



## Review Article

### A REVIEW ON THERAPEUTIC USE OF *VIDANGA (EMBELIA RIBES)* FOR PATHOLOGICAL CONSEQUENCES ASSOCIATED WITH OBESITY AS PER *AYURVEDIC* CLASSICS

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#### ABSTRACT

*Atisthaulya* is one of the oldest documented metabolic disturbance in *Ayurveda* associated with obesity. In *Ayurvedic* literature, *Ati-sthaulya* has been described not as obese state only rather than a clustering of pathological events induced by obesity. The concept of *Atisthoulya* bear a resemblance with metabolic syndrome (MetS). *Vidanga (Embelia Ribes)* is one of the important herb that has been described in *Charak Samhita* to treat *Atisthoulya*. This reviews aims at providing scientific evidences behind such use of *Vidanga (Embelia Ribes)*.

**Keyword:** *Atisthoulya*, Metabolic syndrome, *Vidanga*, *Embelia Ribes*

#### INTRODUCTION

Obesity is a common preventable risk factor for the development of metabolic disarrangement as well as significant deterioration of health. The epidemic of obesity presents a major challenge to health across the life course around the world. Obesity associated dysfunctional metabolic system may give rise to a clustering of cardiovascular diseases (CVDs) risk factors such as dyslipidaemia, impaired glucose tolerance, elevated blood presser which is known as metabolic syndrome (MetS).<sup>1</sup> An adiposity especially visceral and/or ectopic adiposity are thought to be the core clinical component of MetS.<sup>2</sup>

According to International Diabetes Federation, diagnostic criteria of MetS includes central obesity, impaired glucose tolerance or dyslipidaemia or elevated blood presser.<sup>3</sup>

*Ayurveda* is one of the most ancient medical literature in India as well as world. Obesity was in prime area of interest in *Ayurvedic* compendia also due to its effects in morbidity and mortality.<sup>4</sup>

In *Ayurvedic* literatures, obesity and subsequent pathological consequences has been termed as *ati-sthaulya*. *Medativridhhi* and *vishama-dhatuposhana* are the key pathological phenomena in *atisthoulya* which are conventionally known as adiposity and dysfunctional metabolic system respectively.<sup>5</sup>

A numbers of herbs has been mentioned as anti-obesity agents in context to *Atisthoulya* including *Vidanga (Embelia Ribes)* by *Acharya Charak*. The anti-obesity effects of *Vidanga (Embelia Ribes)* are caused by its *prabhava*.<sup>6</sup>

Although *Vidanga* is widely accepted as most effective *krimighna dravya* (antimicrobial agent) in *Ayurveda*.<sup>7</sup> Many bioactive

components are present in *Embelia Ribes* including embelin, alkenylresorcinol, embeliphenol-A etc. This review has focused to provide a scientific rationale behind the use of *Vidanga* for obesity induced metabolic dysfunction in *Ayurveda*.

This review aims at scanning the published research articles on *Vidanga (Embelia Ribes)* and to provide scientific evidences behind their use in *Ayurveda* for obesity associated pathological consequences.

Studied data has been collected from two basic sources classical *Ayurvedic* compendia and electrical databases. Database searching was conducted in two phase. Primarily Pubmed, Scopus, Google scholar databases were searched using search terms '*Embelia Ribes* or embelin' in title. Published literature concerning effect and mechanism of action of *Embelia Ribes* or embelin in obesity or hypertension or diabetes or dyslipidemia reported on human or animals was retrieved and analyzed. Those studies which explained the role of *Embelia Ribes* or embelin in obesity or hypertension or diabetes or dyslipidemia were included and rest were excluded. In next phase, the searching term was "metabolic syndrome". Those studies which explained the diagnostic criteria and mechanism of metabolic syndrome were included in this study.

#### EFFECTS OF *EMBELIA RIBES* ON OBESITY ASSOCIATED PATHOLOGICAL CONSEQUENCES

##### Effects of *Embelia ribes* on Elevated Blood Pressure

*Embelia Ribes* has been reported to produce different hypotensive effects. The aqueous extract to f *Embelia Ribes* (100mg/kg) was able to decrease both the SBP and heart rate, as well as increase endogenous antioxidants such as SOD, CAT, and GSH.<sup>8</sup> Six

weeks chronic oral administration of *Embelia Ribes* ethanolic extract on streptozotocin (STZ) induced diabetes mellitus at the dose of 100 mg/kg and 200 mg/kg significantly reduced the levels of blood glucose, glycated haemoglobin, heart rate (HR) and systolic blood pressure (SBP) in rats.<sup>9</sup>

Blood pressure lowering effect was also found in high fat-fed rats after treatment with 50mg/kg of embelin for twenty one days.<sup>10</sup>

#### Effects of *Embelia ribes* on Dyslipidemia

Administration of *Embelia Ribes* ethanolic extract to diabetic rats produced considerable reduction in serum lipase activity, that suggests its potential in prevention of lipid abnormalities and obesity (Bhandari et al 2013).<sup>11</sup> Ethanolic extract of *Embelia Ribes* has shown lipid lowering potential in terms of decrease serum total cholesterol, and triglycerides, and increase in HDL-cholesterol levels in streptozotocin induced diabetes in rats after twenty days of oral administration at the dose of 200 mg/kg compared to pathogenic diabetic rats (Bhandari et al 2012).<sup>12</sup> Pretreatment with embelin (50 mg/kg) significantly decreased the elevated levels of serum lipid levels and lipoproteins in high fat diet induced obese rats (Chaudhari HS et al).<sup>13</sup>

#### Effects of *Embelia ribes* on Elevated Blood Sugar

Oral administration of *Embelia Ribes* ethanolic extract at the dose of 100 mg/kg and 200 mg/kg for six weeks significantly reduced the levels of blood glucose, glycated haemoglobin in streptozotocin induced diabetic rats (Bhandari et al 2008).<sup>14</sup>

In a meta-analysis, *Embelia Ribes* and embelin has been found to restore blood glucose and glycosylated haemoglobin significantly in animals. Meta-analysis findings also reported considerable restoration of insulin, lipid profile, haemodynamic parameters, serum and oxidative stress markers.<sup>15</sup>

The methanolic and ethanolic extract of *Embelia Ribes* leaves effectively inhibited the activity of  $\alpha$ -amylase and  $\alpha$ -glucosidase in a dose-dependent manner. The effect of the methanolic extract was more prominent than that of ethanolic extract.<sup>16</sup>

The inhibition of alpha-glucosidase and alpha-amylase enzymes can modify the digestion of carbohydrates that is reflected in reduced the post-prandial blood glucose.<sup>17</sup>

Alkenylresorcinol, embeliphenol-A has been isolated from ethyl acetate extract of the stems of *Embelia Ribes* that possess significant  $\alpha$ -glucosidase inhibitory activity in a concentration-dependent manner.<sup>18</sup>

Embelin, isolated from *Embelia Ribes* fruits, regulated insulin mediated glucose uptake in epididymal adipose tissue through translocation and activation of GLUT4.<sup>19</sup>

Histopathological observations in streptozotocin induced diabetic rats have shown the rejuvenation of  $\beta$ -cells destroyed by following embelin treatment, which indicates the insulin-mimicking effect of embelin by regenerating insulin producing cells.<sup>20</sup>

#### Effects of *Embelia ribes* on Obesity

Oral administration of *Embelia Ribes* ethanol extract at the dose of 100 mg/kg in high fat diet induced obese mice has shown a preventive effect on body weight gain as well as exerted lipid lowering action, improvement in insulin and leptin sensitivity and increased antioxidant defense.<sup>21</sup>

Embelin has been found to be effective in inhibiting adipogenesis and lipogenesis in vitro via canonical Wnt signaling pathway. Embelin has a potential role to prevent fat accumulation and to improve obesity-associated insulin resistance in the high fat diet induced obesity in mice.<sup>22</sup>

## DISCUSSION

*Atisthaulya* is one of the oldest documented metabolic disturbance in *Ayurveda* associated with obesity. In *Ayurvedic* literature, *ati-sthaulya* has been described not as obese state only rather than a clustering of pathological events induced by obesity. There is fundamental equivalency in metabolic syndrome (MetS) and *Ati-sthoulya* in respect to risk factors, diagnostic evaluation and pathophysiological phenomena.<sup>23</sup>

MetS is constellation of central obesity, impaired glucose metabolism, elevated blood pressure and dyslipidemia caused by dysfunctional metabolic system.<sup>24</sup>

In classical *Ayurvedic* texts, *Vidanga (EmbeliaRibes)* has been described as a therapeutic agent to treat *Atisthoulya*. *Embelia Ribes* has been found to alleviate all the components of MetS including adiposity, insulin resistance, elevated blood pressure, dyslipidemia in animal studies.

*Embelia Ribes* fruits contain a quinone derivative embelin, which is considered one of the major bioactive constituents, has been identified for its various medicinal activities such as, anti-hyperglycaemic, anti-hypertensive, anti adipogenic etc.

## CONCLUSION

As per *Ayurvedic* classics, *Vidanga (Embelia Ribes)* are indicated in pathological consequences associated with obesity. This review indicates a scientific rationale behind such use of *Vidanga (Embelia Ribes)* based on animal studies. Presently no any clinical study are available describing any such effects. A large scale clinical trial is essential to confirm the therapeutic potency of *Vidanga (Embelia Ribes)* in MetS.

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