

Report on Phase I: Fall 2006

We have divided this research projects in four different phases. The first phase of research was aimed at evaluating the Air Fantastic Air Purifier and assesses its efficiency in reducing the indoor aeroallergens and air-microflora, especially the bacteria and mold spore concentration in the indoor air. The first phase research was divided into two groups: 1.Observation on the effect of the air purifier in reducing the concentration of bacteria and mold in the air,

2. Observation on the effect of the air purifier in reducing the concentration of aeroallergens like pollen, spores and other particulate matters concentration in the air.

The first part was carried out by Rupa M. Patel under my supervision (Dr. N. Ghosh).

Report by Rupa M. Patel: Air Fantastic Air Purifier on Microbial colonies

To evaluate the Air Fantastic Air Purifier we set up the following criteria and variables.

Criteria: Evaluation of the Air Fantastic Air Purifier using petri-plates and coated slides to collect the microbial spores, propagules (like fungal hyphae) and aeroallergens (like pollen, spores and other particulate matters) with a standard distance of 1foot, 2 feet, 4 feet, 6 feet and 12 feet away from the air purifier. The petri-plates and slides were previously made before setting up the experiment. The slides were coated and placed in clean slide boxes and the boxes were sealed with parafilm to avoid any contamination. The petri-plates were made following standard aseptic procedure by autoclaving the media at 15lb steam pressure /sq Inch at 121 degree Celsius. After pouring the media the petri-plates were stored on the table top to cool down and then stored in the refrigerator after sealing the plates with parafilm.

Variables:

Distance: A number of sets of the petri plates and coated slides were placed with those distances of 1foot, 2 feet, 4 feet, 6 feet and 12 feet away from the air purifier with various time intervals.

Time Period:

Control (exposure 0 hours): Assay done with the petri plates and coated slides keeping the air purifier off.

24 hours: Assay done with the petri plates and coated slides after running the air purifier for 24 hours in the room.

pollen sampling tape take place at suitable intervals. Slides will be analyzed with five latitudinal traverses corresponding to the mean concentration will be assessed. The mean concentration will be determined mathematically by taking a sum total of all the prepared slides and multiplying this sum by a correction factor. Correction factors are microscope-objective specific and are determined prior to counting. It can be expressed as the total area sampled divided by the graticule width (8).

The prepared slides will be examined, counted, and photographed using a BX-40 Olympus microscope attached to a DP-70 Digital Camera attached to a Dell Computer equipped with Image Pro 6.0 Image Analysis software. This assessment will involve the optical counting of pollen grains, fungal spores and other particulate matters through a microscope and the use of a micrometer scale and graticule (100 square microns). The graticule is a scale that measures distances to the 10^{-2} division of a millimeter. The graticule was calibrated using a stage micrometer. The pollen, fungal spores and insect residues will be identified using standard keys from literature and the websites (Ref. 9, 10, 11, 12 and 13).

Result and Discussions

Figure 1 Control ((No treatment with air purifier)

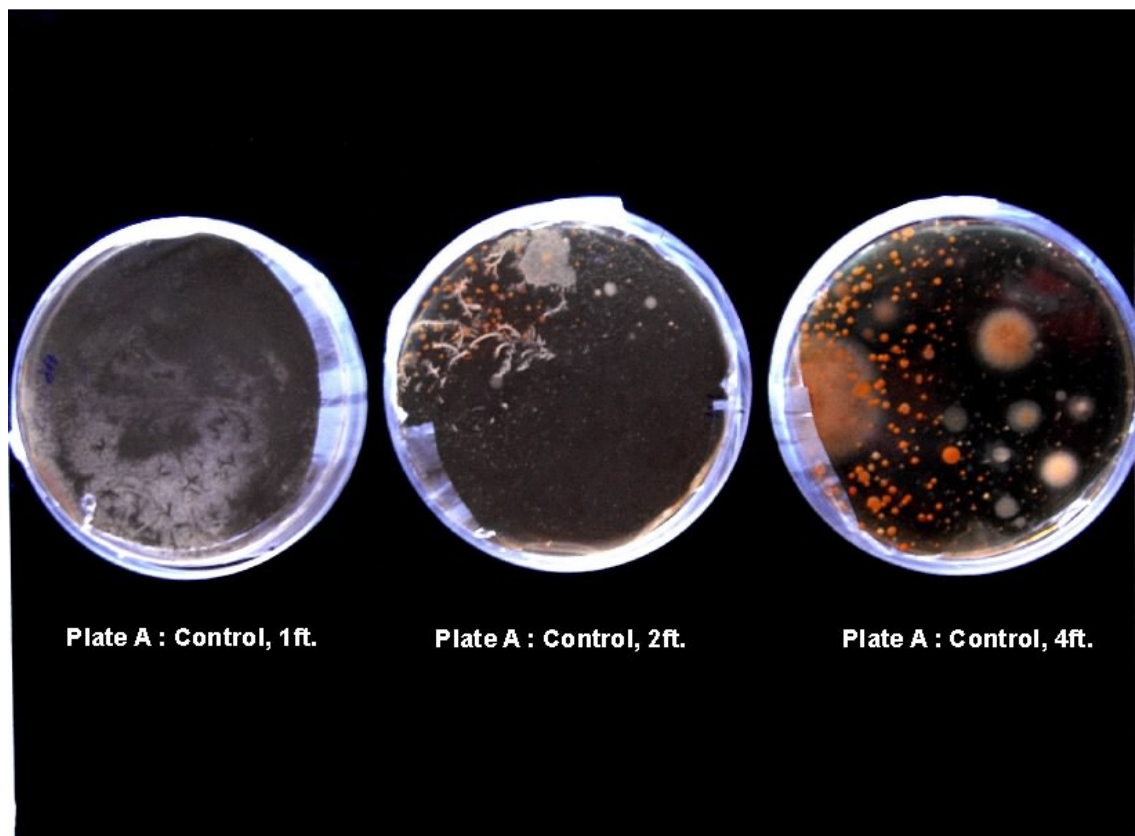


Figure-1 shows the number of microbial colonies produced in the Control set, before any treatment of indoor air with the air purifier.

Fig. 1A: Number of microbial colonies produced after 24 hours in Control (no Air Purifier)

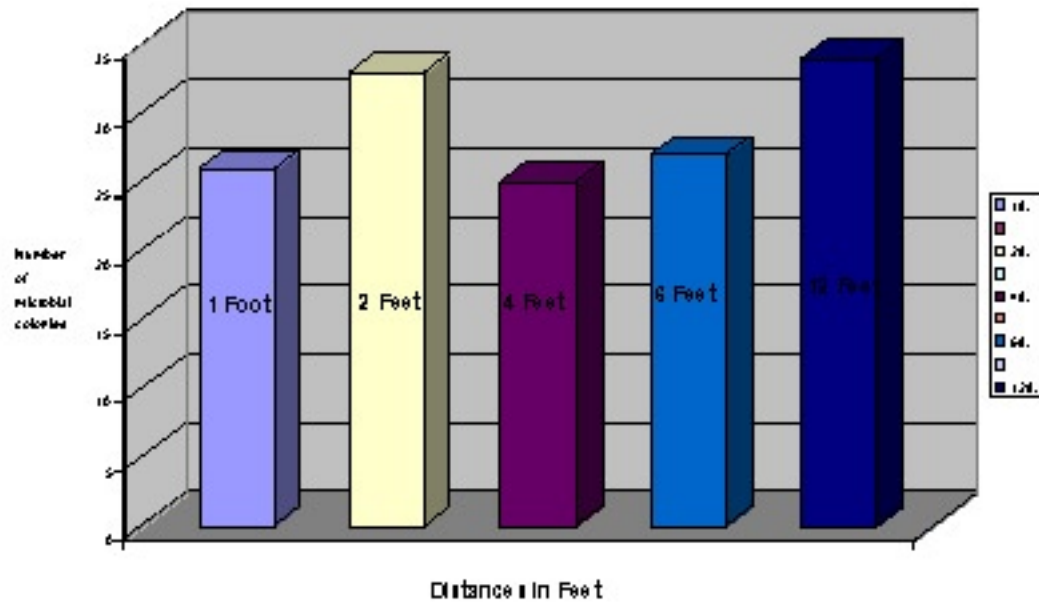
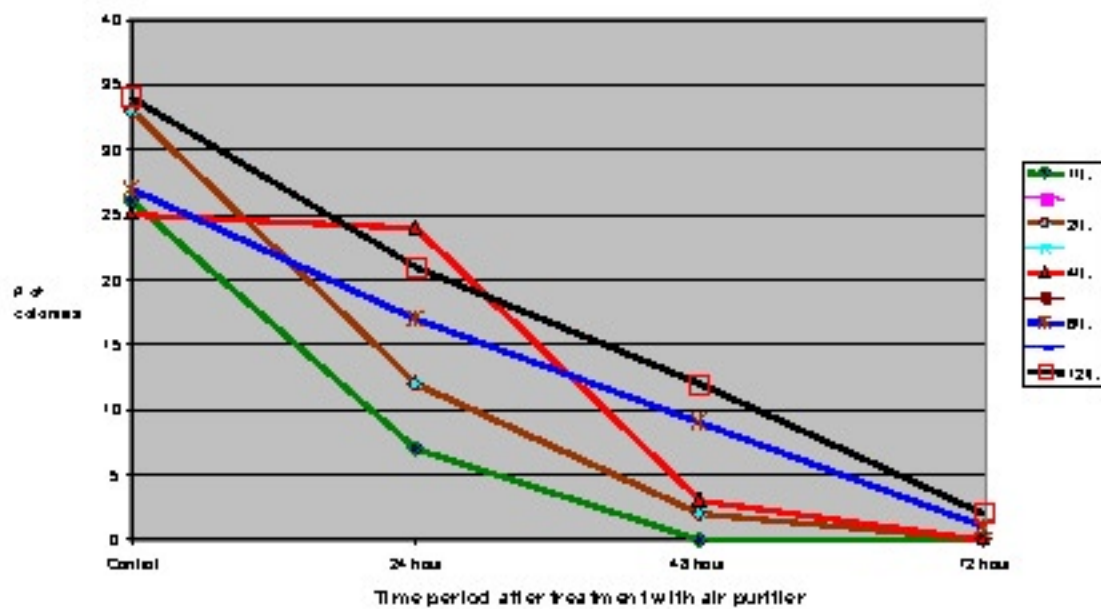


Figure 1A shows the distribution of microbial colonies in the Control se (No treatment with air purifier).

Figure 2: Effect of air purifier after different period of exposure on the number of microbial colonies



From the figure-2 is a graph on the distribution of the number of microbial colonies before and after the treatment of indoor air with the air purifier, it is very clear that there was a gradual reduction in the number of microbial (bacterial and fungal) colonies with greater interval of exposure with the air purifier.

Figure 3

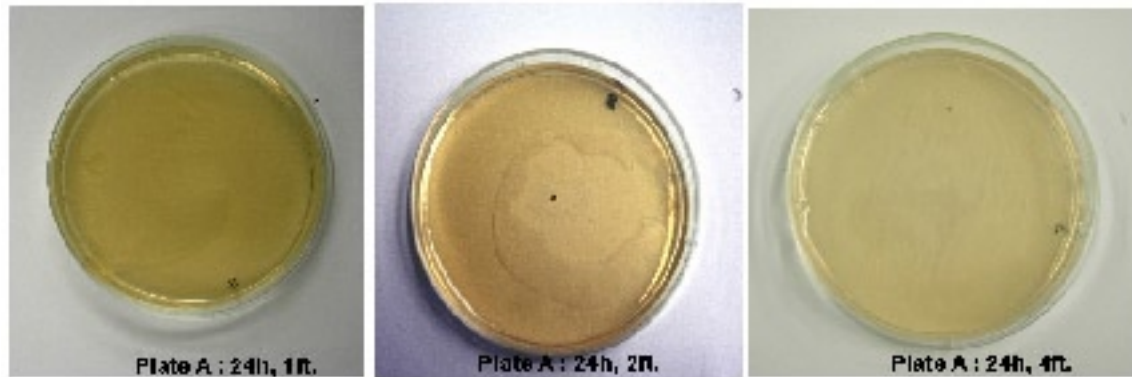
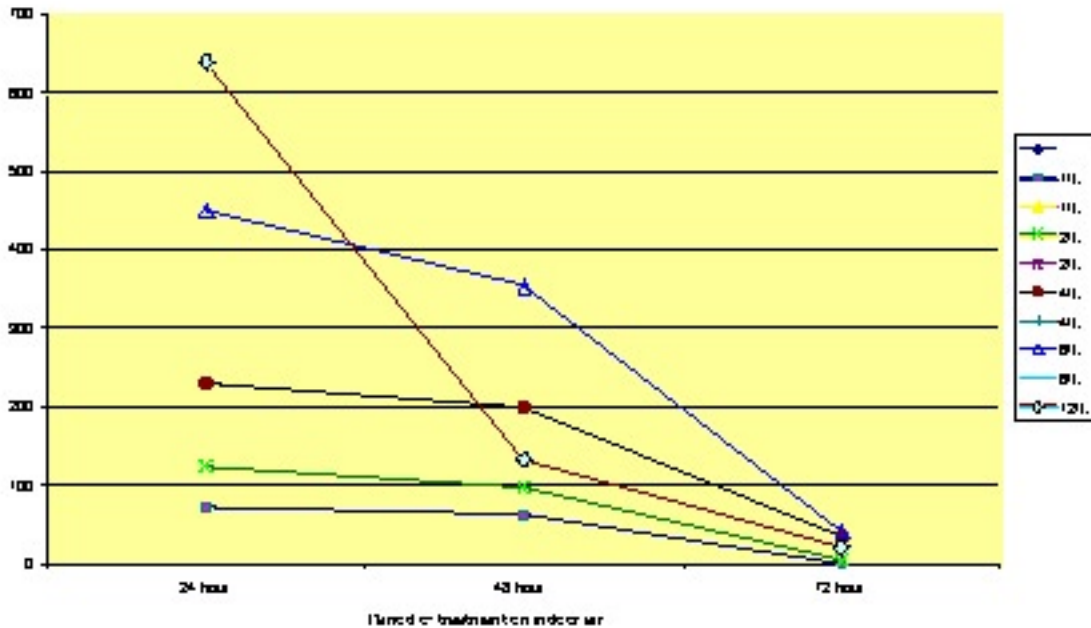


Figure 3 shows the petri-plates after a 24 hour treatment with the air purifier. Note the reduction in number of colonies compared to figure-4 (Control, No treatment with air purifier).

It was also evidenced that the petri-plates placed closer to the distance to the air purifier (1 ft. and 2 ft.) produced least number of colonies after 24h., 48h. and 72 hours of treatment of the indoor air with the air purifier. Figure-3 shows the level of infection after 24 hours with distances 1 ft, 2ft. and 4 ft. away from the air purifier. There was very minor trace of inoculums from the petri-plates from 1 ft. or 2 ft. and 4 ft. distances after 24 hours of treatment of the room air indicating thereby definite reduction of the microbial aeroallergen in the room air. After 72 hours of treatment of the indoor air with the air purifier there was almost no microflora or propagules left in the indoor air since there was no microbial colony produced on the petri-plates. All the experiments were carried out with setting at High in the air purifier. Figure 1 shows the Control plates without any treatment. All the 3 petri plates from the set up of 1ft, 2ft and 4 ft show vigorous growth of the microbial colonies after incubation in an incubator at 37°C.

Figure 4: Effect of treatment of air purifier on the concentration of indoor aeroallergen concentration



The petri plates from the set up of 24 hour treatment with air purifier from distances 1ft, 2ft and 4 ft from the air purifier showed no significant microbial growth. At the distance of 1 ft no microbial colony was recorded on the petri-plate while the petri plates from 2 and 4ft showed very minor trace of inoculums. Figure 4 shows the distribution of the aeroallergen count after the treatment of the room air after 24hour, 48 hour and 72 hours. After 72 hours of treatment there was almost no aeroallergen left closure to the air purifier.

Future Research

We will carry out the research in Phase-II for

1. Assay for the rest of the time intervals and distances away from the air purifier in a different room.
2. Identification of specific aeroallergen the concentrations of which were reduced with the treatment of the indoor air with the air purifier.
3. We will also use the variable of “Space” using a different size of room to assess the efficacy of the air purifier.
4. We will use digital and Fluorescent Microscopy to characterize the aeroallergens the concentration of which is reduced by the air purifier.
5. We will correlate our findings on reduction of bacterial population and identifying the specific bacteria in relation to their pathological importance.

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