

Dietary fiber from mannan smoothie prevents metabolic syndrome development in metabolic syndrome-prone rats

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Abstract

Metabolic syndrome is an increasingly prevalent health concern comprising multiple metabolic perturbations that can lead to life-threatening diseases if uncontrolled. Apart from physical activity, one way to control metabolic syndrome is by incorporating fiber-rich foods, such as konjac potato, into the diet. The present study examined the effects of Mannan Smoothie (MS), a modified konjac potato product, on metabolic syndrome-prone OLETF (Otsuka Long Evans Tokushima Fatty) rats. OLETF rats were fed standard chow mixed with 30% MS or standard chow only for 10 weeks ($n=12$ for each group). Compared with OLETF rats fed on standard chow ($n=12$), MS-fed OLETF rats had similar food intake, but 34% less body weight gain ($p<0.01$). Abdominal fat was significantly lower in the MS group compared with the control group. MS feeding also resulted in significantly lower postprandial blood glucose and insulin levels compared with the control group (119 ± 16 mg/dL vs. 138 ± 21 mg/dL, respectively, $p<0.05$). Finally, MS feeding was associated with significantly higher gut weight and villus height compared with the control group. Overall, these data suggest that dietary fiber from MS has the potential to maintain body weight, regulate blood glucose, and improve gut morphology in subjects with metabolic syndrome.

Keywords : Mannan smoothie (MS), metabolic syndrome, rat

I Introduction

Metabolic syndrome includes obesity, impaired glucose tolerance and high blood pressure; if uncontrolled, this syndrome can lead to more serious health complications including cardiovascular disease. Global obesity rates are concerning: in 2016, WHO reported that 39% of adults were overweight and 13% were obese¹⁾. A March 2023 report from the World Obesity Atlas predicted that by 2035, around 51% of the world population will be obese, impacting all regions and continents²⁾. Effective weight management is crucial in combating obesity and its associated risks; in addition,

unhealthy dietary choices, including high-calorie, high-fat, sugary, and processed foods, combined with a sedentary lifestyle, are key contributors to obesity^{3, 4)}. While there are several synthetic drugs for obesity management, side effects are often problematic⁵⁾. Therefore, diet-based approaches, especially high-fiber diets, are gaining attention due to their safety and positive results in experimental studies⁶⁾.

Konjac is widely used in the pharmaceutical, cosmetic, and the chemical industries due to its non-toxic gelling, thickening, and emulsifying properties^{7, 8)}. It also offers various physiological benefits, including lowering postprandial glucose levels⁹⁾, improving lipid metabolism¹⁰⁾, reducing