Scent of a spider: Sex pheromone of the wasp spider identified

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(PhysOrg.com) -- Wasp spiders normally live alone. In their mating season, however, they look for a partner. To help them along, the females exude a chemical lure, a pheromone that has an irresistible scent to the males.

A team led by Gabriel Uhl (University of Bonn, Germany) and Stefan Schulz (TU Brunswick, Germay) has now identified this pheromone and synthesized it in the laboratory. As the scientists report in the journal Angewandte Chemie, they were able to use this synthetic substance to attract spiders in the field with a pheromone for the first time.

Female wasp spiders (*Argiope bruennichi*) have striking markings reminiscent of a wasp. The spiders prefer to live in the fields of the Mediterranean region, but have begun to spread into central Europe as well. Their prey consists primarily of grasshoppers. Adult females build nets in the grass and lure the much smaller males, who are searching for partners in the meadow. In order to find a female, the males follow the alluring scent of pheromones.

In order to track down the pheromones of the wasp spider, the scientists placed female spiders in glass chambers and used carbon filters to capture the volatile compounds out of the atmosphere. After extraction from the filters and a gas-chromatographic separation, the substances were analyzed by mass spectrometry. “It was found that grown, unpaired females excrete a special substance that juvenile and mated spiders do not,” explains Uhl. “This compound is also found in the nets of females

who are ready to mate." Very few pheromones have thus far been found for spiders. "Among the orb weaver spiders, our project is the first to identify a pheromone," reports Schulz.

The analysis revealed that the wasp spider pheromone is methylcitric acid trimethyl ester, a derivative of citric acid. The molecules of this compound can occur in four different forms, which differ only by the spatial arrangement of the individual atoms relative to each other. The team synthesized these four stereoisomers in the laboratory and compared them to the natural extract. "The volatile substances contained two of the isomers in a ratio that can range from 6:1 to 25:1," says Schulz. Using a synthetic mixture, the scientists were able to lure male wasp spiders into traps in a sunny meadow in high summer. Whereas the successful attraction was dependent on the concentration of the pheromone in the trap, the ratio of the isomers played no role. Says Schulz: "We have thus successfully lured spiders in pheromone traps for the first time."

More information: Stefan Schulz, The Sex Pheromone of the Wasp Spider Argiope bruennichi, *Angewandte Chemie International Edition,* dx.doi.org/10.1002/anie.200906311

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