THE SHADE TREE

A BI-MONTHLY BULLETIN DEVOTED TO NEW JERSEY'S SHADE TREES

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This Issue Presents…

MORE TREES MEANS HEALTHIER BEES, NEW STUDY ON AIR POLLN SHOWS

The Good Men Project • By Luís Patriani • February 4, 2022 by Mongabay

Human-caused air pollution in Brazil's São Paulo state is taking its toll on native bees, but the presence of plants can help ameliorate those effects, a new study shows.

- Scientists analyzed levels of chemical pollutants in native jataí bees across eight landscapes in Brazil's São Paulo state.
- They found that in landscapes with more vegetation, the bees had fewer pollutants, at lower levels, indicating that the plants act as a filter and protective barrier
- The findings add to the growing scientific evidence about the importance of afforestation in urban areas, including creating ecological corridors to connect separate landscapes.
- Air pollution is the world's top driver of illness and death from chronic noncommunicable diseases.

Human-caused air pollution in Brazil's São Paulo state is taking its toll on native bees, but the presence of plants can help ameliorate those effects, a new study shows.

Researchers from the University of São Paulo (USP) and São Paulo State University (UNESP) studied jataí bees (Tetragonisca angustula) as bioindicators of environmental quality — proverbial canaries in the coal mine — to confirm a direct relationship between the amount of vegetation and air pollution.

Plants act as a filter and a protective barrier, and the larger the green area

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MORE TREES HEALTHIER BEES *Continued from page 33*

in a given region, the lower the levels of pollutants in the environment and, consequently, in the bees, the study found. The findings have important implications, given that bees are the main pollinators in the animal kingdom, responsible for pollinating 75% of all farmed plants worldwide.

The study measured accumulated levels of 21 chemical elements in the tissues of jataí bees collected in eight areas in São Paulo state where remnants of the Atlantic Forest still stand. These areas had forest cover ranging from 16-70%, and varying types and levels of human activity and presence, such as agriculture, roads, cities, industries, pastures and degraded land.

"The distinguishing feature of our work is that our bioindicators were a group of bees that had not been studied on a global scale and are widely distributed in Brazil, occurring both in urban areas and in preserved areas," says study author Marcela de Matos Barbosa, an entomologist at USP.

Barbosa says that when the bees fly through different environments to collect pollen, they can carry fine particles of atmospheric aerosols from the surrounding pollution.

The study shows that bees living in more forested areas have lower levels of mercury, copper, cadmium and chromium in their bodies. The main source for heavy metals such as cadmium and chromium are the agrochemicals used on farms.

The study also shows how different types of land use influence the presence of the pollutants found in the bees. Where there are roads, for example, the bees accumulate chromium, mercury, aluminum, uranium, arsenic, lead and platinum in their bodies. In areas with degraded soil or pastures, the main pollutants found are zinc, cadmium, manganese, magnesium, barium and strontium.

The importance of urban ecological corridors

The findings add to a growing body of evidence about the importance of mitigation projects such as afforestation in urban areas, says study coordinator Milton Cezar Ribeiro, a professor at UNESP's Biosciences Institute.

According to Ribeiro, urban ecology is a field that's been growing recently in academia. It addresses the creation of urban ecological corridors from an ecological and socio-environmental perspective.

"We created a tool to simulate the best scenarios within a human and non-

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human context, where certain groups of plants are selected according to the routes to connect the city center to the outskirts," he says.

Ribeiro says taking care of landscapes separately without connecting them isn't enough. "Planting trees in the streets is vital, as well as encouraging the use of vegetation in houses, buildings and even on walls."

Giuliano Locosselli, a biologist at the USP Biosciences Institute and author of a pioneering study published in 2019 that showed how pollution in the city of São Paulo

impacts tree growth, says it's also important to select the right plant species to create urban ecological corridors.

"Some trees are more resistant to pollution while others are less resistant. The question today is to know which ones are what," Locosselli says. "We are trying to answer this question under a larger project that is part of a major international consortium focused on nature-based solutions. The idea is to help municipalities and decision-makers to build more efficient and resilient urban forests."

Lack of effective policies

Public policies and law enforcement, however, have been major obstacles to progress on this front. In the city of São Paulo, for example, a law proposed in 2009 mandated that the entire public bus fleet running on diesel should switch to clean fuels by 2018. But this hasn't been enforced to date, and diesel emissions are now responsible for almost 95% of particulate matter — the most toxic pollutant to human health.

Cases like this are among the reasons why air pollution is today the world's top cause of illness and death from chronic non-communicable diseases, responsible for 40% of deaths from heart attacks and 50% of cases of pneumonia in children. Air pollution is also considered the top reason for infant mortality, in addition to being responsible for 6% of cases of lung cancer.

Evangelina Vormittag, former technical director of the microbiology laboratory at USP's medical school and founder and director of Instituto Saúde e Sustentabilidade (Institute of Health and Sustainability), says these figures are a tragedy playing out in real time, with the government lacking the political will to make a meaningful change.

"Brazil needs governments with the strength and courage to make the necessary change, and that requires confronting economic forces," she says. "For example, there is a 20-plus-year-old law that mandates vehicle inspection throughout Brazil, and states must comply with it, but no state does. What's the

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sanction? Nothing."

Vormittag's institute, together with more than 20 other organizations under the Coalizão Respirar (Breathe Coalition), filed a lawsuit challenging the constitutionality of the criteria adopted by Brazil's National Council for the Environment (CONAMA) for establishing air quality standards.

"Since 2005, the WHO has determined concentration levels of pollutants that are safe for health. We are now in 2021 and the levels we take as legal are three times higher than what the World Health Organization recommends," Vormittag says. "In practice, what happens is that states, which are responsible for managing air quality, are allowed to pollute three times more. The air is polluted and they say it's normal. And nobody warns the population about it."

She points out that none of the nine states that make up the Brazilian Amazon monitors their air quality. Their failure to do so is something that Vormittag describes as catastrophic.

"In the Amazon there is neither measurement nor assessment. So if there was any monitoring, it would be a scandal," she says. "The levels of pollution by particulate matter in areas with fires are similar to China's."

SCREAMING TREES SEEK HELP: PREDATORS TO THE RESCUE EARLIER TREE GREENING

TRT World and Agencies • February 3, 2022

In an experimental study involving oak trees, caterpillars that eat oak leaves, and predators that eat caterpillars, a complex web of interaction is revealed.

Trees can 'talk', although their communication occurs via scent rather than acoustics like humans and other mammals. Each tree species has a unique bouquet of volatile organic compounds (VOC) that it emits, which animals can distinguish. For example, leaf-eating insects hone in on their host trees via following volatile organic compounds.

Yet the trees are not entirely helpless when it comes to leaf-eating insects finding and munching on their leaves, and defend themselves. How do they do it?

Dr Martin Volf, first author of a recent study, tells TRT World that he was inspired to do this experiment because "Forest canopies are extremely diverse environments. Most of the species dwelling there are insect herbivores that feed on

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trees." He adds: "So, I have always been extremely interested in exploring what strategies trees use to defend against the plethora of natural enemies they face."

"When attacked by herbivores, trees start releasing small organic compounds carried by air," Volf notes in an email to TRT World. "Predators can pick up these scents to locate the tree under attack. This allows them to find the herbivores and feed on them."

The trees produce bitter substances that the leaf-eating insects do not like to ingest, and they also release VOCs to alert different parts of the trees.

This leads to the trees attracting other animals such as birds and predatory insects which, the news release notes, have learned to interpret the meaning of VOCs. These animals fly to the tree, and start eating the leaf-eating insects, ridding the tree of pests.

Thus the trees' screams, so to speak, are heard across the forest and the trees are assisted in purging themselves of leaf-eating insects.

"The fact that plants can chemically attract parasitic wasps, predatory bugs and even birds when attacked by pests had been known for some time," says Volf in a news release. Volf led the study at the German Centre for Integrative Biodiversity Research (iDiv), and now works at the Biology Centre of the Czech Academy of Sciences.

"However, this defence mechanism had never been tested for adult trees in a realistic environment so far," Volf adds.

"This was made possible by a combination of research methods, from animal behaviour experiments at the height of 40 metres on iDiv's Leipzig Canopy Crane in the floodplain forest to molecular analyses of plant scents through metabolomics," he notes. Metabolomics is "the large-scale study of small molecules, commonly known as metabolites, within cells, biofluids, tissues or organisms" – in this case, tree leaves.

The researchers simulated herbivore feeding on leaves in the spring by spraying branches in the crowns of adult oaks (Quercus robur L.) with methyl jasmonate (MeJA), which they say is "used in ecological studies to simulate herbivory by chewing-insects". This allowed them to test the effect of induced defence – the plant's response to injury by predators or mechanical injuries.

The researchers also superglued green non-toxic plasticine dummy caterpillars (3mm in diameter, 30 mm in length) on the oak leaves, to simulate an attack by real caterpillars in addition to the methyl jasmonate.

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DOGGETT . . . Liquid asset for trees and tree care companies.

The fastest growing segment of the tree care industry is liquid tree fertilization and Doggett is leading the way. The spectacular growth in this field has come from the fact that the fertilizing method that helps trees the most also helps tree care companies the most.

Liquid fertilizing is right for trees because the fertilizer is injected into the soil. This fractures and aerates the soil so that water, oxygen and fertilizers are made available to the feeder roots. Doggett's forty years of experience have resulted in XL Injecto Feed—a solid in a liquid—suspended particles of concentrated nutrition which you mix with water. Its slow release formula provides nourishment for up to two years and is available in five formulations for varying fertilizing situations.

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Doggett Corporation, Lebanon, NJ 08833 Tel: 908-236-6335

SCREAMING TREES SEEK HELP *Continued from page 38*

They left the caterpillars in place for 2.5 weeks during the induction period. They checked them for beak and bite marks every few days and replaced missing ones. They also made note of the abundance of real caterpillars.

The researchers also tested leaves in the laboratory with real moth caterpillars. They gave the insects both induced and non-induced (control) leaves to feed on. The caterpillars of the gipsy moth (Lymantria dispar) avoided induced leaves, showing that the trees had produced VOCs that the insects did not want to eat, such as tannins that repelled the bugs.

Volf tells TRT World that the researchers worked with oaks in this particular experiment. But, he says, they also work with "lime trees, hornbeams, willows, or tropical trees, such as figs, in our other projects. The whole experimental setup is rather complex."

He sums up the complexity in a few words for TRT World readers: "In short, we either expose the trees to real herbivores or trick them to think they are under attack by triggering a hormonal response in them," he explains. "We then monitor what changes in their chemical defences this real or simulated herbivory elicits and explore how the resulting changes affect predators and herbivores."

The news release notes that predators (such as birds, parasitoid wasps and predatory bugs), according to the researchers, visited the induced branches more than the control branches. They were called to help the tree – and feed on what was feeding on the tree – by the tree.

Asked about the most important takeaways from the experiment, Volf tells TRT World that "The main message is that ecological interactions between organisms are fascinatingly complex. Very rarely there are just two species interacting."

He notes that "More often we see complex interaction webs. Here, trees used chemical defences to attract predators in order to get rid of herbivores. If we want to understand these interactions, and possibly benefit from them in terms of pest control, we need to study them in their full complexity."

Volf says he particularly enjoyed the interdisciplinary nature of this project: "Such a collaboration between biologists, ecologists, and chemists is necessary to understand natural processes and how they may be changing, especially in response to the ongoing global change."

HELP WANTED TOWNSHIP OF BLOOMFIELD

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POSITION:
TREE MAINTENANCE SUPERVISOR F/T

Department: Public Works
& Park Maintenance

Brief Description: Supervises and works with crews performing tree and shrub maintenance; may climb trees when necessary using individual climbing gear such as saddle and rope; may work from a vertical lift truck when conditions are unsafe to climb or remove dead or diseased limbs or top trees. Ensures safety procedures, rules and regulations are followed. May operate motor vehicles and light construction equipment on a limited basis. When assigned to an electric utility unit, supervises and works with crews performing tree and shrub maintenance primarily around electric power lines, to minimize storm and short circuit hazards; does other related duties as required. Qualifications: Three (3) years of experience in the care and maintenance of trees and shrubs, which shall have included the use and/or operation of manual or mechanical equipment used to climb trees; one (1) year of which shall have been in a lead worker or assistant supervisor capacity. Ability to use or operate chain saws, stump grinders, chippers, handsaws, axes, wedges and other power and hand tools used to perform tree maintenance tasks. Knowledge of the occupational hazards and safety precautions involved in tree maintenance work. Knowledge of current NJDOT guidelines for traffic control when working in public rightsof-way. Driver's license valid in New Jersey and Commercial Driver's License (CDL) required.

Salary: $23.99-$45.65 per hour; Salary is commensurate with experience.
How to Apply: Please send cover letter, resume, references and copy of credentials to Kimberly Duva, Asst.
Twp. Administrator; kduva@bloomfieldtwpnj.com.
Closing Date: TBD

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PRESIDENT HOLLOWAY JOINS RUTGERS FORESTRY CLUB FOR 150TH ANNIVERSARY ARBOR DAY CELEBRATION

May 12, 2022 By: Office of Communications • Newsroom, Rutgers

Arriving fresh from a meeting across town, still formally dressed in suit and tie, Rutgers President Jonathan Holloway addressed the attendees and participated in a tree planting on George H. Cook campus to commemorate the 150th anniversary of Arbor Day.

Holloway expressed the importance of the activity not only to the community, but to him personally. "This one activity is a hopeful activity that you can play a role in making things better," he said. Holloway then recounted his personal connection to Arbor Day, going all the way back to 1976—during the nation's bicentennial anniversary. The memory still vivid, Holloway described how as a nine-year-old, he was given at school three pine tree sprigs for planting at home. He recalled wondering how the delicate sprigs wrapped in damp, rough brown school-issue paper towels would ever transform into trees. Decades later, although Holloway's parents have since passed, upon visits to his childhood home he can still see "his" trees towering into the sky.

Hosted by the Rutgers University Forestry Club, the event, held outside Waller Hall, encompassed a symbolic planting and forestry education event. The planting of a Scarlet oak—donated by Plant Detectives and the New Jersey Tree Foundation—was preceded by Holloway and club officials, outgoing president of the forestry club, Ryan Schmidt (SEBS '22); club secretary Felix Peters; incoming president, Julee Politano and club advisor, urban forestry professor Jason Grabosky. For logistical purposes, the tree had been planted in the ground prior to the event, with the honorary application of mulch left for the officials at the ceremony.

In addition to other educational activities around the campus, a pruning demonstration was done by Sean Lynch of the New Jersey Chapter of the International Society of Arboriculture on a sugar maple in front of Waller Hall. Using special gear, Lynch climbed the tree in order to make proper cuts so the wounds would heal properly.

On top of the lasting impact the Scarlet oak will have on the campus – look for its red foliage in the fall – the Forestry Club will continue its green path at Rutgers and will be conducting an inventory of trees on the New Brunswick campus.

These efforts are not instantaneous though, and implementing these changes takes the combined effort of many individuals and organizations. We aim to band together with other environmentally focused clubs to build a broader community

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on campus and will work to strengthen our relationship with our sponsors, the New Jersey Chapter of the International Society of Arboriculture who are joining us here today, and the Society of American Foresters.

With our combined resources, we will educate the students at Rutgers University on the importance of trees, their impact on the environment, and how together we can work towards making a greener and more sustainable campus.

These ambitious goals cannot be met just by the forestry club alone and we would like to personally thank all of our sponsors for their help and support today and throughout the year.

Thank you to:

- Rutgers Facilities for preparing the planting site for this tree
- Plant Detectives and NJ Tree Foundation for generously donating, delivering, and planting this tree
- NJ Arborists Chapter of the International Society of Arboriculture for their pruning demonstration and general ongoing support for our student chapter
- Rutgers Green Team for lending us their wheelbarrow and tools
- Mike O'Keefe for providing mulch
- Paula Walcott-Quintin, from the Office of Communications and Marketing at SEBS and NJAES for providing publicity and communications
- Janice Geiger for allowing the Forestry Club to use the room in Waller Hall for our meetings
- Pam Zipse and Jason Grabosky for their fearless leadership and for helping us all find the forester within us. Without you two, I personally wouldn't know my oaks from my maples
- And lastly, a special thank you to the President of Rutgers University, Dr. Jonathan Holloway, who we are honored to have in attendance for today's Arbor Day event.

SAVE THE DATE:

2022 NJ Shade Tree Federation

Annual Meeting Scheduled For

October

13 & 14th.
Cherry Hill, NJ

The New Jersey
Shade Tree Federation
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