BIDR News

AUTUMN 2021

Water as a source of human-wildlife conflict: The impacts of desert ecotourism around perennial water sources in arid areas

Treated municipal wastewater as a water source for aquacultural fish production

Does desert time exist? Desert flowers synchronize their scent emissions according to their local habitat conditions and their phylogenetic origin

Dear Reader,
Every environmental problem encompasses many areas, ranging from science and engineering to management and policy, in all their complex and multifaceted effects. Therefore, advanced scientific dryland research requires integrating interdisciplinary and multidisciplinary teams to assess the various aspects of this environment's dynamics and management.

Although the formal structure of the Jacob Blaustein Institutes for Desert Research is built around three individual research institutes, each one conducting outstanding research on its own, the BIDR has established deep and fruitful interactions between its various research groups, both in its course offerings and its multidisciplinary scientific endeavors.

This issue of our newsletter features a sampling of the many scientific collaborations between BIDR researchers from different institutes, along with short descriptions of their research. Though their fields may differ, all of the researchers expressed their appreciation of the strongly multidisciplinary and collaborative atmosphere of the BIDR. The research featured in these pages is steeped in the struggle to provide resources to people worldwide who are facing desertification and climate change impacts.

Thus, the content of this newsletter fits well with my vision for the BIDR—continuing to build an excellent multidisciplinary academic institution with a vital role to play on the global stage.

Fortunately, we have had several occasions recently in which to showcase this excellence, as the BIDR was honored with several high-profile visits in the past few months. On May 31, 2021, Ben-Gurion University of the Negev's Board of Directors visited the BIDR and learned about the groundbreaking research taking place here. The board members also participated in the inaugural tasting of wine made here from grapes grown in our very own vineyard. A few weeks later, on July 2, we were honored to host the President of Germany, Frank-Walter Steinmeier, along with Israeli President Reuven Rivlin. The two Presidents were received by Prof. Daniel Chamovitz, President of Ben-Gurion University of the Negev, and myself. They were given a tour of the Sede Boqer Campus with a glimpse at the activities underway in our three research institutes, provided by the institutes' directors, researchers, and students.

Allow me to conclude with a few important in-house updates. *The Moshe Mirilashvili Center for Food Security in the Desert* was recently established within the BIDR through a generous donation made by Dr. Michael Mirilashvili, President and CEO of Watergen and Vertical Field. We are still in the preliminary stages of defining the new center, including its activities and role. I am confident that Prof. Shimon Rachmilevitch, who was selected as its director, will do an excellent job and that the center will be a significant addition to the BIDR.

We are excited to announce that Prof. Meirav Seifan was appointed as the new Director of the Albert Katz International School for Desert Studies, and Prof. Nurit Agam was appointed to lead the Blaustein Center for Scientific Cooperation. I want to take this opportunity to thank Prof. Ali Nejidat and Prof. Boris Krasnov, who have concluded many productive years at the helms of the AKIS and the BCSC, respectively: Thank you!

Without further ado, I welcome you to open the pages of this newsletter
and join our researchers in their groundbreaking work.
Yours in friendship,

Noam Weisbrod

אוניברסיטת בן-גוריון בנגב
Ben-Gurion University of the Negev

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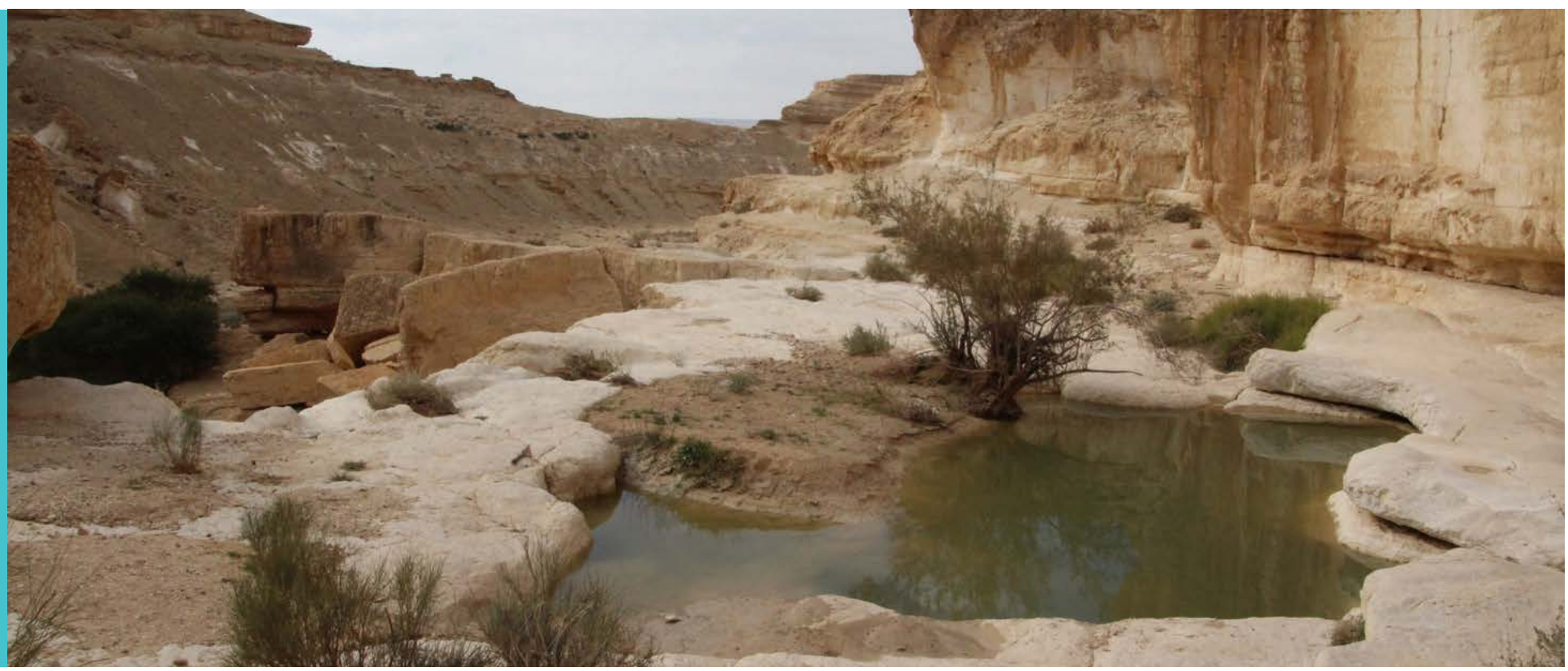
Water as a source of human-wildlife conflict: The impacts of desert ecotourism around perennial water sources in arid areas



Water in the desert

In desert ecosystems, the scarcity of water sources is a critically limiting factor for both wildlife species and humans, sometimes resulting in conflicts between them.

Desert ecotourism that centers on oases can disturb wildlife by driving animals away, altering their activity times, or even creating dependence on human food sources left behind in visitors' trash. Humans can also affect local species through their impact on the water quality in desert water sources. A new collaborative study, led by PhD student Einat Zahabian, under the supervision of Dr. Oded Berger-Tal and Prof. David Saltz (SIDEER), and Dr. Roy Bernstein (ZIWR), aims to deepen our understanding of how human disturbance impacts the highly sensitive, but rarely studied, ecosystem of springs and rockpools in arid environments.

The study quantifies the impacts of ecotourism pressure, around perennial water sources in the Negev Desert, on local wildlife, both directly, by measuring how the presence of humans changes the activity times and behaviors of

PhD student Einat Zahabian collecting water for analysis

mammals and birds, using camera traps, experimental feeding trays, and acoustic recorders, and indirectly by measuring how human visitation affects water quality in perennial water sources and how, in turn, water quality affects the organisms living within it. By examining desert ecotourism's impacts, this research will produce planning and management tools for the Israel Nature and Park Authority (INPA) that will help to reduce conflict and promote coexistence between humans and wildlife around valuable water resources.

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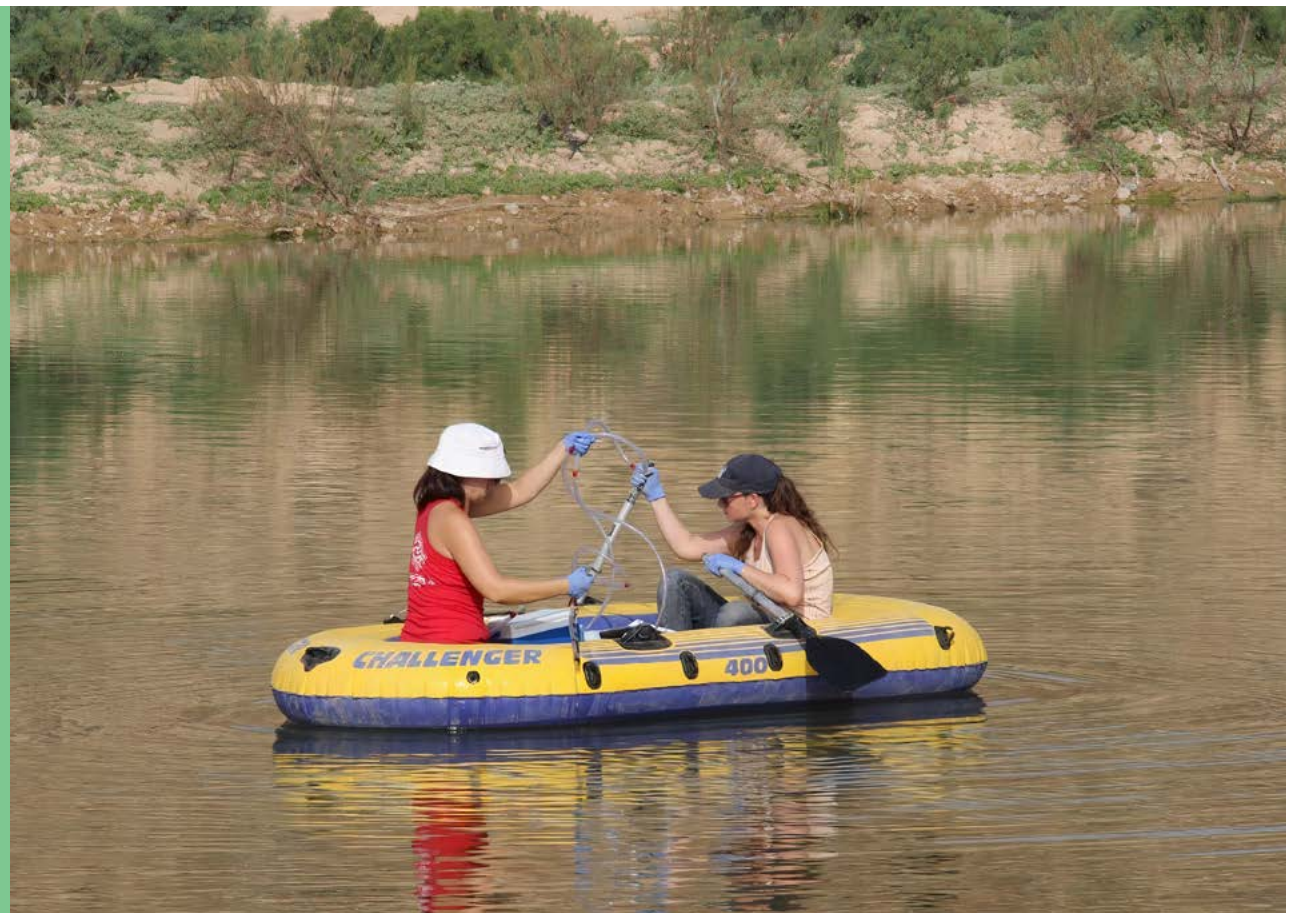
Treated municipal wastewater as a water source for aquacultural fish production



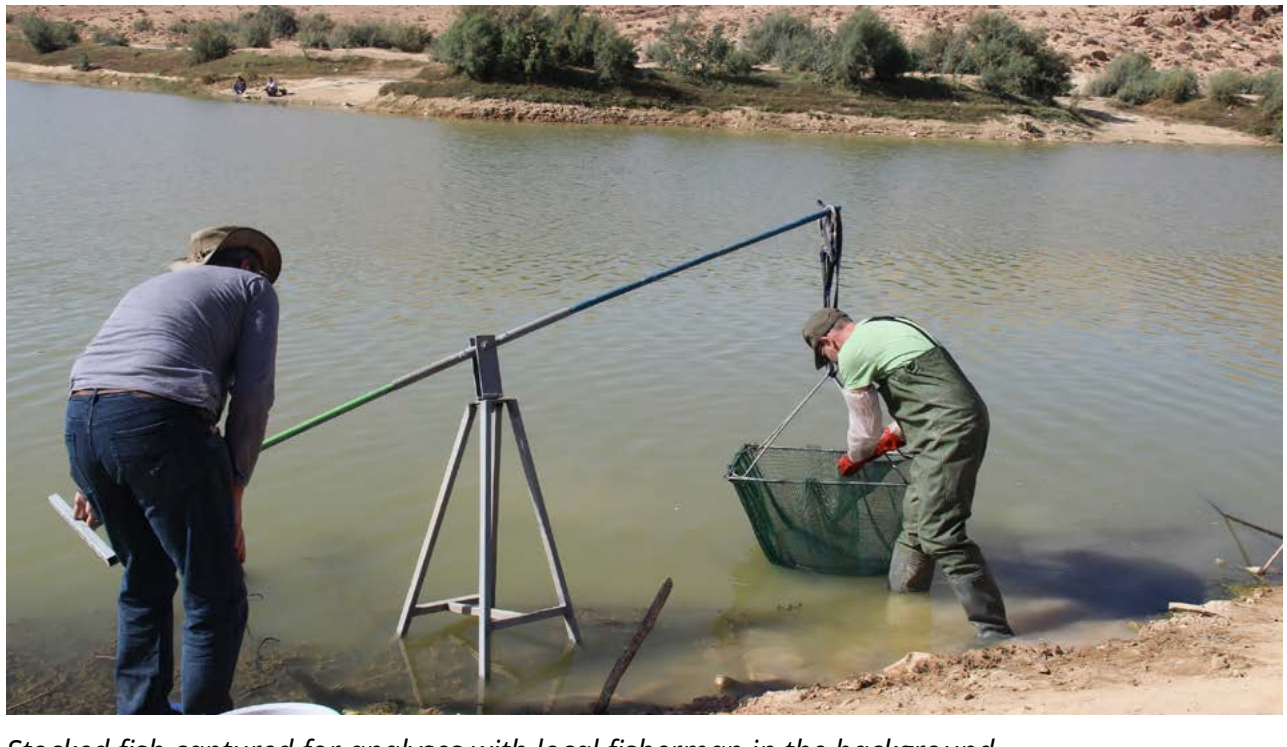
Sample collection from the lake for analysis

Aquaculture is currently the fastest-growing food production sector due to the increasing demand for fish and the inability of ocean-caught fish to meet this demand. Declining freshwater availability is becoming a major limiting factor in fish production. One alternative water source that is already widely applied in agriculture is treated municipal wastewater. Though it has been used in agriculture and aquaculture around the world for centuries, scarce scientific attention has been paid to treated wastewater reuse in aquaculture.

The feasibility of growing fish in treated wastewater, including their safety for human consumption, was investigated by PhD student Dr. Inbal Zaibel, along with her supervisors, Prof. Shai Arnon (ZIWR) and Prof. Dina Zilberg (FAAB). The study revealed that the performances of treated-wastewater-grown fish, including their growth rate, survival, and disease resistance, were comparable to fish grown in tap water. They also concluded that the fish are safe for humans to eat, in terms of microbiological contamination and the bioaccumulation of heavy metals and certain organic micropollutants, with levels found to be in accordance with international standards.

Reuse of treated wastewater as an alternative water source for aquaculture can be economically and environmentally advantageous. Sociocultural barriers can be overcome through a combination of further research, legislation, and public relations, enabling fish production in urban areas, wherever wastewater treatment is applied.

Stocked fish captured for analyses



Stocked fish captured for analyses with local fisherman in the background

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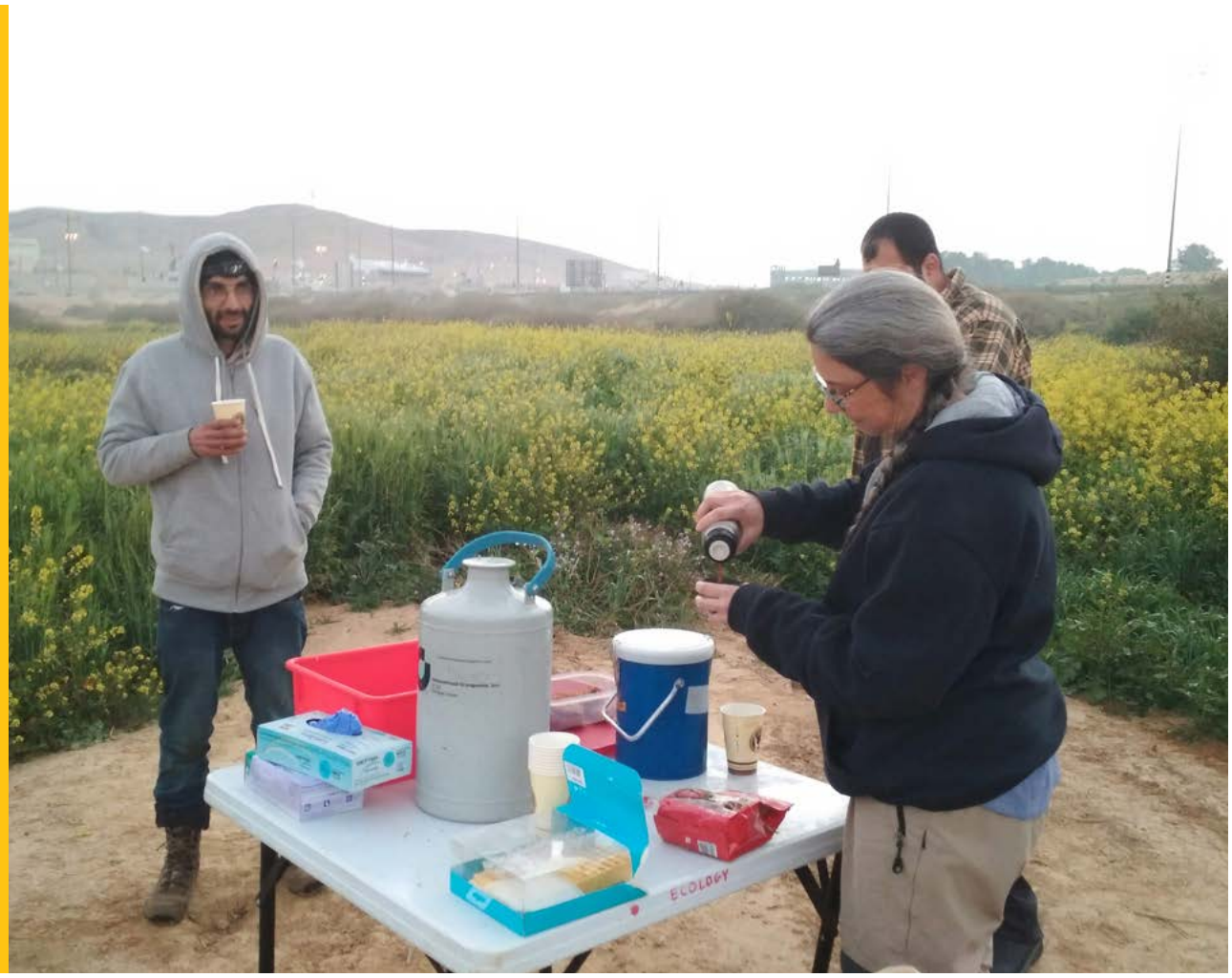
Does desert time exist? Desert flowers synchronize their scent emissions according to their local habitat conditions and their phylogenetic origin

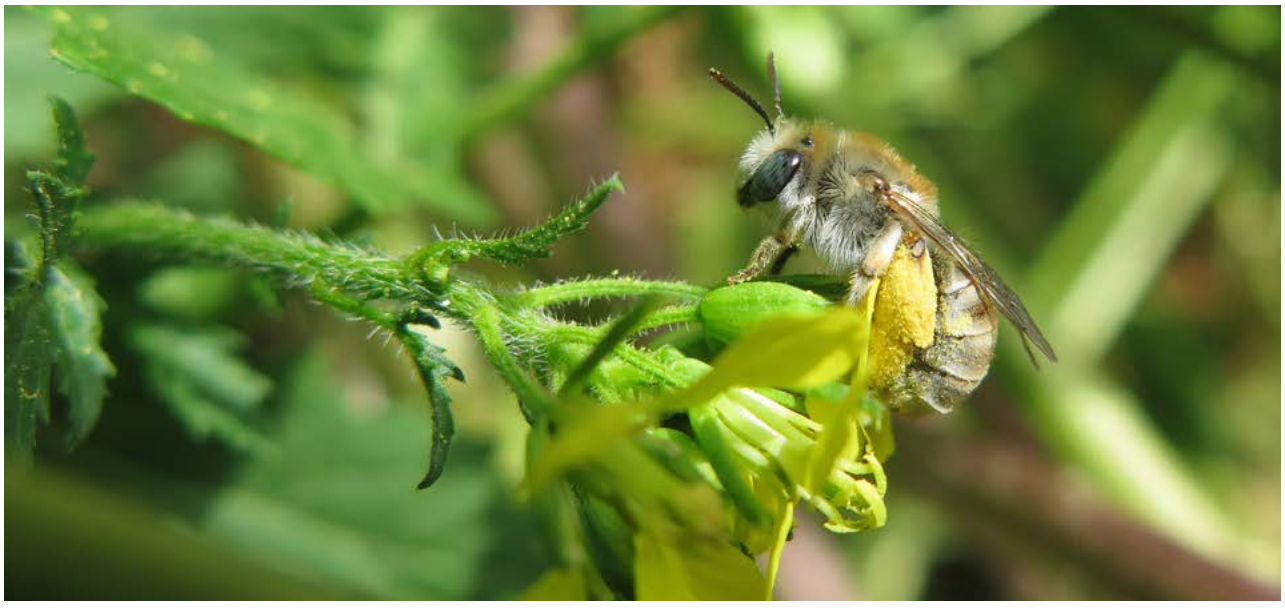


Wake up and smell the coffee and the flowers: Early morning sampling at the Sinapis alba (white mustard) field near Dimona

Most plant species depend on insects for pollination services. To attract these pollinators, plants use visual signals, such as flower shape, size and color, the quality and quantity of nectar, and, of course, smell. The smell of flowers is attractive to insects and humans alike and is composed of several small volatile molecules. Interestingly, flower scent changes throughout the day: some plant species begin emitting a scent early in the morning, while others are particularly fragrant at night. Researchers have claimed that these patterns follow the activity peaks of the plants' particular pollinators.

In a study conducted by the working groups of Dr. Vered Tzin (FAAB) and Prof. Merav Seifan (SIDEER), and led by Dr. Alon Cna'ani, Efrat Dener and Ibrahim Salman, these researchers asked whether desert plants of the Brassicaceae family, growing under stressful conditions, adapt their smell-emission timing to ensure pollinator attraction, thus maximizing their reproductive success. Several Brassicaceae species were collected along a geographical gradient in the Negev Desert, the flower smells of each plant were collected, and the volatile molecules were quantified and identified.

The study's findings showed that the timing and composition of scent emission were governed by a combination of genetic relatedness and two environmental factors: minimum winter temperature and the amount of sand in the plant growth site, most likely due to sand's effects on water availability to the growing plants. Overall, plant species whose distribution is associated mainly with arid regions, with limited water and warmer temperatures, tended to emit smell in a more unified way, across 24 hours, than species with a Mediterranean distribution, which emitted smell mainly during the day. Pollinator observations showed that there is a direct connection between the timing and composition of smell emission and pollinator attraction to the plants, indicating that species growing in desert habitats adapt their smell emission to better capture the more limited activity of pollinators under these regions' limited resource availability. The predicted increase in winter temperatures and intensification of desertification, due to climate change, may significantly affect the timing and composition of smell emission, jeopardizing the effectiveness of pollination services.



Pollination services provided by a Longhorn bee