Southeast Asian Water Environment 4

Edited by Kensuke Fukushi, Futoshi Kurisu, Kumiko Oguma, Hiroaki Furumai and Psyche Fontanos

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Production of natural coagulant from *Moringa oleifera* seed for drinking water treatment

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Abstract Water treatment industry worldwide including South East Asia is facing high demand for synthetic coagulants for water treatment process. Research is continuously being done to find the best treatment methods and lower cost alternatives. *Moringa oleifera* seed could be a suitable natural alternative to synthetic coagulants. This paper investigates processing *Moringa oleifera* seed in order to concentrate the bio-active constituents which have coagulation activity. The proposed method to isolate and purify the bio-active constituents is the cross flow filtration method, which produced the natural coagulant with very cost effective processing technique (oil extraction; salt extraction; and microfiltration through 0.20 μm). Coagulation activity was determined using conventional jar test procedures, and the major water quality control parameters monitored was the residual turbidity for river water with low initial turbidity. Results showed residual turbidity of less than 5 NTU which is recommended by the World Health Organization (WHO). The turbidity removal was 94.82% for river water of low initial turbidity of 44.2 NTU, without any chemicals added. The microfiltration method is considered to be a practical method which needs no chemicals added. The product is commercially valuable and can contribute to the economic development of South East Asian countries.

Keywords microfiltration, *Moringa oleifera* seed, natural coagulant, oil extraction, salt extraction, water treatment

INTRODUCTION

Developing countries are facing potable water supply problems because of inadequate financial resources. The cost of water treatment is increasing rapidly, and the quality of river water is not stable due to suspended and colloidal particle load caused by land development and high storm runoff during the rainy season such as that experienced by Malaysia and other South East Asian countries. Due to many problems created by using synthetic coagulants such as aluminium sulphate which is used widely in Malaysia, there is a high demand to find an alternative coagulant which is natural based.

Naturally occurring coagulants are usually presumed safe for human health. Many researchers have reported on *Moringa oleifera* various uses and as a coagulant specifically for the last 25 years (Jahn, 1984, 1988; Sutherland *et al.*, 1992; Gassenschmidt *et al.*, 1995; Muyibi and Okuofu, 1995; Muyibi and Evison 1995, 1996; Ndabigengesere *et al.*, 1995; Ndabigengesere and Narasiah 1998; Okuda *et al.*, 1999; Muyibi and Evison 1999; Diaz *et al.*, 1999; McConnachie *et al.*, 1999; Muyibi *et al.*, 2001, 2002, 2003; Muyibi and Alfugara 2003; Birima *et al.*, 2003, Kebreab *et al.*, 2005). They have found that the *Moringa oleifera* seed is non-toxic and a good coagulant in water treatment. It is recommended to be used as a coagulant in developing countries. Encouraged by the results of these studies, many developing countries have used this plant as a viable coagulant in water and wastewater treatment on a small scale (Ndabigengesere *et al.*, 1995).

In Malaysia, aluminium sulphate is the most used coagulant in water treatment for coagulation- flocculation processes. The cost of aluminium sulphate is RM 1400/tonne which is produced locally. The lime for pH adjustment is added to the water treatment process, which is considered as an additional cost for water treatment companies. Therefore, this paper is focused on presenting an efficient and cost effective processing technique for *Moringa oleifera* seed to be used for drinking water treatment.

MATERIALS AND METHODS

Good quality dry seeds of *Moringa oleifera* were selected from the pods that were collected from Serdang, Selangor Darul Ehsan, Malaysia (Figure 1). The pods collected were allowed to dry completely on the tree (the brown colour pods) because the green pods do not possess any coagulation activity (Ndabigengesere *et al.*, 1995). The seeds coat and wings were removed manually. Grinding and sieving of the seeds through sieve 250 μm were done accordingly (Gassenschmidt *et al.*, 1995). The powder with size of <250 μm was used in this research work 7.03.

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