

# CHAPTER ONE

## INTRODUCTION

### 1.1 Background

The neem (*Azadirachta indica* A. Juss) trees have been grown successfully in all parts of Sudan. Neem has become a naturalized species in various parts of the Sudan. (Elteraifi *et al.*, 2001).

Neem tree occurs throughout Sudan; its performance is quite good even in the harshest conditions. Most of the original plantations were carried out by the colonial officers along the railway and the Nile banks. Then they spread all over the country (Elteraifi *et al.*, 2001).

The neem tree is noted for its drought resistance. Normally it thrives in areas with sub-humid conditions, with an annual rainfall between 400 and 1200 mm. It can grow in regions with an annual rainfall below 400 mm, but in such cases it depends largely on ground water. Neem can grow in many different types of soil, but it thrives best on well drained deep and sandy soils. It is a typical tropical/ subtropical tree and exists at annual mean temperatures between 21-32<sup>0</sup> C. It can tolerate temperatures below 4<sup>0</sup> C. Temperature is one of the most important factors affecting seeds. Water uptake, gas diffusion, respiration and other metabolic processes all proceed faster at higher temperatures. Germination is dependent on all these processes and thus is strongly affected by temperature (Saad and Rao, 2001).

In India, neem grows in the plains and in areas that reach an elevation of approximately 1850 m. In its introduced range, neem is cultivated from sea level up to 1500 m elevation. Neem is tolerant to most soil types including dry, stony, shallow soils, lateritic crusts and highly leached sands and clay (Siddig, 2009).

Seed propagation is the usual method of neem regeneration. Seeds normally do not store well over 6 months. Seeds should be cleaned with water to remove the casing. No pre-treatment is necessary, commonly planted in nursery seedbeds for 8-11 months. Neem seedlings, once established, do not need frequent watering or fertilizing. Cutting is also possible (Siddig, 2009). Mature fresh seeds germinate within 2-3 weeks with a germination percentage of 75-90 %. Neem can also be propagated vegetatively by air layering, root and shoot cuttings, grafting and cutting. Clonal propagation and micro propagation by somatic embryogenesis and organogenesis are also used (Allan, *et al.*, 1999).

The term "provenance" is normally used in a broad sense, including all seed sources (natural and introduced) from anywhere in the world. Provenance testing of a tree species is important because it defines the genetic and environmental components of phenotypic variations that are associated with geographic locations (Callaham, 1964; Zobel and Talbert, 1984).

## **1.2 Justification and problem statement**

Neem has become naturalized species in various parts of the Sudan in quite diverse ecological, climatic and edaphic conditions. The tree has been introduced to Sudan for several decades from its natural habitat in the Indian contents. In Sudan, Neem was reputed for its use mainly as a shade, ornamental avenue tree. However, elsewhere it is well recognized for its medicinal and biochemical uses in pesticides and insecticides products. Because neem is such a versatile resource that can be used in different rural areas in the Sudan, creating plantation and in a consequence related industries, based on neem as a basic raw material or ingredient, the tree can be established in these areas thus it can contribute to rural development and open opportunities for more jobs and economic development.

It has been observed that neem growth performance shows strong differences ranging from satisfactory growth rates in some areas to virtually a complete failure in other parts of the Sudan. Reasons for such variability may be attributed to either adaptability to prevailing environmental conditions or the genetic diversity residing in the germplasm of the different ecotypes and provenances evolved during the sequence of its naturalization since its introduction one century ago.

To fully utilize the rich resource of neem in the Sudan a comprehensive genecological study supported by experimental work and sufficient trials to support or reject the hypothesis of the existence or nonexistence of different provenances and genotypes is imperative. Such work will aid in decision making concerning the existence of real differences in growth attributes that can be related to provenances variation or to adaptation of the same genotypes to the various ecosystems where it's grown.

### **1.3 Objectives**

Main objective:

To assess variation of the neem and its extent of adaptation to the various eco-climatical conditions in Sudan.

Specific objectives:

- 1- To study the variation in some seed morphometric characteristics among seven different neem provenances grown in Sudan.
- 2- To measure neem seeds viability and germination percentage under storability condition viz (normal and cool storage).
- 3- To investigate the variations in growth performance of neem seven provenances in Sudan.
- 4- To assess variations in drought tolerance among seedlings of four provenances from the Sudan.

#### **1.4 Structure of study**

This study consists of six chapters. Chapter one gives background information about neem in Sudan, justification and objectives of the study. Chapter two reviews literature on neem and including introduction, propagation, botanical and description, distribution, silviculture of the neem tree, tree seed biology, seed morphometric characteristics, seed testing, variation in seed characteristics, variation in growth characteristics, provenance variation, seed and seedling provenance variation. Chapter three consists of an introduction to the variation in seed morphometric characteristics, a detailed

description of materials and methods used particularly seed sources, fruit collection and processing, seed storage, determination of other seed characters, morphometric characteristics, results and discussion. Chapter four gives introduction the seedlings growth performance, materials and methods descriptions of the study area and presentation of methodological of nursery process which are used in data collection, analysis, result and discussion. Chapter five introductions give the drought tolerance, materials and methods: seed sources, Collection and processing of neem seeds, experimental design, result and discussion. Finally, Chapter six provides conclusions, linkage between theoretical framework and the empirical results, recommendations and limitations of the study.