CHAPTER 1

INTRODUCTION

Lectins are proteins or glycoproteins of non-immune origin that specifically and reversibly bind to carbohydrates or glycoconjugates (Rini, 1995; Lindhorst, 2000). They can combine specifically with glyco-components of cell surface thereby agglutinating the cells. Boyd and Shapleigh (1954) coined the term 'Lectin' from the Latin word 'legere', which means 'to select', to emphasise the ability of some RBC-agglutinating proteins, known as hemagglutinins, to discriminate blood cells within the ABO blood group system. Although, the term was originally coined to define agglutinins that could discriminate among different types of red blood cell**,** it is now used more generally and includes carbohydrate-binding proteins from many sources regardless of their ability to agglutinate cells (Hirabayashi**,** 1997)**.** Lectins are ubiquitous in nature, and occur in animals, bacteria, fungi, plants and viruses

(Lis and Sharon, 1998; Mo *et al.*, 2000). Many lectins have been purified and characterized from various plant sources. The presence of lectin in fungi was however noticed when Ford, during 1910, reported the first ever fungal lectin in fly agaric, wherein the lectin activity was found to be associated with the toxicity of the fungus. Later on, it was found out that the occurrence of lectins in higher fungi is wider than in higher plants (Singh *et al.*, 2010). Mushrooms which are macrofungi have been long known for their nutritive and medicinal values, and now represent a rich source of lectins. Of all the mushroom proteins, lectins are probably the most extensively investigated (Singh *et al.*, 2010). Mushroom lectins have become of more interest, mainly due to the discovery that many of them exhibit potent biological activities (Mo *et al.*, 2000) including antiproliferative activity (Liu *et al.* 2006), antitumour activity (Wang *et al*. 2000) and mitogenicity (Wang *et al*., 2002; Ngai and Ng, 2004). Examples include *Agaricus bisporus* lectin showing antiproliferative activity against human colon cancer cell lines HT29 and breast cancer cell lines (MCF-7) (Yu *et al.*, 1999), *Volvariella volvacea* lectin possessing antitumor activity against sarcoma S-180 cells (Wang, 1998), *Tricholoma mongolicum* lectin inhibiting mouse mastocytoma P815 cells *in vitro* and sarcoma S-180 cells *in vivo* (Wang *et al.*, 1995), and *Grifola frondosa* lectin showing cytotoxic activity against HeLa cells (Guillot and Konska, 1997). Because of the diverse roles and applications of mushroom lectins, there are now a large and continuously increasing number of them that are commercially available and used in biochemical studies. *Agaricus bisporus* lectin marketed by Sigma Aldrich Co., USA and EY Laboratories Inc., USA; *Aleuria aurantia* lectin marketed by Vector Laboratories Inc., USA; *Marasmius oreadus* and *Polyporus squamosus* lectins marketed by EY Laboratories Inc., USA are a few examples of commercially available lectins (Singh *et al*., 2010). Moreover, there is an ever increasing interest in mushroom lectins due to their unique

carbohydrate-binding behaviours (Singh *et al*. 2010). The hemagglutinating activity of many mushroom lectins cannot be inhibited by simple sugars. A novel lectin, isolated from the fruiting body of *Lyophyllum shimeiji*, could not be inhibited by simple sugars and glycoproteins (Ng and Lam, 2002). Other mushroom lectins whose hemagglutination activity cannot be inhibited by simple sugars include *Oudemansiella radicata* lectin (Liu *et al*., 2013), *Volvariella volvacea* lectin (Lin and Chou, 1984), *Agrocybe aegerita* lectin (Zhao *et al*., 2003), *Armillaria luteo-virens* lectin (Feng *et al*., 2006), *Boletus venenatus* isolectins (Horibe *et al*., 2010), *Flammulina velutipes* lectin (Ng and Ngai, 2006) and *Mycoleptodonoides aitchisonii* lectin (Kawagishi *et al*., 2001). Because of the various applications and also because of uniqueness in their carbohydrate-binding behaviour of mushroom lectins, there is an expanding emphasis on the isolation, purification and characterization of new lectins from different mushroom sources. In the present study, a new lectin whose hemagglutinating activity cannot be inhibited by simple sugars, was purified and characterized from the fruiting body of an edible mushroom *Lentinus cladopus* Lév.