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Regulation of Fatty Acid Metabolism and Effect of Starvation on the Expression of *Mi-sbp-1* in Root Knot Nematode *Meloidogyne incognita*

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Abstract—*Sedentary root-knot nematode, Meloidogyne incognita is an obligate plant pathogen with complicated feeding behavior. The nematode solely feeds from the modified root cells called giant cells induced by it. Fatty acids function in important biological processes such as membrane biogenesis and energy storage. Nematodes can synthesize fatty acids de novo, but also take up fatty acids from the roots of a host plant. Infective second-stage juveniles (J2s) survive by utilizing the lipid reserves when they are outside the roots as source of energy. Here, we identified and functionally characterized the Mi-sbp-1 gene in M. incognita that is involved in the fat metabolism through qRT-PCR, Nile red staining and in vitro RNAi. M. incognita Mi-SBP-1 is similar to Caenorhabditis elegans SBP-1, a homolog of the sterol regulatory element binding protein family of transcription activators that are critical regulators of cholesterol and fatty acid homeostasis in mammals. We investigated the ability of M. incognita to utilize stored body fat upon starvation and the mechanisms to metabolize fat. J2s showed significantly increased transcript accumulation of Mi-sbp-1 upon starvation, in contrast, considerable decrease in fluorescence due to Nile red staining that specifically stains fat indicating decrease in intracellular fat. In the developmental expression analysis, more transcript accumulation of Mi-sbp-1 was found in J3s and J4s compared to post J2s. Monitoring of fat levels in J3 and J4 stages within the adzuki bean revealed the importance of this gene in the fatty acid metabolism as indicated by reduced florescence due to Nile red staining. Further, in vitro RNAi strategy was used to knockdown Mi-sbp-1 gene in J2s confirmed through qPCR also showed long term effect by negatively affecting the developmental progression of M. incognita infecting adzuki bean. Taken together, our findings demonstrate that Mi-sbp-1 is a key transcription factor controlling lipid homeostasis in M. incognita.*

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