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SmCSP4 from aphid saliva stimulates salicylic acid-mediated defence responses in wheat by interacting with transcription factor TaWKRY76

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Summary
Aphid salivary proteins are critical in modulating plant defence responses. Grain aphid *Sitobion miscanthi* is an important wheat pest worldwide. However, the molecular basis for the regulation of the plant resistance to cereal aphids remains largely unknown. Here, we show that SmCSP4, a chemosensory protein from *S. miscanthi* saliva, is secreted into wheat plants during aphid feeding. Delivery of SmCSP4 into wheat leaves activates salicylic acid (SA)-mediated plant defence responses and subsequently reduces aphid performance by deterring aphid feeding behaviour. In contrast, silencing *SmCSP4* gene via nanocarrier-mediated RNAi significantly decreases the ability of aphids to activate SA defence pathway. Protein–protein interaction assays showed that SmCSP4 directly interacts with wheat transcriptional factor TaWRKY76 in plant nucleus. Furthermore, TaWRKY76 directly binds to the promoter of SA degradation gene *Downy Mildew Resistant 6 (DMR6)* and regulates its gene expression as transcriptional activator. SmCSP4 secreted by aphids reduces the transcriptional activation activity of TaWRKY76 on *DMR6* gene expression, which is proposed to result in increases of SA accumulation and

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