Solanum anguivi Lam. fruits' nutritional quality and potential effect on type 2 diabetes mellitus

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The burden of diabetes is enormous due to its rapidly increasing global prevalence affecting development as it may affect the productivity of the patients. Although drugs have been developed to treat type 2 diabetes mellitus (T2DM), they are often accompanied by several side effects and are expensive. *Solanum anguivi* Lam. fruits (SALF), locally known as *katunkuma,* are a traditionally consumed vegetable believed to treat T2DM, possibly due to the presence of bioactive compounds such as phenolics and saponins. The present study examined the morphological characteristics of the leaves, stem and fruits of *Solanum anguivi* Lam. accessions and the bioactive compounds content (BCC) and antioxidant activity (AA) of different SALF accessions. The influence of the ripeness stage and thermal treatments on the BCC and AA of SALF accessions was investigated. The BCC analysed included phenolics, flavonoids, saponins, alkaloids, and vitamin C. The study further explored the potential of dietary SALF to prevent (prevention study) and manage T2DM-like phenotypes (therapeutic study) using the fruit fly, *Drosophila melanogaster* (*D. melanogaster*) as the model organism. *D. melanogaster*'s energy metabolism is reportedly comparable with humans, and it has been previously shown that they develop a T2DM-like phenotype upon the intake of a high-sugar diet (HSD).

Solanum anguivi Lam. accessions varying in morphological characteristics were also found to vary in BCC and AA. For the different SALF accessions, the BCC and AA changed with ripening. The unripe stage exhibited the highest AA. Thermal treatments significantly affected the BCC and AA of SALF, with boiling resulting in the highest AA. In the therapeutic study, the HSD-fed female flies exhibited elevated glucose levels, which significantly decreased in a dose-dependent manner upon exposure to SALF-supplemented HSD. In both the therapeutic and prevention studies, both male and female flies fed on a SALF-supplemented HSD exhibited a significant increase in survival compared to corresponding HSD-fed and control diet-fed flies. The mRNA levels of genes involved in the fly's energy metabolism (*Srl*, *dIlp3* and *dIlp6)* were not significantly different between flies exposed to HSD+SALF or HSD. However, *dIlp6* was significantly higher in female flies that fed on HSD+5mg/ml SALF when compared to the control-fed, suggesting a central role for *dIlp6* in mediating the increased survival of the flies by SALF. In conclusion, the study showed for the first time that dietary SALF lowers HSD-induced glucose levels in *D. melanogaster,* which was not mediated through an up-regulation of central genes of the fly's energy metabolism. Simultaneously, dietary SALF increased the flies' survival, thus suggesting a protective effect of SALF against premature death associated with a T2DM-like phenotype. Consumption of dietary SALF

may therefore help in the prevention and management of T2DM in humans. However, additional studies in higher organisms are needed to unravel the underlying mechanisms of the antidiabetic effects of dietary SALF.