CHAPTER I

INTRODUCTION

1.1 Cause of the problem and development

At present, the tanning industry in Thailand is growing at high rate. Most of tanneries establish at the circumference of Bangkok, particularly Taiban Subdistrict, Muang District, Samut Prakam Province which had moved from Klongtai Port to settle down at 30^{th} kilometer and 34^{th} kilometer on Sukhumvit Road as known "Tanning Industrial Zone". Both are located nearby Chao Phraya Estuary against the Gulf of Thailand.

Tanning process is classified into two types, namely, chrome tanning and vegetable tanning. Chrome tanning is method that uses compounds of three-valent chromium (basic Cr (III) sulfate) as tanning agent, whereas vegetable tanning process uses tannin as tanning agent. Due to chemicals for chrome tanning process is easy to find and inexpensive including it produces higher durable leather, so almost tanneries in Thailand (about 80%) have chosen this method (Phannasawat and Chawanparid, 1993).

As a result, high toxic wastes especially chromium which is heavy metals have discharged into the environment. In human bodies, chromium uptakes at a threshold level can resulting in vomit, ulcer and dermatitis on prolong contact or finally bring about lung cancer (Mertz, 1974 ref. in Bulyakitchinda, 1983). Therefore, it is very harmful to release effluent contaminated chromium in natural system because it is reverse to human by food web and food chain simultaneously biomagnifications at the end (human is always ultimate consumer).

For tanning wastewater management of both Tanning Industrial Zone at 30^{th} kilometer and 34^{th} kilometer, they operated by each tannery releases wastewater to open-channel around themselves. Later, these effluents will be combined and treated at the center of wastewater treatment system that used activated sludge system (AS) before discharging into the sea against the Gulf of Thailand. Chromium in wastewater can be decreased from 30 – 100 mg/l to about 1 mg/l with this method (Phannasawat and Chawanparid, 1993) which means that there are chromium contaminations into the Gulf of Thailand everyday.

Consequently, tertiary treatments are required. Constructed wetlands, natural procedure applied for wastewater treatment, have been considered as very interested method because they are suitable for treated wastewater (Reed et al, 1995), using low-cost either system operation or maintenance, easy to maintain and can be adapted to wide fluctuations of water quality and hydrological conditions as well (Hammer, 1989 ref. in Katekinta, 1994).

The emergent plants selected in this study are two types of *Colocasia esculenta* (L.) Schott, green and violet stem, which are in Family Araceae, Genus Colocasia (L.) Schott classified in the marginal plant (Sripen, 2000). They are perennial herb which have many interested characteristics for this experiment that are 1) native species in tropical zone (optimal growth in hot and humid area), 2) growing well in swamps, mashes, and other muddy shallow water areas (Aquatic Plant Research and control Florida Department of Nature Resources, 1979). Moreover, with their some good properties as tuberous rhizomes and thick succulent stems (Sripen, 2000), possibly assimilate some toxic substance especially heavy metals in high rate. But data is not available about this.

1.2 Objectives

1.2.1 To determine the optimum wastewater level for chromium removal by two types of *Colocasia esculenta* (L.) Schott (green and violet) in constructed wetlands for tannery post-treatment wastewater.

1.2.2 To compare the chromium removal efficiency between green and violet *C. esculenta* in each wastewater level in constructed wetlands for tannery post-treatment wastewater.

1.2.3 To compare the chromium accumulation in lamina, petiole, corm, and root of both *C. esculenta.*

1.2.4 To study the growth rate of both *C. esculenta* in constructed wetlands for tannery post-treatment wastewater.

1.3 Hypothesis

The chromium removal efficiency of *Colocasia esculenta* (L.) Schott (green and violet) in constructed wetlands for tannery post-treatment wastewater depends on wastewater level.

1.4 Scope of study

1.4.1 This study chooses:

(1) Constructed wetlands: FWS wetland system.

(2) Wastewater: Chrome-tanning post-treatment wastewater.

(3) Plant: Two botanical types of *Colocasia esculenta* (L.) Schott, i.e. green and violet petioles.

(4) Heavy metal: Total chromium.

1.4.2 This experiment studies on:

(1) The chromium removal efficiency of two types of *C. esculenta* in constructed wetlands for tannery post-treatment wastewater.

(2) The optimum wastewater level for chromium removing by both types of *C. esculenta* in constructed wetlands for tannery post-treatment wastewater at 0.15, 0.25, and 0.35 m depth.

(3) The chromium accumulation in lamina, petiole, corm, and root of both *C. esculenta* every 10 days during the experimental period, 100 days.

(4) The growth rates of both *C. esculenta*: length of petiole, fresh weight, and dry weight.

1.5 Anticipated benefits

1.5.1 The chromium removal efficiency of *Colocasia esculenta* (L.) Schott in constructed wetlands for tannery post-treatment wastewater.

1.5.2 The optimum wastewater level for chromium removal by *Colocasia esculenta* (L.) Schott in constructed wetlands for tannery post-treatment wastewater.

1.5.3 The applications for chromium removal by *Colocasia esculenta* (L.) Schott in constructed wetlands for tannery post-treatment wastewater.

1.5.4 The future trend for using *Colocasia esculenta* (L.) Schott as phyto-treatment in others benefit.