



Study of Dust Pollution Caused by Traffic in Thiruvanmiyur Area of Chennai City

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Key Words:

Dust pollution
Dust fall rate
Vehicular Traffic
Chennai city

ABSTRACT

The present study deals with the dust pollution caused by vehicles in Thiruvanmiyur area of Chennai city. Four important roads viz., East Coast road, Adayar road, Tidal Park road and Lattice Bridge road of Chennai city were selected. Data revealed that East Coast road was the busiest on which maximum number of vehicles (4221) were passed followed by Adayar road (3668), Lattice Bridge road (2208) and Tidal Park road (2138). On the whole, heavy vehicles were recorded to be in maximum number at all the points on all the roads. Dust fall rate on Tidal Park road (11.14 g/m²/month) and East Coast road (11.15 g/m²/month) was found to be less, as the condition of the two roads was good and they were used by tourists, software company officers and industrialists etc. The roads were also well maintained by the Corporation of Chennai. The dust fall rate at Adayar road (12.95g/m²/month) and Lattice Bridge road (12.98 g/m²/month) was found to be highest, because these road were thickly populated and in very bad condition.

INTRODUCTION

Dust pollution these days is becoming a major problem in urban areas due to daily addition of substantial number of new vehicles, transportation, loading and transfer operations, stone crushing, construction, poor condition of roads and other anthropogenic practices. Soil and other bulk materials resuspended by wind, vehicular traffic, sweeping and handling processes result in considerable contribution to local air quality degradation (Chow et al. 1991). The emission of dust from the sources is more during the day time than night time. Principal sources of contribution to particulate matter include road dust, emissions from foundries, testing of diesel engines and automobile exhausts (Khare et al. 1985). Because of these emissions, the public health implications (David 1995) are substantial. An improved understanding of the association of the particulates with mortality suggests the importance of submicron particles (PM10) to which motor vehicles are major contributors (Anon 1995).

The effect of dust pollution is not only limited to human beings, animals and plants but it is also harmful to sophisticated instruments, household things and dietary products. Keeping in view the importance of dust pollution for living organisms, plants and animals and their related articles, an attempt has been made for the first time to estimate the dust pollution caused by road traffic in Thiruvanmiyur area of Chennai city.

MATERIALS AND METHODS

Four roads of south Chennai areas viz., East Coast road, Lattice Bridge road, Mahathma Gandhi road (Adayar road) and Tidal Park road were selected for the present study. Three locations on each road i.e., starting point (2 km), 3 km inside city and 3 km outside the city were selected. The field work was done in the month of May, 2006. The *Epipremnum pinnatum* (L, 1) plant, a common climber having medium sized leaves, not eatable by animals and *Dracaena draco* (L, 2) plant, a shrub found commonly on both sides of the roads, were selected as experimental plants.

About 15-20 leaves (*E. pinnatum* and *D. draco*) selected from different plants at different sites on each road were washed thoroughly with water and tagged with full information for further identification. The number of different types of vehicles and animal-carts passed in half an hour were counted at three different locations at different times, 6.00 to 6.30 A.M., 12.00 noon to 12.30 P.M. and 6.00 to 6.30 P.M. The counting was repeated three times at each location. After one month, 10 leaves were terminated from each plant at each site. The leaves containing dust were collected in polythene bags separately and brought to laboratory for further investigation. The terminated leaves with dust were weighed to take the initial weight. Then the leaves were washed immediately with water and dried with blotting paper to take the final weight (without dust). The difference between the two weights was taken as the weight of dust on the leaf surface. The leaf surface area was also measured. The dust fall rate was calculated by the formula of Sharma (2001).

$$\text{Dust fall rate} = w/a \times 30/t$$

Where, w = weight of dust (g), a = area of leaf surface (cm²), t = time in days for which the leaf remained on plant under observation.

The total leaf area of collected leaves from all the sites and roads was determined. Likewise the total weight of dust was also determined. Total dust fall rate was expressed in g/m²/month.

RESULTS AND DISCUSSION

The results of the present study are presented in Tables 1 and 2. The data show that at inside city and outside city highest numbers of vehicles pass on the East Coast road followed by Adayar road, Tidal Park road and Lattice Bridge road. The highest number of vehicles of about 1520/day passed on East Coast road followed by 1407/day on the Adayar road. Outside the city, the total number of vehicles passing through the Tidal Park road and the Lattice Bridge road was 790/day and 884/day respectively. The number of vehicle passed inside the city, 3 km away from the starting point, was 1414, 1192, 790 and 625 per day for the East Coast road, Adayar road, Tidal Park road and Lattice Bridge road. The total number of vehicles passed at the starting point of East Coast road, Adayar road, Lattice Bridge and Tidal Park road were 1287, 1069, 699, and 639 per day. Among the vehicles, heavy vehicles were maximum in number at each point, followed by two wheelers, three wheelers and animal carts. 6.00 to 6.30 P.M. was the peak time when maximum number of vehicles were seen at each point followed by 12.00 noon to 12.30 P.M. and 6.00 to 6.30 P.M. for East Coast road, Adayar road and Tidal park road except for the Lattice Bridge road, where in the total number of vehicles was maximum at 6.00 to 6.30 P.M. followed by 6.00 to 6.30 A.M. and 12.00 to 12.30 P.M. (Table 1).

The total number of two wheelers passed on the roads was maximum (Table 2) at outside city, (1710/day) followed by inside city (1447/day) and starting point 1211/day. The recorded data showed that the three wheelers were maximum (1094/day) at outside city followed by inside city (974/day) and starting point. The total numbers of heavy vehicles plying on these roads were maximum at

Table 1: Types and number of vehicles, and dust pollution caused by them on different roads of Chennai.

Vehicles Passed	Starting Point (0 km)				Inside City (3 km)				Outside City (3 km)				Total
	AD	ECR	TID	L.B	AD	ECR	TID	L.B	AD	ECR	TID	L.B	
6.00-6.30 A.M.													
Two Wheelers	68	80	53	50	93	98	56	56	97	86	62	52	851
Three Wheelers	80	68	48	38	84	72	54	50	59	68	59	94	774
Heavy Vehicles	101	110	66	49	76	140	45	47	80	95	46	38	893
Animal Carts	02	03	07	03	02	03	09	10	02	03	04	06	54
12.00- 12.30 P.M.													
Two Wheelers	94	179	116	118	146	134	72	66	234	216	95	159	1629
Three Wheelers	147	183	59	73	80	114	80	40	178	125	70	95	1244
Heavy Vehicles	264	305	88	95	152	186	77	50	205	286	142	102	1952
Animal Carts	01	06	02	04	01	04	02	03	02	02	06	09	42
6.00-6.30 P.M.													
Two Wheelers	110	133	83	127	234	216	141	135	196	254	119	140	1888
Three Wheelers	77	72	54	75	132	133	60	58	82	110	74	80	1007
Heavy Vehicles	172	146	56	62	187	305	107	99	264	273	105	99	1826
Animal Carts	03	02	07	05	05	09	06	11	07	02	08	10	75
Total Vehicles	1069	1287	639	699	1192	1414	709	625	1407	1520	790	884	12235
Weight of dust (g/m ² /month)	19.41	12.46	12.07	13.07	08.45	12.35	12.53	15.54	11.00	12.07	8.83	9.72	12.05

AD-Adyar Road, ECR-East Coast Road, TID-Tidel Park Road, L.B-Lettice Bridge Road

Table 2: Study of dust pollution caused by traffic on different roads of Thiruvanmiyur, Chennai.

Distance	Vehicle Passed	Adayar Road	East Coast Road	Tidal Park Road	Lattices Bridge Road	Total
Starting Point (0 km)	Two Wheelers	272	392	252	295	1211
	Three Wheelers	304	323	161	186	974
	Heavy Vehicles	487	561	210	206	1464
	Animal Carts	06	11	16	12	45
Inside City (3 km)	Two Wheelers	473	448	269	257	1447
	Three Wheelers	296	319	194	148	957
	Heavy Vehicles	415	631	229	196	1471
	Animal Carts	08	16	17	24	65
Outside City (3 km)	Two Wheelers	527	556	276	351	1710
	Three Wheelers	319	303	203	269	1094
	Heavy Vehicles	550	654	293	239	1736
	Animal Carts	11	07	18	25	61
Total		3668	4221	2138	2208	12235
Average dust fall (g/m ² /month)		12.95	11.15	11.14	12.98	12.05

outside city (1736/day) followed by inside city (147/day) and starting point (1464/day). The maximum numbers of animal carts were recorded at inside city (65/day) followed by outside city 161/day and starting point (45/day).

Data showed that East Coast road was the busiest on which maximum numbers of vehicles (4221)

were passed followed by Adayar road (3668), Lattice Bridge road (2208) and Tidal Park road (2138). On the whole, heavy vehicles were recorded to be maximum in number at all the points on all the roads.

Dust fall rate on Tidal Park road was found less at Tidal Park road (11.14 g/m²/month) and on East Coast road (11.15 g/m²/month) as the condition of roads was good. These roads were used by tourists, software company officers, industrialists, etc., and were well maintained by the Corporation of Chennai.

The dust fall rate at Adayar road and Lattice bridge road was highest (12.95 g/m²/month, 12.98 g/m²/month) because the roads were in very bad condition and thickly populated. The traffic also moves on non-metalled portions, which are made only for pedestrians. The traffic movement on the open soil on Lattice Bridge road results in blowing of soil dust into the atmosphere. Due to these facts this road recorded the highest dust fall rate among the major roads of south Chennai city.

Generally, dust fall rate was found to be increasing from outside city to inside city. This may be due to more traffic towards the city as maximum number of vehicles passed at 3 km inside city (4601) as compared to starting point (3694) and at outside city (3940). The average dust fall rate per unit area was 34 g/m²/month in Chennai city. Similar results have been recorded by Lone et al. (2005) in Aligarh city. Vehicles actually act as vector for spreading dust pollution. Gupta & Vidya (1994) considered that increased vehicular traffic during tourism period is one of the major activities which contribute SPM in the atmosphere. Mohan et al. (1992) also observed that the vehicular traffic is responsible for indoor and outdoor pollution. The present study also showed that the dust pollution on road was due to traffic as well as due to poor condition of roads. Anon (1996) in his studies suggested the options for reducing air pollution from mobile sources include replacing old vehicles, maintaining in-use vehicles more effectively, using alternative cleaner fuels, reformulating fuels, improving traffic management, expanding mass transit systems and improving the road capacity.

The dust pollution estimation in Indian cities is lacking. Therefore, there is an urgent need to estimate the dust fall rate in each and every city of the country and strategies should be made for proper construction of roads and reduction in number of vehicles. At the same time sources of dust should be checked by growing grasses on both sides of roads.

REFERENCES

- Anon, 1995. Diesel exhausts - A critical analysis of emissions, exposure and health effects. Health Effect Institute, Cambridge, Massachusetts.
- Anon, 1996. Air Quality Monitoring in Calcutta During the Period October 1995 to October 1996, West Bengal Pollution Control Board, pp.11.
- Chow., J.C., Pritchett, L.C., Watson, J., Frazier, C. and Houch., J, 1991. A multiple port resuspension for fugitive dust characterization. Air Waste Manage. Assoc. Pittsburgh P.A. USAP. 155.
- David, B.P. 1995. The effect of air pollution in asthma and respiratory allergy - An American experience. Jr. Allergy Chemical Immunology, 8: 19-23.
- Gupta, D. and Vidya, A. 1994. Ambient air quality of Shimla town with reference to suspended particulate matter. Ind. J. Env. Health, 36(1): 40-42.
- Khare, P., Kulshreshtha, U.C., Saxena, A., Kumar, N., Kumari, K.M. and Srivastava., S.S. 1985. The source apportionment of particulate matter using enrichment factor and principal component analysis. Ind. J. Env. Health, 38(1): 86-94.
- Lone, P.M., Khan, A.A. and Shah, S.A. 2005. Study of dust pollution caused by traffic in Aligarh City. Indian J. Environ. Hlth., 47(4): 33-36.
- Mohan, J., Gadgil, A. and Pawar, N. J. 1992. Indoor air quality assessment at selected locations in Pune city. Ind. J. Env. Health, 34(3): 209-213.
- Sharma, P.D., 2001. Ecology and Environment. Rastogi Publications, Meerut, India, pp. 416-419.