

## Mosses as Air Cleansers: A Bio-Solution Against Air Pollution

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### Introduction:

Air pollution is one of the most serious problems in the present developing world. It is a threat to humans and the environment as it affects the growth and development of plants, causing less yield in productivity. In 2014, reports showed that in India air pollution had reduced crop productivity by almost half in 2011 when compared to 1980, measured on the basis of black carbon and ground-level ozone. In humans it may lead to respiratory diseases, allergies, cardiovascular disorders, neurological disorders and can also lead to death. This type of pollution is caused by agents like carbon monoxide, nitrous oxides, methane, sulfur dioxide, chlorofluorocarbons and other particulates, which are generally produced due to increasing industries and chemical factories.

### Agents causing dangerous effect on plants:

Oxidants like ozone affect the upper surface of leaves and cause spots and bleaching of the leaf tissues. This damage may not be noticed but overall it affects the crop eventually. Mainly affected crops include cucumber, grape, lettuce, onion, potato, radish, spinach, sweet corn, tobacco and tomato. Sulfur dioxide enters into the leaves through the stomata opening and causes acute or chronic injury. An acute injury is caused by absorption of high levels of sulfur dioxide which causes bifacial lesions that usually occur to the veins and the margins of the leaves. Long-term absorption of sulfur dioxide at low concentrations causes chronic injury, chlorosis of the leaf and bronzing on the lower surface of the leaves. Fluorides are gaseous compounds that are absorbed by the leaves and margins causing red-brownish lesions at the tips of the leaves. The particulate matter like dust particles gets absorbed into the leaves and causes injury to leaves by inhibiting the photosynthesis process in plants.

### Mosses as Biocleaner and Bioindicators:

Mosses are bryophytes that are small non-vascular, dense green non-flowering plants. They grow up to 0.2-10 cm in height and reproduce by spreading spores, they mostly grow on wetlands. These mosses possess good air purifying mechanisms, the dirt particles which are

present in the air are filtered by the mosses when this air passes through it. These mosses have plenty of tiny leaves that are spongy in behaviour which absorbs positively charged microparticles, harmful gases and dirt particles present in the air. Due to the unique property of mosses they are used in testing the environmental pollution of particular areas. They are grown in different areas for some time and the heavy metal elements, chemical elements and other pollutants in the air are analyzed. Some species which are mostly used are *Pleurozium schreberi*, *Hylocomium splendens*, *Bryum argenteum*, *Bryum capillare*, *Brachythecium sp.*, and *Hypnum cupressiforme*.



#### Methods to cultivate:

- Ex-situ cultivation: Starter mosses are collected and these are grinded with some water and buttermilk (used to maintain the slight acidic property). A tray or container is taken and a layer of some stones is placed and a layer of clay mud is applied to the

stones. Carefully pour the grinded mosses material on the mud. Make sure that it is maintained wet by spraying water. These will only grow at low temperatures.

- In-situ cultivation: Explants of mosses are surface sterilized by 1% (w/v) solution of NaDCC under constant agitation for 3 min and washed thrice in water and these plants are used for inoculation. The explants are inoculated in sucrose-free medium  $\frac{1}{2}$  or  $\frac{1}{4}$  strength Murashige and Skoog medium (MS) including vitamins or Knops minimal medium adjusted to pH 5.8. The cultures are grown at 20.5 oC ( $\pm 3.5$ ) with a 16 h light/8 h dark.

#### **Methods to implant mosses in the polluted areas**

- ✓ These mosses can be directly grown all over the ground by placing them in the polluted area.
- ✓ Hanging the mosses by moulding into sphere shape in the areas
- ✓ Construction of benches or filters on which these mosses are grown and these are directly placed in the polluted places.
- ✓ Growing the mosses on trees in polluted areas.





**Conclusion:**

Mosses can trustfully help to solve the problem of air pollution in the environment. It may take time to solve the total threat, but this formula of using mosses in polluted areas can lower the problem to some extent. This will help in the intake of less polluted air by all living organisms, which will decrease diseases in animals as well as plants. This ultimately will lead to healthy life for animals and increases the growth and productivity of crops in agriculture.