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Press Release

Biblical ecosystems withstand more than 7 lean years

Tübingen researchers show Mideast vegetation resistant to climate change

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Wild tulips growing in the desert.
Photo: Katja Tielbörger

Ecosystems in the Middle East are home to a wealth of unique species – including the ancestors of many of our staple crops today. Yet the climate scenario in this dry region is alarming. Already, the region has a relatively small amount of water available for every person living there – and it is predicted that in the future, there will be even less rain. That could jeopardize Middle Eastern ecosystems and threaten the survival of important species.

Researchers headed by Tübingen Professor of Plant Ecology, Katja Tielbörger, have carried out long-term experiments in Israel aimed at testing this prognosis. Over nine years, an area rich in plant species was subjected to artificially low rainfall – as predicted for the future. The researchers also examined the effects of higher-than-average rainfall. They selected four ecosystems along an aridity gradient ranging from extreme desert – with 90mm of precipitation in a year – to much damper Mediterranean conditions of 800mm of rain annually. Their findings are published in the latest *Nature Communications*.

The study revealed that – against expectations – the ecosystems in question showed barely measurable reactions to the manipulation of rainfall. Neither nine years of greater aridity nor nine years of extra rain had much effect on the diversity or composition of species, their concentration or the biomass which is important for grazing pastures. “This means we need to revisit the popular theory that arid regions are

particularly sensitive to climate change," says Tielbörger, the study's lead author.

The researchers say the high level of resilience in these systems is due to the region's large natural variability in precipitation. The predicted changes in climate – including a reduction in rainfall of around 30 percent – were nevertheless within the vegetation's natural comfort zone.

In many comparable experiments, the results of irrigation and artificial aridity are assessed simply by comparing the plants within the field station with those outside. But Tielbörger's team took a bigger picture: "We took a whole new research approach. The experiment location along a natural aridity gradient meant that each dryer zone served as a predictor of climate change on the next-damper location," she says. Until now, predictions were chiefly based on theoretical models; and now those models are being put to the test, the outcome is the opposite of what was forecast. "Our study is the biggest open-air experiment of this kind in the world, both in the number of places investigated, the long period of investigation and the very high number of species we observed," says Tielbörger. She points out that this makes these latest results particularly reliable and durable.

The study casts a more optimistic light on the mostly dim predictions regarding the effects of climate change, even if it is only valid for the systems studied here. Tielbörger stresses: "our results are not meant to trivialize the effects of climate change. But they are important in helping us invest in adaptation to climate change in the right place." Ecosystems in biblical regions may be less endangered by global warming than previously thought.


Left: In a 9-year experiment, researchers studied the effects of lesser and greater precipitation.
Right: Flowering meadows in Israel. Photos: Katja Tielbörger

Publication:
Katja Tielbörger, Mark.C. Bilton, Johannes Metz, Jaime Kigel, Claus Holzapfel, Edwin Lebrija-Trejos, Irit Konsens, Hadas A. Parag, Marcelo Sternberg: Middle-Eastern plant communities tolerate nine years of drought in a multi-site climate manipulation experiment. *Nature Communications*, DOI 10.1038/ncomms6102.

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