

UNIVERSITI TEKNOLOGI MARA

**THE ASSESSMENT OF SELECTED
ATMOSPHERIC POLLUTANT
ELEMENTS USING MOSS
(*Leucobryum aduncum*) AS BIO-
MONITOR**

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ABSTRACT

In these modern days, air quality is deteriorating in line with the current development. Manjung district is one of the most rapid develop districts in Perak with various types of industrial activities and the atmospheric pollutants resulted from it most likely to cause serious pollution to the Manjung atmosphere. Analysis of mosses for atmospheric pollution is a suitable and effective method as they pick up nutrients directly from ambient air and their ability to retain many trace elements deposition. Therefore, moss (*Leucobryum aduncum*) was used in this study to evaluate selected atmospheric pollutant elements including radionuclides (U, Th and ^{40}K) and non-radionuclide elements (Cu, Fe, Cr, Zn, As, Se, Pb and Cd) contents in Manjung District and part of Perak Tengah areas. The samples were collected from three directions (North, North-East and South-East) within 40 km radius from Teluk Rubiah, Manjung with 5 km intervals. The analysis was done using Energy Dispersive X-Ray Fluorescence (EDXRF) Spectrometer. In addition, the atmospheric pollution level and origin of pollutants were predicted through the calculation of enrichment factor (EF), contamination factor (CF) and pollution load index (PLI). The obtained results show Zn, Se, Pb, As and Cd were originated from anthropogenic activities while U, Th, ^{40}K , Cu, Fe and Cr were from natural sources. However, no pollution risk of contaminants was observed. Subsequently, the hazardous radiation effects of radionuclides in study areas can be neglected as the hazard index was 100 times lower than unity. Furthermore, the correlation of atmospheric pollutants in moss and air has been assessed using transfer factor (TF). The possible contaminants sources were also predicted using two multivariate analysis including cluster analysis (CA) and principle cluster analysis (PCA). The overall results obtained show that moss species of *Leucobryum aduncum* is suitable for bio-monitoring indicator of atmospheric pollutants and can be used as a baseline for the atmospheric pollution in the study areas.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND

Clean air is the basic needed to human lives. However, these days world has experienced some degree of degradation of air quality as the enormous growth of human numbers, resource used and technological advancement. Even the remote area has been affected by today's modern development activities. This indicates that the environmental pollution is taking place without any boundaries, either in rural or urban areas. The pollution may come from human activities directly or indirectly causing undesirable or deleterious change in our environment through infusions of matter and energy at higher levels than natural.

The main categories of environmental pollution are air, soil and water pollution. The major components of the pollutants can be carried by air, sometimes over the long distances, which can eventually deposited on the ground and polluting the soil (Rana, 2006^a; Godish, 2004). Commonly, outcomes from the industrial processes, automobiles, heavy-duty trucks, wood and coal burning activities releases fine and toxic particles into the environment. These are the major sources of air pollution including soil pollution and consequently the water pollution may result from soils runoff and solid waste discharges from factories as well as port activities, oil spill and effluents (Godish, 2004).

In general, any substance that has been introduced into the atmosphere that can cause severe effects to living things and the environment is considered as air pollutants (Rana, 2006^a). These substances include particulate matter (smoke, dusts, fumes and aerosols), gases (sulfur dioxides, nitrogen dioxides, and hydrocarbons), radioactive materials and hazardous air pollutants (HAPs). The atmospheric contaminants may come from natural and anthropogenic sources. Forest fires, plant and animal decomposition, soil erosion, and mineral weathering by wind are the examples of the air contamination from natural sources (Rana, 2006^a). Natural pollutants has low significance to human as the level of the contaminant are very low,