Study on Human Cancer Inhibition by Bitter Almond (*Prunus armeniaca LINNE var. ansu* MAXIMOWICZ.) Extracts

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ABSTRACT

Bitter almond is the dry and mature seed of *Prunus armeniaca LINNE var. ansu* MAXIMOWICZ. It has been prescribed in many traditional Chinese medicines for its antitussive, expectorant, and laxative functions. This study shows that amygdalin can kill cancer cells selectively at the tumor site without systemic toxicity. In the present study, we examined the cytotoxicity of 70% ethanol extracts of bitter almonds as an inhibitor of human cancer cell line (HepG2, A549and FL83B). By MTT assay, we demonstrated that bitter almond extracts reduced viability of anti-cancer cells by a dose and time dependent manner. Furthermore, apoptotic features such as shrinkage of the cancer cells proved that bitter almond extracts presented cytotoxic effects.

INTRODUCTION

In general, almond is categorized into two types: sweet and bitter almonds. Almond is said to have the functions of anti-cancer, promoting digestion, antitussive, suppressing pant, and improving one's look. It is known to be one of the food materials in our daily life. The lipid content of almonds ranges from about 40% to 60%, Oleic acid, linoleic acid and linolenic acid account on a mass basis of about 70%, 20% and less than 1%, respectively. Generally speaking, sweet almond is used for food processing, whereas bitter almond is applied to the Chinese medicine. In literature, the active constituent in bitter almond is amygdalin (as shown in Figure 1), which could be hydrolyzed into hydrogen cyanide by β-glucosidase.

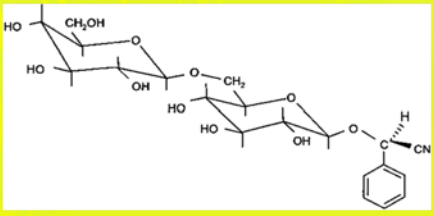

Figure 1. The chemical structure of amygdalin.

MATERIALS AND METHODS

Bitter almonds were purchased from the Xing Yuan trading company (Kaohsiung, Taiwan)(Figure 2). Human hepatoma HepG2 (BCRC 60177), human lung carcinoma A549 (BCRC 60074), and normal human embryonic kidney FL83B (BCRC 60325) cells were purchased from Bioresource Collection and Research Center (Hsinchu, Taiwan). Fetal bovine serum (FBS) and 10trypsin were purchased from Biological industries (Kibbutz Beit Haemek, Israel). Dulbecco's Modified Eagle's medium (DMEM), Hams F-12k medium, and 3-(4,5- cimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) were purchased from Sigma–Aldrich (St. Louis, MO, USA).

Figure 2. The morphology of tree and seed of bitter almond.

RESULTS

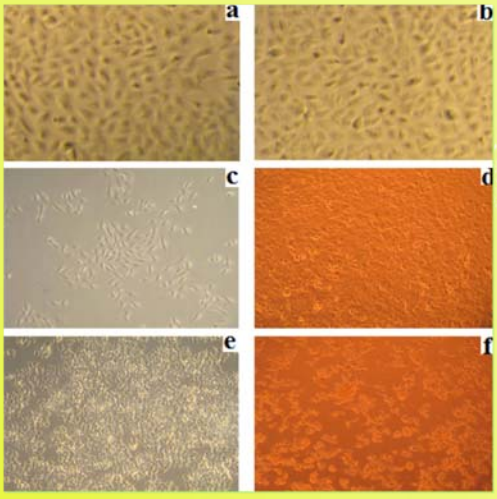

Figure 3. Microscopic images of human cancer cell line (FL83B, A549 and Hep G2) before and after treatment. (a) FL83B before treatment. (b) FL83B after treatment. (c) A549 before treatment.(d) A549 after treatment. (e) Hep G2 before treatment. (f) Hep G2 after treatment. Bar = 10 μm.

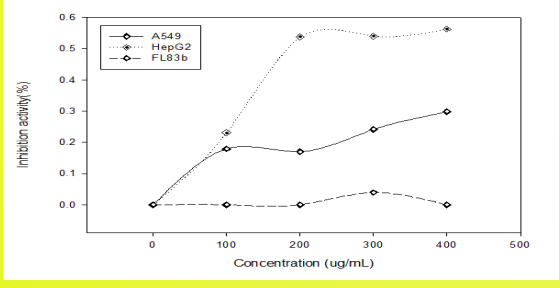

Figure 4. Inhibitory effects of bitter almond extracts on HepG2, A549, and FL83b cells. Cells were treated with increasing concentrations of SAMPLE for 24h, and cell viability was determined by the MTT assay. Results are expressed as percentages of MTT absorbance with respect to the untreated vehicle control wells (n=6).

CONCLUSIONS

The major effective ingredient of this herb medicine is amygdalin (D-mandelonitrile-β-Dgentiobioside), which has antitussive and lubricant activities. It is decomposed by the action of β-D- glucosidase to yield hydrocyanic acid, which reflexively stimulates the respiratory center and produces antitussive and antiasthmatic effects. This study shows that amygdalin can kill cancer cells selectively at the tumor site without systemic toxicity. The bitter almond extracts induced suppression of cell viability of anti-cancer may in part be attributed to their phytochemical (amygdalin) contents and as an effective inducer of apoptosis as well.

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