

Mollugo pentaphylla: New nutraceutical use as antidiabetic

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Abstract

Nutraceuticals are the emerging era in the treatment of diabetes mellitus, one of the seriously problematic due to leading the causes of death in all over the world. The newer anti-hyperglycemic drugs continue searching because the existing synthetic drugs have several limitations. Traditional medicinal plants are used in the treatment of diabetes mellitus more than a century, but only a few of these have proofed their safe and efficacious. The aim of this review article is focused *Mollugo pentaphylla* one of the medicinal plants used for antioxidant activities. It contains several kinds of alkaloids, flavonoids, saponins, tannin, diterpenes, triterpenoids, glycosides and phenols. Many researchers have evaluated that these phytochemical substances have the major impact on diabetes mellitus. This review focuses on the hypoglycemic activity of this plant and clears that it has the potential to be considered as a candidate for preparing the new treatment of diabetes mellitus.

Keywords; Diabetes mellitus; Hypoglycemia; *Mollugo pentaphylla*; Nutraceutical; Plant

1. Introduction

Diabetes mellitus (DM) is a major heterogeneous endocrine and metabolic disorder, characterized by altered metabolisms of carbohydrate, lipid and protein, which not only lead to hyperglycaemia but also cause many complications, such as hyperlipidaemia, hypertension and atherosclerosis^{[1],[2],[3]}. Antioxidants have been shown to prevent the destruction of β -cells by inhibiting the peroxidation chain reaction and thus, may provide protection against the development of diabetes. On the other hand, plants contain natural antioxidants (tannins, flavonoids, vitamins C and E, etc.) that can preserve β -cell^{[4],[5]} function and prevent diabetes induced ROS formation and many plant species are known in folk medicine of different cultures to be used for their hypoglycaemic properties and therefore used for treatment of DM. Despite this, few traditionally used antidiabetic plants have received proper scientific screening. The World Health Organization (WHO) has recommended that this area warrants further evaluation. Ethnomedical Information on *Mollugo pentaphylla* cited the folkloric use of the plant as an emmenagogue on female human adult in India and Indonesia^[6]. Hot H₂O extract of dried entire plant in India used for whooping cough and in cases of atrophy in human. Decoction of dried entire plant used to treat hepatitis in Taiwan. *M. pentaphylla* is a component in an important folk medicine named "Peh-Hue-Juwa-Chi-Cao" in Taiwan, which is used as an anticancer, antitoxic and diuretic agent. Eaten as a pot-herb; it is also used medically for mouth infections. The original scientific studies on the plant reported to possess active antifungal activity, antibacterial activity, spermicidal and spermiostatic effect, anti-inflammatory and hepatoprotective activity and antioxidant activity. The plant is reported to contain Flavones such as Apigenin and Mollupentin, Mollugenol Sitosterol Beta.

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2. Nomenclature and morphological characters

Mollugo pentaphylla Linn, commonly known as carpet weed (English), Pitta saga (Oriya) is a perennial herb found throughout India, Ceylon, Malacca, China, Japan, Fiji etc. Roots are creeper and adventitious, leaves are trifoliate small oval shape; flowers are white, pentameric and bisexual. The urban people used this plant medicinally in paste form orally and externally for treatment of skin allergic condition, antimicrobials etc. *Mollugo* is a genus in the flowering plant family Molluginaceae. It comprises a few dozen *species* of herbaceous plants, including *Mollugo verticillata*, carpetweed or green carpetweed. Highly esteemed by Hindus as a bitter vegetable which they eat occasionally on account of its stomachic, aperient and antiseptic properties^[7].

Mollugo pentaphylla L. *Terrestrial*, annual, tufted to erect herb, up to 35 cm tall. Taproot whitish or brown. Stems erect, rounded, solid, glabrous.

2.1. Phytochemical constituents

The Qualitative analysis revealed the presence of carbohydrates, protein, saponins, tannins, terpenoids, flavonoids, steroids, phenols, proteins, alkaloids and glycosides, volatile oils, in the whole plant of *Mollugo pentaphylla* L.

2.2. Traditional uses

Ethnomedical Information on *Mollugo pentaphylla* cited the folkloric use of the plant as an emmenagogue on female human adult in India^[8], which is used as an anticancer, antitoxic and diuretic agent. Eaten as a pot-herb; it is also used medically for mouth infections. The original scientific studies on the plant reported to possess active antifungal activity^[9] antibacterial activity, spermicidal and spermistatic effect anti-inflammatory and hepatoprotective activity and antioxidant activity. The plant is reported to contain Flavones such as Apigenin and Mollupentin, Mollugogenol A, an antifungal triterpenoid, Mollugogenol B, Mollugogenol D, Oleanolic acid and a steroid–Sitosterol Beta.

2.2.1. Anti diabetic activity

Medicinal plants have gained huge interests from researchers around the world because of their positive bioactivity effects. However, there are still not many data available about the anti-diabetic activity of this medicinal plant. *Mollugo pentaphylla* during the review searches were done on the scientific databases i.e., Science Direct, Springer Link, PubMed, Google Scholar and etc. Moreover internet searches were undertaken on the search engine. Different combinations of keywords as well as synonyms for keywords were used during the searches.

2.2.2. Hypouricemia activity

In addition, a recent research showed that fructose-induced hyperuricemia plays a pathogenic role in metabolic syndrome^{[10],[11]}. Thus, lowering uric acid may be a novel treatment target for preventing diabetes. The levels of urea, serum creatinine and uric acid were restored to near normal level by treatment with *Mollugo pentaphylla* leaves extract^[12].

2.3. Antioxidant properties

Many studies reveal that antioxidants capable of neutralizing free radicals are effective in preventing experimentally induced diabetes in animal models as well as reducing the severity of diabetic complications^{[13]-[15]}. The elevated oxidative stress marker and diminished antioxidant status were normalized indicating the antioxidant potential of this plant^[16]. Zarena et al.^[17] reported the 29 kDa protein from *Mollugo Pentaphylla* leaves named agathi leaf protein (ALP) which possesses antioxidant and cytoprotective activities. Additional, the level of lipid peroxidative markers (thiobarbutric acid reactive substances and lipid hydroperoxides) was significantly reduced on treatment with *Mollugo Pentaphylla*, the levels of both enzymatic and non-enzymatic antioxidants were also found to be restored on treatment with this plant^[18].

2.4. Increased hepatic metabolism

The hypoglycemic activity is thought to be due to increased hepatic metabolism. Aqueous homogenate of this plant administered orally to animal model significantly increased hepatic glycogen and free amino acid content, decreased blood glucose, and triglyceride levels^[19].

2.5. Insulin elevation

The hypoglycemic activity is thought to be due to stimulation of synthesis and/or release of insulin from pancreatic beta cells and/or insulin sparing effect [20]. In conclusion, the aim of this review is to focus on the potential utilization of phytochemical constituents which could contribute more effectively to antidiabetic activity of *Molluga Pentaphylla*. It aims to explore a proposed of this plant for complementary alternative medicine and especially for human consumption.

3. Conclusion

Molluga Pentaphylla is a promising nutraceutical as antidiabetic by increasing the hepatic metabolism, in turn increased hepatic glycogen content, decreased the blood glucose and triglyceride levels and the hypoglycemic activity is thought to be due to stimulation of synthesis and/or release of insulin from pancreatic beta cells and/or insulin sparing effect. In conclusion, the aim of this review is to focus on the potential utilization of phytochemical constituents which could contribute more effectively to antidiabetic activity of *Molluga Pentaphylla*.

It aims to explore a proposed of this plant for complementary alternative medicine and especially for human consumption.

Compliance of ethical standard

Acknowledgement

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Disclosure of Conflict of Interest

Authors declare no conflict of interest.

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