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Opinion
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Is the Traditional Chinese Herb "Bombax Malabaricum" a Natural Anticancer Medicine?

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Bombax malabaricum belongs to the family Bombacaceae under the presently valid name *Bombax ceiba*, and is known as "Muk Min" in Cantonese [1]. *Bombax ceiba* was used in Chinese medicine a thousand years ago as recorded in Bencao Gangmu. That work encouraged its use in the treatment of diseases, including those of the spleen, liver, and large intestine, as well as in the elimination of wind (external evil) from the body [2].

According to Traditional Chinese Medicine (TCM) theory, *B. ceiba* has the ability to treat fever, alleviate dampness, detoxify the body, and prevent bleeding. It is said to be cool in nature and has a "yin" content, helping to balance the "yin-yang" inside the body. The flowers and bark of *B. ceiba* have medicinal properties, exhibiting a detoxifying, moisture-eliminating, and cold-expelling function, and providing "pure heat" [3].

Bombax ceiba has been shown to have anti-cancer effects, as it significantly increased the rate of HL-60 human leukemia cell death, raising caspase-3 activity and sub-G1 apoptosis [4]. During early 2014, *B. ceiba* was discovered to have the strongest antiproliferative activity against human renal adenocarcinoma (ACHN) cells [5].

Several flavonoids (Fig. 1), xanthones (Fig. 2), and coumarins (Fig. 3) isolated from *B. ceiba* have been shown to inhibit cancer cell proliferation by inducing apoptosis, interrupting the cell cycle, inducing stress proteins, destroying microtubules and mitochondria, releasing cytochrome c, or activating caspases [6].

The anticancer mechanism of *B. ceiba* is related to neutrophil activity. It significantly increases the number of neutrophils involved in cell-mediated immunity and activates T cells to release several lymphokines. This attracts macrophages, induces vasodilation, and prevents inflammation [4]. *Bombax ceiba* also decreases myelosuppression and enhances immune response for cancer treatment, e.g., by elevating caspase-3 levels in a caspase-dependent pathway. Caspases are proteins that cleave the major cellular components in cells, in addition to their role as repair enzymes during normal cellular functions. Caspases are characteristically activated during apoptosis and stimulate various lytic enzymes, e.g., DNases, which cleave nuclear DNA, causing cell apoptosis as part of the growth and aging processes in various tissues and organs [7].

In summary, the traditional Chinese herb *B. ceiba* has anti-

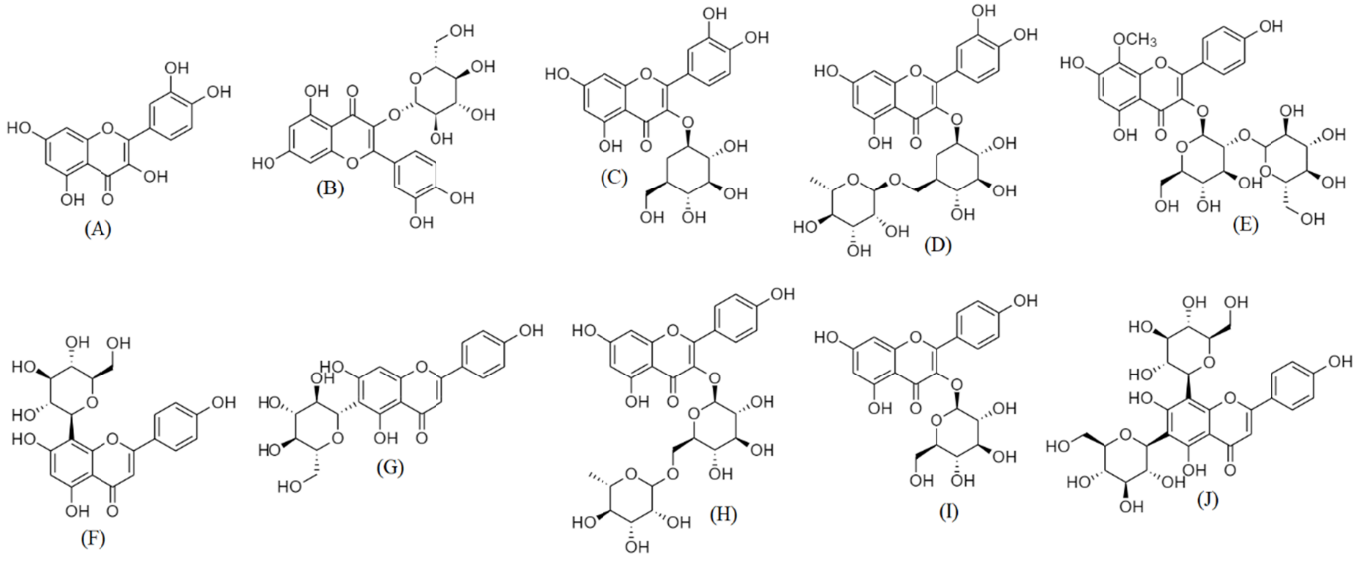

Figure 1. Chemical structures of ten flavonoids. (A) Quercetin, (B) Quercetin-3-O-β-D-glucopyranoside, (C) Quercetin-3-O-β-D-glucuronopyranoside, (D) Rutin, (E) Sexangularetin-3-O-sophoroside, (F) Vitexin, (G) Isovitexin, (H) Kaempferol-3-O-rutinoside, (I) Kaempferol-3-O-β-D-glucuronopyranoside, (J) Vicenin-2.

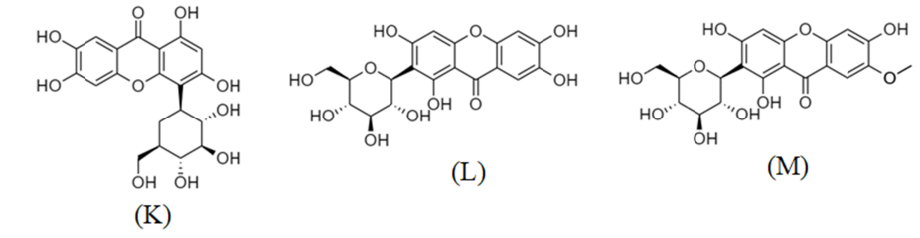

Figure 2. Chemical structures of three xanthones. (K) Isomangiferin, (L) Mangiferin, (M) 7-O-methyl mangiferin.

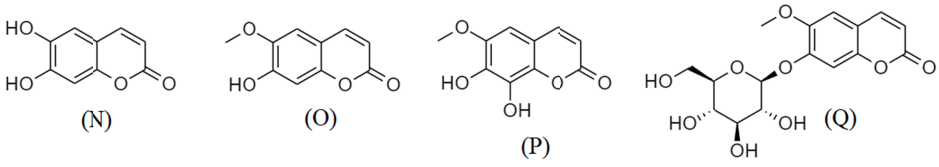

Figure 3. Chemical structures of four coumarins. (N) Esculetin, (O) Scopoletin, (P) Fraxetin, (Q) Scopolin.

cancer properties, but studies and findings are still limited. We recommend comprehensive animal research in order to ascertain the effects of *B. ceiba* compounds on various cancer cell lines as well as to evaluate their safety.

CONFLICT OF INTEREST

The authors have no conflicts of interest to disclose.

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