**UNIVERSITI TEKNOLOGI MARA**

# UNBLEACHED PULP AND PAPER PROPERTIES OF SODA-ANTHRAQUINONE PULPING OF *PARASERIANTHES FALCATARIA*

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# ABSTRACT

This study was conducted to investigate the potential of Batai (*Paraserianthes falcataria* ) as a raw material for the pulp and paper industry. Three batai trees with a DBH of an average DBH of 26.7cm and an average tree height of 10.55 m were harvested from Donghwa Plantation in Merbok, Sg. Petani, Kedah. The study also investigate the effects of the tree portion (bottom and top), percentage NaOH (16%,18% and 20%) used, percentage of AQ (control & 0.1%) and beating revolutions (0, 5000, 10000, 15000, 20000 and 25000 rev) on the unbleached pulp and paper properties. Chemical composition, wood density and fiber morphology was also conducted. The paper testing was conducted in accordance to ISO and TAPPI standard methods. The addition of 0.1% AQ in soda pulping increase the pulp yield, pulp screened yield and lower pulp screened reject. The study also found that the mechanical properties of paper are higher at the bottom portion rather than top portion. 16% of NaOH results in highest folding endurance, tensile index, tear index and burst index as compared to 18% and 20%. The presence of AQ results in low physical properties of paper namely; thickness and paper grammage. The folding endurance, burst index, tensile index and tear index are higher with 0.1% of AQ. The presence of AQ improved the brightness and lower the opacity of paper. The increase in beating revolution on the unbleached pulp results in lower CSF of pulp and thickness of paper. The better mechanical properties of paper (number of fold, tensile index, burst index and tear index) is a results of higher beating revolutions. However, the higher beating revolutions results in low optical properties of paper (brightness and opacity). Results of wood density, chemical analysis, fiber morphology, pulp and paper properties shows the wood of Batai or *Paraserianthes falcataria* has the potential as an alternative raw material for the pulp and paper industry.

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# CHAPTER ONE
# INTRODUCTION

## 1.1 BACKGROUND OF STUDY

Nowadays, forest products play an important role in the many aspects such as social, economic and environmental for every country. The population of humans rises every year in the world makes the industry of paper and paperboard increase by 4.3% per annum as compared to 1.2% in developed countries (Anonymous, 1997). Paper has been the human consumption in any aspects since two thousand years ago (Roberts, 1996). However, population growth of human rises since 1960, which is increase 1 billion people every 15 years leading to the present 6 billion (Hartmann, 1998); the world population could double again to 12 billion by 2075 (FAO, 1999).

Paper is inconvenient to be replace by others because properties of itself which is durable, easy to carry and easy to care. Consumption of paper rises according to the development of computer and data communication computerised (Hilgen, 2000). For example, people possible to print the articles, journals, and reports from computer or internet sources because there are easier to read. Paper was made according to the certain specifications depends on user requirement and their applications. The Indian pulp and paper industries are facing lack of cellulosic fibers. A 20.6% forest cover in India corresponds to just 0.8 ha per person which is one of the lowest in the world. Pulp and paper product is expected to increase from 7.4 to 13.7 million tons in the time period of 2006-2016, would exactly doubled the demand of cellulosic fiber for paper and paperboard production in India. The shortage of wood fiber is expected to increase at an annual rate of 11.3% by 2016 (Flynn, 2007).

There are disadvantages related with the use of non-wood fibers, such as their higher susceptibility to abnormalities in seasonal weather patterns such as droughts and floods in comparison to woody alternates. An inherent problem of grass and straw in pulping is the high content of small parenchyma cells, leading to a high level of so-called primary fines in the pulp (Jahan, Sabina and Rubaiyat, 2008). The chemical composition of non-wood materials varies, depending on the species and the local conditions, such as soil and climate (Bicho et al., 1999), but generally they have