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(REVIEW ARTICLE)

Review on air purifier

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Abstract

Air contributes a prime role in recycling earth's most essential substances like carbon, since carbon sources encompass fossil fuel combustion and decayed matter of dead animals. Due to urbanization, population has been increased in cities inevitably which cause dreadful air pollution and pose a profound menace to public health and the environment. Outdoor air pollution has become panic in India, because Indian cities are some of the highest polluted cities in the world. Particulate pollution has significant worsen effects on human health. Diseases like asthma, chronic obstructive pulmonary disease (COPD), allergies and insomnia are caused or triggered by rising levels of air pollution. Sometimes the poor air quality leads to long-term health effects. Air purifiers occupy as prime factor to clean the air. It promotes our health against allergies, obnoxious odor and snoring. This review article discuss the causes of air pollution, need for air purifier and mechanism of working of air purifier.

Keywords: Air pollution; Insomnia; COPD

1. Introduction

Due to globalization and industrialization ecological life cycle has been affected which leads to increase in air pollution. The World Health Organization defines air pollution as "the presence of materials in the air in such concentration which are harmful to man and environment." A lucrative attention turned towards air purifiers for healthy indoor environment and human health against diseases. Air filtration is commonly suggested as a component of environmental control measures for patients with allergic respiratory disease.

2. Causes of air pollution

The various causes of air pollution are:

i. Burning of fossil fuels, petroleum, coal and wood in industries, automobiles, aircrafts, railways, thermal plants, agricultural burning, kitchens, etc. (Soot, CO_2, CO, nitrogen oxides, sulphur oxides).
ii. Metallurgical processing (mineral dust, fumes containing fluorides, sulphides and metallic pollutants like lead, chromium, nickel, beryllium, arsenic, vanadium, cadmium, zinc, mercury
iii. Chemical industries contribute to greater extent by pesticides, fertilizers, weedicides and fungicides
iv. Usage of cosmetics
v. Industries Ex; Textile industry, wheat flour mills and asbestos.
vi. Welding, stone crushing, grinding of gem
vii. Natural causes like usage of petroleum solvents in dry cleaning paint, sprays, varnish, etc. that contains

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organic solvents which volatilize in the air [1-3].

3. Air filtration technique

As a global problem, air pollution produces severe ill effects to human health, hence air filtration technique is extensively used. Various techniques like usage of air conditioned system, portable air cleaners are used for residential air filtration. Air purifier is also called as air cleaners conserve the place clean by removing the pollutants like dust and pollen [4]. Air purifiers contribute great to maintain clean environment since it filter the air contaminants and provide the greater relief to asthmatic and allergic patients .An air purifier is a device (either stand-alone, transportable units or affixed to an "air handler unit") that removes contaminants from the air in an enclosed environment. HEPA (High-efficiency particulate arrestance) was first introduced in the 1950's [5].

4. Mechanism of action of air purifier [6]

4.1. Particles filtration

HEPA filters capable of removing 0.3 mm particles with 99.97% efficiency. It consist of prefilter to eliminate the coarser particles especially against mold spores. HEPA filters made from fiberglass efficiently remove the air contaminants.

4.2. UV technology

Thermodynamic sterilization is the process of killing microorganism by burning by the destruction of DNA. A UV air purifier can transform molecules of oxygen and water from air into ozone and hydroxyl compound. The active molecules react with the air pollutants hence destroyed and finally converted into harmless components like water and carbon dioxide [6].

4.3. Activated carbon technology

Volatile organic compounds like formaldehyde, benzene and methylene chloride are basically air borne in room temperature leads to consequential damage to kidney, liver, lungs and entire nervous system. Activated carbon consists of many molecular sized pore with high absorbent ability and chemical bonding. It captures air pollutants like gases, tobacco smoke, bad odors and chemical emissions effectively [7- 9].

4.4. Negative ion technology

Chemical injections are used by negative ion purifiers to clean the air. Air borne particles are taken by the negative ions and transformed in to walls. Negative ions the air by magnetically attracting to pollutants until these newly-formed larger particles become too heavy to remain in the air we breathe [10, 11].

4.5. Ozone generators

It produces ozone, which is a strong oxidant gas capable of oxidizing chemicals [12].

5. Control of indoor air pollution

Channel for outdoor air consists of joints and cracks in walls, floors, ceilings around windows and doors. Volatile organic compounds may be released by various sources including paints, glues, resins, polishing materials, perfumes, spray propellants and cleaning agents. Formaldehyde is a component of some household products which irritate the eyes, nose and airways. To control the indoor air temperature proper ventilation and shading is needed. Hence natural ventilation is achieved by opening windows and doors, gas stove is well ventilated, avoiding smoking inside house. Encase the pillows, mattresses, and box springs in dust-mite-proof covers. Indoor air pollution may arise from the use of open fires, unsafe fuels or combustion of biomass fuels, coal and kerosene [13-14].

6. Effect of indoor plants

Indoor plants remove pollutants from the air by absorbing the gases through their leaves and roots Benzene (found in some plastics, fabrics, pesticides and cigarette smoke) and formaldehyde (found in some cosmetics, dish detergent, fabric softener and carpet cleaner) are common examples of common indoor VOCs which can be efficiently eliminated by the plants. The mechanism behind is the microorganisms which live in the soil of potted plants plays significant role

in neutralizing VOCs and other pollutants. Plants most useful in removing VOCs include Japanese royal ferns, spider plants, Boston ferns, purple waffle plants, English ivy, areca palms, golden pothos, aloe vera, snake plants and peace lilies [15].

Table 1 Indoor plants suitable for air pollution control [16-19]

Name of the plant	Family	Growth habit
Dypsis lutescens	Araceae	Erect, small
Orchid (*Dendrobium*)	Orchidaceae	Small plant
Aloe vera	Xanthorrhoeaceae	Small plant
Spathiophyllum	Areceae	Small palm
Chlorophytum comosum	Liliaceae	Medium plant
Nephrolepis obliterata	Lomariopsidaceae	Small plant
Hedera helix	Araliaceae	Vigorous climber

Large number of houseplants clean indoor air. Bamboo palm, rubber plant, dracaena, spider plant, peace lily and golden pothos. Formaldehyde, reasonable for home pollutant was effectively removed by Boston fem plant and peace lily eliminates acetone [20].

7. Diseases caused by indoor air pollution

Over 3.8 million people a year die prematurely from illness owed to the household air pollution induced by the inefficient use of solid fuels and kerosene for cooking. Among these 3.8 million deaths:

- 27% are due to pneumonia
- 18% from stroke
- 27% from ischemic heart disease
- 20% from chronic obstructive pulmonary disease (COPD)
- 8% from lung cancer [21]

Particulate matter smaller than 2.5 micrometers is responsible of triggering a chain of reactions (including oxidative stress, inflammation, autonomic imbalance etc.). This may be the prime cause to "vasoconstriction, endothelial dysfunction, increased blood pressure (BP) and heart rate, myocardial ischemia, impaired heart rate variability (HRV), repolarization abnormalities, arrhythmias, and enhanced thrombotic and coagulation potential. Longer-term exposures have been linked to the chronic progression of atherosclerosis as well as the increased incidence of hypertension and diabetes mellitus" [22].

8. Benefits of air purifier

8.1.1. Air purifiers remove triggers for asthma attacks

Air purifier are capable of eliminating microscopic level impurities. Asthmatic trigger factors like dirt, dust, carbon monoxide, air freshening sprays, hairsprays, smoke from cooking, paints, cosmetics, mold spores, new carpets are effectively removed by air purifier and protect us from disease like asthma [23].

8.1.2. Air purifiers trap tobacco and cigarette smoke, preventing lung disease

Encasing smoke with air purifiers with HEPA filters and activated carbon are gaining more popular nowadays since inhaling of tobacco smoke cause chronic obstructive pulmonary diseases and heart diseases. Breathing in tobacco smoke can result in the development of chronic obstructive pulmonary diseases as well as heart disease. Elderly people are at a higher risk of dementia due to exposure of secondhand smoke. HEPA filters can remove tobacco smoke 0.3 μ and cigarette smoke from 4-0.1 μ [24].

8.1.3. Air purifiers eliminate radon gas:

Radon gas is produced from natural combination of uranium in soil, rock and water and inhalation of Radon gas cause lung cancer. It enters home through cracks in floors and wall, electrical wire and sump pits. Air purifier protects from lung cancer by eliminating the toxic radon gas [25].

9. Conclusion

Clean air is not only important, but foremost requirement to all. Indoor air pollution ranks top five public health threats. Air purifiers are deigned to clean the indoor air by particulate matter filtering mechanism like dust, pollen and gaseous pollutants like hydrocarbons. Air purifiers are considered as life savers since many disease occur due to VOC', molds and improper ventilation at home and it reduces carbon dioxide levels in our home. Natural air purifiers include free ventilation to home, avoiding paraffin candles, using air purifier plants can reduce the risk of indoor air pollution. Indoor plants perform the function of natural living air purifiers since the foliage and roots can absorb the chemical pollutants.

Compliance with ethical standards

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Disclosure of conflict of interest

There are no conflict of interest.

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