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## Daftar Isi

# COLOR REDUCTION OF RICE STRAW FILTRATE FROM LEAD (PB) ADSORPTION BY L-A ARABINO FURANOSIDASE ENZYM

# MENURUNKAN INTENSITAS WARNA COKLAT PADA FILTRAT HASIL ELIMINASI TIMBAL (PB) MENGGUNAKAN ENZIM L-A ARABINO FURANOSIDASE

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**Abstract**

Rice straw could adsorb heavy metals from polluted water, but the drawback of rice straw is the color of the filtrate is brown, so that it cannot be used for everyday or household purposes. In the previous study, it was found that the variables which gives the highest respond in terms of % adsorption of Pb, were enzyme-50, amount of enzyme : straw = 2 : 1 (10 ml of enzyme for each 5 g of straw), 1 hour incubation time, amount of washing 5 x 5 ml, place of plant: low land, and size of straw: ground. As for the type of washing liquid, both either demineralised water or Pb solution were the same. A problem rise from the brown color of straw filtrate as side product of heavy metal absorbtion. The condition caused the filtrate water no longer to use daily. An attempt of using enzyme has been tried to reduce the brown color and it did. Grind straw from low land and L-□arabino-furanosidase are used is used in this study to reduce the brown color. However, the experiment/study is continued to optimize the reduced variables. To make the color elimination method feasible to use in daily life, especially in remote and poor villages/areas, a more thorough and in depth study is conducted to optimize the usage of the enzyme.The adding of enzyme (1:4) contribute significantly toward the absorbance of the filtrate. And also the incubation time as well (up to 60 minutes), the longer the incubation time, the higher the absorbance of the filtrate which means that more brown colour is eliminated.

**Key words**: brown color of rice straw filtrate, L-□arabino-furanosidase enzyme, adsorption, lead.

**Abstrak**

Jerami padi dapat menjerab lagam-logam berat pada air yang terpolusi, tetapi filtratnya menghasilkan wara coklat. Penelitian terdahulu diketahi bahwa penjerapan Pb yang optimum diperoleh dengan menggunakan jumlah enzim : jerami = 2 : 1 (10 ml enzime untuk setiap 5 g jerami), waktu pendiaman 1 jam, jumlah pencucian 5 x 5 ml, cairan pencuci air bebas mineral dan larutan Pb telah memberikan hasil yang sama. Permasalahan muncul dari filtrat jerami padi yang berwarna coklat sebagai hasil samping penjerapan logam berat. Kondisi tersebut menyebabkan air siasa perendaman / filtrat tidak dapat digunakan untuk keperluan sehari-hari. Pada penelitian ini dilakukan studi menggunakan jerami

digiling yang berasal dari dataran rendah dan enzim L-□arabino-furanosidase untuk mengurangi warna coklat pada filtrat.Penelitian ini dilanjutkan untuk mengoptimasikan variabel yang telah dipersempit yaitu jumlah enzim dan waktu pendiaman yang dapat menarik sebanyak mungkin warna coklat dari filtrat jerami padi. Sehingga didapatkan cara yang fisibel untuk digunakan sehari-hari, terutama di desa yang jauh, dilakukan penelitian yang lebih mendalam untuk mengoptimasi penggunaan enzim ini. Perbandingan enzim:jerami (4:1) dan waktu pendiaman 60 menit telah memberikan hasil yang sangat signifikan terhadap absorbansi filtrat. Semakin lama waktu pendiaman, maka semakin tinggi absorbansi filtrat, yang berarti semakin banyak warna coklat yang dihilangkan dari jerami.

**Kata kunci** : warna coklat dari filtrat jerami padi, enzim L-□arabino-furanosidase, adsorpsi, timbal.

## 1. Introduction

Heavy metals contamination of ground and surface water is of growing concern in many parts of the world, particularly in developing countries in which large populations have to use these sources for drinking and cooking water. As a develop country, Indonesia is facing substantial heavy metal pollution of ground- and surface water in industrialized areas. A study by Sutomo *et al.*, (2001) found that there was Pb in drinking water in an area in Yogyakarta and its impact on children. Yuliandari *et al.*, (2000)., reported that the blood samples of pregnant women, breast feeding mothers and children under five years old in Kenjeran area (in Surabaya) contained heavy metals such as Cd, Hg, and Pb. Kohar *et al.*, (2007a) in their study on the hair of autistic and non autistic children and adults also found an interesting results, that the hair of the autistic children contained twice as much lead as the hair of non autistic adults, and the adults hair also contained twice as much lead as in the hair of non autistic children.

Many studies have been conducted to eliminate heavy metals from water resources, such as flocculation, filtration, using activated charcoal, ion exchange, and precipitation by chemicals. However, because of the high cost of these methods, the development of a more cost-effective and environmentally friendly remediation system is necessary. In order to find more cost-effective and environmentally friendly methods, several studies have been carried out since many years ago, by using living and dried plants, and agricultural wastes, such as soybean hulls, sugarcane bagasse, rice hulls, rice straw, barley straw, rice milling by product, etc., treated or untreated straw, studies on single or mixed metals solutions, or on industrial effluents (Friedman and Waiss, 1972; Kumar and Dara, 1980; Larsen, and Schierup, 1981; Suemitsu et al., 1986; Marshall et al., 1995; Kohar et al., 2002, 2002a, Tarley, et al., 2004, Kohar et al., 2005, Kohar et al., 2007, Soediman et.al, 2008, 2008a, Rocha et al, 2009, Soediman and Kohar, 2011). On the other hand, Indonesia also has vast number of *padi* fields, and the production of rice is over 50 million tons per year, and the resulting rice straw is considered agricultural waste that is usually burnt in the fields, thus yielding a lot of smog (Indraningsih et al., 2008). Yet, rice straw has not received much attention as a potential remover of heavy metals so far, and the results appear to be inconclusive.

Although straw has been a good adsorbent for heavy metals in solution there is a drawback in using it for cleaning polluted water from heavy metals, which is the brown colour produced when straw is soaked in water. The filtrate has brown colour, and of course it cannot be used in everyday needs not to say as drinking water. Some means and materials have been used to clean the filtrate from the brown colour, such as bentonite, zeolite, sand, charcoal, and carbo adsorbent (Suesti, 2007). However, the results were not conclusive.

A preliminary study using L-□arabino-furanosidase enzyme has been conducted in eliminating the brown colour (which is due to lignin) of the straw's extract, and it showed a satisfactory result, which is extracting lignin from the straw and the end result is clear water with low concentration of heavy metal (Pb)