Seed Polymorphism of Terminalia laxiflora Engl. &Diels seeds in relation to Germination

Mai M. A.Hassan[a], Fatima Algunaid Hassan[b], Sayda M. Mohammed [a,] Nada Babiker[c]

a. National tree seed Centre, Forest Research Centre, Agricultural Research Cooperation, Ministry of Agriculture, Khartoum, P.O. Box: 7089, Khartoum, Sudan.

b..Assistance Professor, Field: Natural Resources, Environmental Science Faculty ofAgriculture and Natural Resources, Forestry and Range Sciences Department, University of Bakht Er-Rudam Ministry of Higher Education and ScientificResearchm, White Nile state (AD Duwem) Sudan.

fhassan50@yahoo.com

c.. National Research Centre, Biotechnology commission, AlAmarat-Sudan.

Abstract.T. laxiflora is one of the important Sudanese trees, which has low seed germination problem. In some cases the germination was found to be related to seed polymorphism, so this study was carried out to investigate the seed polymorphism and vaibilty of this species with regard to germination. Germination percentage, sesds length, seed width, wing length and number of wings were examined in T. laxiflora 10 trees in ElNour forest east of Eldamazin city in Blue Nile State in season 2007. The results showed that seed length, seed width, wing length were significantly different in the 10 trees but No of wings was 2 for all trees. Germination percentage has a significant variation but it was not found to be associated with seed polymorphism.

Key words: *Terminalia laxiflora*, polymorphism, germination

I INTRODUCTION:

In general, the frequency distribution of seed size and shape from either single plants or populations is a continuous distribution, normal or skewed. In plants showing seed polymorphism, two or more sharply defined distribution patterns are seen (Harper, 1977). Attributes such as seed size, shape, dormancy, or internal structures are some of the forms in which polymorphism may be manifested (Van Staden et al 1989). Seed coat colour changes are often associated with the onset of impermeability during seed maturation and there is evidence that seed coat colour is controlled by a single gene (Egley and Paul, 1993). Sometimes seed weight and volume are significantly related to the properties of non dormant seeds (Morrison, 1992). Augspurger and Hogan (1983) have noted that Lonchocarpus pentaphyllus has mature indehiscent fruits that may contain one, two, and three (rarely four) winged seeds; while this had clear implications for dispersal, the influence on germination remains unknown. That different sizes of seed may show marked differences in germination is well known: large and medium-sized seeds of Syzgium cumini gave better germination than smaller seeds (Ponnamal et al, 1992). Beside large seeds produced more vigorous seedlings (Gonzalez, 1993) also (Roy 2006) reported that actual percentage germination and seedling vigour were greater for larger seeds. Seed viability may relate to seed polymorphism where seeds of a species exhibit two or more distinctly different morphologies in size, shape, or color (Baskin and Baskin, 1994).

Form field observations T. laxiflora seeds have seed polymorphism within and among populations and with regard to poor germination percentage of this species, this study was

carried to investigate the seed polymorphism within one population of T. laxiflora in relation to germination.

II. MATERIAL AND METHODS:

The seeds of T. Laxiflora was collected from ELnour forest at Blue Nile State. (11 o 50/ North and 34o 29/ East) 10 trees were selected. The distant between each tree and another was about 100 metre. 500 seeds were selected randomly from each tree and the seeds length, seed width, seed wings width and number of wing were measured. Cutting test used for testing fruits viability, 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 .Seeds 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 the following: Sound seeds (normal, firm, fresh and full size), Empty seeds (Empty fruit coats, with no seeds) and Dead seeds (fragile, dark, coloured and decayed or abortive).

Germination was carried out in a controlled germination room at the National Tree Seed Centre –Soba 30oc, 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 were divided into 4 replicates of 25 fruits each. Fruits were sown immediately after treatment(soaking in acid for 60 minutes).

The CRD (Complete Randomize Design) with four replicates was selected and the statistical analysis was done by JMP package (Programme improved form SAS Package) for analysis of variance, means were compared using Tucky - Kramer .

III.RESULTS AND DISCUSSION:

T. laxiflora length of seeds wings had significant differences between trees. Tree number 2 had the longest wings while the trees 9 and 10 had the shortest length (table, 1) these differences of seed wings length may be a plant strategy for survival while the seeds with short wings can't be dispersed for long distances the long ones went further and colonize new lands. These seeds polymorphism may be a somatic polymorphic which is the production of seeds of different morphologies or behaviour on different parts of the same plant and is a somatic differentiation rather than the result of genetic segregation. This phenomenon appears to be confined to a limited number of families of higher plants (for example, Cruciferae, Compositae, Chenopodiaceae, Gramineae). Seed produced within a somatic polymorphism may vary in size (Xanthium sp.2), colour (Atriplex heterosperma Bunge3) and/or external structure (Chenopodium album L.4) (Sorenson, 1978).

The seeds width also showed high significant differences but when the tree number 10 had the shortest length of wings it was the widest seeds it seems to be that the width of wings is inversely proportional to seed width. (Table 1).

Number of wings of T. laxiflora hadn't significant difference although their seeds have three wings (table, 1). This variation may be an indicator of mutation in trees of T. laxiflora and it may affect the seed dispersal through influencing the seeds movement by wind.

T. laxiflora seeds length also had significant differences between trees. The tree number 2 which had the longest width also it was the longest ones (table, 1). The large seeds have higher germination percentage, greater seedling survival and increase growth (Singh, 2000).

This result showed significant differences in germination percentage between the ten trees of T. Laxiflora, There were also differences in number of dead, empty and sound fruits between the 10 trees (table 2).this may explain the differences in germination in the same bulk or between seasons to another. These differences may attribute to genetically differences between

trees. There are genes responsible for dormancy which was located in chromosome A3 in wheat (Mori et al, 2005) may be this gene is also present in this species and the presence and absence of this gene controlled the differences between trees. The rate of germination of this species showed that it start to geminate after 3-4 weeks after sowing (Fig 1). Also there were differences in the start point from one tree to anther. Tree (1) began germinating in the third weeks, Trees (2, 3, 6) began at the fourth week and trees (4, 7, 9) started at the fifth week.
However, germination was not found to be related to seed polymorphism and the variation in germination together with poor germination was mostly found to be due to combined dormancy found in most species of the combretaceae.(Mahgoyb, 2002). But the differences in the seed infestation which present as dead seeds need more investigation on insects feeding on the fruits of this species? Is the chemical composing of this fruits varying from on tree to anther which makes some trees favourable? .

Table (1) *Differences of T. laxiflora* seeds (10 trees) parameters

Trees	**Mean Wings Length**	**Mean Seeds Width**	**No of wings**	**Mean /Seed length**	**Mean /germination percentage**
Tree 1	0.84 bc	1.49 c	2	7.55b	19.8a
Tree 2	0.96a	1.63b	2	8.19a	10.5a
Tree 3	0.90 abc	1.66 b	2	7.28bc	14.7a
Tree 4	0.84 c	1.57bc	2	7.27bc	15.1a
Tree 5	0.78 c	1.45cd	2	6.11e	/
Tree 6	0.81 c	1.43cd	2	7.05dc	18.9a
Tree 7	0.8 c	1.14e	2	8.46a	4.2b
Tree 8	0.94ab	1.19e	2	6.05e	0b
Tree 9	0.70e	1.34d	2	6.27e	14.7a
Tree 10	0.71e	1.92 a	2	6.74d	4.2b
p	≥0.0001	≥0.0001	1	≥0.0001	≥0.002
SE	±0.02	±0.03	±0	±0.09	±4.1
CV	=20	=18	=0	=14	=79

Table 2 Differences of *T. laxiflora* fruits (10 trees) viability and germination

Trees	Sound fruits %	Empty fruits %	Dead fruits%
Tree1	2	0	98
Tree2	36	0	64
Tree3	14	0	86
Tree4	10	0	90
Tree5	30	0	70
Tree6	58	0	42
Tree7	54	0	46
Tree8	74	0	26
Tree9	70	0	30
Tree10	24	0	76
Mean	**38,4**	**0**	**61.6**

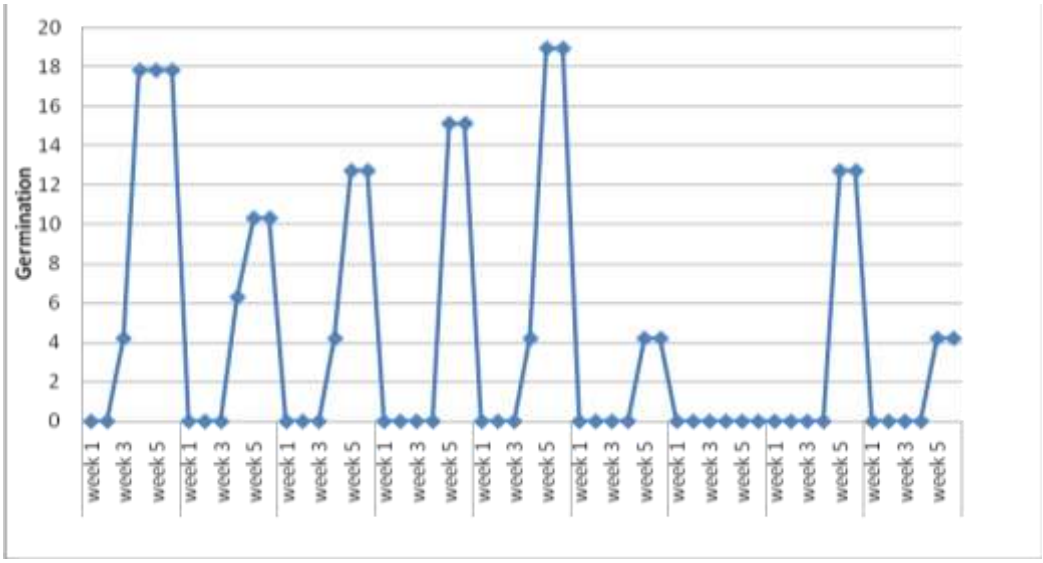

Fig (1) the germination rate of *T. laxiflora* fruits over 6 weeks

REFERNCES:

Augspurger and Hogan (1983). Wind dispersal of fruits with variable seed number in a topical tree (Lonochocarpus pentaphyllus: leguminaceae) joster: Ecology vol 70 No 2 pp 339-347.

Baskin, J. M. and C. C. Baskin. 1994. Nondeep simple morphophysiological dormancy in seeds of the mesic woodland winter annual Corydalis flavula (Fumariaceae).Bulletin of the .Torrey Botanical Club 121: 40-46.

Gonzalez. M. (1993). Ye.G.N, store D.pong.S, creely.w. Arabidopsis ovule is the target for agrobacterium in planta vacuum in filtration trans formation. The plant journal vol 19 issue 3 pp249-257.

Harper,J.L.,(1977).Population Biology of Plants. Academic London.

Mahgoub, S.M(2002). Studies on the physiological, environmental and biochemical factors affecting the germinability of seeds of some forest tree species. University of Khartoum, Khartoum (Sudan). Faculty of Science, Dept. of Botany.

Mori, M, Uchino, N, Chono, M, Kato, K, Mori, H, 2005, Mapping QTLs for grain dormancy 3Aand the group 4 chromosomes and their combined effect, Theor Appl Genet, 110(7) 1315-23.

Morrison,(1992).Dormancy and germination CASOSA, international seed testing.
Ponnamal.N.R.M.C and Arjunan et al (1993). Seedling growth and biomass production in Hardwickia binata Roxb. As affected by seed size. Indian Forester 119(1)59-62.

Roy, S. (2006). Plantation Technology in Tropical. Springer Tokyo. Pp123-130.

Schmidt, L, (2000), Guide to Handling of Tropical and Subtropical seeds, DANIDA Forest Seed Centre. Krogerupvij 3A-DK 3050. Humbelbeak, Denmark.Sorensen, A, E, (1978).Nature. 276,174-176

Van Mölken.T,. Jorritsma-Wienk.L, Hoek .P.H.Wand Kroon,H. (2005) Only seed size matters for germination in different populations of the dimorphic Tragopogon pratensis subsp. Pratensis (Asteraceae)1. American Journal of Botany. 2005;92:432-437.).