

CHAPTER 1

INTRODUCTIONS

1.1 Overview of research project

Free radicals or reactive oxygen species (ROS) can react and generate destruction with the nucleic acids, proteins, and enzymes present in the body. This attack is known as oxidative stress and can cause cells to lose their structures and functions. Moreover, the exposure with environmental pollutants, cigarette smoke, automobile exhaust, radiation, air-pollution, pesticides, etc. can stimulate the generation of free radicals (1), which may result in tissue injury and subsequent diseases (2). Many diseases like Alzheimers, Parkinson's, atherosclerosis, cancer, and ischemic reperfusion injury in different tissues including heart, liver, brain, kidney and gastrointestinal tract have been reported as ROS mediated (3). Therefore, the interest in the antioxidant compounds to eradicate or reduce ROS is substantially increased and the natural antioxidant is on focus.

Phyllanthus emblica Linn. or *Emblica officinalis* Gaertn., has common names as emblica, amala, indian gooseberry. It is known in Thai name as Ma-Kham-Pom (4, 5). *P. emblica* is a medicinal plant that has been used in Chinese, Ayurvedic and Thai folk medicine (6). *P. emblica* fruits and its extract show many pharmacological effects against many diseases. It has significant effects on lowering serum lipid level (7, 8) and antiatherosclerotic (9). This plant extract has antitumor (10), antitussive (11), antipyretic (12), anti-ulcerogenic (13, 14) activities and hepatoprotective effect (15). The fruit of *P. emblica* is a rich source of vitamin C (ascorbic acid) (6, 16, 17) and phenolic compounds (18-20) which is natural antioxidants. The antioxidant activity (21, 22) and the antidiabetic activity of *P. emblica* were also reported (23).

Diabetes mellitus (DM) is the most common endocrine disorder. It is a chronic condition, characterized by chronic hyperglycemia. Diabetic patients with poor blood glucose control are more likely to develop chronic complications like retinopathy, cataract, neuropathy, atherosclerosis, nephropathy, and delayed healing

of wounds (24, 25). Increasing in protein glycation and accumulation of advanced glycation endproducts (AGEs) have been involved in the pathogenesis of diabetic complications. In glycation reaction process and the AGEs formation, the free radicals are also generated and affect the tissue damage (26). Since *P. emblica* extract showed antioxidant and antidiabetic activity that can prevent diabetic complications and lowering blood glucose level. Furthermore, the relationship between antioxidant and antidiabetic activity of this plant extracts were reported (23). However, there are a few reports about the antidiabetic activity of *P. emblica* by *in vitro* antiglycation mechanism. Therefore this research studied the antioxidant and antiglycation of *P. emblica* extract.

This research was focused on fractional extraction of the *P. emblica* crude extract to gain the semi-pure fraction that had the highest antioxidant and antiglycation activities. Furthermore, the fractional extraction process was expected to provide benefits on improving physicochemical properties of the extract for tablet formulation, such reduction in hygroscopicity and viscosity of the extract. The appropriate formulation of *P. emblica* fractional extract tablets was investigated along with their pharmaceutical properties. The stability on the biological activities was thoroughly investigated to ensure that the developed formulation can be applied as a commercial dietary supplement product in the future.

1.2 Aims of the study

- 1.2.1 To develop the preparation process of the *P. emblica* crude extract with different solvents to gain the high antioxidant and antiglycation activity for future tablet formulation
- 1.2.2 To formulate the *P. emblica* extract tablet which have acceptable pharmaceutical properties and good appearance