University of Bakht Alruda, Retreed Quarterly Scientific Journal, Issue No. 26 December 2018 [UBJSR: ISSN :( Online) 1858-6139]
http://mag.uofb.edu.sd

# Exploring the Age Effect and location of Trees on seed characteristics in the forest of Acacia nilotica in Khartoum, Sudan

*Fatima Algunaid Hassan [a], Mai Mamoun Ali Hassan [b]*

*[a] Faculty of Agriculture and Natural Resources, Forestry and Range Sciences Department, University of Bakht Er–Ruda Ministry of Higher Education and Scientific Research, White Nile State (AD Duwem) Sudan.*
*[b] National tree seed Centre, Forest Research Centre, Agricultural Research Cooperation, Ministry of Agriculture, Khartoum, Sudan . maimamoun2@gmail.com*
*Corresponding author's e-mail: fatimagunaid@gmail.com*

**Abstract**

This study explored the effect of age and location of the trees in the forest on seed characteristics with emphasis on seed viability and vigor. The seeds samples were selected from three locations in the forest (North, South and West directions). Within each locations five categories of tree age were selected according to the diameter at breast height (DBH) as indicator of age (20-40, 41-60, 61-80, 81-100, 101 and above). In each category 3 trees were selected. The results indicate that when seed was grown in the germination room the location of the trees affected the seeds weight and germination percentage. When planted in the field the location of the tree had no effect. The findings suggest that may be an indicator the position of the trees do not influence the seeds vigor and that the results are depend on where the growth is conducted.

**Key words:** Acacia nilotica, Location, Seed Viability, Age Effect, Germination Percentage.

## 1. Introduction

In Sudan, the most well stocked forests of *Acacia nilotica* are found on the banks of the Blue Nile and its tributaries the Dinder and Rahad and on the banks of the White Nile to Jebelein [Sahni, K. C., (1968)]. Khartoum (sunt) (*Acacia nilotica*) forest provides income for land owners and local inhabitants from the collection of fruits and fuel wood and the production of profitable crops. The area also serves as a nesting site for various bird species. Such forests provide a considerable number of environmental benefits, such as the reduction of ambient temperature, wind speed, polluted gases (e.g., Carbon dioxide, Sulfur dioxide, Nitrogen oxides, etc.), increase in relative humidity and Oxygen content, and the interception of particulate matter and dust [Yousif and Ibrahim, 2014]. Acacia belongs to the family Mimosoideae and consists of nine subspecies distinguished by the pubescence of the pods and the shape of the tree [Brenan, J. P. M., 1983]. In Sudan there are three sub-species, namely, nilotica, tomentosa and adansonii [Sahni, K. C., (1968)]. Acacia nilotica is distinguished by its hard, heavy, and dense wood, termite resistance and water repellence [Wyk, B., et.al.,( 2000)]. There are many uses for Acacia nilotica worldwide. In the Sudan, its trunks are used for railway sleepers, fuel wood and fencing posts; its leaves and shoots are used as fodder; its pods are used in local tanneries and its gum is used for medical purposes [Wyk, B., et.al., (2000)]. Seed vigor has been defined as the sum total of those properties of the seed which determine the potential level of activity and performance of the seed lot during germination and seedling emergence [Perry 1977 – ISTA 1976 ] In khartoum Sunt

forest there were a decreasing in new regeneration and there weakness in tree performance in some location inside the forest which may be attributed to many factors such as the location of the forest in central of Khartoum city so the forest's exposure to polluted gases, over exploitation by the visitors and decreases in new regeneration which may be caused by the stress of the environmental and human factors. This study was conducted to explore the effect of age and location in the forest which may affect seed characteristics with emphasis on seed viability and vigor.

## 2. Materials and Methods

The study was conducted at the Khartoum Sunt forest which is located on the eastern bank of the White Nile within latitude 15 ˚ 34'N -15 ˚ 35'N, and longitude 32˚ 30'E – 32 ˚ 29'E, and occupies an area of about 459.5 feddans. The seeds samples were selected from three locations in the forest (North, South and West directions because the East direction its dangers to reach). Within each locations five categories of tree age were selected according to the diameter at breast height (DBH) as indicator of age (20-40, 41-60, 61-80, 81-100 and 101 and above). In each category 3 trees were selected. For each seed sample 100 seeds were used. These were divided into 4 replicates of 25 seeds each. Seeds were sown immediately in round aluminum dishes filled with moist sand. Dishes were watered daily with a fine shower . Germination was carried out in a controlled germination room at the National Tree Seed Centre –Soba 30oc, light for 12 hours from fluorescent lamps and in the field to test the harsh conditions on the seeds characteristics. Germination counts were done at 7 days interval and for a period of 6 weeks for each seed shape. For cutting test Two hundred fruits were taken at random from the composite working samples taken from 10 trees of each species. Fruits were divided into 2 replicates of 100 fruits .Fruits were cut transversely one by one with the aid of a pruning shear. Cut fruits were visualized by naked eye and a hand lens to identify seed viability .The number of seeds /Kilogram (Kg) was calculated. The statistical analysis(ANOVA) was done by JMP package (Programm improved from SAS Package). The means compared done by Tucky- Kramer.

## 3. Result and Discussion

**Table 1. Effect of trees geographical location inside the forest on different seeds characteristics**

| Direction | No of seeds per kilogram | Moisture content % | Sound seeds% | Dead seeds % | Insect damaged seeds % | Empty seeds % |
|---|---|---|---|---|---|---|
| North | 12.6 a | 4.4a | 65.9a | 12.8a | 20.4a | 4.7a |
| West | 11.38 b | 3.9a | 65.9a | 10.5a | 16.1ab | 5.9a |
| South | 11.32 b | 3.9a | 68.4a | 14a | 10.9b | 4.2a |
| P= | 0.01 | 0.76 | 0.5 | 0.5 | 0.03 | 0.6 |
| SE± | 0.3 | 0.5 | 2 | 2 | 2 | 1 |
| C.V= | 11 | 48 | 13 | 70 | 61 | 109 |

### Number of seeds per kilogram

Seed weight is essential for sales and calculating sowing rates (Dougheryt and Duryea, 1991). There was a significant effect of tree location on seed weight. The seeds collected from the north direction were lighter than those collected from west and south direction, also there were significant effects of tree age, the seed weight of west direction become lighter with

increase tree age. This may be attributed to the stress of man use or to the wind type (table 1& fig 1).

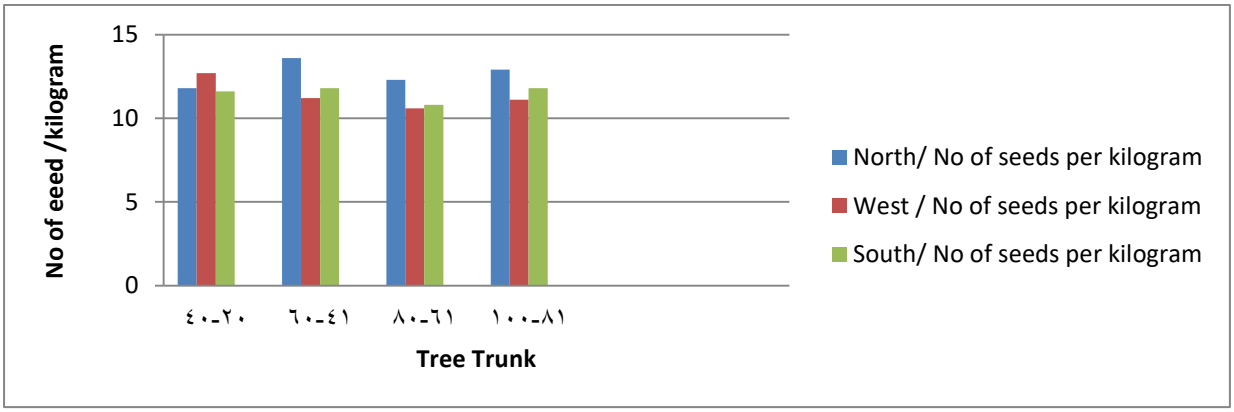


**Fig (1) Effect of tree age on No of seeds per kilogram**

## Seeds Moisture content

**Table 2.Effect of direction on seed moisture**

| Direction | Moisture content % | Rank |
|---|---|---|
| North | 4.4 | a |
| West | 3.9 | a |
| South | 3.9 | a |
| P= 0.76 | SE± 0.5 | CV= 48 |

**Table 3. Effect of tree age on moisture content**

| Tree age(Trunk diameter) | North/ seeds moisture content % | West / seeds moisture content % | South/ seeds moisture content % |
|---|---|---|---|
| 20-40 | 6.2 a | 3.3 a | 3.7 a |
| 41-60 | 3.8 a | 4.9 a | 4.4 a |
| 61-80 | 4.9 a | 4.5 a | 3.9 a |
| 81-100 | 2.8 a | 4.9 a | 3.2 a |
| 101 ≤ | | 4.1 a | 4.5 |
| **Mean** | **4.42** | **4.43** | **3.93** |
| P = | 0.47 | 0.86 | 0.65 |
| SE ± | 1.5 | 1.4 | 0.7 |
| CV = | 5.7 | 56 | 27 |

The results showed that the tree age and location of the trees in the forest do not affect the seed moisture content significantly (table 2, and 3). It may be assumed that the type of the wind that flows (the north area affected with dry north wind beside that it is near the city center with its polluted and hot gases , the west side was beside the river bank which may increase the air relative humidity and it increases the seeds moisture content , The south side affected with wet south west wind in summer and it was protected from the dry north wind by its location ) may slightly decease the seeds moisture content but it seems that it has no effect. The lack of effect of position can be attributed to the seeds type. *A. nilotica* seeds are orthodox seeds which already have low moisture content and are one of the hardest seed coats (Abbott, 1955).

**Viability test (Cutting test):**

The simplest viability testing method is direct eye inspection of seeds, which have been cut open with a knife or scalpel. It is also a useful tool in estimating the size and maturity of the seed crop before collection and the efficiency methods used in processing (Willan. 1985). In the Philippines significant correlation has been found between cutting and germination tests in fairly large-seeded species such as Leucaena, Intsia Bijuga and Lagerstroemia speciosa (Seeber and Agpaoa 1976), but germination % was consistently 10–20 % less than the percentage of sound seeds on cutting test (willan, 1985).

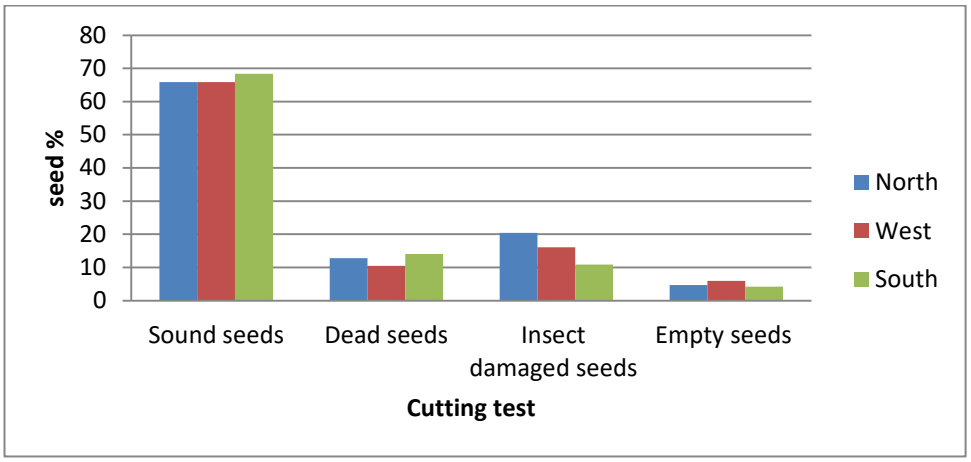


**Fig (2) Effect of trees geographical location inside the forest on different seeds viability**

The Results showed that trees located in the north direction were infected more than the trees in the north and west direction (fig 2). This may be due to the fact that borers rarely infest healthy plants growing in their natural environments. When trees or shrubs are transplanted into the landscape, stresses such as drought, soil compaction, sun scald, or injuries can weaken them and make them more susceptible to attack (Potter and Potter, 2010).

**Viability test (germination test)**

Germination test determines the percentage of seeds that are alive in any seed lot. The level of germination in association with seed vigor provides a very good estimate of the potential field performance. The results in Fig (3) show that seeds collected from different directions are not affected when they are planted in the field. This result may be an indicate that the position of the trees do not influence the seeds vigor or that the environmental factors in this forest do not change the seeds vigor severely. The germination percentage (fig 3) of the seeds grown in germination room were affected by the location. The seeds collected from the south direction gave the highest percentage. When grown in the field the percentage germination was decreased. This result is an indication that field germination is good for estimating the seed vigor of the seed lot. On the other hand, the results showed that the seeds collected from south direction are more viable than those from west and north. Unexpectedly the seeds from the west germinated less than those from the north, in spite of the harsh conditions in the north.

The results showed that the seed vigor percentage were high in the seeds that collected from the middle aged trees in the south direction while the age of the trees in the west and north direction have no effects on the seed viability or vigor. It seems that the trees in the south direction were producing the healthier seeds when compared with other directions. (fig4).

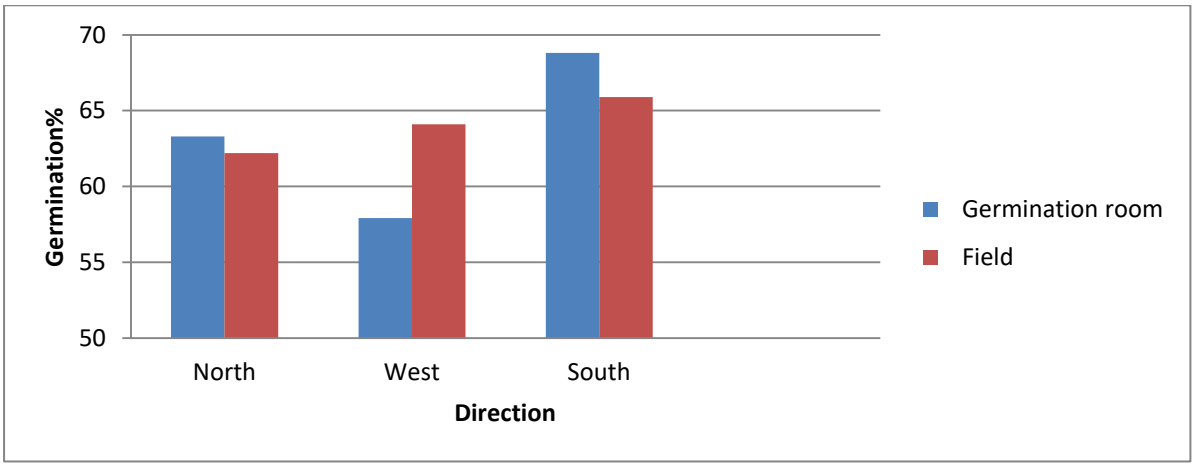


**Fig (3) Effect of trees geographical location inside the forest on germination percentage**

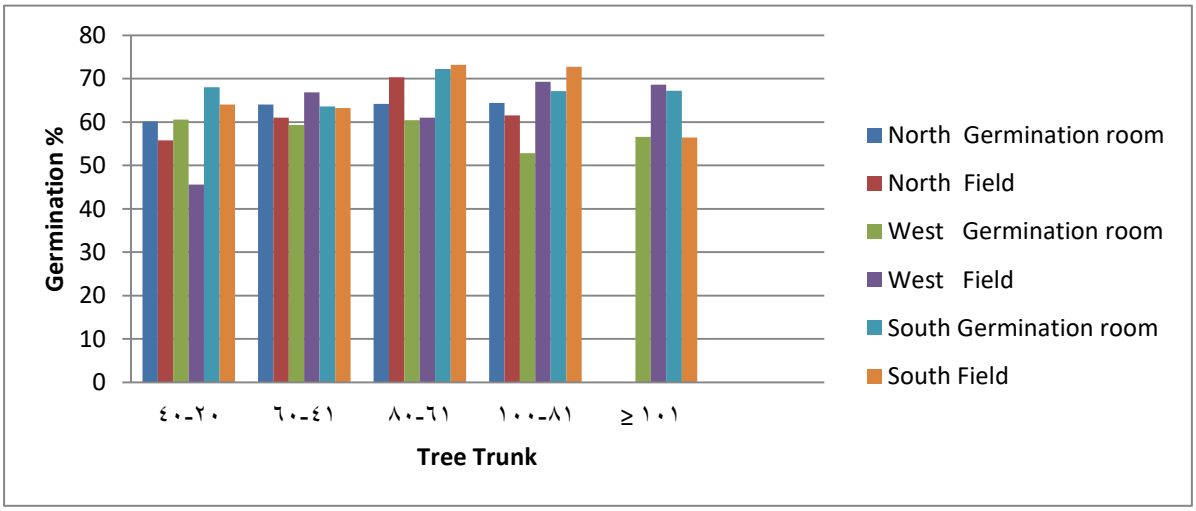


**fig (4)Effect of trees geographical location and tree age inside the forest on germination percentage**

## Concolusion

The location of the trees negatively affects the seeds weight and germination percentage of the seeds that grown in germination room. Seeds that collected from different directions are not affected by direction or age when it planted in the field. This may be an indicator that the position of the trees does not influence the seeds vigor or the environmental factors.

**References**

**Abbott, D.L. (1955).** Temperature and the dormancy of apple seeds. Proceedings of the XIVth International Congress, Schveningen1:746-753

**AOSA (2002):** Seed Vigour Testing Handbook, Contribution No. 32 to the Handbook of Seed Testing, Association of Official Seed Analysts, NE, USA.

**Dougherty, P. M. and M. L. Duryea, eds.( 1991).** Re gen er a tion Planning/Forest Regeneration Manual. Kluwer Ac a demicPublishers,Netherlands

**ISTA (1976):** Handbook for Vigour Tests, International Seed Testing Association, Switzerland.

**1ST A (1985).** International Rules for Seed Testing 1985.Seed Science and Technology.

**ISTA (2009):** International Rules for Seed Testing. International Seed Testing Association, Switzerland.

**Matthems, S., A**. A. Powell (1981): Electrical conductivity test. In: PERRY, D.A. (Ed.) Handbook of vigour test methods. Zurich: International Seed Testing Association 37-41.

**Perry, D. A. (1977**): A vigour test for seeds of barley (Hordeum vulgare) based on measurement of plumule growth. Seed Science ond Technology, 5, 709-719.

**Seeber, G. & Agpaoa,** A. (1976). Forest Tree Seeds. In: Manual of Reforestation andErosion Control for the Philippines. 473-535. German Agency for TechnicalCo-operation, Eschborn

**Willan, R, L. (1985**). A guide to forest seed handling.FAO forestry

**Wyk, B.et.al., (2000**). Photographic guide to trees of southern Africa. Briza Publications, Pretoria.

**Yousif and Ibrahim.,(** 2014)The Role of Khartoum Sunt Forest Reserve (Riparian Forest) in Climate Modification of Khartoum – Sudan . JOUR. OF NAT. RESOUR. & ENVIRON. STU. , 2. 1, 21-26