3. Study the effects of fumes on microbial count in the surrounding air -

To study the effect of fumes on microbial count in the surrounding air, method used by Pathade G. and Abhang Pranay (2014) was used. In short, sterilized nutrient agar plates were opened near yadnya and 10 ft, 20 ft, 30 ft apart from the yadnya (as shown in fig.1 positions A1, A2, A3, A4). Experiment was performed in duplicate i.e. two plates were opened at the same position. Plates were also opened at the four corners (vedi) of Somyag (as shown in fig.1 positions C1, C2, C3, C4), and 10 ft apart from the corners (as shown in fig.1 positions B1, B2, B3, B4).Plates were incubated at room temperature for 24 hours and colony count was taken and Graphs were plotted for,

A. Average microbial count at 4 corners and 10 ft apart from corners taken at morning and evening for alternative 25 days.
B. Microbial count at 4 corners and 10 ft apart from corners taken at morning and evening for alternative 25 days.

I. Estimation of SOx

SO_x was estimated by improved West and Gaeke method (1956), in short, SO_2 from the surrounding air stream was absorbed in a sodium tetra-chloromercurate solutionwith the help of Handy sampler. (Spectralab, HDS -8)on alternative 25 days at the position D (as mentioned in fig.1), it forms a stable dichlorosulphomercurate $(HgCl_2SO_3)^{2-}$ complex, which then behaves effectively as fixed SO_3^{-2} in solution. The amount of SO_2 was then estimated by the color produced when p-rosailine-hydrochloride and formaldehyde was added in solution, which can be measured on spectrophotometer at 560 nm. Calibration curve of standard sodium meta-bi sulphate was used for SOx estimation by using following formula-

$$\text{SO}_x \text{ in ppm (by volume)} = \frac{\mu\text{g of SO}_2\text{/mL (from calibration curve)}}{\text{Volume of air sampled /L}}$$

$$\mu\text{g /m}^3 \text{ of SO}_x = \frac{\text{ppm by volume} \times 64 \times 10^6}{24470}$$

II. Estimation of NOx –

NO_x was estimated by modified Jacobs - Hochheiser method (1972), in short, NO2 in air was collected by scrubbing a known volume of air through an alkaline solution of arsenitewith the help of Handy sampler (Spectralab, HDS - 8),on alternative 25 days at the position D (as mentioned in fig.1). The nitrite ions thus formed was reacted with sulfanilamide and N-(1-naphthyl) ethylenediamine (NEDA) in phosphoric acid to form the colored azo dye, which can be measured on spectrophotometer at 540 nm. The method was standardized statistically by using $NaNO_2$ standards. Standardization is based upon the empirical observation that 0.74 mole of $NaNO_2$ produces same color as 1 mole of NO_2. SO_2 can be removed using H_2O_2.

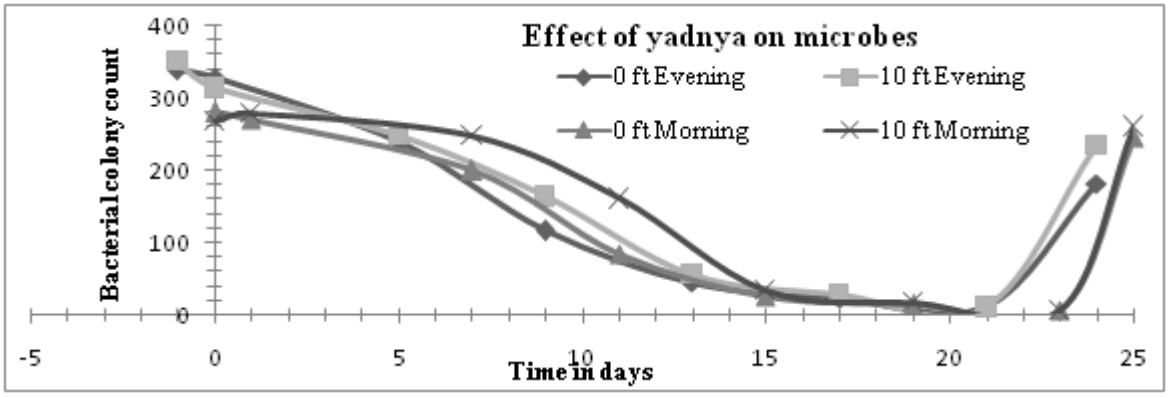
$$\mu\text{g NOx/m}^3 = \frac{\mu\text{g of NO}_2\text{/mL (from calibration curve)} \times \text{volume of reagent}}{0.85 \times \text{volume of air sampled in m}^3}$$

$$\text{NOx (ppm)} = \mu\text{g of NOx/m}^3 \times 5.32 \times 10^{-4}$$

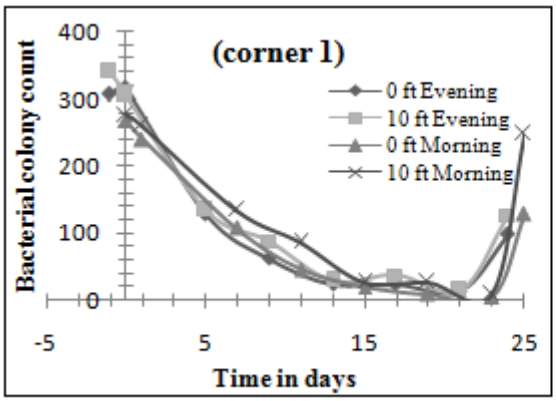
4. Results

4.1 Effects of fumes on microbial count in the surrounding air

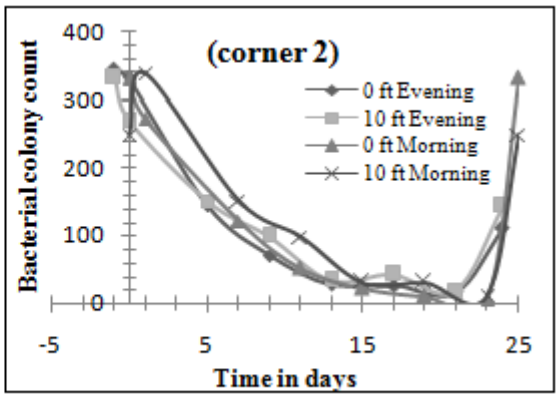
As per the results, microbial count in the air decreases up to 95% due to fumes of the yadnya. Average colony count before yadnya (day -1 and 0) was 346 colonies which get reduced to 12 colonies at the last day of yadnya (day 23).Microbial count is least near the yadnya (0 ft), and increases as distance increases (As in graph 1). As compare to the average of microbial count, taken before yadnya (i.e. 305 colonies on day -1and 0) was reduces up to 81%, 79%, 77%, 72% at 0 ft, 10 ft, 20 ft, 30 ft respectively (an average of count at specific positions, i.e. 56 colonies at 0 ft, 62 colonies at 10 ft, 69 colonies at 20 ftand 85 colonies at 30 ft), during yadnya.



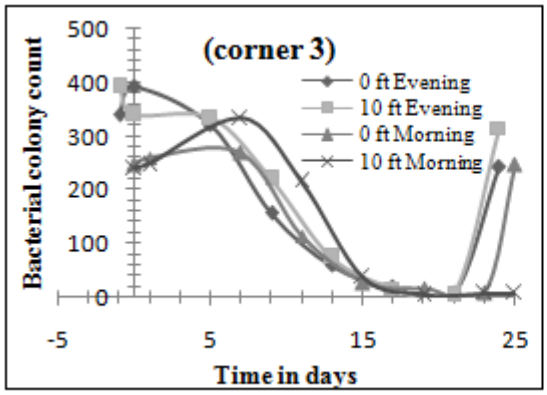
Graph 1: Effect of fumes on microbial count taken at the corners (average count)



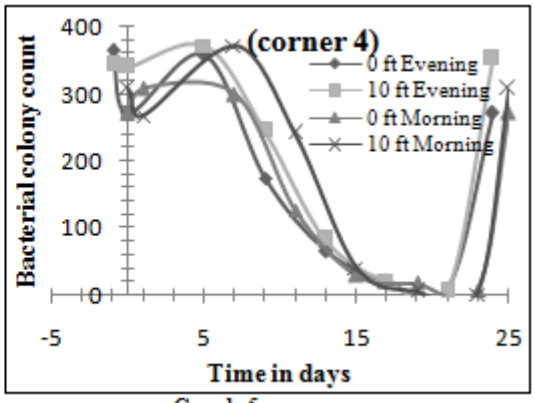
Graph 2



Graph 3



Graph 4

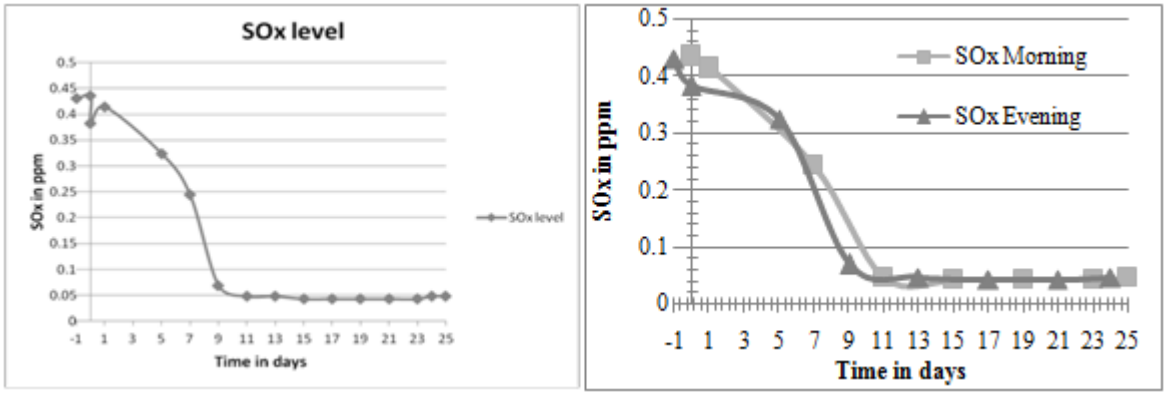


Graph 5

Graphs 2,3,4,5. - Effect of fumes on microbial count at corner 1,2,3,4 respectively taken in the morning and evening. Microbial count is less in all four corners as compare to 10 ft apart from the respective corners. Average count at 10 ft apart from corner (113 colonies) was 18% more as compare to an average count at respective four corners (94 colonies). (Red and purple lines are above the blue and green lines in the graph 2, 3, 4 and 5). Microbial count was least during the period day 15 to day 23, but it increases after the yadnya (i.e. day 24 and 25). It was during those days when Somyag yadnya was performed.Microbial load in the air can be reduced by performing yadnya daily.

4.2 Estimation of SOx

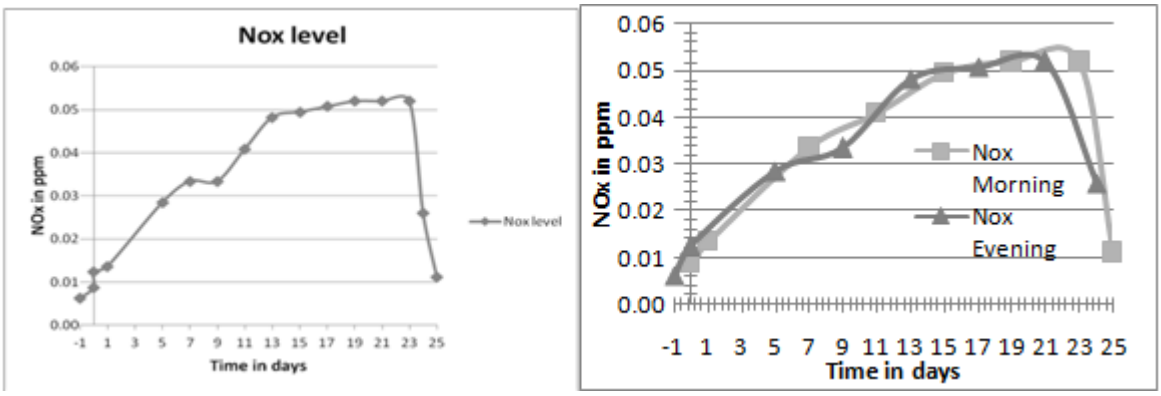
SO_x level decreases during and after yadnya up to 10 times that of initial (Reduces from 0.43 ppm to 0.048 ppm). SO_x level remains decreased after the yadnya (at least up to 2 days) was finished (as in Graph 6). SO_xpollution in the air can be reduce up to 90% by performing yadnya.



Graph 6: SOx levels in morning and evening during 25 days

4.3 Estimation of NOx

NOx level increases during Yadnya up to 0.05 ppm, but also decrease to normal level (0.01 ppm) after Yadnya (on day 24 and 25).NOx level increases up to 20% as compare to initial (day -1 and 0) NOxlevels (Graph 7).



Graph 7: NOx levels in morning and evening during 25 days

Standard NO_x (mostly NO_2) level provided by 'National Ambient Air Quality Standards' (NAAQS) as well as 'Maharashtra Pollution Control Board' is 0.053 ppm (annual average per hour). Maximum value recorded was 0.052 ppm (during day 19 to 23) which is less as compare to standard levels.

5. Conclusion

Due to Somyag yadnya microbial load in the air can be reduced up to 95%. Many of the bacteria present in the surrounding environment may be killed or inactivated due to Somyag Yadnya. SOx levels decreases up to 90% which is long term effect due to Yadnya. Although NOx levels increases due to Somyag, it was reduced to its initial levels. As per results NOx levels does not exceeds standard or threshold levels. Results show that Somyag Yadnya can control air pollution due to microbes and oxides of sulphur and nitrogen.

6. Acknowledgement

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Author Profile

Pranay Abhangreceived the B.Sc. and M.Sc. degrees in Biotechnology of Pune University from Fergusson College, Pune in 2012 and 2014, respectively. He joined Institute of Bioinformatics and Biotechnology in SavitribaiPhule Pune University from 2014 as a Teaching Associate.