CHAPTER 1

INTRODUCTION

1.1 Introduction

Synthetic dye are commonly use in biomedical, foodstuff, plastic and textile industries (Pointing, 2001). Vaidya and Datye (1982) reported that more than 10,000 commercial dyes are available to the textile industries and approximately 10 to 15 % of these were release into the environment due to losses during dying process. This effluent is either treated by biological process at the plant treatment site or treated together with the domestic wastewater in municipal water treatment centre (Sanin, 1997). However, synthetic dye cannot be degraded easily (Morais *et al*., 1999) and concern arises as most of these dye are toxic to flora and fauna or mutagenic and carcinogenic (Baughman and Perenich, 1988; Nilsson *et al*., 1993). Furthermore, certain chromophores can have negative impact on organisms living in water because of the light diffusion reduction (Banat *et al*., 1996).

Several methods such as ozonization, flocculation and alkalinization can be used for decolorization purpose, but due to the high cost of these methods, most of recent researches aiming to reducing this pollution by using white rot fungi (Doralice *et al*., 2001). There are several studies on using white-rot fungi for decolorization process such as by *Phanerochate chrysosporium* (Glenn and Gold, 1983), *P. chrysosporium* (Goszczynski *et al*., 1994; Cripps *et al*., 1990) and *Pycnoporus sanguineus* (Trovaslet *et a*l., 2007; Pointing and Vrijmoed, 2000). White-rot fungi can produce and secrete ligninolytic enzymes such as laccases (benzenodiol:oxygen oxidoreductase; *p-diphenol* oxidase, urishiol oxidase) which present low specificity with regard to substituted aromatic structure (Thurston, 1994; Yaropolov *et al*., 1994). Previous study showed that laccases secreted by *Pycnoporus sanguineus* could be utilized to decolorize azo, tryphenylmethane and anthraquinone dyes (Lu *et al*., 2007; Pointing and Vrijmoed, 2000).

This study aimed seeks to find out the optimum condition for the decolorization of crystal violet dye *by Pycnoporus sanguineus*. The three parameters selected for investigation are initial dye concentration (ppm), agitation speed (rpm) and process time (h). This study also seeks to investigate possible interactions process that may exist among the three parameters during the dye decolorization process. Response surface statistical design was used to study the existence of possible interaction among the parameters. Response surface analysis was also employed to determine the best operating parameters combination which was subsequently implemented in the scale-up the experiments using stirred tank reactor. The effect of impeller geometry *viz*. curved blade impeller and angled blade 60° impeller on the decolorization process was also investigated.

1.2 Objective

The objectives of the study were:

1. to find optimum level for selected operating factors in the decolorization of crystal violet by *P. sanguineus* pellets;
2. to study the effect of different impellers' geometries on dye decolorization of crystal violet by *P. sanguineus* pellets.