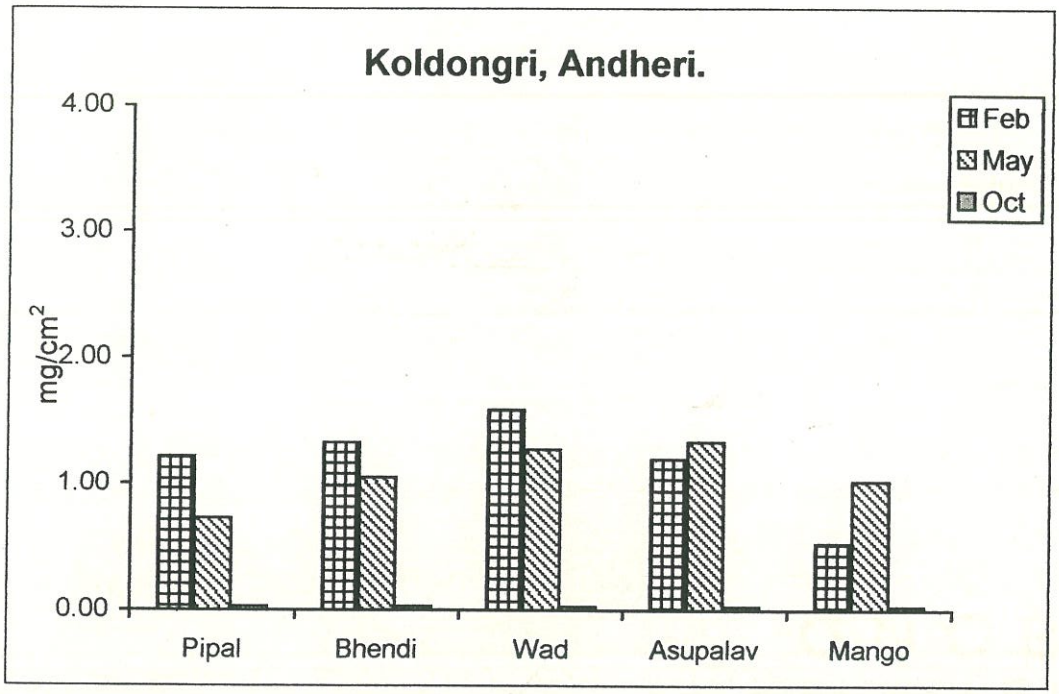


Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites



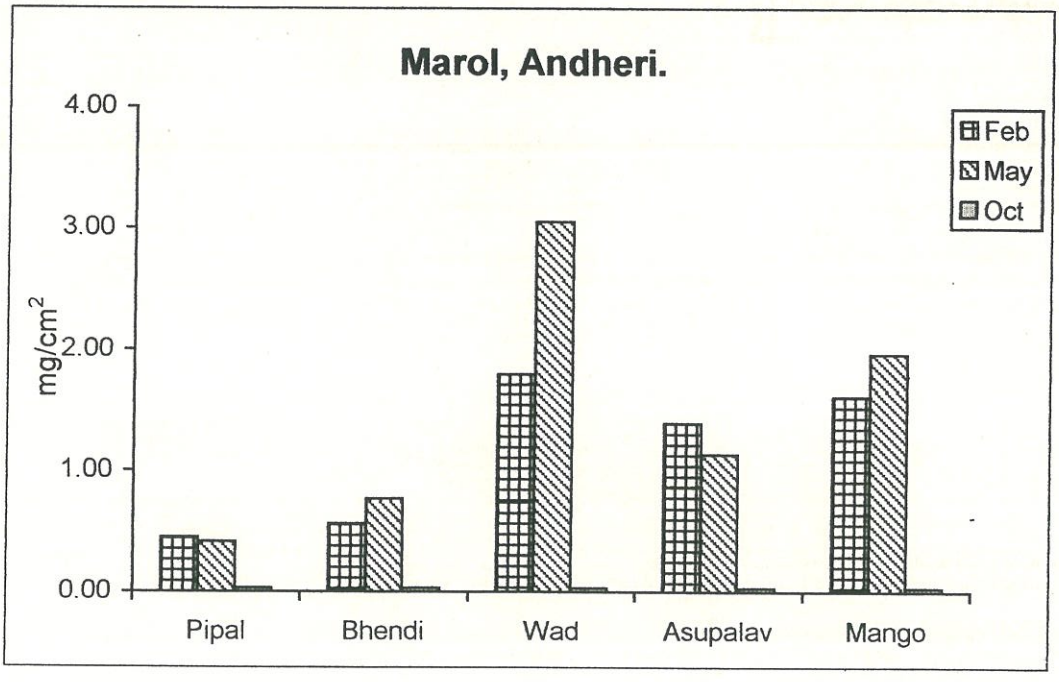
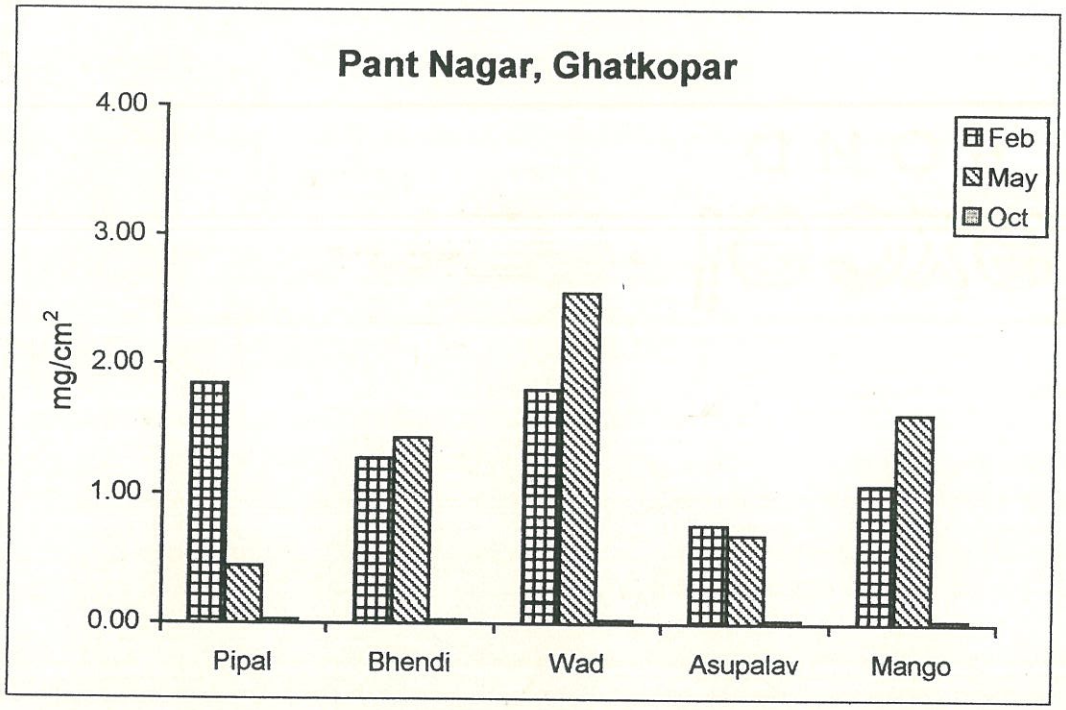


Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites



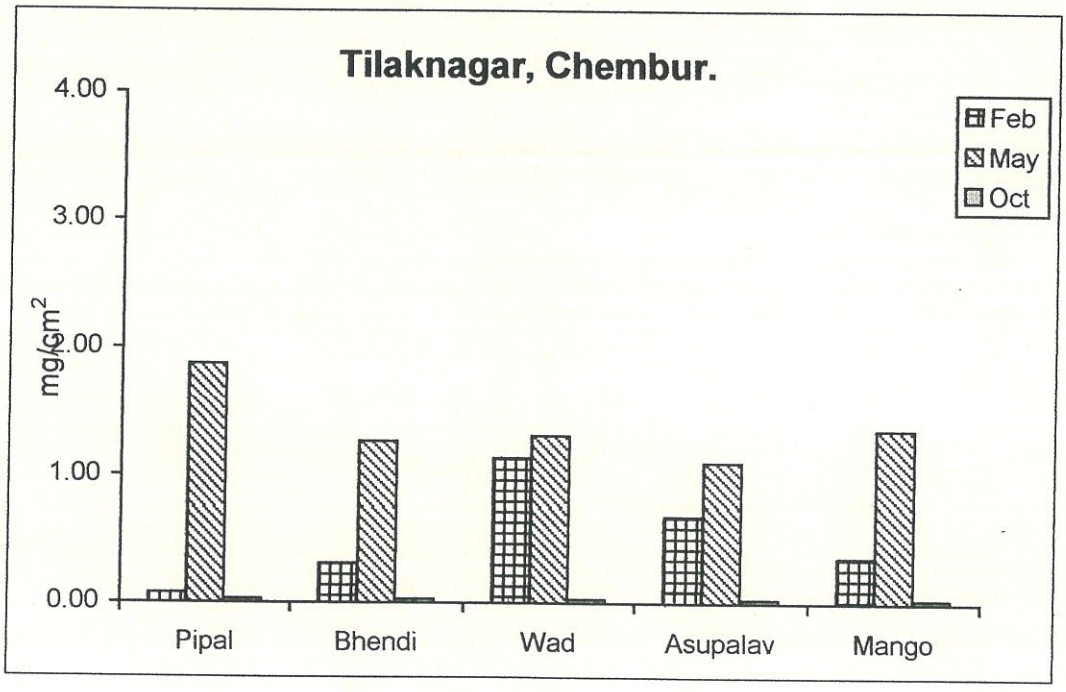
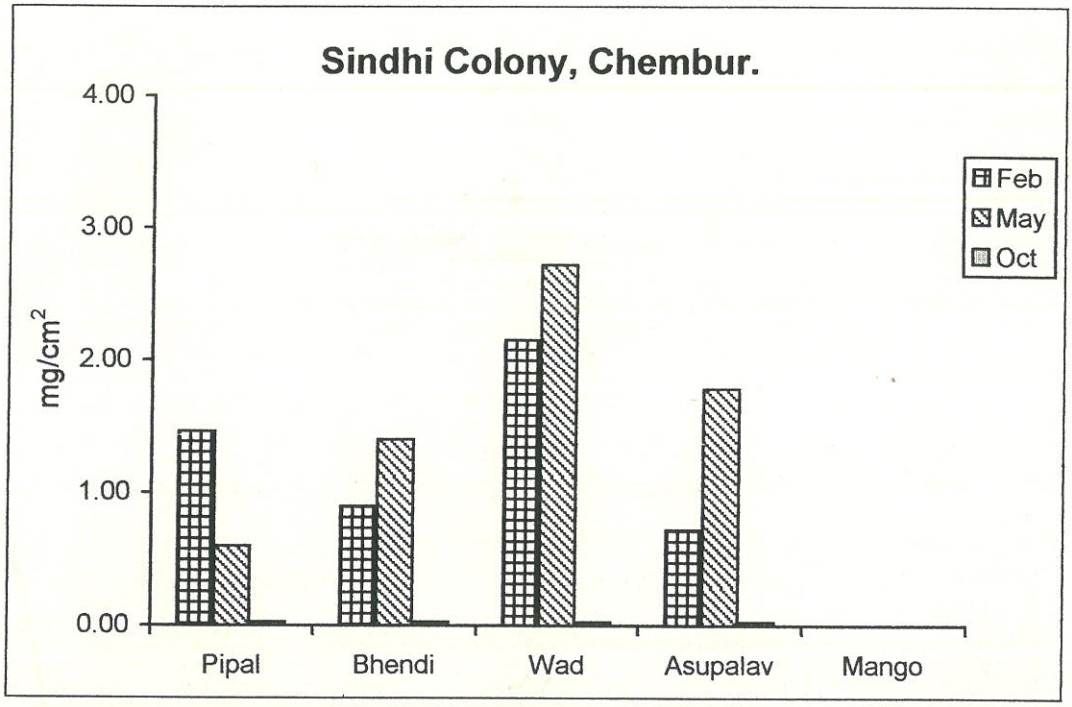


Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites



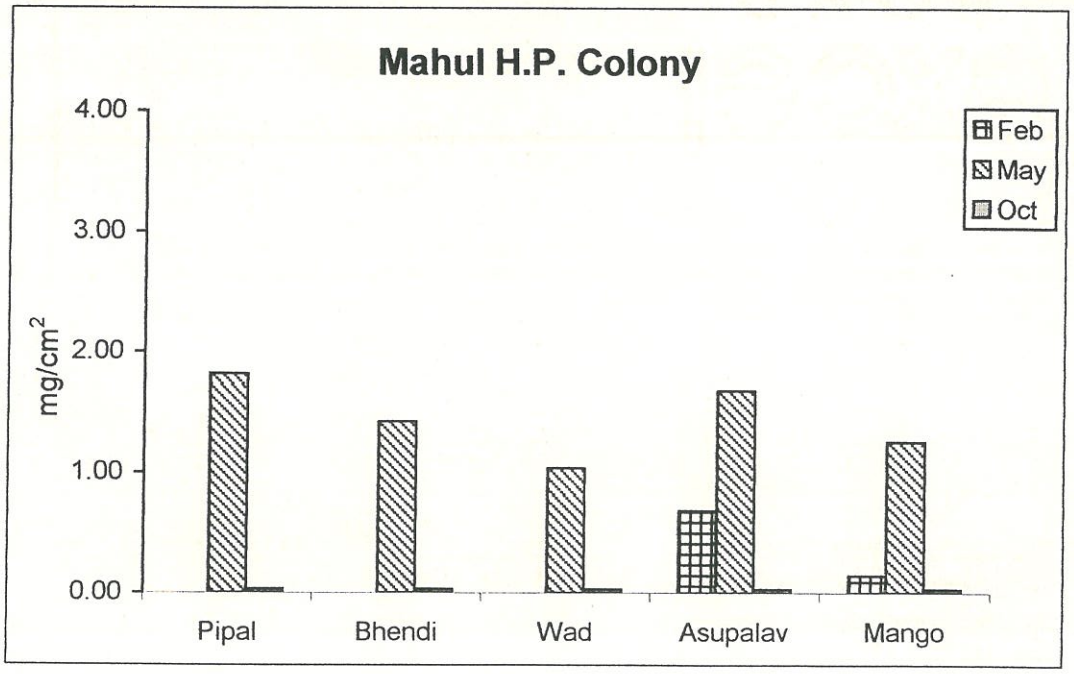
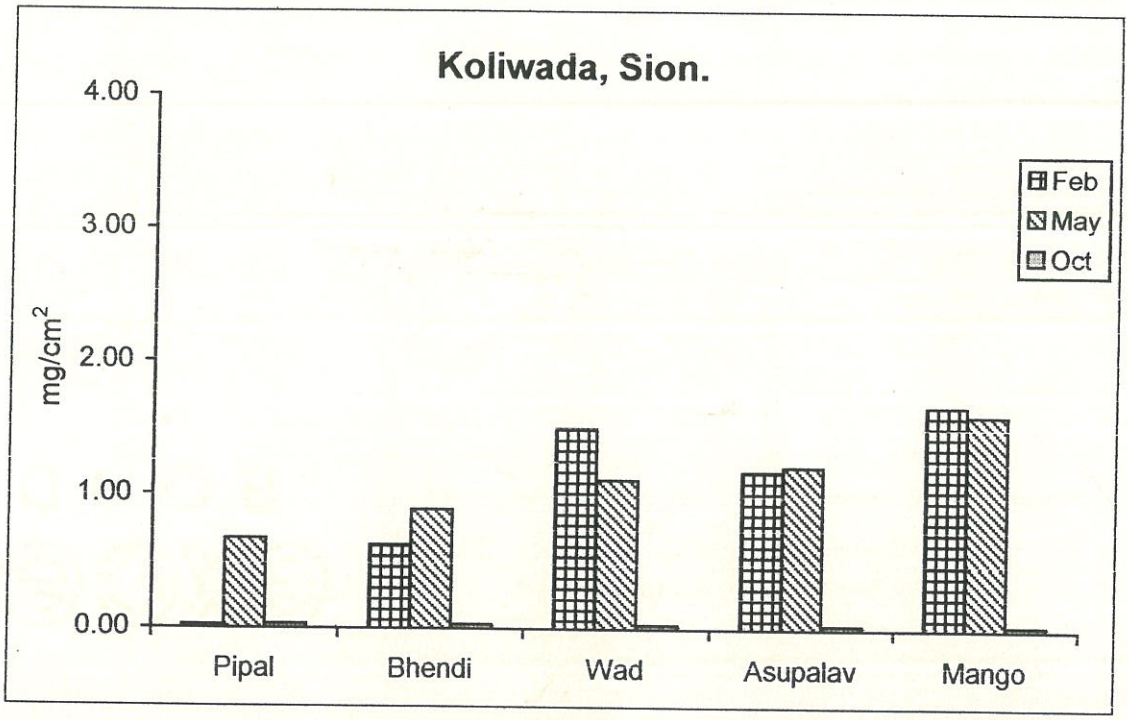


Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites



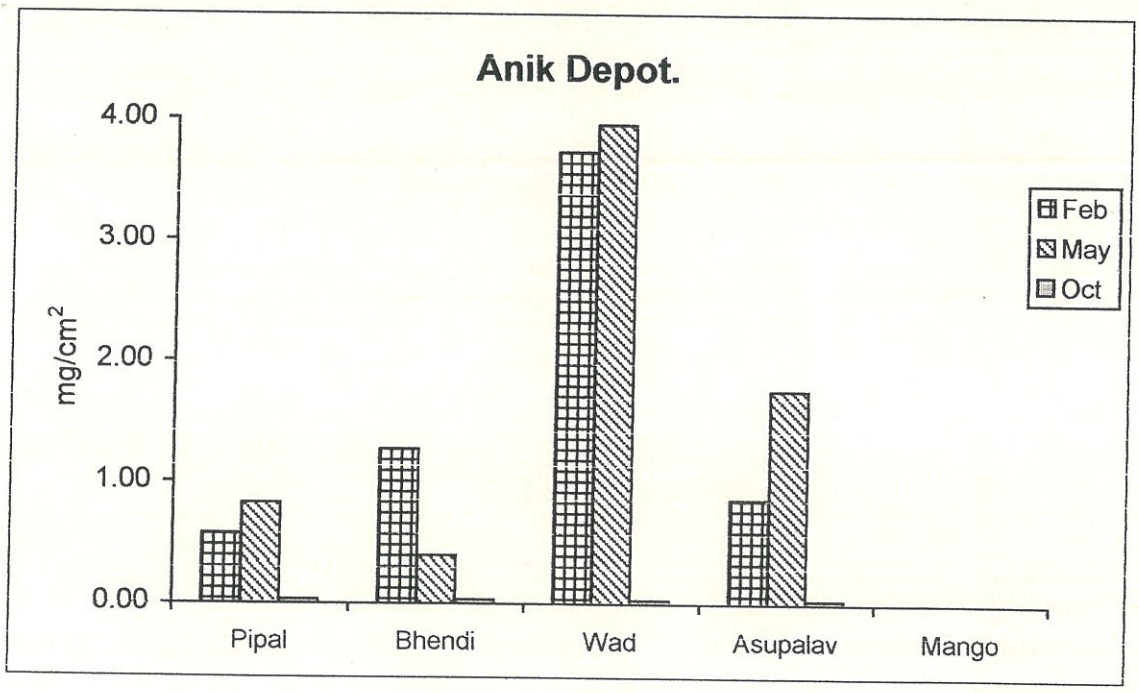
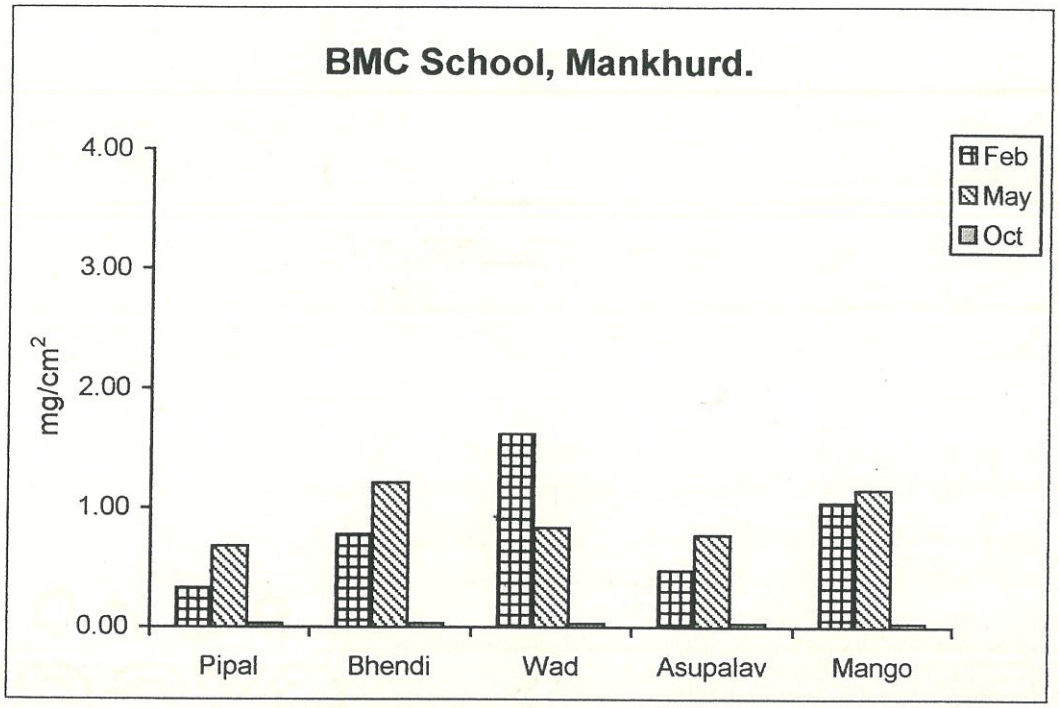


Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites



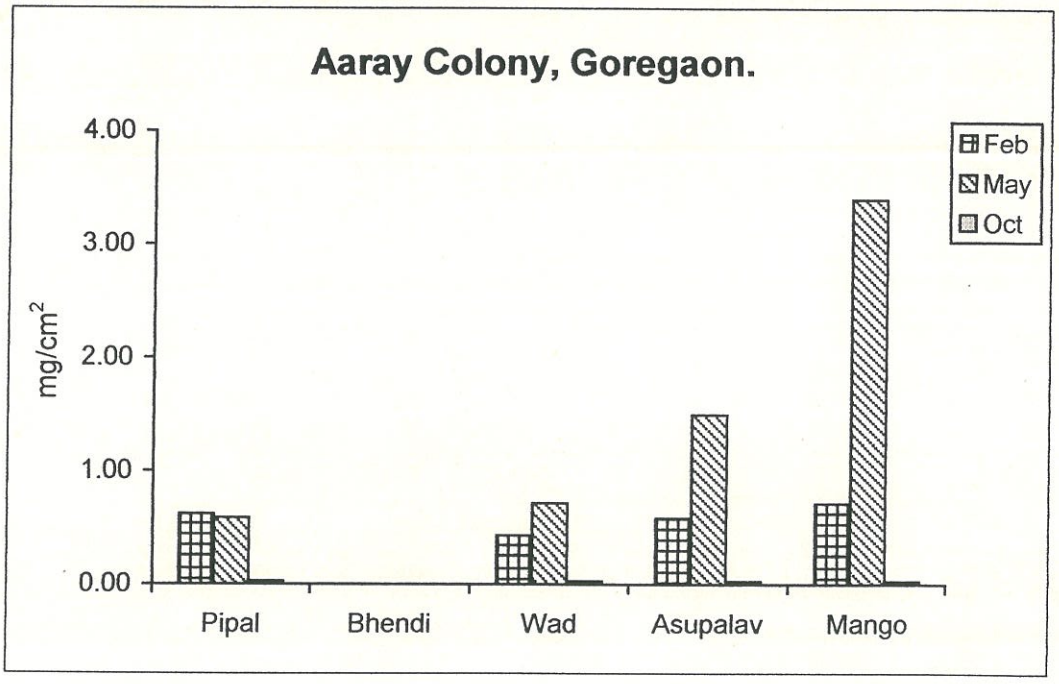
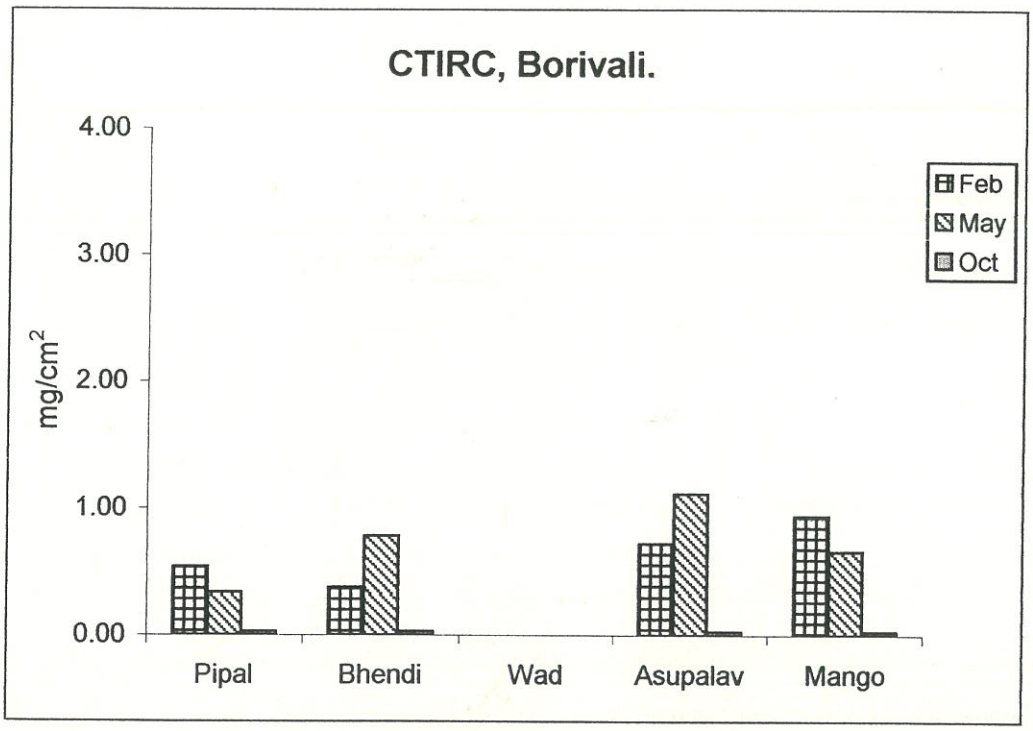


Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites



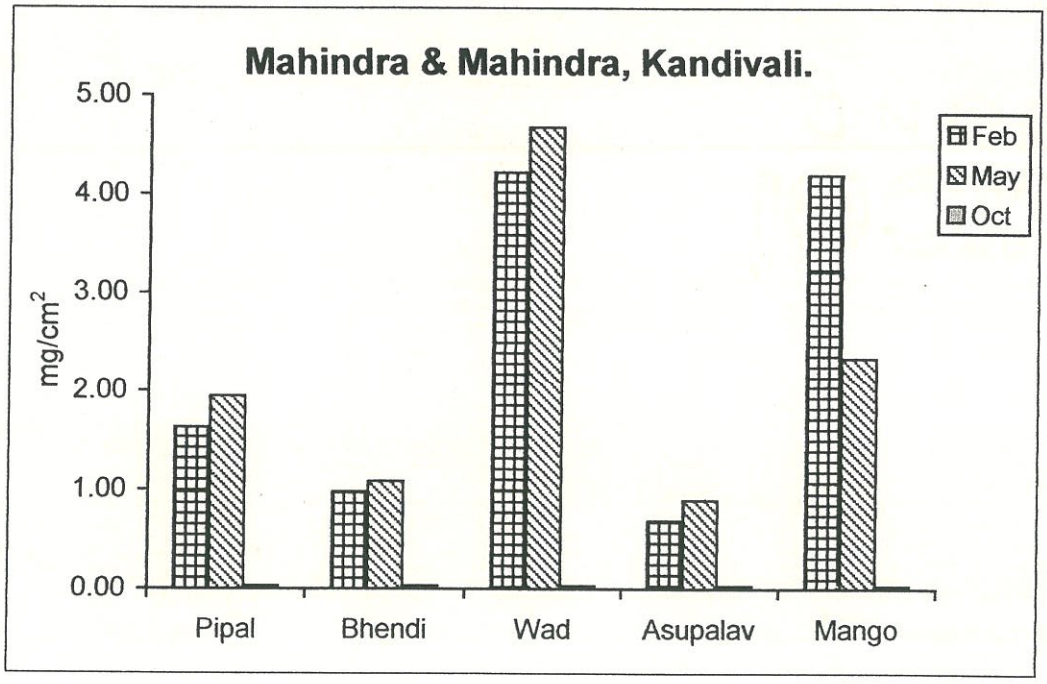


Fig. No. 3.2 Dust load on leaves (mg/cm^2) of five tree species at 25 sites

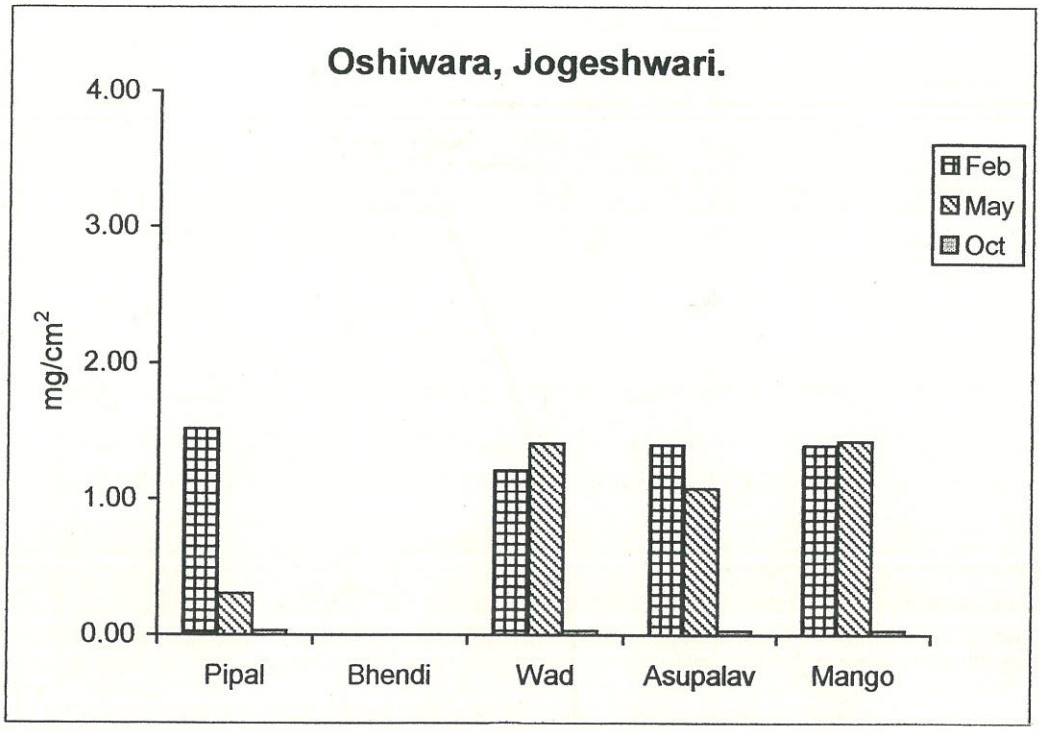


Table No: 3.29 Lead content of leaf tissue and dust deposits on leaves of Wad and Asupalav in ug/gm

Sr. No.	Site	Plants	Leaf ug/gm	Dust ug/gm	Leaf ug/gm	Dust ug/gm
			May		October	
1	Kandivali	Wad	6.23	130.13	0.04	0.15
		Asupalav	7.70	116.47	ND	0.16
2	Mankhurd	Wad	6.59	20.47	0.21	ND
		Asupalav	4.44	9.97	ND	0.8
3	Carnak Bunder	Wad	9.90	118.80	0.08	0.11
		Asupalav	6.92	95.39	0.09	0.09
4	Parel	Wad	7.30	46.16	0.24	0.16
		Asupalav	5.87	54.35	0.04	0.1

Table : 3.30 Effect of foliar spray of urea and ascorbic acid on *Bougainvillea spectabilis* growing along busy road (values are av- of 5 samples ± sd)

Treatment	No. of leaves	Area of lowest leaf (cm2)	Fresh wt. of leaves (gm)	Dry wt. of leaves (gm)
Control (C)	26.8	6.78 ± 2.22	3.158 ± 0.304	1.373 ± 0.047
Distilled water (D)	28.8	8.51± 2.47	3.357 ± 0.445	1.401 ± 0.048
Urea (U)	27.8	10.54 ± 3.71	3.708 ± 0.58	1.587 ± 0.177
Ascorbic acid (A)	25	9.94 ± 1.04	3.351± 0.328	1.497 ± 0.932

Table No.3.31: National Ambient Air Quality Standards (11th April 1994)

Parameter	Exposure period	Industrial area	Residential, Rural & other area	Sensitive area
SO_2	Annual avg. I	80 ug/m^3	60 ug/m^3	15 ug/m^3
	24 hrs avg. II	120 ug/m^3	80 ug/m^3	30 ug/m^3
Nitrogen as NO2	Annual avg. I	80 ug/m^3	60 ug/m^3	15 ug/m^3
	24 hrs avg. II	120 ug/m^3	80 ug/m^3	30 ug/m^3
SPM	Annual avg. I	360 ug/m^3	140 ug/m^3	70 ug/m^3
	24 hrs avg. II	500 ug/m^3	200 ug/m^3	100 ug/m^3
Respirable particulate matter	Annual avg. I	120 ug/m^3	60 ug/m^3	50 ug/m^3
	24 hrs avg. II	150 ug/m^3	100 ug/m^3	75 ug/m^3
Lead	Annual avg. I	1.0 ug/m^3	0.75 ug/m^3	0.50 ug/m^3
	24 hrs avg. II	1.5 ug/m^3	1.0 ug/m^3	0.75 ug/m^3
Carbon Monoxide	8 hrs. II	5.0 mg/m^3	2.0 mg/m^3	1.0 mg/m^3
	1 hr.	10.0 mg/m^3	4.0 mg/m^3	2.0 mg/m^3

Source-Central Board for The Prevention And Control Of Water Pollution

- Annual arithmetic mean minimum 104 measurements in a year taken twice a week 24 hrly at uniform interval.
- 24 hourly/ 8 hourly values should be met 98% of the time in a year, however, 2% of the time, it may exceed but not on two consecutive days.

Table No. 3.32: Ambient Air Quality Levels At Fixed Monitoring Sites April 99 To March 2000

Station	Concentration – ug/m^3			
	SO_2	NO_2	NH_3	SPM
Colaba	18.36	29.32	47.36	147
Worli	30.26	34.3	79.67	218
Dadar	14.84	36.35	72.81	181
Parel	42.58	45.75	132.42	243
Sion	21.91	44.23	69.5	238
Khar	20.87	36.35	78.1	306
Suparitank	15.7	27.03	48.2	194
Andheri	26.33	41.48	71.5	290
Sakinaka	31.53	27.27	57.53	185
Jogeshwari	22	30.05	72.21	126
Ghatkopar	13.55	34.45	94.03	217
Bhandup	28.67	18.04	50.75	108
Mulund	42.26	31.79	63.84	207
Borivali	9.09	22.22	54.43	243
Tilaknagar	35.41	46.21	82.15	341
Maravali	27.47	46.21	292.61	424
Aniknagar	18.21	46.21	78.36	170
Mankhurd	20.53	29.53	68.35	159

Table No.3.33 : The Percentage C.P.C.B. Standards At Fixed Air Monitoring Sites.

Sr.		SO_2	NO_2	SPM
1	Range*	9-43	22-57	147-424
2	Maximum	43	57	424
3	%> at Ind.site	Not exceeded	Not exceeded	Exceeded at all the sites

Table No. 3.34: Air Quality Monitoring With Mobile Van At Traffic Junction Year 1999-2000

Table No. 3.34: Air Quality Monitoring With Mobile Van At Traffic Junction Year 1999-2000

Sr.No.	Site	SO2		H2S		NOx		RSP		CO(ppm)		Ozone	
		AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX
A	CST H.O.Traffic Jn.	56	266	17	92	339	654	262	972	4.5	9.9	31	
B	Byculla Traffic Jn.	20	82	8	25	161	868	162	402	2.3	10	52	67
C	Nana chowk Traffic Jn.	17	23	10	12	48	96	103	356	2.4	10	17	12.3
D	Haji Ali Traffic Jn.	54	148	17	46	322	889	245	739	5.5	12.8	18	24
E	Parel Traffic Jn.	22	84	7	17	287	740	309	659	4.1	8.4	2	28
F	Dadar Traffic Jn.	28	73	9	24	349	991	269	604	5.2	13.3	12	16
G	Wadala Traffic Jn.	62	168	94	312	446	990	338	977	5.4	25	26	29
H	Mahim Traffic Jn.	50	156	62	295	419	954	291	889	9.1	25	24	60
I	Santacruz Traffic Jn.	47	203	-	-	309	801	240	531	5.1	14.4	46	95
J	Andheri Traffic Jn.	98	254	50	243	520	999	520	1111	11.9	21.4	50	93
K	Gold Spot Traffic Jn.	56	82	11	38	526	855	375	604	11.3	20.6	71	13.2
L	Marol Traffic Jn.	37	59	7	26	144	570	169	427	5	10.7	22	132
M	Borivali Traffic Jn.	-	-	-	-	296	495	180	388	4.7	7.8	35	54
N	CTIRC Borivali	13	32	11	28	36	101	91	250	1.1	2.7	15	64
O	Chembur Traffic Jn.	23	59	6	8	63	103	188	424	-	-	-	38

Source: BMC Unit ug/m^3

Avg. 24 hrs. Max. 1 hour

Table No.3.35: Site Wise Percentage Exceeding C.P.C.B. 24hrs Standards In The Year 1999-2000

Sr.	Site	SO_2	NO_2	SPM
1	Colaba	-	-	13
2	Worli	5	2	58
3	Dadar	-	3	34
4	Parel	8	8	62
5	Sion	-	9	58
6	Khar	-	22	83
7	Suparitank	-	-	37
8	Andheri	-	5	74
9	Sakinaka	7	-	29
10	Jogeshwari	-	-	32
11	Ghatkopar	-	-	48
12	Bhandup	8	4	38
13	Mulund	21	5	48
14	Borivali	-	-	68
15	Tilaknagar	-	6	76
16	Maravali	-	14	85
17	Aniknagar	-	-	25
18	Mankhurd	-	-	26

Source: C.P.C.B.

Table No.3.36: Air Quality Of Quary Area

Sr. No.	1. 1 SITE	SO_2		H_2S		Nox		2. RSP		Co(ppm)		3. OZONE	
		Avg	max	Avg	max	Avg	Max	Avg	max	Avg	max	Avg	max
a	Chandivali Sakinaka	25	44	-	-	46	101	99	256	1.7	2.8	24	40
		13	64	5	15	44	189	436	1569	2.5	4.6	-	-

Avg.24hrs. max.1 hour

Table No.3.37 Air Quality At Dumping Grounds

Sr.No.	Site	SO2		H2S		NOx		RSP		CO(ppm)		Ozone	
		AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX	AVG	MAX
A	Malad Dumping Ground	17	78	372	63	262	170	821	2.8	10	16	16	56
B	Gorai Dumping Ground	15	110	23	101	646	128	418	1.5	10	14	14	92
C	Deonar Dumping Ground	23	98	178	132	727	343	1929	2.3	10	24	24	100
D	Soranto Socy. Ghatkopar	29	98	58	112	767	194	493	3.2	10	13	13	80
E	Mulund Dumping Ground	8	20	151	114	262	225	387	1.4	4	3	3	12

Avg. 24 hrs. max.1 hour Unit ug/m^3 for all parameters except CO

Table No.3.38: Emission Load Of Mumbai City (Tons/Day) 1999-2000

Sr.	Source	SO2	Particulate matter	NOx	CO	HC	Other	Total
1.	Domestic	7.3557	0.1419	6.182	-	-	-	13.6790
2.	Industrial	173.294	44.825	100.133	5.346	1.012	9.405	334.015
3.	Refuse burning	0.1022	1.372	0.252	5.418	-	1.918	9.0622
4.	Transport aton	14.1383	-	-	-	-	-	-
(a)	Diesel	0.6556	14.6509	81.3153	43.923	16.6287	16.6287	187.2849
(b)	Petrol		2.475	19.4282	297.363	44.1782	0.143	364.243

Total emission load = 801.532 i.e. 802 Tons/day (Source M.P.C.B.)

Table No. 3.39: Monthly & Annual Averages Of "PSI" For Fixed Air Monitoring Sites

Station	Month												
	Apr 1999	May 1999	June 1999	July 1999	Aug 1999	Sept 1999	Oct 1999	Nov 1999	Dec 1999	Jan 2000	Feb 2000	Mar 2000	Annual Average
Colaba	-	25	35	-	22	20	37	84	82	67	50	-	47
Worli	79	41	41	57	25	20	50	98	100	70	58	64	59
Dadar	50	46	48	39	25	32	39	82	95	71	61	-	53
Parel	96	78	64	50	41	32	72	115	114	84	-	-	75
Sion	67	65	48	34	44	62	60	68	116	91	-	-	66
Khar	82	63	60	67	49	47	72	113	136	117	-	-	81
Suparitank	47	30	-	33	24	22	54	91	111	61	104	90	61
Andheri	75	50	48	41	31	43	66	100	118	90	84	-	68
Sakinaka	66	56	35	-	32	40	69	89	-	84	88	88	65
Jogeshwari	80	42	33	33	-	45	74	88	110	-	-	-	63
Ghatkopar	69	48	45	30	45	25	40	86	99	-	-	-	54

Bhandup	69	50	-	36	27	39	49	106	121	-	-	-	62
Mulund	53	49	30	0	24	31	59	88	122	97	-	-	55
Borivali	-	-	-	-	-	-	-	40	69	51	-	62	56
Tilaknagar	-	-	-	34	34	50	81	92	97	78	-	90	67
Maravali	-	-	55	67	46	74	104	100	133	117	46	110	91
Aniknagar	61	56	-	37	34	28	39	-	88	-	101	-	60
Mankhurd	60	48	36	-	35	29	37	72	79	-	134	-	50
Average	69	50	45	40	34	38	60	90	107	83	81	84	65

PSI Pollution standard index **PSI Descriptor**

Pollution index descriptor **Good**

Index value range
0-25 Fair
26-50 Moderate
51-75 Unsatisfactory
76-100 Harmful
Above 100

Table No. 3.40: The Range Of Noise Levels Observed in Mumbai Alongwith The Standards Year 1999-2000

Sr. No.	Area	Prevailing Noise levels in Mumbai	C.P.C.B. Standard*	
			Day db/A	Night db/A
1	Residential	46.113	55	45
2	Commercial	58.113	65	55
3	Traffic	70.103	75	70
4	Air Port area	86.103	65	55
5	Silence	48.85	50	40

* Central Pollution Control Board.

Table No. 3.41: Air Pollution In Mumbai In Year 2000-2001

	$SO_2(\mu g/m^3)$		$NO(\mu g/m^3)$		$SPM(\mu g/m^3)$		$CO(mg/m^3)$	
	2000 Jan	**2001 Jan**	**2000 Jan**	**2001 Jan**	**2000 Jan**	**2001 Jan**	**2000 Jan**	**2001 Jan**
Mahim	46	74	448	439	353	429	9.2	7.2
Andheri	78	265	484	429	499	582	10.6	8.7
Wadala	42	29	465	358	499	273	6.5	3.6
Sion	11.66	38.17	91.07	NA	132.6	232	1.91	7.6
Mulund	41.40	58.29	196.22	NA	143.5	30	3.5	6.4

Source: Air Quality Monitoring Unit at BMC & MPCB

Table No: 3.42: Monthly Averages Of Air Pollution Parameters

FOR 1999 (ALL values in Ug/m^3)

MONTH	KALBADEVI (C)						PAREL (I)						BANDRA (R)					
	SO_2	NO_2	H_2S	NH_3	SPM	RESP	SO_2	NO_2	H_2S	NH3	SPM	RESP	SO2	NO2	H2S	NH3	SPM	RESP
JANUARY	23	37	2	42	387	123	39	25	2	57	321	136	35	24	2	29	278	173
FEBRUARY	33	24	3	15	367	128	29	24	1	40	314	153	19	23	1	34	326	161
MARCH	13	25	1	95	294	80	18	50	2	71	458	107	6	12	3	49	159	127
APRIL	6	20	2	77	228	75	6	19	2	43	298	99	6	9	1	34	91	91
MAY	8	13	1	43	270	85	15	62	3	48	181	61	8	12	2	27	159	117
JUNE	7	21	4	28	234	91	43	39	2	61	289	75	6	62	2	36	170	120
JULY	7	39	1	8	183	79	16	44	2	31	183	89	10	45	2	31	164	171
AUGUST	6	30	1	27	257	164	14	39	1	23	130	36	6	18	2	16	70	329
SEPTEMBER	7	32	1	26	416	52	16	26	1	40	124	63	6	12	1	45	53	107
OCTOBER	15	57	1	9	268	82	25	38	2	52	240	117	23	34	2	28	114	99
NOVEMBER	22	50	4	89	338	101	25	52	3	41	350	163	25	41	8	50	286	150
DECEMBER	22	58	3	63	318	115	26	55	4	135	343	135	25	38	5	53	362	146
A.AVERAGE	14	34	2	44	297	98	23	39	2	54	269	103	15	28	3	36	186	149

Source: NEERI

Table No: 3.43: Monthly Averages Of Air Pollution Parameters

FOR 2000 (ALL values in Ug/m^3)

MONTH	KALBADEVI (C)						PAREL (I)						BANDRA (R)					
	SO2	NO2	H2S	NH3	SPM	RESP	SO2	NO2	H2S	NH3	SPM	RESP	SO2	NO2	H2S	NH3	SPM	RESP
JANUARY	14	60	1	39	355	136	20	57	2	127	397	106	14	43	2	58	356	126
FEBRUARY	9	67	6	18	344	99	18	48	8	44	411	122	10	30	7	45	243	125
MARCH	12	52	3	97	305	101	24	75	3	76	398	91	16	26	17	70	267	159
APRIL	7	30	5	45	219	60	10	22	4	40	220	58	7	32	4	25	194	148
MAY	6	32	1	57	155	38	8	16	3	37	161	51	8	10	6	53	114	57
JUNE	7	10	2	56	210	70	9	6	1	22	162	54	7	7	1	28	57	91
JULY	7	17	1	31	122	62	9	9	1	17	167	72	6	9	1	18	178	113
AUGUST	6	15	1	21	176	56	7	10	4	30	76	90	6	7	3	17	127	86
SEPTEMBER	7	36	2	33	217	65	9	18	3	206	185	94	11	16	2	109	128	113
OCTOBER	8	36	3	67	252	54	12	31	2	113	238	106	12	25	7	97	144	100
NOVEMBER	9	32	24	40	346	113	13	49	45	28	363	179	7	42	21	24	316	201
DECEMBER	13	40	4	18	378	185	12	41	2	49	600	182	9	37	3	82	431	258
A.AVERAGE	9	36	4	44	257	87	13	32	7	66	282	100	9	24	6	52	213	131

Source: NEERI

Table No. 3.44 Rainfall in Mumbai from May 2000 to Dec 2000

Date	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0	6.8	20.7	TR	26.4	0	0	0
2	0	8.2	14.4	TR	6.7	13	0	0
3	0	3.8	22.6	0.3	5.6	0	0	0
4	0	23.8	194.7	4.8	1.2	0	0	0
5	0	0.2	33.6	7.6	2.8	TR	0	0
6	0	31.1	50	TR	2	0.1	0	0
7	0	0.5	61.8	0	0	0	0	0
8	0	4.4	186.4	TR	1.4	2.6	0	0
9	0	153.4	90.8	0.5	0.7	2.8	0	0
10	0	1.2	75.3	0.5	0	0.3	0	0
11	0	TR	8.3	121.9	1	0	0	0
12	0	TR	81	24.8	0.2	39.2	0	0
13	0	2.6	351.5	25.1	TR	0	0	0
14	0	0.4	17.1	0.6	0	0	0	0
15	0	TR	2.6	2	0	0	0	0
16	TR	TR	6.5	1.6	0	0	0	0
17	18.7	TR	0	3.8	0	0	0	0
18	139.8	TR	0.4	3.1	0	0	0	0
19	190.8	0	4.1	4.8	0	0	0	0
20	3.8	0	3.1	1.4	0	0	0	0
21	0	0	3.8	2.7	2.8	0	0	0
22	0	0	0.3	18.4	3.8	0	0	0
23	1.4	1.8	TR	38.3	20.8	0	0	0
24	0.4	11.5	0.3	28.9	0	0	0	0
25	0.1	3.1	TR	74.3	0	0	0	0
26	1.8	16	0	3.2	TR	0	0	0
27	0	5	0	14.1	3.6	0	0	0
28	11.8	18.5	0.5	63.8	TR	0	0	0
29	TR	28.4	TR	28.2	0	0	0	0
30	14.6	44.1	0	14.1	0	0	0	TR
31	4.6		0	7.3		0	0	5.9
Total	**387.8**	**364.8**	**1229.8**	**496.1**	**79**	**58**	**0**	**5.9**
Max	**190.8**	**153.4**	**351.5**	**121.9**	**26.4**	**39.2**	**0**	**5.9**
Rainy days	**7**	**15.0**	**19**	**19**	**8**	**4**	**0**	**1**

Source : Meteorological Centre Coloba, Mumbai- 400 005.

Table No. 3.45 Monthly mean temperature , Relative Humidity and Rainfall recoded in Mumbai in the year 2000.

Month	Mean Temperature °C		Relative Humidity %		Ave. Rainfall
	Max.	Min.	830	1730	mm
January	32.4	17.7	68.0	50	0.0
February	30.4	17.9	73	50	0.0
March	32.9	19.8	69	47	0.0
April	32.9	24.7	72	65	0.0
May	32.9	26.4	76	69	387.8
June	32.0	26.0	82	74	364.8
July	29.9	25.6	85	80	1229.8
August	30.4	25.5	85	80	496.1
September	31.8	24.4	80	71	79.0
October	33.3	24.4	80	68	58.0
November	34.6	20.5	66	52	0.0
December	34.2	16.6	56	45	5.9

Source : Meteorological Centre Coloba, Mumbai- 400 005.

MUNCIPAL CORPORATION OF GREATER BOMBAY
MUNICIPAL LABORATORY

It is distinctly understood
that this report will not be
urged for advertisement purpose.

Muncipal Laboratory
C/North ward office Building,
2nd floor, Room no.49,
Office J.K. Sawant Marg,
Dadar, Bombay 499 028.

Description of sample : Ringwell water for Construction.
Date of receipt at the laboratory : 3.6.98

By whom sent : M/s. The Deeplakshmi Co-operative Housing Society Ltd.
Hathiskar Marg, Prabhadevi Sea Beach,
Bombay- 400 025

TABLE NO 3.46: RESULT OF THE ANALYSIS IS AS FOLLOWS:

To neutralise 200 ml. sample of water using Phenolphthalein as an indicator 0.1 NaOH required.	0.8 ml
To neutralise 200 ml. sample of water using Methyl Orange as an indicator 0.1 HCL required.	8.8 ml.
Organic Solids	80.0 mg/lit
Inorganic Solids	1900.0 mg/lit
Sulphates (as SO4)	182.2 mg/lit
Chlorides (as CL)	600.0 mg/lit
Suspended matter	15.0 mg/lit
pH Value	7.4

OPTION : The sample submitted is fit for construction purposes as per IS : 456-1978, however there are no standards for washing, flushing and gardening purposes.

Dated: 10th day of June'98

Muncipal Analyst.

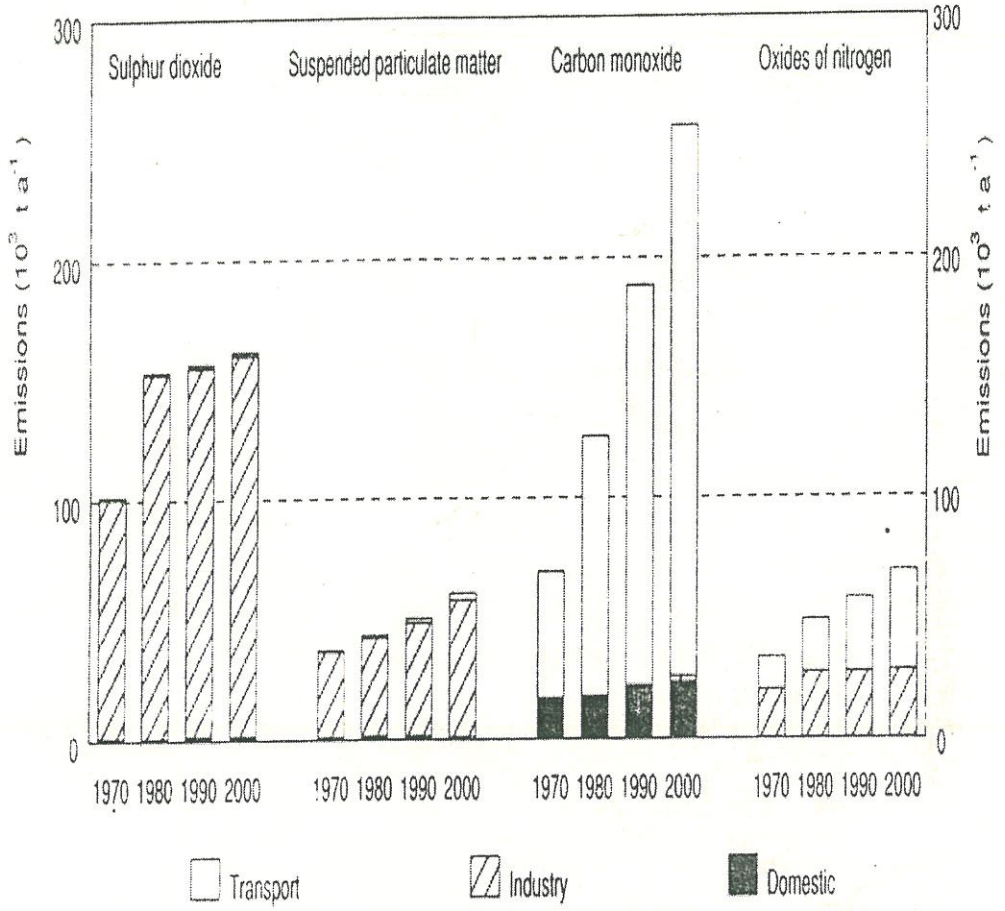


Figure 3.3 Estimated and projected anthropogenic pollutant emissions in Bombay by source, 1970–2000

Source: NEERI, 1991a

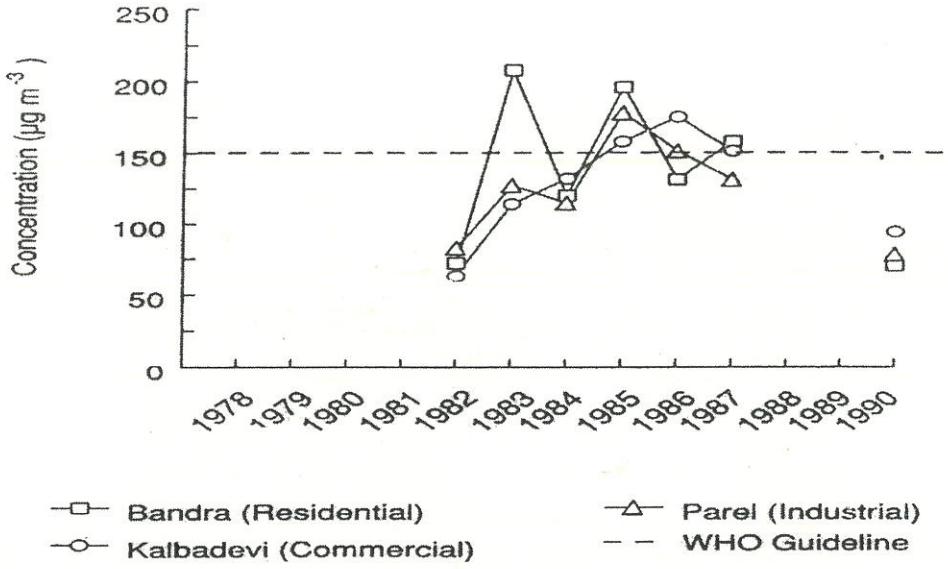


***Figure** 3.4 Annual 98 percentile nitrogen dioxide concentrations*

Sources: NEERI 1983, 1988, 1990, 1991b

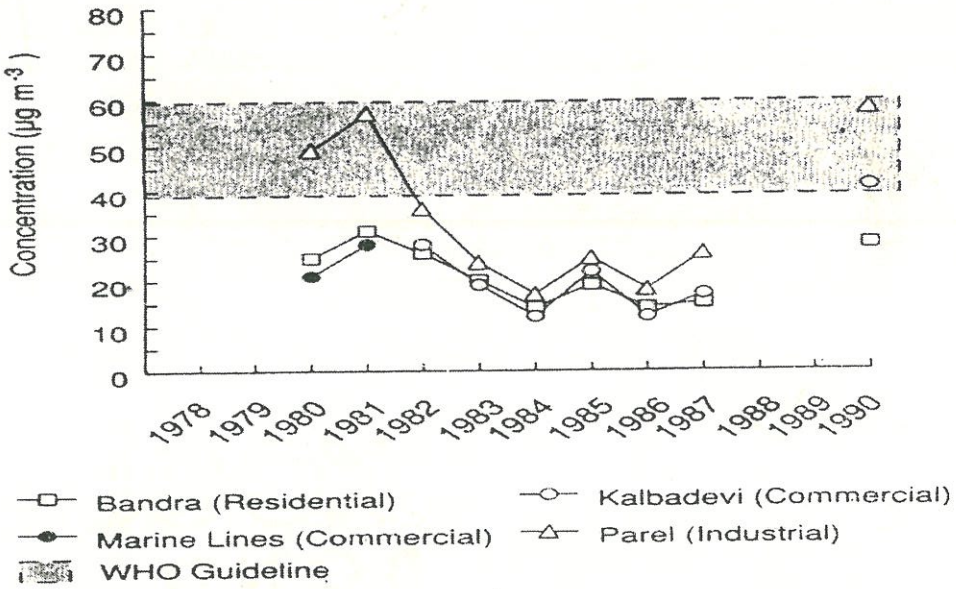


***Figure** 3.5 Annual mean sulphur dioxide concentrations*

Sources: NEERI, 1983, 1988, 1990, 1991b

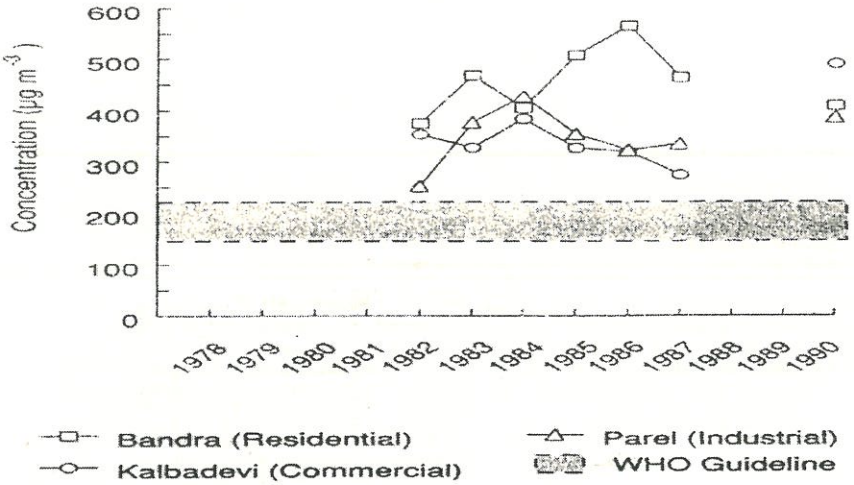


Figure 3.6 Annual 98 percentile suspended particulate matter (TSP) concentrations

Sources: NEERI 1983, 1988, 1990, 1991b

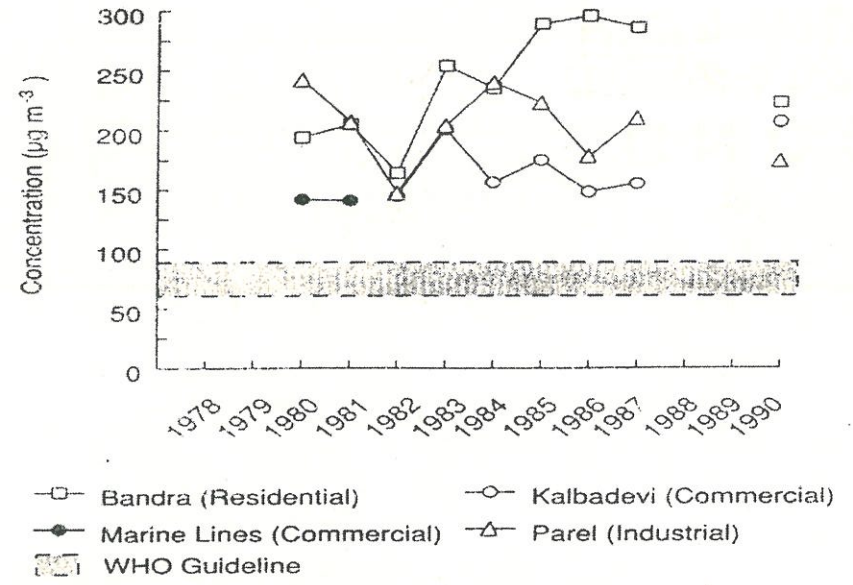
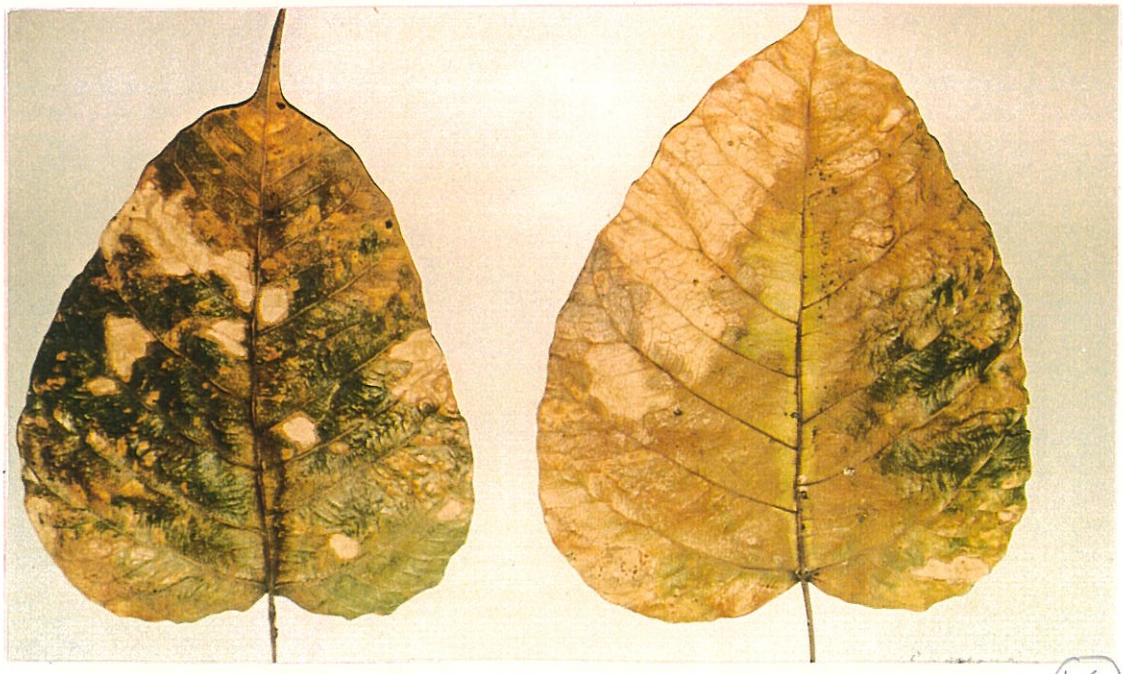


***Figure** 3.7 Annual mean suspended particulate matter (TSP) concentrations*

Sources: NEERI, 1983, 1988, 1990, 1991b

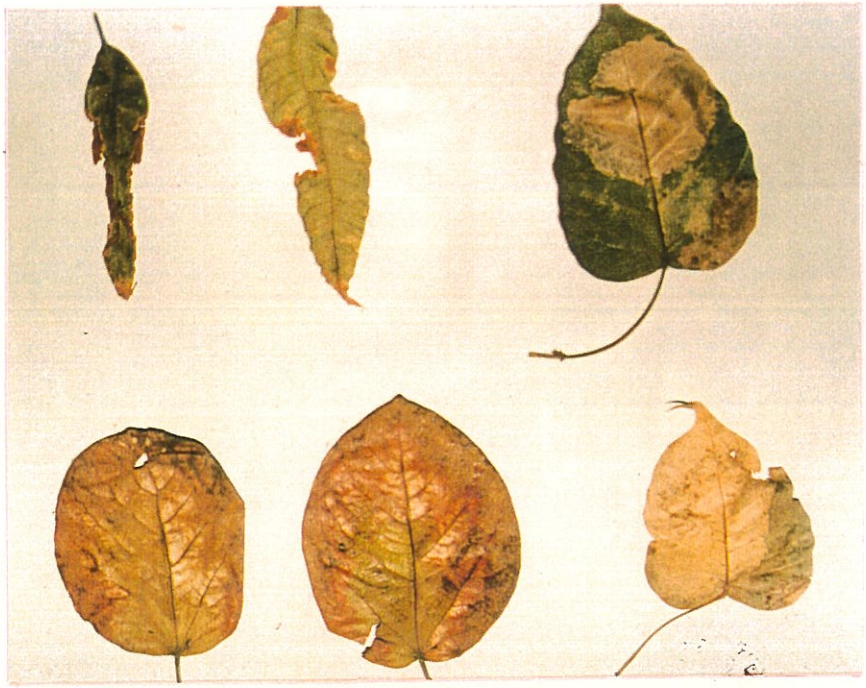
17

3.1 Mango leaves showing injured portion, at Western Express highway, Kandivali (E.).



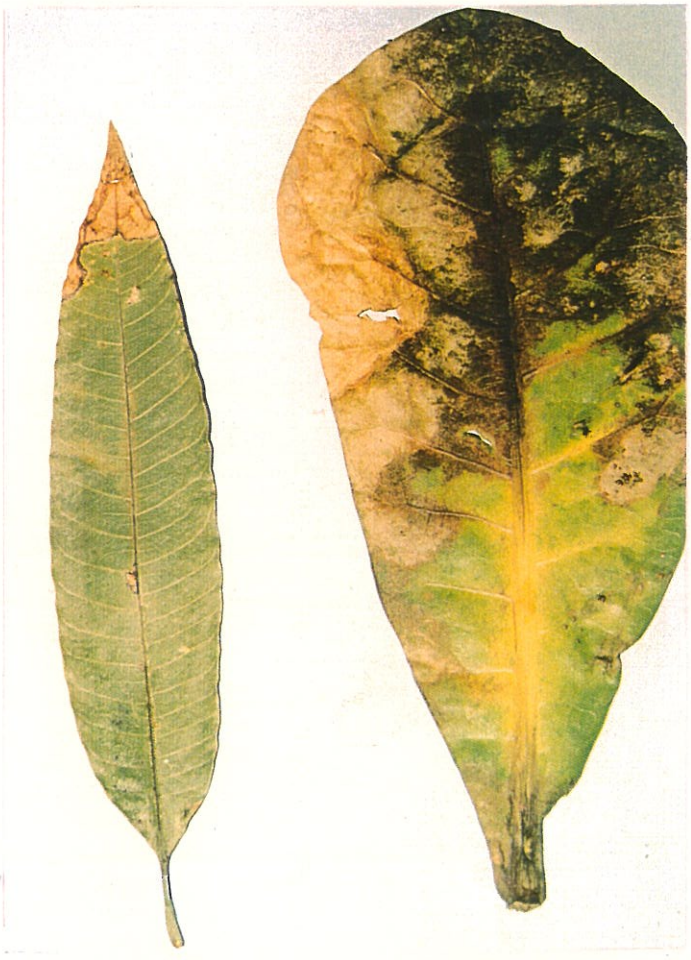
16

3.2 Pipal leaves showing leaf injury at Carnak Bunder



(12)

3.3 Mango, Pipal and Banyan leaves showing leaf injury, at Mahul (Chembur).



(13)

3.4 Mango and Samudra-phul leaves showing tip & lamina burning, at Homi Bhabha Marg, Colaba

4 DISCUSSION

In Brihan Mumbai area, 25 sites were studied for three seasons namely February, May and October, and plant species were observed carefully for there canopy shapes, phenology, visible leaf injury, and deposition of dust on the leaves

4.1 Dust Pollution.

Five plant species namely Banyan, Pipal, Asupalav, Bhendi and Mango were observed in detail for dust deposition on their leaves for three seasons at all the sites studied. Heavier dust load was recorded on leaves of Banyan tree, as compared to other plant species at most of the sites studied . This is due to texture of leaf surface available for capturing dust as well as its flat, horizontal orientation. Suspended particulate matter (SPM) emissions attributed to transport have increased greatly. Recent estimates suggest that transportation, especially motor and diesel vehicles and very old vehicles are the main source of particulates. At the locations like Carnak bunder, Kandivali, Anik depot, Marol Naka (Andheri) with heavy vehicular traffic, maximum dust is deposited on the leaves, whereas at sites like Tilak Nagar (Chembur), Gamdevi (August Kranti Maidan), Oshivara (Jogeshwari), heavy dust load on the leaves, is due also to playgrounds in the immediate neighborhood. Places like Kamala Nehru Park, Aarey Milk Colony (Goregaon, CTRIC (Borivali), show negligible dust load on the leaves though these sites have many visitors, tourists, and children playing around, but these places are well irrigated regularly and maintained for expected visitors.

Dust load on most of the species studied was found to be more during 1st and 2nd observations (February & May), However after monsoon the dust deposition was found to be almost negligible, thanks to effective washing by rains.

Dust particles in atmosphere, depending on their size and weight, settle under force of gravity on surface of the vegetation and soil, but the finer ones remain suspended in air for longer periods of time and get dispersed, distributed and diffused by wind motion and currents. These suspended particulate matters (SPM) gradually gathers mass through agglomeration, coalescence and aerosol formation with water vapour and eventually settle down on surfaces of vegetation or may get washed by rain. These dusts causes clogging

of stomatal openings on leaves and thus hamper photosynthesis that in turn reduces productivity and fresh weight of the plant. With heavy dust load, foliage appears grayish and sickly as against the expected fresh green coloration. Dust reduces the aesthetic value of the vegetation. Graphical representation of 5 plant species studied for dust collection shows that Banyan leaves capture more dust as compared to Bhendi, Asupalav, Mango, and Pipal (Fig.No 3.1).

4.2 Air Pollution.

Out of the 25 sites studied, for three seasons, tip burning of the leaves was observed mostly at Carnak Bunder site, in the post monsoon observation. This was due to gaseous air pollutants, because of heavy vehicular traffic in the area.

4.3 Insect Infestation

Leaf injury due to insect bite was seen in all three seasons studied but was more in post – monsoon observation. This was due to production and vigorous activity of larvae of different types of insects. Insect--bite induced necrosis was more pronounced during this season. At Mysore Colony (Chembur) and Mankhurd, it was observed that leaf injury due to insect-bite was more prominent during October. Such insect-bite injury was more common on leaves of the plants growing close to stagnant drains, dirty water, nallah and hutment, since these provide breeding grounds for insects.

4.4 Phenological changes

Trees growing in urban areas are often suspected not to follow their normal cycles of foliation, defoliation, flowering and fruiting. Accelerated or delayed flowering on some tree species was seen along two sides of Western Express highway in 1998. *Delonix regia* was seen flowering at Dadar in the month of December, whereas its normal flowering season is April-May-June. At many places Mango tree was seen bearing flowers and young fruits during the month of November.Industrial auto-emissions (especially ethylene) are reported as the causative agent suppressing flowering, accelerated refoliation, etc. During the present studies also flower buds and fruits were seen simultaneously on *Peltophorum* species in Gamdevi and Kamala Nehru Park (Malbar Hill) and on *Thespesia* on E. Mosess

Road, Parel and at Dadar. In the absence of reports on experimental studies and statistically viable field data, it is not possible to establish this phenomenon wherein phenological variations have been noticed.

4.5 Changes in Canopy shapes

From the 25 sites studied, abnormal canopy shapes and crowns were observed at some sites. These are mostly due to human interference rather than natural causes. At Carnak Bunder area, most of the trees showed abnormal canopy shapes. Construction on and below roads affect underground parts of trees which in turn lead to aboveground parts too, giving odd shapes to canopy of trees. At E. Mosses Road, Worli, Banyan and Gulmohar trees show alteration in canopy shape due to convenience trimming by dwellers on footpaths where huts are very close to the trees. At Bandra near Mehboob Studio, a Banyan tree shows irregular growth and canopy, since it is close to a construction site. Trees very close to a compound wall at Khar show lopsided canopy due to tilted trunk. Similar effects were observed at Koldongri (Andheri), Bhandup, Sion Koliwada and Tilak Nagar where mature Mango trees showed lopsided canopy development. At Sindhi Camp Chembur, Bhendi tree was partly embedded in a wall and showed abnormal canopy.

4.6 Lead contents of dust and leaf tissue

Quantitative estimation of Lead (Pb) from leaf tissue, and dust deposited on leaves of Banyan and Asupalav trees at four sites, shows that only a fraction of lead in dust enters the leaf tissue, mostly due to diffusion from leaf surface. Concentration of lead in dust deposited on leaves was high (Table No.3.29) during May observation and after rains (October) it was negligible.

The source of this lead is not certain. It may be that lead accumulated in soil over the years may find its way in dust. Another possibility points to the suspect quality of petrol still available in the city. Further investigation is open and may be taken up by competent authorities. It may be noted here that very little lead is detectable in leaf washes, after rains. Leaf tissue, with lead content upto 9.9ug/gm (Table No, 3.29) does not show any toxicity symptom. Levels of Pb where detected in leaves are too low at present and are not considered a cause for alarm.

4.7 Experiment for amelioration of plant health in urban areas.

An experiment was conducted on Boganvel, (*Bougainvillea spectabilis*). Results show that productivity of the species improved with Urea spray as compared to Ascorbic acid and distilled water sprays (Table No.3.30) Nitrogen is known to be major nutrient that is in deficient supply. Urban soils are also no exception, they are more likely to be deficient in the nutrient. Hence, improved growth of plants was perceptible even in a month of the experiment. Other material tested, water and ascorbic acid had only watering effect, which was anyway, being done in that place. (Photograph 4.5 and 4.6)

4.8 Air monitoring comparison of sites.

To indicate co-relation between traffic junction data and health of the trees, common study sites of this project and those covered by BMC monitoring Van are considered, namely i) Saki Naka ,Marol Fire station, Andheri (E). ii) C.T.I.R.C., Abhinav Nagar Borivali (E) and iii) wadia Hospital, Parel.

Table No. 4.1 : Comparison of Air-Quality Monitoring With Mobile Van At Traffic Junction, Year 1999-2000 with Phytomonitoring Carried out for this Project.

Site	SO_2		NOx		RSP		Dust deposited on leaves.
	AVG	MAX	AVG	MAX	AVG	MAX	
Andheri Marol	98	254	520	999	520	1111	1960 ug/cm^2
CTIRC Borivali (E)	13	32	36	101	91	250	660 ug/cm^2
Wadia Hospital Parel	22	64	267	740	309	659	2510 ug/cm^2

Unit ug/m^3

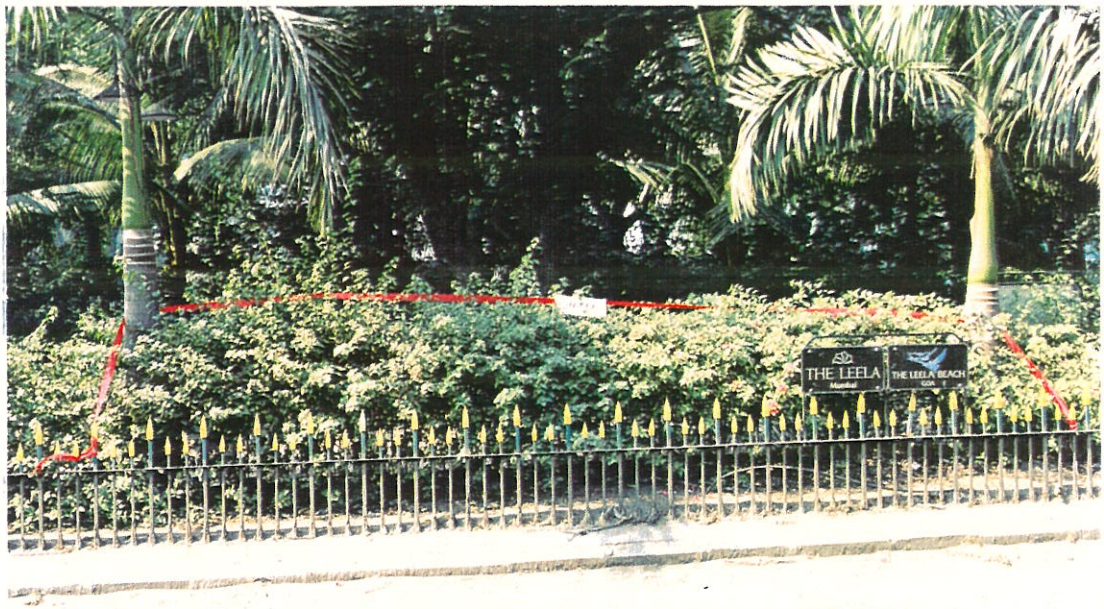
15

4.1 Heavy traffic at Carnak Bunder, note the foggy environment

4.2 Traffic on Western Express Highway at Kandivali

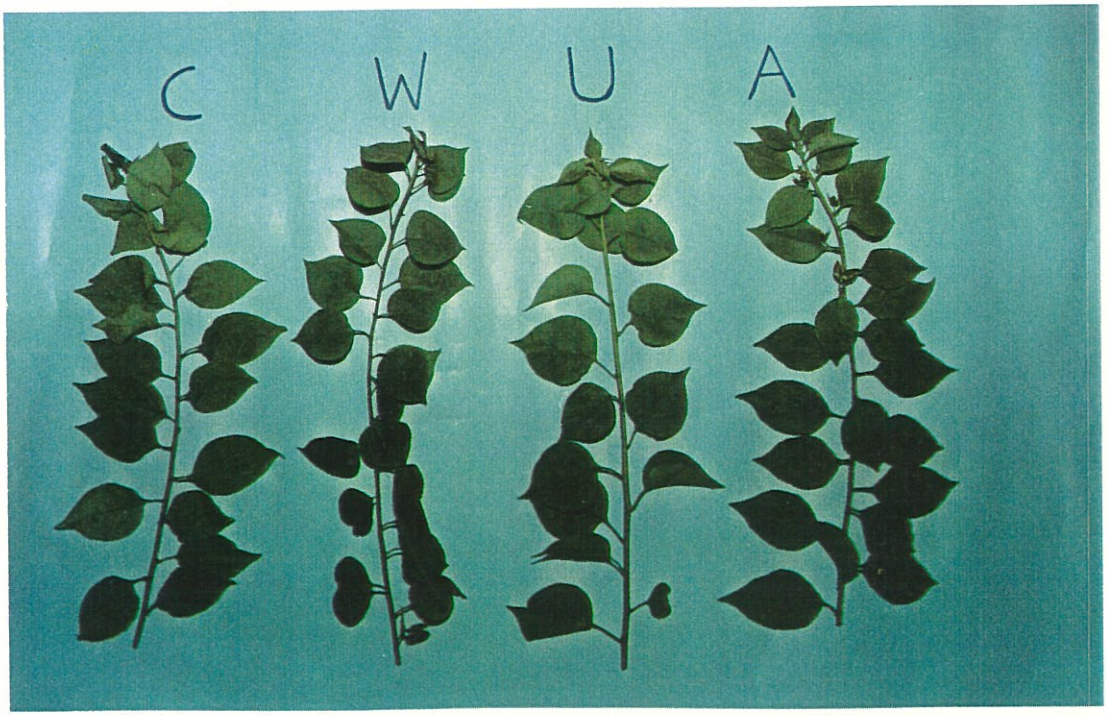
4.3 Heavy traffic at Marol Naka creating foggy condition

4.4 Heavy traffic at Marol Naka creating foggy condition



20

4.5 Foliar Spray experiment on Boganvel hedge on road divider.



4.6 Twigs of Boganvel after the Foliar spray experiment.

(18)

4.7 Banyan leaves with heavy dust deposition at Kandivali

(14)

4.8 Leaves with insect bite after monsoon

The above table indicates that at CTIRC SO_2 , NOx and RSP were within permissible limits. Our observation also shows that values of deposited dust load were lower at CTIRC, as compared to Andheri and Parel sites. This shows parallel nature of results obtained by two types of methods, and hence on the basis this, we may consider pollution status indicated by plant monitors as indicative of pollution levels in respective areas. Stress due to pollution is found to be less at CTIRC compared to other sites and trees are found to be healthy, with good foliage. This enhances the aesthetic value of the area favouring biota habitat.

4.9 Pollution and health of trees.

Of the 25 phyto-monitoring sites of this project, 20 are common with air monitoring sites of BMC. Comparison of findings of dust loads at these 20 sites show that at 8 sites, pollution levels were high according to both the methods. These sites were – Kandivali, Mehboob studio at Bandra, S.V.Road at Khar, Maravali, Bhandup, Wadia hospital at Parel, Pant Nagar at Ghatkopar and Koldongri at Andheri. Five sites that show low pollution loads by both methods were –Woollen Mill compound at Dadar, Municipal school at Mankhurd, BEST House at Colaba, Kamala Nehru Park on Malabar Hill and CTIRC at Borivali (E). While positive correlation has been noticeable at these15 sites, rest of the sites do not show such relationship. (Refer Map fig., 4.1).

4.10 Area wise pollution

Phytomonitoring results show that during may, dust load on the foliage was more as compared to February observations. Post monsoon, dust deposited was negligible and tree crowns were bright and green.

All the 25 monitoring sites are arranged according to the dust deposited on the foliage. The same with decreasing order of dust load are given in below . It may be noted that the health of the trees in the top eight sites was poor, while health of trees of last five sites in the list given below was good. Twenty-five monitoring sites in Brihan Mumbai area are arranged according to decreasing dust load on phytomonitors.

Table 4.2: A summary table wherein dust loads values found on all the five phytomonitors in all the three seasons, at 25 sites, is given below. The sites are arranged according to decreasing dust load.

Site	Average dust load in mg/cm^2
Mahindra & Mahindra Factory, Kandivali. *	2.66
Mehboob Studio, Bandra (W). *	1.77
Khar Police Station, S. V. Road, Khar. *	1.77
Carnac Bunder Road	1.52
Maravali Municipal School,Sindhi Colony, Chembur *	1.50
" S " Ward Office, L. B Shastri Marg, Bhandup. *	1.46
H.P. Colony, Mahul.	1.44
Wadia Hospital , Parel. *	1.44
BMC School, Vidya Vikas, Pant Nagar. *	1.35
Marol Fire brigade station, Andheri – Kurla Road. *	1.31
Garware House, Kol Dongri, Andheri (E). *	1.25
Anik BEST Depot. *	1.25
Woollen Mill Compound, Dadar *	1.17
E. Moses Road, Worli. *	1.12
BMC School Sion *	1.15
Tilak Nagar , Chembur. *	1.14
Kalidas Natyagriha, Mulund (West). *	1.12
Oshiwara Municipal School, Jogeshwari' *	1.11
BMC school, Mankhurd *	1.03
Gamdevi,	1.02
Nathalal Parikh Marg (Near BEST House) Colaba *	0.98
Homi Bhabha Marg , Colaba	0.98
Kamala Nehru Park, Malabar Hill	0.85
Chhota Kashmir, Aarey Colony,Goregaon.	0.71
CTRIC, Borivali (East). *	0.68

4.11 Trees recommended for attracting biota.

It has been generally observed that a group of good /healthy trees with dense foliage attract birds while on isolated tree, even if healthy may not prove good enough as bird habitat. Hence, continuity in tree cover is bound to provide habitat for birds. From amongst a large variety of trees, the ones given below are favoured by insects and birds due to their dense foliage, flowers, fruits and branding pattern and hence are

Fig. 4.1 Map of Brihanmumbai : Results of Air Monitoring - BMC Results (◯), Phytomonitoring (□) : Clean Areas (Green), Polluted (Red)

recommended for plantation wherever possible. Heavy and noisy vehicular traffic in the immediate vicinity, however is a deterrent for bird landings. The list of trees /shrubs is given below.

Table no. 4.3 : Trees recommended for attracting biota.

Name	**Common Name**	**Reason for attraction**
Caesalpinia coriaria	Divi-Divi	Flowers, Shelter
Cassia alata	Ringworm senna	Flowers, insects
Cassia fistula	Bahava/Amaltas	Flowers, insects
Cassia siamea	Kasod	Fruit, insects
Cordia sebastina	Scarlet cordia	Flowers,
Erythrina indica	Pangara	Flowers,
Ficus benghalensis	Vad/banyan	Fruit, shelter
Ficus benjamina	Pimpri	Fruit, shelter
Ficus racemosa	Umber	Fruit, shelter
Ficus religiosa	Pimpal	Fruit, shelter
Guiacum officinalis	Lignum Vitae	Flowers
Jacaranda acutifolia	Neelmohar	Flowers
Lagerstroemia indica	Chinai mendi	Flowers
Lagerstroemia speciosa	Tamhan	Flowers, shelter
Muntigia calabura	Barbados cherry	Flowers, fruit
Murraya paniculata	Kunti	Flowers, insects
Peltophorum pterocarpum	Sonmohar	Flowers, shelter
Pongamia pinnata	Karanj	Flowers, insects, shelter
Spathodea companulata	African Tulip tree	Flowers, insects, shelter
Syzygium cuminii	Jamun	Fruit, shelter

5 OTHER URBAN STRESSES

Biologists have adopted the term stress for any environmental factor potentially unfavorable to living organisms. As conditions vary from the ideal, the efficiency of metabolic processes of plants decreases, vigour declines and growth diminishes, sometimes proportionately. These stresses either natural or man-made affect productivity and also reduces the aesthetic value of plants.

5.1 Natural stresses: Wind and Salinity.

This problem creates stress of three types in a coastal city like Mumbai. Airborne salts, saline soils and water salinity.

5.1.1 Airborne salts

All along the west coastal area of the city, from Colaba – Cuffe Parade in south to Charkop Link Road in the north, trees facing the sea suffer from this stress. Tips and margins of leaves of most of these trees appear brown and dead and salt crystals deposited on leaf surface are also visible. Branches on sea-side are often defoliated and some trees show better crown growth on leeward side. Trees observed suffering this stress were *Barringtonias*, Pipal, Coconut, Mango etc. The stress is more severe in pre-monsoon to mid-monsoon period i.e. from May to July, due to strong westerlies. (Photograph 5.16 and 5.17).

5.1.2 Saline soils

Ordinary terrestrial plants show weak and stunted growth in saline soils, many show injury symptoms as their roots reach saline soils, in case their plantation is done in pits containing sweet earth. Often, after initial stress injury, plants survive moderate salinity conditions of soils. Sweet earth, organic manure and washing away of salts due to heavy rains are helpful.

5.1.3 Water salinity

Along coastal area, subsoil water is often found to be saline (Table No.3.46). Since Brihan Mumbai Corporation is not in a position to supply enough water for gardening in the city, several establishments have opted to sink tube-wells for irrigating their garden plants. In an area in Prabhadevi, the ill effects of saline water irrigation on lawns and herbaceous garden plants, was repeatedly noticeable in the form of leaf burning and stuntedness of shoots. Leaves of most herbaceous plants, in an otherwise meticulously maintained garden, were seen eliminated due to paucity of adequate supply of fresh water and only woody perennials form the greenery. Same situation is expected to get repeated all along the coastal areas of the city (Photograph 5.15).

5.2 Man-made stresses

5.2.1 Soil compaction

Soil, a complex physical and biological system providing support, water, nutrients and oxygen for a plant is a major component of the physical environment, second only to climate in influencing the development and distribution of plants. Hardening or compaction of soil due to irregular and uneven irrigation practices and trampling affects the normal development of root system, which in turn causes stunted growth and yellowing of plants. Compaction of soil also causes lack of aeration, it reduces water-holding capacity of soil and therefore affects absorption of nutrients by roots and in turn these plants under stress show reduction in reproductive and vegetative growth. Occasional loosening of soil is the only correct remedy for compact soil.

5.2.2 Nutrition

Trees need periodic manuring and watering so that added nutrition reaches roots, which is essential for proper growth. Urban trees once planted need continued care and as such, these operations are needed to be attended to periodically.

5.2.3 Misuse of trees

During the survey of the sites in Brihan Mumbai, it was observed that trees on the roadside are being exploited for various reasons other than their real roles of beautification, enhancing aesthetic value or forming a screen and shade at respective locations. Tree trunks of old trees are often used as a residence, a temple, a tea stall or as shops for selling books, cassettes, household articles etc. by vendors. Hawkers and vendors show no respect for trees. The tree guards protecting the newly planted saplings are often used for display of wares or for hanging their clothes. Even food stalls on pavements often release their disposables at the roots of trees, killing them slowly with their waste. The older, fully grown trees also keep getting damaged due to continuous digging by public utility concerns such as the corporation, telephones, PWD etc, and also due to improper concretisation. The cementing and tiling on pavements without any space around the base of the tree makes it gasp for breath and weakens the tree. (Photographs 5.1 to 5.13)

5.1 Pavement dwellers near tree at Cross Maidan, Churchgate

5.2 A tree with concrete base –a temple at Cross Maidan, Churchgate

5.3 Tree trunk used by vendors as shops for selling cassettes

5.4 Commercial kitchen under shade of trees

5.5 Shopping complex under the Banyan tree at C.T.O., Fort

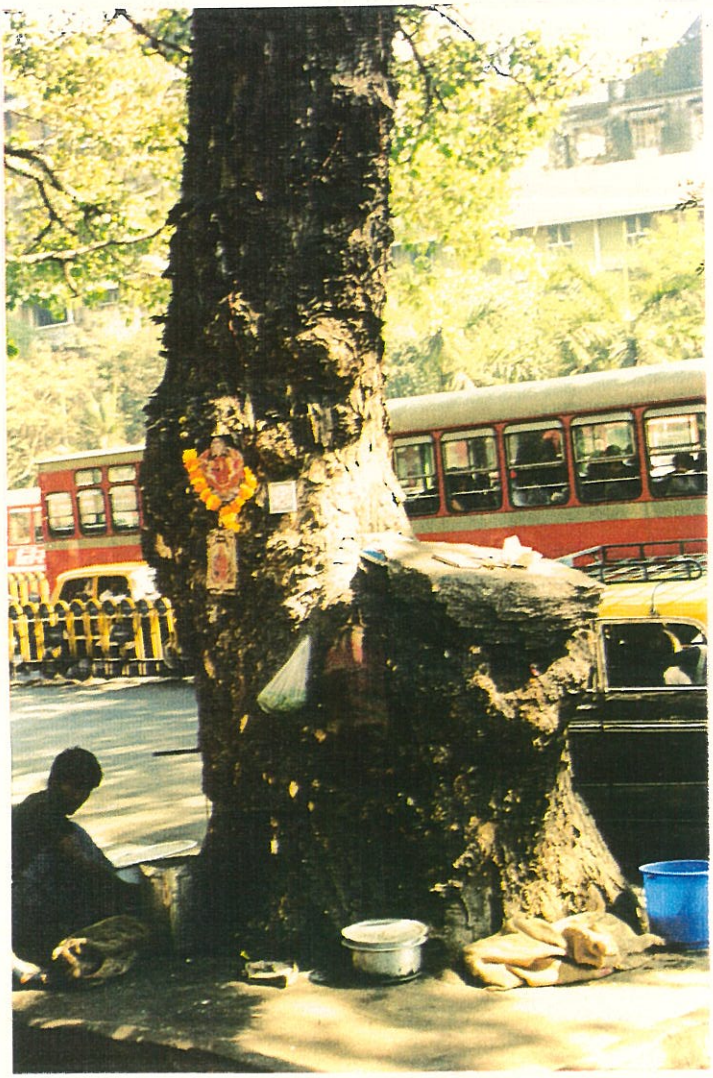
5.6 Bicycle stand near a tree at Churchgate

5.7 Mutilated tree trunk used as temple and as attic

5.8 Tree guard misused by vendors

5.9 Shelter for small entrepreneur, causing filthy surroundings

27



5.10 Stump of a tree used as table

24

5.11 Kailashpati tree very close to compound wall is unsafe for the structure

5.12 A proper tree base providing root aeration & irrigation, Subhash Nagar, Chembur

32

23

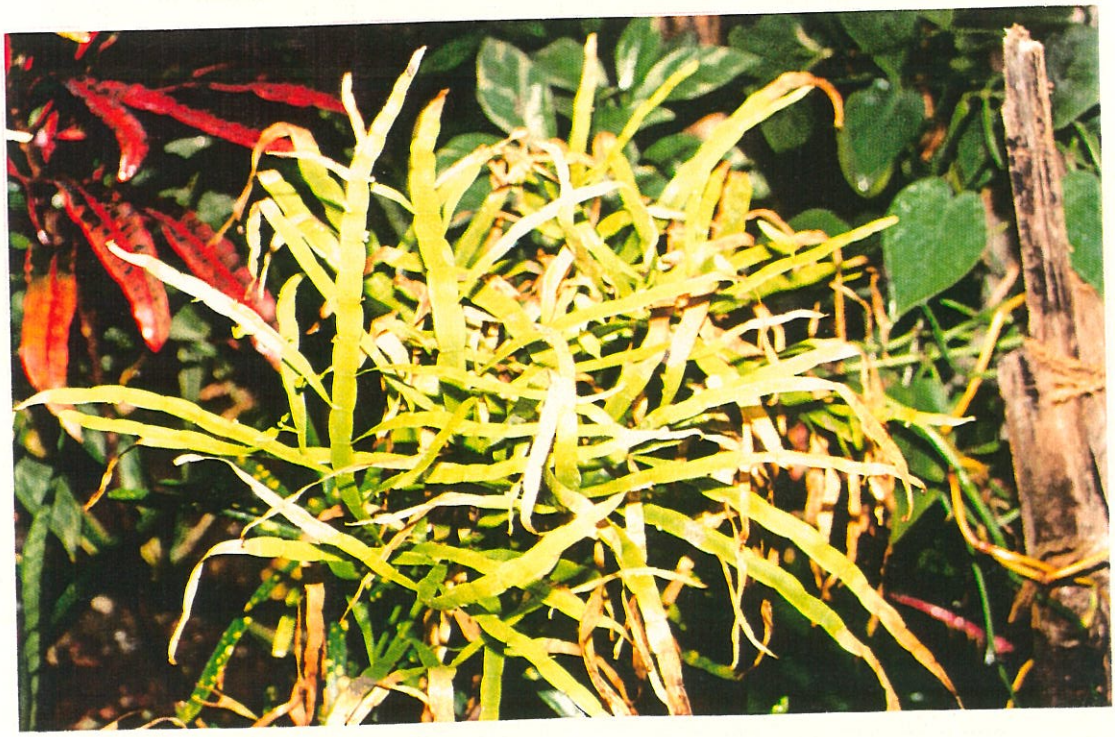
5.13 A tree asphalted around its base, adversely affecting root system, Veer Savarkar Marg, Dadar

5.14 Boganvel plants along sea front at Cuffe Parade

5.15 Saline water for irrigation + sea breeze causing injury to mango leaves

22

5.16 Monstera leaves showing tip burning due to salinity at Prabhadevi



5.17 Ornamental plant showing bleaching & tip burning due to saline conditions

6 RECOMMENDATIONS

6.1 Introduction

In view of the observations made throughout the Brihan Mumbai region during the year 2000 and keeping in view the objective of optional benefits derivable from urban greenery through maintenance of its good health following recommendations are made. The recommendations refer to different aspects of plantation in urban areas, from site selection to maintaining good form of the trees and shrubs planted. Objectives of plantation in urban areas are reiterated as – improvement of aesthetic appeal, improvement of local environment through amelioration of micro-climate, absorption of air pollutants and providing habitat for avifauna. Recommendations for betterment of existing plants are given, followed by guidelines for new plantation. Some cases repeatedly encountered in urban areas are also stated for necessary care.

6.2 Existing plantation

6.2.1 Watering

Periodic watering is recommended for most plants, even as they reach maturity. At least twice a week watering, about 5 litres at a time at the base of the trunk is recommended.

6.2.2 Nutrition

Application of 8 to 10 kg of Farmyard manure, twice a year, is recommended for each tree, to maintain / regain bright green colouration of foliage and its density. An occasional dose of urea will also enhance the brightness of foliage.

6.2.3 Soil

Occasional loosening of soil, which tends to get compacted due to trampling and other stresses as well as due to quick-flow irrigation by hose-pipes (as is often practiced at present) is recommended to ensure proper root respiration and nutrient absorption.

6.2.4 Leafy crowns

6.2.4.1 Washing

The leafy crowns should be washed with water sprays, at least thrice, during the dry season from November to May, so as to ensure their greenness, and efficiency for

sorption of pollutants. Mixing urea at 1% in spraying water enhances green colouration of crowns. If absolutely necessary, insecticide spray also may be practiced.

6.2.4.2 Trimming of branches

This should be practiced to the minimum possible extent, aimed only at instances like – removal of traffic hazard, proper spread of street light, safety of road users and danger to electrical installations.

Proper method for trimming – Major branches – A branch should be sawed (not hacked) (a) at a point nearest to the origin of the branch or (b) the cut should be perpendicular to the axis of the branch, that being cut. This will avoid (a) formation of stump or (b) will ensure minimal exposure of cut surface. Smoothen the cut surface with sand - paper. Apply non toxic paint to the smooth surface, to ensure non- oozing of plant sap, safety of plant against infections and non – visibility of cut scar in case of (a).

6.2.4.3 Training of branches

Ultimate and penultimate branches of trees near houses or electric poles, should be trained to avoid entering windows or affecting electric lamps. Training a branch is to bend / divert growth away from the potentially affected object. This is a delicate and painstaking process, requiring patience. Use of thick rubber tubes or rubber-coated wires proves adequate, for bending growing branches, without hurting the latter. The results proves rewarding since the resulting crown shape is aesthetically attractive and branches do not get `stumped'.

6.2.5 Tree guards

Iron or brick guards, set up for protecting seedlings / saplings should be removed once the plants grow to a stem thickness good enough to stand on its own and the leafy crowns have achieved height above the reach of the local browsing animals. Timely removal of guard will ensure normal growth of the shoot system and its escape from strangulation / over – crowding of branches within the guard perimeter.

6.3 New Plantation

6.3.1 Site selection

There are hardly any spaces available for new plantation in old parts of the city; only replacements are possible where the old plants face mortality. Wards B and C do not provide place for plants in public or even private places. Rest of Mumbai is luckier in this respect. Following recommendations are relevant for those places where there are some vacant places available for plantation and maintenance of healthy trees

6.3.1.1 Roads

a) Express highways major roads with wide footpaths, other roads – New trees along footpaths, about 2 meters from the edge of road. Strips of green (12M x 2M) with 2 trees, rather than a tree in $1M^3$ holes separated by 10 Meters in footpath is recommended (see Fig 6.1). Trees should be tall, without branches in lower 2 M of the trunk, big. dense crown of leaves, preferably evergreen, or with only a short leafless period (Refer Appendix A).

b) Road dividers – Short – statured shrubs should be planted here, to ensure that headlights from vehicles in opposite direction do not blind car drivers.

c) Traffic islands – Ornamental trees and shrubs of mainly aesthetic nature should be planted here. Delicate herbaceous plants that are sensitive to air pollution should be recommended here for monitoring air quality.

6.3.1.2 Railways

Plantation here should be similar to that along major roads. Wherever the railways tracks are on elevated or low-level ground, the sloping shoulders should be stabilized with grass and small shrubs..Care has to be taken to ensure that railway traffic is not affected in any way, due to spread of trees-branches in air and roots under ground.

6.3.1.3 Playground

Playgrounds should be surrounded by tall and medium-sized trees with wide, shadow providing crowns. Rim of the ground should be marked with green hedge of perennial shrubs. (Appendix A).

6.3.1.4 Residential areas

Tree and shrub plantation in residential premises should be for two purpose i) usufruct benefits to locals and ii) providing shade on houses which should get cooling effect to some extent. Care needs to be taken however, to avoid growing trees that spread their roots horizontally above or below the surface of ground, adversely affecting walls and other structures of houses (Photographs 6.4 and 5.11).

6.3.1.5 Institutional areas

Different types of institutions plant different trees as per their choice at the time of planting, It will be more rewarding to attend to the following suggestions to maximize plantation benefits as per functions of the institutions. A) Industries should plant broad-leaved evergreen trees, positioned strategically to ameliorate pollution emitted by the industry. They should also benefit by prompt removal of litter from ground, which may otherwise prove to be a fire-hazard. B) Commercial areas and offices may choose general interest plantation. C) Educational institutions and hospitals should plant trees to screen off roads and other pollution sources and maintain serene and tranquil environment on their premises. D) Recreational and Entertainment establishments will be benefited mainly by plantation of ornamentals. (Photograph 6.3).

All of these establishments will derive maximum benefits of plants when the latter are maintained the way described in 6.2.

6.3.2 Choice of species

For maximum benefit, plant species should be chosen judiciously, for maximum benefit to the environment, to the citizens and to the plants themselves through better chances for survival under urban stresses to which they are subjected. As a thumb rule, trees with evergreen foliage or those with short duration leaflessness are suitable in cities. Effective dense foliage attracts birds. Whereas roadside trees should have no branches for at least two meters from ground, spreading crowns are good for plantation in open places like playgrounds. Details of the discussion about nature of leaves, flowers, fruits etc. are beyond the scope of this project. A list of plant species suitable for different sites in cities, is given in the Appendix A. Reference to the list will be beneficial for urban environmental health.

6.3.3 Site treatment for plantation

Normal horticultural practices for digging of pits, filling the same with earth and manure mixture, pesticide treatment and use of quality seedling for plantation, followed by regular watering, soil loosening etc.are adequate. The prescribed discipline in the matter however, needs to be emphasized, since aftercare of saplings and young plants is often missing, leading to large-scale mortality of urban plants.

6.3.3.1 Roadside

In case of roads with proper footpaths and in case of highways within the city, a revised approach for roadside plantation is recommended. Instead of single tree in paved footpaths rows of 2 to 3 trees, along a belt (10 – 12 M long and 2 M wide) in the footpath is recommended, to facilitate working of soil and ensuring proper growth of roots, and consequently shoots of trees. (Refer Fig. 6.1)

6.4 Specific cases that call for specific recommendations

With its high population density and high level commercial activity and severe limitation in space, Brihan Mumbai city throws up some peculiar situations affecting welfare of trees, that cannot be attended to with generalized, routine solutions. A few such cases, needing care and attention are stated below.

6.4.1 Water shortage

It was observed that tube well water in Prabhadevi area is adversely affecting herbaceous plants and lawns in a co-op Hsg Society. Testing of water showed it to be saline (Table No.3.46) and hence harmful to delicate plants. Avenues should be explored to augment quality water supply. Recycling of wastewater from household should be tried, on a suitable scale. The effort is bound to prove rewarding since water is threatened to be progressively scarce commodity in near future.

6.4.2 Plantation on sea front

(a) Due to breeze from sea to land, it is difficult for young seedling to survive. Scorching of foliage of mature trees to salt-laden winds is also observed repeatedly. Special care of seedlings (protection by mats on windward side) is necessary. Adequate nutrient supply, watering and soil working are also needed to help young plants to survive and grow to maturity.

(b) The city sea-front promenades are constructed on scattered rocky – sandy formations, with conventional land filling some 60 – 80 years ago. Coconut and Barringtonia trees are planted on these. Few of these trees are healthy, due to poor root growth in residual, compact soil in the footpaths. In some places, the concrete footpaths have sunk due to washing off of landfills. The trees hence have little soil available for anchorage, especially for the deep-rooted Barringtonias. It is recommended that till suitable measures are taken to improve foundation of the promenades, only surface rooting coconut trees be planted in such sea-front areas, with protective measures as already suggested.(Refer Appendix A).

6.4.3 Road digging and Pavement working

These activities are almost continuous in the city, for one or other purpose, affecting roadside trees in two ways I) Injury to root system and ii) Extensive shoot damage, due to mis-handling and soil / dust deposition on foliage. Immaculate and painstaking planning for infrastructure development is recommended. Additionally, it is recommended that all road digging operations should be accompanied by immediate sprinkling of water to reduce dust load of air. After completion of work, closing of dug part should be done properly and asphalted immediately, to avoid raising of dust when vehicular traffic resumes on such patches.

6.4.4 Road widening

Widening of existing roads necessitate removal of trees that were initially planted as roadside trees along old roads. It is recommended that re-location of trees should be planned at the time of preparing blue-prints for road widening itself.

6.4.5 Misuse of trees

Instances of mis-use of trees are too common (photographs 5.1to 5.10). This should be avoided, especially when the activities of pavement dwellers / entrepreneurs cause direct or indirect, immediate or delayed injury to plants and cost their aesthetic appeal. Intervention by authorities in these cases is a must. One possible way of achieving this is given in 6.5.

6.5 Involvement of Society

It is recommended that citizen, individuals, organizations, institutions, etc. should be encouraged to adopt urban trees, groups / rows of trees for care in all possible ways, to

ensure healthy, efficiently functioning plants, improving urban environment. (Photograph 6.1 and 6.2).

6.6 For selecting plant species following criteria was considered.

Table: 6.1 Qualities considered desirable for selecting plant species for cultivation in different areas in cities.

	Location of trees & shrubs	**Desirable qualities**
1	Plants along Heavy Traffic Roads.	Tolerant to vehicular pollution, capture dust, form screen / filters along roadsides and protect roadside residents.
2	Plants along Light Traffic Roads.	Mainly as screen, to protect privacy of roadside residents.
3	Plants around Playgrounds	Provide shade and recreation to children.
4	Plant along Sea-front	Tolerate salt spray and wind, provide shade.
5	Plant along Residential Areas	Usufruct benefits (flowers, fruits). People's preferences, religious, aesthetics, etc.
6	Plants in Institutional Premises	Provide shade. Ornamental value.
7	Plants in Industrial Areas	Scavenge / Absorb air pollutants. Ornamental value.

6.7 List of plant species recommended for plantation in different types of areas, in Brihan Mumbai.

Table No. 6.2 :Trees For Industrial Areas

a) Tall Trees, in order of preference for their tolerance to pollutant gases

No	Name	Family	Common Name(s)
1.	*Ficus benghalensis*	Moraceae	Banyan, Wad
2.	*Spathodea campanulata*	Bignoniaceae	African Tulip Tree
3.	*Roystonea regia*	Palmae	Bottle palm
4.	*Pterygota alata*	Sterculiaceae	Narikel
5.	*Casuarina equisetifolia*	Casuarinaceae	Suru

b) Small trees / Shrubs

No	Name	Family	Common Name(s)
1.	*Nerium indicum*	Apocynaceae	Kanher
2.	*Callistemon lanceolatus*	Myrtaceae	Bottle Brush
3.	*Saraca asoca*	Caesalpiniaceae	Ashok
4.	*Ixora arborea*	Rubiaceae	Nevali
5.	*Ixora nigricans*	Rubiaceae	
6.	*Guaiacum officinale*	Zygophyllaceae	Lignum-Vitae
7.	*Lagerstromia indica*	Lythraceae	Chinai Mendi
8.	*Cassia alata*	Caesalpiniaceae	Ringworm Senna

Table no. 6.3 : Trees for Heavy Traffic Roads, in order of preference (more tolerant one at the top of the table).

a) Tall Trees

No.	Name	Family	Common Name(s)
1.	*Alstonia scholaris*	Apocynaceae	Saptaparni, Satvin
2.	*Acacia auriculaeformis*	Mimosaceae	Australian Acacia
3.	*Acacia holoceracea*	Mimosaceae	Australian Acacia,(White)
4.	*Barringtonia racemosa*	Lecythidaceae	Samudraphal
5.	*Chrysophyllum cainito*	Sapotaceae	Star Apple
6.	*Peltophorum pterocarpum*	Caesalpinaceae	Sonmohar
7.	*Samania saman*	Mimosaceae	Rain Tree
8.	*Thespesia populnea*	Malvaceae	Bhendi
9.	*Pterygota alata*	Sterculiaceae	Narikal
10.	*Spathodea campanulata*	Bignoniaceae	African Tulip Tree
11.	*Tabebuia pentaphylla*	Bignoniaceae	
12.	*Ficus benghalensis*	Moraceae	Banyan, Wad
13.	*Ficus benjamina*	Moraceae	Pimpri
14.	*Cassia siamea*	Caesalpiniaceae	Kasod
15.	*Barringtonia acutangula*	Lecythidaceae	Tivar
16.	*Anthocephalus cadamba*	Rubiaceae	Kadamb
17.	*Albizia lebbek*	Mimosaceae	Sirish
18.	*Albizia procera*	Mimosaceae	Kinhai
19.	*Ficus religiosa*	Moraceae	Pimpal
20.	*Sterculia foetida*	Sterculiaceae	Jangli Badam
21.	*Pongamia pinnata*	Fabaceae	Pangara
22.	*Putranjiva roxburghii*	Euphorbiaceae	Putranjiva
23.	*Syzygium cuminii*	Myrtaceae	Jambhul
24.	*Parkia bigladulosa*	Mimosaceae	Chenduphal
25.	*Castanospermum australe*	Fabaceae	Morton Bay Chestnut
26.	*Delonix regia*	Caesalpiniaceae	Gulmohar

b) Small Trees & Shrubs

No	Name	Family	Common Name(s)
1.	*Nerium indicum*	Apocynaceae	Kanher
2.	*Thevetia peruviana*	Apocynaceae	Piwali- Kanher
3.	*Cordia sebestena*	Boraginaceae	Scarlet-cordia
4.	*Kigelia pinnata*	Bignoniaceae	Sausage Tree
5.	*Lagerstroemia speciosa*	Lythraceae	Taman
6.	*Pongamia pinnata*	Fabaceae	Karanj
7.	*Ixora arborea*	Rubiaceae	Nevali
8.	*Hibiscus tiliaceus*	Malvaceae	Belpatta
9.	*Ixora nigricans*	Rubiaceae	Katkura
10.	*Cordia dichotoma*	Boraginaceae	Bhokar
11.	*Cassia fistula*	Caesalpiniaceae	Altamas, Bahawa
12.	*Cassia renigera*	Caesalpiniaceae	
13.	*Cassia alata*	Caesalpiniaceae	Ringworm Senna
14.	*Cassia javanica*	Caesalpiniaceae	
15.	*Diospyros peregrina*	Ebenaceae	Timbuni
16.	*Lagerstroemia indica*	Lythraceae	Chinai Mendi
17.	*Muntingia calabura*	Tiliaceae	Barbados Cherry

Table No. 6.4 : Trees For Light Traffic Roads, in order of preference (more tolerant one at the top of the table).

a) Tall Trees

No	Name	Family	Common Name(s)
1.	*Ficus benjamina*	Moraceae	Pimpri
2.	*Kleinhovia hospita*	Sterculiaceae	
3.	*Spathodea campanulata*	Bignoniaceae	African Tulip Tree
4.	*Polyalthia longifolia*	Annonaceae	Asupalav
5.	*Michelia champaca*	Magnoliaceae	Son-champa
6.	*Ficus religiosa*	Moraceae	Pipal
7.	*Mangifera indica*	Anacardiaceae	Mango-Amba
8.	*Syzygium cuminii*	Myrtaceae	Jamun
9.	*Millingtonia hortensis*	Bignoniaceae	Akashneem

b) Small Trees & Shrubs

No	Name	Family	Common Name(s)
1.	*Ficus elastica*	Moraceae	India Rubber Plant
2.	*Cassia siamea*	Caesalpinaceae	Kasod
3.	*Cassia fistula*	Caesalpiniaceae	Amaltas, Bahawa
4.	*Cassia alata*	Caesalpiniaceae	Ringworm Senna
5.	*Muntingia calabura*	Tiliaceae	Barbados Cherry
6.	*Tecoma stans*	Bignoniaceae	
7.	*Gliricidia sepium*	Fabaceae	Undir Mari
8.	*Calliandra sp.*	Mimosaceae	
9.	*Adenanthera pavonia*	Mimosaceae	Ratan Gunj

Table no. 6.5 : Trees on Sea Front, in order of preference, more tolerant to salt spray at the top of the table.

No	Name	Family	Common Name(s)
1.	*Casuarina equisetifolia*	Casuarinaceae	Suru
2.	*Barringtonia recemosa*	Lecythidaceae	Samudraphal
3.	*Cocos nucifera*	Palmae	Coconut, Naral
4.	*Terminalia catappa*	Combretaceae	Jangli Badam
5.	*Thespesia populnea*	Malvaceae	Bhendi
6.	*Pongamia pinnata*	Fabaceae	Karanj
7.	*Pithocellobium dulce*	Mimosaceae	Vilayati Chinch
8.	*Parkinsonia aculeata*	Caesalpiniaceae	Vilayati Bhabhal
9.	*Nerium indicum*	Apocynaceae	Kanher
10.	*Barringtonia acutangula*	Lecythidaceae	Tivar
11.	*Kigelia pinnata*	Bignoniaceae	Sausage Tree
12.	*Calophyllum inophyllum*	Clusiaceae	Undi
13.	*Cerbera manghas*	Apocynaceae	Sukanu
14.	*Streblus asper*	Moraceae	Kharota
15.	*Thevetia peruviana*	Apocynaceae	Piwali- Kanher
16.	*Bougainvillea sp.*	Nyctaginaceae	Boganvel

Table no. 6.6 : Trees for Residential Premises, recommended on the basis of their utility and for safety to houses.

a) Tall Trees

No	Name	Family	Common Name(s)
1.	*Anthocephalus cadamba*	Rubiaceae	Kadamb—Shade
2.	*Artocarpus heterophyllus*	Moraceae	Phanas--Fruit,Shade
3.	*Cocos nucifera*	Palmae	Coconut, Naral
4.	*Melia azedarach*	Meliaceae	Neem--Medicinal
5.	*Mangifera indica*	Anacardiaceae	Mango-Amba-Fruit
6.	*Michelia champaca*	Magnolia	Sona-champa, Flowers
7.	*Polyalthia longifolia*	Anonaceae	Asupalav-Ornamental
8.	*Roystonea regia*	Palmae	Bottle Palm--Ornamental

b) Small Trees / Shrubs

No	Name	Family	Common Name(s)
1.	*Bauhinia purpurea*	Caesalpiniaceae	Dev Kanchan--Ornamental
2.	*Bauhinia variegata*	Caesalpiniaceae	Kachnar- Ornamental
3.	*Brownea coccinia*	Caesalpiniaceae	Ornamental
4.	*Caesalpinia pulcherrima*	Caesalpiniaceae	Sankasur- Ornamental
5.	*Cestrum nocturnum*	Solanaceae	Night Queen, Ratrani
6.	*Ficus elastica*	Moraceae	India Rubber plant --Ornamental
7.	*Gardenia jasminoides*	Rubiaceae	Gandharaj--flowers
8.	*Guaiacum officinale*	Zygophyllaceae	Lignum-Vitae Ornamental
9.	*Ixora arborea*	Rubiaceae	Nevali -- Flowers
10.	*Lagerstromia indica*	Lythraceae	Chinai Mendi --Ornamental
11.	*Lawsonia inermis*	Lythraceae	Mendi -- Foliage
12.	*Murraya paniculata*	Rutaceae	Kunti -- Flowers
13.	*Nerium indicum*	Apocynaceae	Kanher -- Ornamental
14.	*Nyctanthes arbortristis*	Oleaceae	Parijatak -- Flowers
15.	*Saraca asoca*	Caesalpiniaceae	Ashok -- Flowers
16.	*Tecoma stans*	Bignoniaceae	Ornamental
17.	*Thevetia peruviana*	Apocynaceae	Piwali- Kanher --Flowers

Table No. 6.7 :Trees For Institutional Premises Recommended for shade and aesthetic value and can withstand urban dusty atmosphere.

a) Tall Trees

No	Name	Family	Common Name(s)
1.	*Alstonia scholaris*	Apocynaceae	Saptaparni, Satvin
2.	*Anthocephalus cadamba*	Rubiaceae	Kadamb
3.	*Cordia sebestena*	Boraginaceae	Scarlet-cordia
4.	*Peltophorum pterocarpum*	Caesalpiniaceae	Sonmohar
5.	*Delonix regia*	Caesalpiniaceae	Gulmohar
6.	*Ficus benjamina*	Moraceae	Pimpri
7.	*Putranjiva roxburghii*	Euphorbiaceae	Putranjiva
8.	*Lagerstroemia speciosa*	Lythraceae	Taman
9.	*Mangifera indica*	Anacardiaceae	Mango-Amba
10.	*Michelia champaca*	Magnoliaceae	Sona-champa
11.	*Millingtonia hortensis*	Bignoniaceae	Akashneem
12.	*Polyalthia longifolia*	Anonaceae	Asupalav

b) Small Trees /Shrubs

No	Name	Family	Common Name(s)
1.	*Bauhinia purpurea*	Caesalpiniaceae	Dev Kanchan
2.	*Bauhinia variegata*	Caesalpiniaceae	Kachnar
3.	*Brownea coccinia*	Caesalpiniaceae	
4.	*Nerium indicum*	Apocynaceae	Kanher
5.	*Caesalpinia pulcherrima*	Caesalpiniaceae	Sankasur
6.	*Cassia alata*	Caesalpiniaceae	Ringworm Senna
7.	*Cassia fistula*	Caesalpiniaceae	Amaltas
8.	*Ixora nigricans*	Rubiaceae	
9.	*Lagerstromia indica*	Lythraceae	Chinai Mendi
10.	*Nyctanthes arbortristis*	Oleaceae	Parijatak
11.	*Pisonia aculeata*	Nyctaginceae	
12.	*Saraca asoca*	Caesalpiniaceae	Ashok
13.	*Murraya paniculata*	Rutaceae	Kunti
14.	*Mussaenda erythrophylla*	Rubiaceae	

Table no. 6.8 : Trees Around playgrounds, in order of preference, more desirable at the top of the table.

No	Name	Family	Common Name(s)
1.	*Ficus benghalensis*	Moraceae	Banyan, Wad
2.	*Cordia sebestena*	Boraginaceae	Scarlet-cordia
3.	*Spathodea campanulata*	Bignoniaceae	African Tulip Tree
4.	*Thespesia populnea*	Malvaceae	Bhendi
5.	*Tamarindus indica*	Caesalpiniaceae	Chinch, Tamarind
6.	*Barringtonia recemosa*	Lecythidaceae	Samudraphal
7.	*Peltophorum pterocarpum*	Caesalpiniaceae	Sonmohar
8.	*Kigelia pinnata*	Bignoniaceae	Sausage Tree
9.	*Ficus religiosa*	Moraceae	Pipal
10.	*Ficus benjamina*	Moraceae	Pimpri
11.	*Syzygium cuminii*	Myrtaceae	Jamun
12.	*Mangifera indica*	Anacardiaceae	Mango-Amba
13.	*Polyalthia longifolia*	Anonaceae	Asupalav
14.	*Delonix regia*	Caesalpiniaceae	Gulmohar
15.	*Pithocellobium dulce*	Mimosaceae	Vilayati Chinch

6.1 Beatification by Resident Forum, Near Diamond Garden, Chembur

6.2 Covering nallahs by concrete pots with ornamentals at Chembur

6.3 Screen of Asupalav : protection from noise & dust pollution at Kalidas Natya Mandir, Mulund

6.4 Screen of Asupalav protection from noise & dust pollution at Chembur

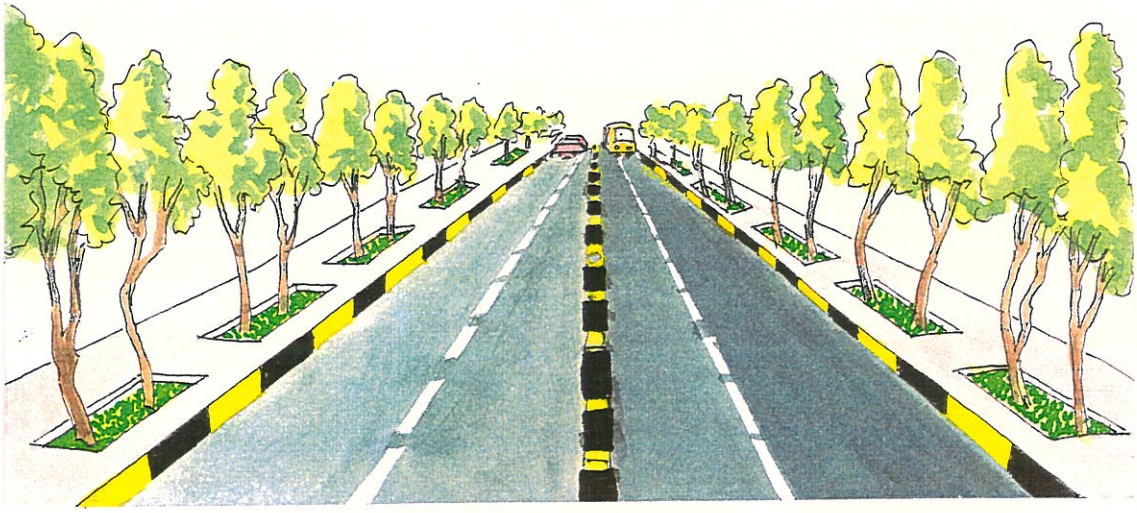


Fig.6.1 Suggested type of plantation along road

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