Review

Phytopharmacological review of *Eurycorymbus cavaleriei*: A rare plant endemic to China that contains effective chemopreventive agents

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*Eurycorymbus cavaleriei* is a tall deciduous, broad-leaved dioecious tree endemic to China and widely scattered in its subtropical mountains, among evergreen and other deciduous broad-leaved trees in the forests. The plant is reported to contain coumarins, flavonoids, terpenoids, benzeneacetic acid derivatives, lignans, phenolics and fatty alcohol compounds. These compounds have been reported to have antioxidant and quinone reductase induction activities, which can mean that the plant itself has the potential to have chemopreventive properties. The plant is now considered as a valuable source of unique natural products for development of medicines against cancer and also for the development of industrial products. This review gives a bird’s eye view mainly on the plant’s morphology, phytochemistry, and the pharmacological actions of its chemical constituents.

Key words: *Eurycorymbus cavaleriei*, chemopreventive, pharmacological action.

INTRODUCTION

Natural products have been the single most productive source of leads for the development of drugs. Various screening approaches are being developed to improve the ease with which natural products can be used in drug discovery campaigns. Data mining and virtual screening techniques are also being applied to databases of natural products. The more efficient and effective application of natural products will improve the drug discovery process (Newman et al., 2007; Ganesan et al., 2008; McChesney, 2007).

Many natural products are in clinical development, particularly as anti-cancer agents. Application of molecular biological techniques is increasing the availability of new, if not, novel compounds that can be conveniently produced in bacteria or yeasts. *Eurycorymbus cavaleriei* is a deciduous, broad-leaved dioecious rare tree native to China. It is a tertiary relict and the sole member of its genus within the family Sapindaceae. It is commonly known as “Sanhuamu” in China, and is threatened by habitat loss (Fu and Jin, 1992). It is a widely scattered in China’s subtropical mountains, ranging from Taiwan in the Southeastern China to Yunnan in the Southwestern China, and among evergreen and other deciduous broad-leaved trees in the forests. There are few investigations on its chemistry constituents and pharmacological activities. The sporadic study on *E. cavaleriei* indicates that the ethanol extract of the twig of *E. cavaleriei* has high induction activity of quinone reductase, which is one of the primary lines of defense against reactive chemical species and has emerged as an important drug target for cancer chemoprevention (Tan et al., 2009). Chemical studies on the plant have reported the isolation and identification of several chemopreventive agents. The present attempt is to review and compile updated information on various aspects of *E. cavaleriei*.

PLANT MORPHOLOGY

*E. cavaleriei* (Levl.) Rehd. et Hand.-Mazz is a much
E. cavaleriei is a branched cylindrical deciduous tree, 20 m in height, with gray bark and short floss. Its leaf, together with the stalk, is 15 to 45 cm long, with a buckling floss on the back of the leaf axis; 4 to 10 pairs of leaves are arranged oppositely along the branches, like thin papers, about 7 to 11 cm long, 2.5 to 3.5 cm wide, elliptic to broadly oblong lanceolate or ovate with short petiole, tapering apex and obtuse base (Figure 1a-f).

The inflorescence is hemispherical with dense flowers, rachis and corymbose branches are arranged in short floss. The flowers are fragrant; their stems are 2 to 5 mm long; sepals are ovate, 1 to 1.5 mm long with short floss; petals are about 2 mm long with long floss; glabrous filaments are about 4 mm long; ovary of tomentose, the fruit capsule is about 8 mm long, 7 mm width; seeds are black, red hilum. Flower season is from May to June, fruit season is October.

E. cavaleriei is found in the broad-leaved forests of Yunnan, Guizhou, Guangxi, Hunan, Jiangxi, Guangdong, Fujian, and Taiwan. They are scattered in the 300 to 1400 m altitude of subtropical evergreen broad-leaved forest, and barely found in low mountains valley and valley forests. The resources of E. cavaleriei have become scarce increasingly (Flora of China, 1985).

**PHYTOCHEMICAL REVIEW**

The genetic, ecology, and nutrient properties of E. cavaleriei have been previously studied (Zhu et al., 2005; Chen et al., 2005; Gao et al., 2009; Wang et al., 2008; Buerki et al., 2009; He et al., 2009; Wan et al., 2009; Yao et al., 2010), but only few investigations on its chemistry constituents have been reported up to the present.

The research teams of Che Chun-Tao (The Chinese University of Hong Kong) and Ma Zhong-jun (Zhejiang University) have led to the isolation of effective chemical constituents from E. cavaleriei. In their studies, the chemistry constituents of this rare plant, include coumarins, flavonoids, terpenoids, benzeneacetic acid derivatives, lignans, phenolic compounds, and fatty alcohols (He et al., 2010; He et al., 2011; Cheng et al.,...
Figure 2. Pytochemicals of *Eurycorymbus cavaleriei*: (A) coumarins (Cheng et al., 2009); (b) flavonoids (He et al., 2010); (c) terpenoids (He et al., 2010; Cheng et al., 2008, 2010); (d) benzeneacetic acid derivatives (Ma et al., 2009); (e) lignans (Ma et al., 2009); (f) phenolic compounds (He et al., 2010); (g) others (He et al., 2011). Glu: Glucopyranosyl; Man: Mannopyranosyl; Xyl: Xylopyranosyl.
PHARMACOLOGICAL REVIEW

Although, this plant is an archaic species in the world, few pharmacological studies on it have been reported. A group evaluated the antioxidant activities of the phenolic compounds that were isolated from the stem part of *E. cavaleriei* by 1,1-diphenyl-2-picrylhydrazyl-free radical scavenging assay (He et al., 2011). The result indicated that the compound (46), Koaburaside, exhibited antioxidant activity (IC₅₀ value of 9.0 mM) and showed weak inhibitory activity against influenza A neuraminidase.

In order to explore the cancer chemopreventive activities of *E. cavaleriei*, some research teams evaluated its ethanol extract and isolates for their quinone reductase (QR) inducing activity. The researchers used the screen method based on glutathione (GSH) alkylation.

Ma et al. (2009) tested a benzeneacetic acid derivative, a lignan and terpenoids (Cheng et al., 2008, 2010). The results indicated that these compounds, 5'-Hydroxycleomiscosin B (6), Cavalrols B (16), Cavalrols D (18), Cavalrols G (21), Cavaol D (32), and Cavaol C (34) showed moderate QR induction with concentrations, to double the enzyme activity (CD) of 10.5, 8.62, 9.13 2.56, 7.9, and 9.9 μg/ml, respectively. Compounds Cavalrols F (20) and Cavalrols H (22) showed cytotoxicity against hepatic cell line with IC₅₀ values of no more than 1 mg/ml.

Some compounds from the plant were also tested for their relative ability to induce the detoxification enzyme, NAD(P)H: quinone oxidoreductase 1 (NQO1). These were coumarin compounds (Cheng et al., 2009), Fraxoside (1), 7,8-Dihydroxy-6- methoxycoumarin (2), Scopoletin (3), Moluccanin (5), Cleomiscosin A (7), Cleomiscosin C (8), 5'-Demethylaquilochilin (9), Jatrocin B (10), and 4'-O-Methyljatrocin B (11). Results showed that 5'-demethylaquilochilin has the most potent chemopreventive ability.

Due to the published reports on *E. cavaleriei* about its phytochemistry and pharmacological actions, this rare plant has gained prominence as an important source of biologically active secondary metabolites that can be developed into anticancer drugs.

REFERENCES


