



Oral hypoglycaemic, antihyperglycaemic and antidiabetic activities of Sri Lankan Broken Orange Pekoe Fannings (BOPF) grade black tea (*Camellia sinensis* L.) in rats

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ABSTRACT

Ethnopharmacological relevance: Sri Lankan traditional practitioners recommend the consumption of black tea infusion (BTI) made from *Camellia sinensis* L. plant for regulation of glycaemia. However, they do not specify the grade of tea and their origin (i.e., agroclimatic elevation) and as such many prediabetics and mild diabetics use BOPF grade tea.

Aim of the study: This study examines the blood glucose lowering potential of Sri Lankan BOPF grade tea and its potency with respect to agroclimatic elevations.

Materials and methods: Unblended orthodox BOPF grade tea samples were collected from high-, mid- and low-grown agroclimatic elevations in Sri Lanka. Different concentrations of warm BTI (60, 120 and 480 mg/ml), tolbutamide (reference drug: 22.5 mg/kg body weight) and water (control) were orally administered to different groups of rats, and hypoglycaemic and antihyperglycaemic activities were assessed. Antidiabetic activity was determined using streptozotocin induced diabetic rats. Mechanisms of blood glucose lowering actions were investigated using several standards techniques.

Results: BTI exhibited significant ($P < 0.05$), dose-dependent and marked hypoglycaemic and antihyperglycaemic activities with quick onset. These effects did not differ with respect to agroclimatic elevation, although there were differences in the content of phyto-constituents. BTI also showed marked and quick antidiabetic activity. BTI inhibited intestinal glucose absorption and impaired α -glucosidase and α -amylase activities. BTI possessed insulinomimetic action, ability to improve insulin sensitivity and in vivo antioxidant activity. Notably, BTI was nontoxic.

Conclusions: BTI of Sri Lankan BOPF grade tea has oral hypoglycaemic, antihyperglycaemic and antidiabetic actions which are mediated via multiple mechanisms. This study also indicates that, BOPF grade tea of any agroclimatic elevations in Sri Lanka could be used in the regulation of glycaemia.

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1. Introduction

Hot water infused brew of black tea [*Camellia sinensis* (L.) O. Kuntze (family: *Theaceae*)] is the most consumed beverage of the world after water (Mohamed and Zoysa, 2008). It is recorded that, globally about 3–5 billion cups are consumed daily (Modder and Amarakoon, 2002). Based on ethnomedical claims (Gomes et al.,

1995; Anderson and Polansky, 2002; Modder and Amarakoon, 2002; Shoji and Nakashima, 2006) and epidemiological (He and Kies, 1994; Yang and Landau, 2000; Salazar-Martinez et al., 2004; Sharangi, 2009), clinical (Savage et al., 2003; Wu et al., 2003; Store and Baer, 2008) and experimental (Gomes et al., 1995; Abeywickrama et al., 2005; Cameron et al., 2008; Jayakody and Ratnasooriya, 2008; Kwon et al., 2008; Sharma et al., 2008; Kusano et al., 2008; Ratnasooriya et al., 2009; Abeywickrama et al., 2010) evidences, it is now considered as a medical preparation. Tea is manufactured from freshly harvested two or three of the topmost immature leaves and bud of the tea plant (Wijeratne, 2008). Based on the manufacturing techniques, there are three types of teas: green, oolong and black (Modder and Amarakoon, 2002). Globally, black tea is the most consumed variety (Anon., 2009).

In Sri Lanka, traditional medical practitioners often recommend heavy consumption (6–10 cups per day) of black tea brew for pre-

Abbreviations: ALT, alanine-transaminase; AST, aspartate-transaminase; BI, briskness index; BOPF, Broken Orange Pekoe Fannings; BTI, black tea infusion; BW, body weight; C, (+)catechin; DPPH, 1,1-diphenyl-2-picrylhydrazyl; EC, (–)epicatechin; ECG, (–)epicatechin gallate; EGC, (–)epigallocatechin; EGCG, (–)epigallocatechin gallate; GA, gallic acid; TF, theaflavins; TPP, total polyphenols; TR, thearubigins; STZ, streptozotocin.

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