

When pollutants team up

Sulfur dioxide (SO₂) and nitrogen dioxide (NO₂), two major pollutants of fossil-fuel combustion, are capable of producing more crop damage together than either can alone, scientists report. Research conducted at Argonne National Laboratory, near Chicago, shows that soybeans fumigated with both gases — at levels below which either gas might be expected to show effects — not only lowered crop yields, but also aged plants more quickly, diminished the chlorophyll concentrations in leaves, and caused visible leaf damage. Patricia Irving, an ecologist directing the research, says, "These preliminary results suggest that while current [federal air pollution] standards may protect crops from individual pollutants, they may not protect crops from certain combinations."

Plants were grown in outdoor test plots 40 miles southwest of Chicago. Pipes suspended above the fields supplied the pollutant gases, which wafted through the plant rows on natural wind currents. The plots included sections fumigated with SO₂ only, with NO₂ only, with both, and with neither. Concentrations of SO₂ ranged from 0.13 to 0.42 parts per million in air; NO₂ from 0.06 to 0.40 ppm. Monitored over two growing seasons, test fields were fumigated intermittently for a total of roughly 30 hours each season. Even after accounting for background and ambient pollutant levels in the area, gas concentrations, as measured by field monitors, never exceeded the Environmental Protection Agency's maximum permissible levels.

The plot fumigated with just NO₂ showed no ill effects. The one with just SO₂ showed no adverse effects the first year, and a maximum yield reduction of 6 percent the second year. However, yields for the plot receiving both gases were between 9 and 25 percent lower than those for the plot receiving neither gas. And that's what is really important, Irving says, because these particular pollutants seldom occur individually.

Slake this thirst with water and lime

If this summer has left you feeling parched, consider how the nation's crops are being affected. Drought conditions are bad enough. But if plants are also growing in highly acidic soils — those with a pH of 5 or less — aluminum toxicity may be further aggravating their thirst. Soils with toxic levels of aluminum, prevalent throughout the eastern United States, especially the Southeast, develop where high rainfall normally occurs.

The popular use of nitrogen fertilizers contributes to soil acidity, notes soil scientist Charles Foy of the Agriculture Department's Beltsville Agricultural Research Center (BARC) in Maryland. And aluminum, which dissolves more easily in acid soils than in neutral ones, will stunt the growth of sensitive plants, according to BARC plant physiologist Donald Krizek. What results are thirsty roots that have trouble absorbing both water and nutrients.

In research Krizek conducted with Foy at BARC's Plant Stress Laboratory, sunflowers in soil with a pH of 6.5 were stressed with severe water deprivation (as measured by soil-moisture tension of 60 to 80 centibars). The resulting plant growth was stunted by 40 percent, compared with the normal growth of sunflowers that had been well watered (as indicated by moisture tension of 0 to 20 cbars). In another test, well-watered sunflowers grown in acid soils (pH 4.5) also suffered a 40-percent stunting, due to aluminum toxicity. But sunflowers exposed to the double stress—acid soil and severe water deprivation — underwent a 70-percent stunting.

Similar effects were seen in research on barley. Wheat, oats, soybeans, sorghum and alfalfa are also sensitive to this problem. The BARC team hopes to develop an acid-tolerant species, and is currently looking at genetic-engineering techniques. But there is also a cure for those plants that remain sensitive: serve them water and lime (calcium hydroxide).

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Is leukemia risk a Smoky legacy?

A health survey of the 3,217 military troops participating in a 1957 nuclear-weapons test — code-named Smoky — has been completed by the Centers for Disease Control (CDC) in Atlanta. Results of the study, published in the August 5 *JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION*, show that though there was no overall elevation in cancer incidence for Smoky participants, the leukemia rate for the group exceeds expected levels.

An earlier survey by epidemiologist Glyn Caldwell and colleagues at CDC found the suggestion of an elevated leukemia risk for the troops at the Smoky test (SN: 2/11/78, p. 92) in Nevada. However, because the exact ages of the troops were not known when that analysis was done, and because only a fraction of the men involved had been identified for a follow-up health survey, both the expected cancer-incidence rate and actual-incidence figures were preliminary and speculative. Based on more than 95 percent of the Smoky troops, results of Caldwell's new survey are stronger.

One of the study's more provocative findings is its inability to link radiation exposures with cancer incidence. Specifically, the military units receiving the highest cumulative gamma-radiation exposures had a lower frequency of cancer than less-exposed troops — "an apparent contradiction if radiation were the causal factor," Caldwell and colleagues note. In fact, they report, the cumulative 1957 gamma-radiation exposures for Smoky participants were generally low and "well within the occupational safety limit of 5,000 millirem per year." Moreover, they found no statistically significant increase in cancer frequency related to any individual military unit.

Oral contraceptives may 'promote' cancer

Oral-contraceptive steroids, especially synthetic estrogens, appear to be promoters of liver cancer, according to animal studies by James D. Yager Jr. of the New York University Medical Center in New York City. Rats were given steroids—either mestranol (M), norethynodrel (N), or both — at levels 10 to 15 times the human-equivalent dose. Results suggest "that M, in addition to being a strong promoter, might have a weak [cancer] initiating potential" too, Yager reports in a recent *ENVIRONMENT HEALTH PERSPECTIVES* (Vol. 50). N proved a weaker promoter. "The lack of detectable genotoxic and mutagenic effects suggests that [these steroids] are not complete carcinogens, but rather compounds that modify and enhance the carcinogenic process through as yet unknown mechanisms," Yager concludes.

IUDs and pelvic inflammatory disease

The risk of pelvic inflammatory disease (PID), a major cause of infertility among women, is increased by use of intrauterine contraceptive devices, studies have shown. Now an investigation not only confirms this risk but reveals that IUDs vary considerably in their ability to trigger such disease.

David W. Kaufman of Boston University School of Medicine and co-workers studied 460 women, of whom 155 had pelvic disease. All the women were users of IUDs or some other form of contraception.

Women using an IUD are generally at a ninefold greater risk of getting PID than are women using other forms of birth control, the researchers report in the Aug. 12 *JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION*. But women using the Dalkon Shield are at a 79 times greater risk than are non-IUD users, whereas Saf-T-Coil users are at 24 times greater risk, Lippes Loop users are at 13 times greater risk and copper IUD users are at 7 times the risk.

In an accompanying editorial, Peter M. Layde of the Centers for Disease Control in Atlanta points out that these relative risks may be somewhat inflated due to study design. Still, he believes that the study's findings are generally sound.

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