Pollen Tube Attraction in Lilies: Is there More than One Attractant in the Upper Pistil?

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Fertilization in angiosperms is achieved by the delivery of sperm cells to the ovule through pollen tubes. In Torenia fournieri, which has a short pistil, pollen tubes are attracted to a substance called LURE, which is secreted by synergid cells next to the egg cell. However, in a lily with a long pistil, it is not known how pollen tubes are guided to the ovary. In Lilium longiflorum, pollen tube elongation was affected by Chemocyanin from the stigma. Our seniors found that Lilium formosanum pollen tubes were attracted by chemicals in its stigma and upper style. We investigated multiple attractants produced in different parts of the pistil, and in pistils at different bud ages and different stages of growth. Both intact tissues and extracted substances were used in these experiments. We found that the level of attraction to the stigma tissue became stronger before flowering. Pollen tubes remained within the stigmas of small, immature buds, but they grew into the styles of mature buds. Pollen tubes were attracted to and stayed in the liquid from the stigma, whereas they were attracted to and passed through the liquid from the upper style. Attraction at the stigma was weaker than that at the upper part of the style. The stigma extract lost its attraction after tryptic treatment, while the style extract did not. These results indicate that lily pollen tubes are guided to the ovule by tissue-specific multiple attractants produced in different parts of the pistil at specific times.

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