The relationship between fruit polymorphism and germination of Combretum hartmannianum. Schweinf

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Abstract—Combretum hartmannianum is one of the important Sudanese trees, which has a problem of low seeds germination. In some cases variation in germination was attributed to seed polymorphism. This study was carried out to investigate fruits polymorphism of this species with regard to germination. Germination percentage, fruits length, fruits width, wing length and number of wings were examined in 10 trees of Combretum hartmannianum in El Nour forest east of EdDamazin town in Blue Nile State in 2007. The results showed that fruits length, fruits width, wing length and number of wings were significantly different in the 10 trees. Germination percentage had a significant variation but did not seem to be associated with fruits polymorphism.

Index Terms—C. hartmannianum, Germination, Seeds, Sudan, Polymorphism.

I. INTRODUCTION

It is well known that different sizes of seed may show marked differences in germination, large and medium-sized seeds of Syzygium cumini gave better germination than smaller seeds [7], [5]. found that larger seeds of Ziziphus spinosa-christi and Khaya senegalenses germinate better than smaller ones, although small and big seeds were found viable but such a character which was realized to be as a survival mechanism to fulfill spatial distribution of the species, smaller seeds are found dormant and the big ones non dormant (differential dormancy) and the ovate seeds of Balaitus aegyptiaca gave significantly high germination from long and oblong seeds. Seed size did not influence germination percentage in Virola koschymi, although large seeds produced more vigorous seedlings [2]. Sometimes the pattern observed is not entirely consistent. [8] showed that although the germination index for small seeds of Albizia lebbeck (L.) Benth, was greater than for large seeds, the actual percentage of germination and seedling vigor were greater for larger seeds. This is in contrast with another study [3] where 62 percent germination was recorded for large seeds (0.1 g) of A. lebbeck as against 74 percent for smaller seeds (0.08 g). Often larger seeds do not have at least an initial advantage over smaller ones. [4], however, found that many vegetable species almost invariably produce larger seedlings when grown from larger seeds. Differences usually disappear within the first few weeks of growth. Seed size seems to be of importance in seed dispersal and hence plant distribution [5].

[6] suggested that mitochondrial efficiency, at least as a link in the metabolic chain, is responsible for the vigour of seedlings growth. The mitochondrial activity and seedlings vigour may differ between equal sized seeds and of two different cultivars more particularly F1 hybrids exhibit a greater activity than their parents. Combretum spp. are common indigenous species in the wood land and semi humid Savannah of the Sudan. They are useful multipurpose species with a high potential of timber production, medicinal uses (There is a recent review of [12] who showed that Combretum hartmannianum had an anti microbial, anti bacterial, anti inflammatory and anti schistosomal activities.). This is an addition to their vital environmental importance as dominant species in two zones of the high rainfall savanna.

Combretum species facing an increasing rate of cutting down by local people for their useful wood without appropriate replacement of the trees (plantation programmes). Since tropical vegetation zones are based on biodiversity; removal of species could lead to an ecological disturbance either by desert creep or invasion of land by un desirable species. From previous studies at the National Tree Seed Centre [5], the poor germination of seeds is an obstacle for any conservation plans of the species in the future.

This study was carried out to investigate whether the germination of Combretum hartmannianum is affected by seed polymorphism. A total of 10 trees of Combretum hartmannianum were examined in ElNour forest east of Eldamazin city in Blue Nile State, Sudan.

II. Materials and Methods:
The fruits of C. hartmannium were collected from 10 trees in Elnour forest at Blue Nile State (11° 50’ North and 34° 29’ East). The distance between each tree and the other was about 100 metres. A total of 500 fruits were selected randomly from each tree and the length, width, wings width, and numbers of wings were measured for each seed.

Germination was carried out in a controlled germination room at the National Tree Seed Centre –Soba. ; temperature at ±30°C, light for 12 hours a day from fluorescent lamps. Germination counts were done at 7 days interval and for a period of 6 weeks. The fruits from each tree were divided into 4 replicates of 25 fruits each. Whole fruits were used for

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germination since it is difficult to extract seed from fruit immediately after treatment (soaking in acid for 60 minutes). The CRD (Complete Randomized Design) with four replicates was selected and the statistical analysis was done using JMP package (Japanese Programme improved form SAS Package) for analysis of variance, means were compared using Tucky - Kramer.

III. Results and discussion:
Combretum hartmannianum length of fruits wings were highly significantly different between the 10 trees as shown in table (1). Tree number 4 had the longest wings while trees 2, 8, 9 had the shortest wings (table, 1). [11] reported three types of seeds of Salsola affinis, one has long wings and this type is dispersed for long distance while the other two types were tightly attached to the mother plants because of short wings or absence of wings. The seed width of Combretum hartmannianum were also significantly different. Trees number 2 and 4 were the widest, while tree number 8 was the narrowest (table 1). Differences in fruit width could be for dispersal purposes or may refer to genetic variation among members of the same population. Number of wings of C. hartmannium fruits were significantly different from one tree to another, where the number of wings varying from 4 to 5 to 6 wings (table, 1). This variation may be due to crossing between this species and another species, C. aculeatum which has seeds with 5 to 6 wings or may be it is a somatic polymorphism. It might be a kind of tree strategy to invade new lands. The fruits with many wings may travel further distance than those with few ones. This polymorphism in number of wings was reported by [1] in Lonchocarpus pentaphyllus, which had two, three, or four wings. There were highly significant differences in fruit lengths between the 10 trees of Combretum hartmannianum. Tree number 6 had the longest compared with other trees which show highly significant differences. Tree number 8 had the shortest seeds (table, 1). This variation may affect the germination patterns of this species. [10] stated that germination is mainly controlled by seed size. Combretum hartmannianum showed highly significant differences in germination percentage between the ten trees. Tree No 8 had the highest percentage of germination. It may be also genetic differences which confirmed with [13] genetic variation study of this species in this population particulary . Comparing the result of germination with the parameters measured of the fruits collected from the 10 trees, It seems to have no relationship although many studies mentioned a correlation between seed size and germination.

<table>
<thead>
<tr>
<th>Tree</th>
<th>Mean Wings Length</th>
<th>Mean Fruits Width</th>
<th>No of wings</th>
<th>Mean / Fruits length</th>
<th>Mean /germination percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.47 cd</td>
<td>0.40 cd</td>
<td>4.24 b</td>
<td>1.95 c</td>
<td>4.2 d</td>
</tr>
</tbody>
</table>

Plate (1) Differences in fruit wings number .6,5 and 4 wings.
Plate (2) Differences in fruit size length and width. The rate of germination showed a variation within the ten trees, but most of the trees start germination after two weeks (Fig 1).

Fig (1) Germination rate of C. hartmannainum over 6 weeks

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