

Dust monitoring in Alibag using *Ficus hispida* L

Abstract

Technology is an expensive method for monitoring any pollution in the atmosphere. In this work *Ficus hispida* a commonly growing weed in the coastal region of Alibag is used to monitor dust at various locations in the fast developing region. Ten sites were selected and foliar dust was monitored throughout the dry season of 2017. The dust fall showed seasonal variations at different sites and co-related well with local conditions prevalent at the site. The work throws light on the levels of dust pollution in the region and that *Ficus hispida* L. can effectively be used to monitor dust. The plant species has exceptionally rough surface with large leaves, which proves as effective dust capturer.

Keywords: monitoring dust, local biodiversity, *Fisucs hispida*, cheap effective method

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Introduction

Raigad district is a part of west coast of Arabian Sea. It has approximately 240km. coast in West of the Indian peninsular region. The district is rich in natural resources, and is geographically divided into sea coast, central belt and hilly Sahyadri ranges.

There are about 915 industries in Raigad region. Out of which 336 falls under RED category, 202 falls under ORANGE and remaining in GREEN category according to the pollution control boards.

Alibag is located about 120km south of Mumbai at 18°38'29" N 72°52'20" E. tourism is the mainstay of town's economy since the late 1990s. The town and municipality have seen development of industrial sites. RCF was the first industrial unit set up near Alibag at Thal. Other companies include JSW Steel at Dolvi, JSW Steel at Salav, Gas Authority of India Limited at Usar (GAIL), Marine Frontiers Boatyards located at Dharamtar.

Environmental pollution is an unwanted side effect of accelerated pace of industrialization during the past century. However industrialization cannot be stopped at this stage of our development. Since it has become indispensable for providing basic necessities of life. Vegetation is the best possible sink for atmospheric pollutants. Plants also have been used to monitor dust.¹ Leaves of plants have been regarded as bio filters as they absorb large quantities of particles from the environment.^{2,3}

Plants intercepts tons of dust on busy highways and dust is never constant in the atmosphere. It keeps changing with respect to variations in place, time, season, climate, etc. Wind speed, air temperature, inversions, clouds cover all influence particle movements.⁴ The current work aims at understanding the dust holding capacity a roadside plants in Alibag. Alibag is the most favorite travel destination for people near Mumbai and Pune.

Material and methods

Survey of Roadside Vegetation

A survey of plants growing along roadsides and dividers was carried out in Alibag. *Ficus hispida* L. is a common weed frequently occurring in the region of Alibag. It has extremely rough surface. 10 dustiest sites on highways and heavy traffic areas were selected. The study was carried out in dry season i.e. from January 2017 to May 2017. Leaves from this plant were selected from 10 sites and dust fall estimated.

Estimation of dust fall

Ten dustiest sites were selected. Few leaves of *Ficus hispida* L. were washed at the site and marked. At the 7th day the leaves were washed and dust was estimated on the foliar surface.⁵ The leaves were washed with water and filter through Whatmann paper no.1. once washed leaves were traced on graph paper to determine leaf area in m². Dust fall was calculated in gms/m² by method given by (Table 1).^{6,7}

Table 1 Description of sites

S. no	Name of the site	Site description
1	Anand nagar	Residential area with moderate traffic.
2	Revas Road	Very heavy traffic
3	Rautwadi Road	Heavy traffic
4	Versoli Road	Moderate traffic
5	Revdanda Bypass Road	Heavy vehicular traffic consisting of all types of vehicles.
6	Gondhalpada road	Near residential area so less traffic.
7	Pimpalbhath Road	Heavy continuous traffic.
8	Khandala Road	Moderate traffic with heavy vehicles
9	Chendhre bypass Road	Connecting road to highway , less traffic.
10	Karle Khind Road	Heavy traffic with all types of vehicles.

Results and discussion

The results of foliar dust collected on *Ficus hispida* L. in dry season are represented in Table 2.

Table 2 Dust fall on the leaves of *Ficus hispida* L. in gm/m² at sites during the study.

S.no	Jan	Feb	Mar	Apr	May	Nov	Dec
1	60	58.125	20.001	7.976	62.73	7.982	2.83
2	75	75.154	6.538	8.85	79.28	22.44	1.54
3	35	31.01	38.696	19.68	41.22	19.68	3
4	100	154.89	29.47	12.5	142.13	86.4	3.33
5	100	96.95	8	22.44	88.33	53.94	2.11
6	100	121.16	7.386	5.727	86.89	8.86	1.05
7	90	109.81	63.61	85.98	94.24	63.2	1
8	27	26.06	5.88	15.538	30.21	99.1	3.06
9	180	167.77	17.96	68.36	150.29	72.28	2.99
10	150	145.36	29.784	34.29	87.88	69.11	1.53

Anand nagar: This site showed maximum dust fall in month of May 62.73gms/m² and drop down in December 2.83gms/m² (Figure 1).

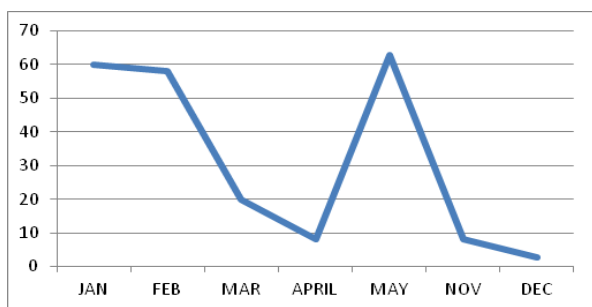


Figure 1 Seasonal Variation in Dustfall using *Ficus hispida* L. in g/m² at Site 1.

Revas road: This site is having heavy traffic and showed maximum dust 79.2gms/m² in month of May and minimum 1.54gms/m² in December (Figure 2).

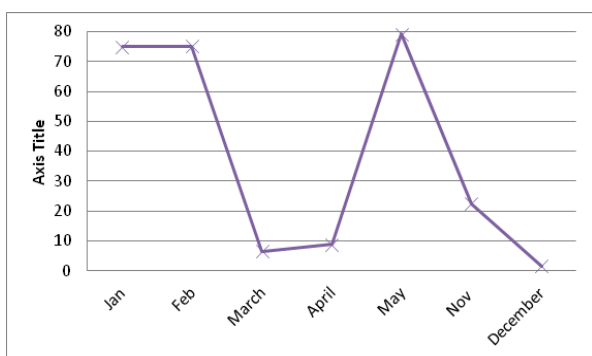


Figure 2 Seasonal Variation in Dustfall using *Ficus hispida* L. in g/m² at Site 2.

Rautwadi road: Maximum dust fall in month of May is 41.2gms/m² and minimum 3gms/m² in month of December (Figure 3).

Versoli road: Maximum dust fall in month of Feb is 154.89gms/m² and minimum 3.33gms/m² in month of December (Figure 4).

Revdandabypassroad: Maximum dust fall in month of Feb is 96.95gms/m²

and minimum 2.11gms/m² in month of December (Figure 5).

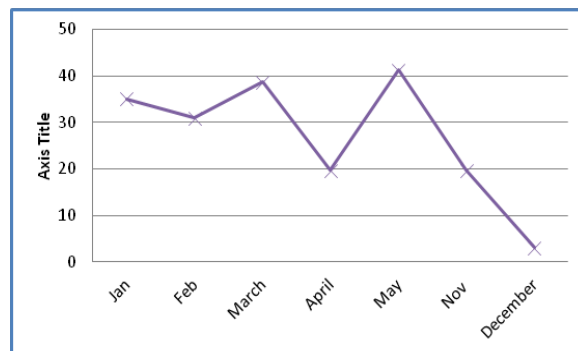


Figure 3 Seasonal Variation in Dustfall using *Ficus hispida* L. in g/m² at Site 3.

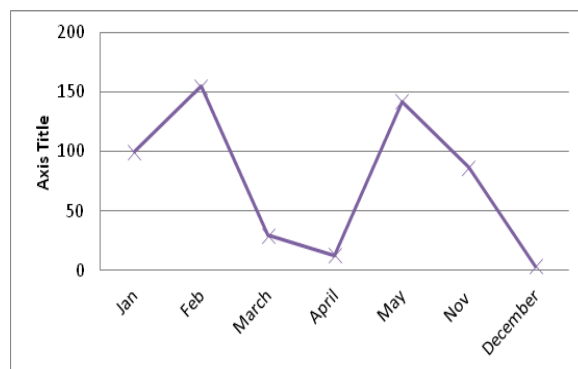


Figure 4 Seasonal Variation in Dustfall using *Ficus hispida* L. in g/m² at Site 4.

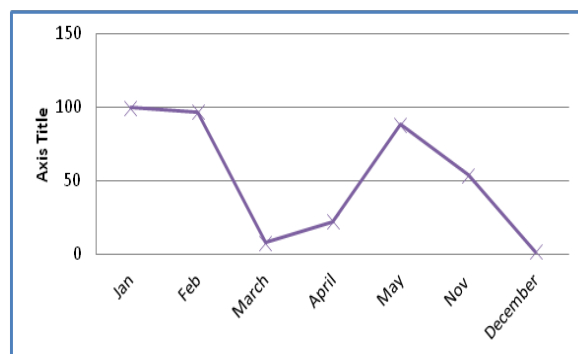


Figure 5 Seasonal Variation in Dustfall using *Ficus hispida* L. in g/m² at Site 5.

Gondhalpada road: Maximum dust fall in month of Feb is 121.16gms/m² and minimum 1.05gms/m² in month of December (Figure 6).

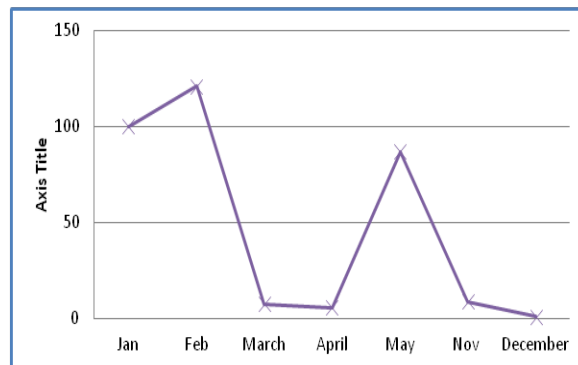


Figure 6 Seasonal Variation in Dustfall using *Ficus hispida* L. in g/m² at Site 6.

Pimpalbhath road: Maximum dust fall in month of Feb is 109.81gms/m² and minimum 1gms/m² in month of December (Figure 7).

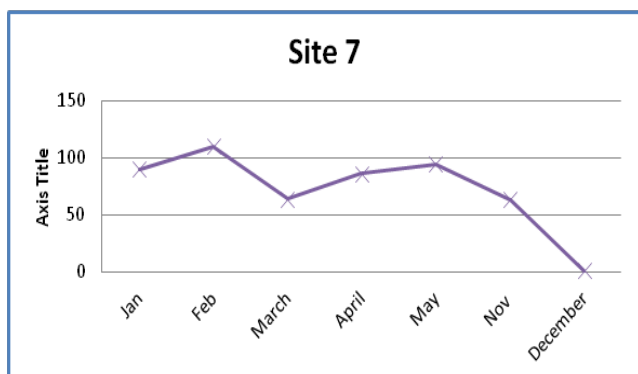


Figure 7 Seasonal Variation in Dustfall using *Ficus hispida* L. in g/m² at Site 7.

Khandala road: Maximum dust fall in month of Feb is 99.10gms/m² and minimum 3.0gms/m² in month of December (Figure 8).

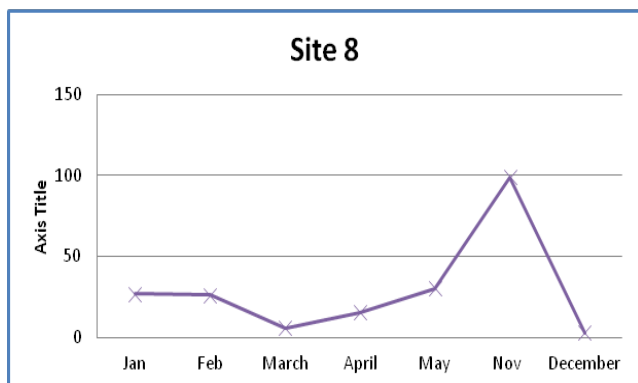


Figure 8 Seasonal Variation in Dustfall using *Ficus hispida* L. in g/m² at Site 8.

Church, bypass road: Maximum dust fall in month of Feb is 167.77gms/m² and minimum 2.99gms/m² in month of December (Figure 9).

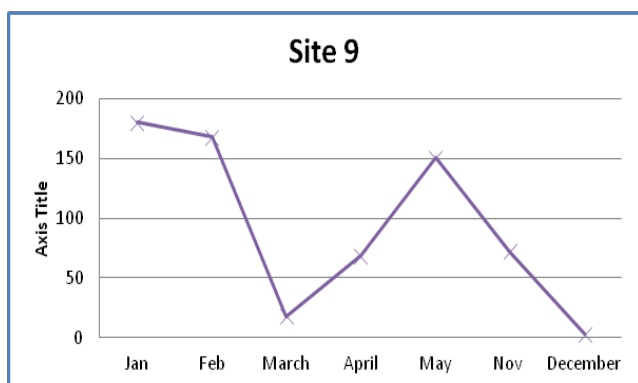


Figure 9 Seasonal Variation in Dustfall using *Ficus hispida* L. in g/m² at Site 9.

Karle khind road: Maximum dust fall in month of Feb is 145.36gms/m² and minimum 1.53gms/m² in month of December (Figure 10).

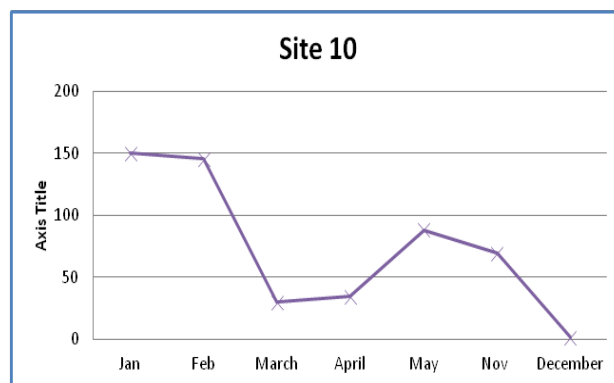


Figure 10 Seasonal Variation in Dustfall using *Ficus hispida* L. in g/m² at Site 10.

Conclusion

Ficus hispida recorded maximum dust fall at site 9 in the month of Feb with the value being 167.77gms/m². December had the least dust deposition compared to all other months at all study sites. High dust deposition is in month of May, similarly in February. The plants growing near church Bypass Road and Versoli Road showed constantly high values of dust deposition. This is largely due to the location of sites being in an area with high vehicular density. Seasonal variations on dust depositions and the relation between pollution was established by.⁸⁻¹⁰

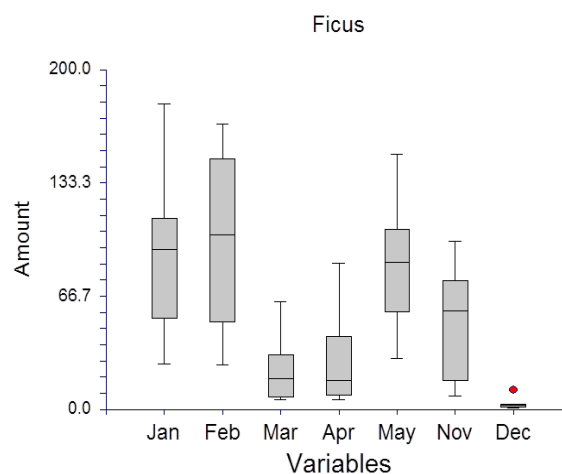


Figure 11 Box and whisker plots showing dust fall on *Ficus hispida* at different sites throughout study period.

The plant species has exceptionally rough surface with large leaves, which proves as effective dust capturer.

Using plants as monitors of dust has advantage over highly expensive and sophisticated instruments as they easily available have low maintenance can be cost effective substituent can be placed at specific sites and also do not risk pilferage (Figure 11).

Acknowledgements

None.

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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