Chapter 1

Introduction

Terminalia chebula Retz. (*T. chebula*) is a plant belonging to the family Combretaceae known as "Sa Maw Thai" in Thai (Ministry of Public Health, Department of Medical Sciences [MOPH], 2000; Smitinand, 2001). It is commonly used as indigenous medicine in several Asian countries including Thailand, India, China, Indonesia, and Nepal. The traditional medicine use of *T. chebula* depended on part used (dried or fresh fruits, bark, leaves, and whole plant) and dosage form (powder and extract by various solvents; water, ethanol or methanol). This medicinal plant has been used for the treatment of several illnesses such as laxative, carminative, astringent, expectorant and tonic (MOPH, 2000). In addition, the fruit of *T. chebula* contains tannins, carbohydrates, glucose, anthraquinone glycosides, and sorbitol (Creencia, Eguchi, Nishimura, & Kakinuma, 1966; Juang, Sheu, & Lin, 2004; MOPH, 2000).

Being in the same family as *T. chebula, Terminalia bellerica* (Gaertn.) Roxb. (*T. bellerica*), is an indigenous plant in Thailand and Southeast Asia. It is commonly known as "Sa Maw Phi Phek" in Thai (Smitinand, 2001). The fruit contains tannins, β-sitosterol, mannitol, glucose, galactose, fructose and rhamnose (Jadon, Bhadauria, & Shukla, 2007; MOPH, 2000; Yadava & Rathore, 2001). *T. bellerica* has been extensively used in Thai traditional medicine for laxative, carminative, astringent, expectorant and tonic (MOPH, 2000).

These two herbal plants have been used for the treatment of several illnesses. In order to use these plants as herbal medicine, they have to be tested for toxicity. Toxicity studies of herbal plant products in animal models aim to determine basic information that leads to evaluate safety and the toxic effects of these products in human.

Toxicology can be classified into three categories. First, descriptive toxicology is the study of the toxicity of substances by testing their toxicity in animals. Important information related to these substances can be collected and used to assess their risks to human health. Second, mechanistic toxicology is the study

aimed at clarifying causes and mechanisms of the toxic substances harmful to living things. Third, regulatory toxicology is the study of laws, regulations, and practices to protect human health from these toxicants. Medicinal plants are required to be tested for their toxicity prior to being applicable to human. Because toxicity testing cannot be conducted directly on human, toxicity testing on animals represents a possible way to provide basic toxicity information in determining whether studied medicinal plants can be eatable or further developed to medicine. The present study is focused on toxicity testing in animals, which is categorized in descriptive toxicology, currently classified into three groups. First, animal testing is used to assess the overall toxicity of chemical substances to experimental animals in which the most common testing method is classified according to duration of toxicant exposure such as acute, subchronic and chronic toxicity. Second, special testing is used to study special or specific toxicity such as teratogenicity, neurotoxicity, and carcinogenicity, etc. Third, environment testing is used to study the possible impact of the use of chemical substances on the environment and ecosystem (Hodgson & Levi, 1987).

Toxicities in animals are usually conducted to evaluate acute and chronic toxicity effect of the substance. Acute oral toxicity refers to those adverse effects occurring after oral administration of a single dose of a substance, or multiple doses given within 24 hours. A primary objective of acute toxicity tests was to determine an LD_{50} dose, the dose that is lethal to 50% of the animals tested. In contrast, chronic toxicity studies refers to the description of the toxicity associated with long term administration of high, survivable dose of a test substance (Gad, 2006). The period of administration of the test substance to animals will depend on the expected period of clinical use.

Therefore, it is worth to study the toxicity of the water extracts from dried fruit of *T. chebula* and *T. bellerica*. This study will help to justify its margin of safety, which can be applied to estimate its toxicity in primates and human beings, and may lead to the development of new drugs from these plants.

Objectives of this study

1. To evaluate the acute and chronic toxicities of the water extract from dried fruit of *T. chebula* in rats.

2. To evaluate the acute and chronic toxicities of the water extract from dried fruit of *T. bellerica* in rats.