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Characterization of nematicidal activity of MRJP-containing glycoproteins from honey

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Parasitic nematodes infect more than two billion people worldwide particularly in developing countries. We previously reported nematicidal activity of natural honey using model nematode Caenorhabditis elegans. This study advanced characterization of nematicidal effects of natural honey and its glycoproteins. Chromatographically separated honey glycoproteins showed potent anti C. elegans activity (LD50=100 ng/μL). Fluorescence microscopic analysis revealed cell death in intestinal lumen and gonads of worms treated by honey glycoproteins. Honey glycoprotein complexes with molecular masses of ~260 kD and ~160 kD comprised of 'major royal jelly protein-1'-containing aggregates. In these complexes, MRJP1 was present in different glycosylation forms. Quantitative PCR based gene expression assays described molecular functions of C. elegans affected by honey and honey glycoproteins. Expression of 14 genes associated with key cellular and molecular functions including energy metabolism, cytoskeleton, cell division, transcription and translation was analyzed. Acacia honey exerted a concentration-dependent regulation of genes involved in citric acid cycle (MDH1 and IDHG1) and cytoskeleton (ACT1, ACT2 and ARP6), likewise, MRJP1-containing glycoproteins caused down regulation of arp-6 and idhg-1; and up-regulation of ACT1 and MDH1 genes. Consistent down-regulation of isocitrate dehydrogenase encoding gene IDHG1 which is among the rate-controlling enzymes of citric acid cycle was considered as main biochemical factor involved in nematicidal activity of honey and MRJP-containing glycoproteins. Although Acacia honey suppressed the expression of gene encoding actin-2, the honey glycoproteins did not. Hence, honey partly exerted anti C. Elegans activity by decreasing the transcription of actin-2, demonstrated by defect in the movement and egg laying. Moreover, gene ARP6 encoding actin-related protein 6 was significantly and constantly down-regulated by honey and honey proteins.

Biography

Bushra Bilal has completed PhD in 2017 from H.E.J. Research Institute of Chemistry, University of Karachi, Pakistan. Her PhD research was on molecular biology and proteomics in which she has carried out research on honey proteins and analyzed the effect of these proteins on the model nematodes C. elegans. During her Masters she has published two research papers.

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