Special Research Report # 435: Postproduction

Effectiveness of Plants on Reducing Ozone as an Indoor Air Pollutant

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BACKGROUND

Ozone is an air pollutant that is commonly found in indoor environments. Office equipment such as copier machines and laser printers can emit ozone. Natural rubbers, linoleum, carpets, and latex paints are among the materials that react with ozone (Weshler 2000).

Direct contact to ozone is not the only source of human health problems. Ozone reacts with other chemicals in indoor environments that lead to the release of radicals in the air (Weshler 2004).

Damage caused by ozone includes cracking of rubber, fading of dyes, photographic damage, and human respiratory health (Weshler 2000).

Inexpensive and effective methods to alleviate ozone levels in indoor environments are needed.

Currently the most widely used method to reduce indoor ozone levels is the air filter, which is costly (Weschler 2004).

Houseplants have been found to help decrease ozone levels in simulated indoor environments (Weschler 2000).

Thus, the objective of this study was to determine if houseplants can reduce ozone levels and assist in improving the indoor air environment of buildings that have high ozone levels.

MATERIALS NEEDED

Three common indoor houseplants were used to study their effectiveness to decrease ozone levels. The three species were (1), Swedish Ivy (Plectranthus australis R.Br.), (2) Golden Pothos (Epipremnum aureum L.), and (3) Pepper-face (Peperomia obtusifolia L.). They were placed in separate "Continuously Stirred Tank Reactor (CSTR) chambers". Twenty of each species were used to completely cover the floor of each chamber. A fourth chamber remained empty and used as a control. Ozone was added to the chambers at levels normally found in indoor air environments. The ozone generator was stopped once ozone concentrations reached 200 ppb (+/- 5 ppb).

RESULTS

The leaf area of the plants in each chamber was determined. Golden Pothos had a leaf area of 1035.2 cm2, Swedish Ivy was 2843.7 cm2, and Pepper-face was 1028.8 cm2. Swedish Ivy had almost 3 times the leaf area when compared to the other two species. The reduction in ozone is compared to the control in Figure 1. It is clear that in the chambers with plants, ozone level decreased more rapidly than the control chambers, which did not have any plants.

From the data presented in Figure 1, it appears that Swedish Ivy may reduce the ozone content more quickly than the other two taxa. However, there is no data to suggest that this difference is

statistically significant. Peperomia and Golden Pothos removed ozone at about the same rate and with about the same leaf area.

There was no indication that the ozone at 200 ppb caused any phytotoxicity to the plants. Apparently, the plants will absorb the ozone and inactivate it without substantial damage to the plants. The importance of this effect is that the plants will be able to remove the ozone over an extended period; Thus, they will remain aesthetically pleasing in the interior environment in which they have been installed.

CONCLUSIONS

Based on the results (Figure 1), it is concluded that the three plant species Plectranthus australis R.Br., Epipremnum aureum L., and Peperomia obtusifolia, are effective in decreasing indoor ozone levels. These plants would be useful in office settings to help maintain a cleaner breathing environment. Although there were no major differences between the species, chambers with plants had a higher rate of ozone reduction than the empty control chamber.

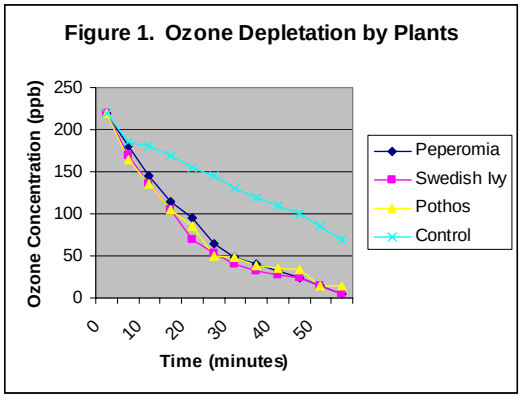
This study supports a previous study (Welcher 2000) and demonstrates that house plants can be used to mitigate ozone in indoor environments.

IMPACT TO THE INDUSTRY

Since ozone is an air pollutant and toxic to humans, removing it from an interior environment is an environmental benefit.

This research demonstrates that plants will absorb ozone. The industry can emphasize this fact to encourage the sales of more plants.
For addition information contact ejh3@psu.edu

Reference –
Welscher, C.J. 2000
Weschler, C.J. 2004
Ozone in indoor environments concentration and chemistry.



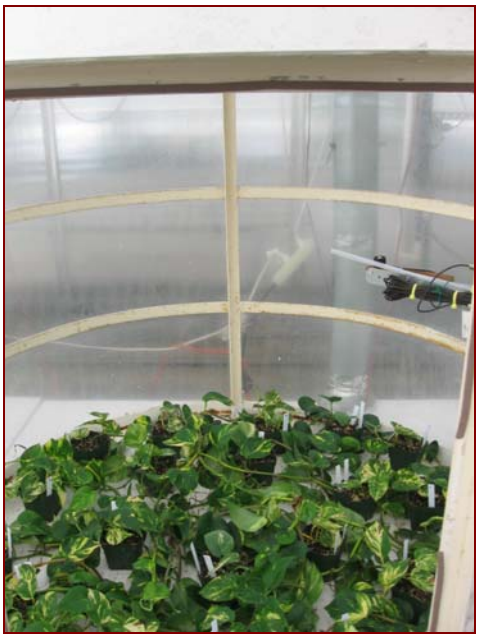


Figure 2. Pepper-face in the CSTR Chamber.