

ESTABLISHMENT OF *Capparis decidua* (FORSK.) EDGEW BY SEED IN THE NURSERY

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ABSTRACT

Capparis decidua is one of the important tree species. Although it has economic importance, little or no information is available on its propagation.

This study was undertaken to find out the optimum conditions for seed germination and seedling growth in the nursery. Shoot heights, root length (cm), shoot fresh weight (g) and germination percentage are measured. Likewise, the impact of: different range of light intensities (full shade, half shade 50%), two soil types (Sand and sand + river silt mixture 1:1) and two watering intervals (two and four days) on the production of *Capparis decidua* seedling from three seed sites, namely, Elobeid, Elkhojlab and Soba under nursery conditions.

The study suggests that the best conditions to produce seedlings were to sow seeds directly in polythene bags containing sand + river silt mixture (50:50%) irrigated every two days under 50% light intensity in the form of overhead shade. Elkhojlab seeds gave the best performance under all treatment combinations.

المخلص

تعتبر شجرة الطنذب من الأشجار المهمة اقتصادياً، بالرغم من ذلك فإنها لم تجد الاهتمام الكافي لتكاثرها. تهدف هذه الدراسة لمعرفة الظروف الملائمة لإنبات البذور وتطور نمو الشتول داخل المشتل. قيست المتغيرات من طول الساق والجذر (سم)، والوزن الرطب للساق (جرام). بالإضافة إلى نسبة الإنبات. وكذلك اختبار تأثير عدة معاملات وهي درجات مختلفة من الكثافة الضوئية (ظل كامل، وظل بنسبة 50%)، واستخدام نوعين مختلفين من التربة (رمل، وخليط بنسبة 1:1 من الرمل والطيني) ومعدلات مختلفة من الري (يومين، وأربعة أيام) على إنتاج شتول الطنذب وذلك بزراعة بذور جمعت من ثلاث مناطق مختلفة (الأبيض، الفوجلاب، سوبا).

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لوضحت النتائج أن أكثر الظروف ملائمة لإنتاج الشتول هي بذر البذور مباشرة فسي لكياس بلاستيكية تحتوي على خليط من الرمل والطين بنسبة 1:1 (بالحجم) ، مع الري كل يومين بتتابع نظام الظل الفوقي بنسبة 50% . أظهرت الشتول من بذور منطقة الخوجلاب تقوفا فسي معظم معالجات النمو في مراحل الشتل.

INTRODUCTION

Tundob (*Capparis decidua*) is one of the neglected trees despite its importance. The tree belongs to the family capparidaceae and is characterized by the linear simple leaves that are deciduous during flowering, pink flowers and fruits, green smooth bark and branches, and equipped with prickles.

The tree is found in low plains and areas with rainfall between 200 to 400 mm. It is also found in the desert and semi-desert especially on sandy soil. In the Sudan the tree is found in Blue Nile, Upper Nile, western and eastern Sudan besides northern areas of the country.

Tundob is a drought resistant tree of multipurpose nature. It gives pesticides, drugs, protective belts, forage, fences, fuel and edible fruits. The tree is widely used as remedies in local medicine e.g root and root bark are used against fever and rheumatism, roots and leaves against enlarged spleen, jaundice and skin diseases, fumigant of stem against rheumatism, and poultice of twigs against headache (Von Maydell, 1986 and ElGhazali *et al*, 1987).

As little or no information on the propagation of the tree is available, the research described in the present paper is carried out with objectives of investigating effects of different soil types, irrigation intervals and light intensity on seed germination and seedling establishment in the nursery.

In addition, as the tree is adapted to different sites in the Sudan, seeds from different locations were collected and treated separately to compare performance of the different provenance.

Materials and Methods

The required amounts of seeds were collected from three different sites, namely Elkhajlab (northern Khartoum), Soba (southern Khartoum) and Elobeid (western Sudan). The effects of soil types (Sand, sand: silt 1:1) and irrigation intervals (two and four days) on seedlings production were checked for the three sites in Shambat Nursery, University of Khartoum.

The layout adopted was completely randomized design with three replicates. The seeds were sown both under half shade and full shade conditions.

After the seventh and 13th week from sowing, parameters of shoot length, root length weight were measured, and germination percentages were recorded after the fifth week from sowing.

Results:

Germination percentage:

Analysis of data obtained (Table 1) revealed that under full shade conditions and after five weeks from sowing, seedlings from Elkhajlab site gave significantly higher germination percentage (55.42%). Soil types had no significant effect on seed germination, while two days irrigation interval gave significantly higher germination percentage than four days interval.

Also, under half shade conditions Elkhajlab seedlings gave the highest germination rate (48.66). Mixed soil gave significantly higher germination (48.25%) than sand soil (43.17%).

Table (1): Effects of different sites, shade and soil types irrigated at different intervals on germination percentage of *Capparis decidua* seeds after five weeks from sowing seedlings after 7th week from sowing

Treatment	Full shade				Half shade			
	EIObeid	ElKhajlab	Soba	Mean	EIObeid	ElKhajlab	Soba	Mean
T1	50.790e	55.770c	57.860b	54.807a	38.223e	49.886a	46.913cd	45.007b
T2	54.356d	57.290b	47.880f	53.175b	36.630f	46.943cd	45.956d	43.176c
T3	55.190c	53.730d	57.103b	55.341a	40.136e	46.943cd	48.876b	45.318b
T4	47.880f	60.076a	54.833ed	54.263b	46.953cd	50.853a	46.950cd	48.254a
Mean	52.050c	56.720a	54.420b		40.490c	48.660a	47.180b	

S.E for S (A) 0.17 0.36

S.E for T (B) 0.20 0.42

S.E for SxT 0.34 0.73

Means with the same letter are not significantly different at probability Level 0.05 according to Duncan's multiple range tests.

T₁: Sand soil with 2-days irrigation interval.

T₂: Sand soil with 4-days irrigation interval.

T₃: Sand soil with 2-days irrigation interval.

T₄: Sand soil with 4-days irrigation interval.

Stem height

After the seventh week under full shade conditions Soba seedlings were significantly taller (4.52 cm) than Elobeid and Elkhajlab seedlings see (Table 2). Mixed soil recorded significantly better results than sand, while four days interval gave better shoot compared to two days interval. However, under half shade condition, Elkhajlab seedlings had significantly taller stem (4.53cm) followed by Elobeid (3.63cm), than Soba seedling (3.53 cm).

After the 13th week (Table 3) Elobeid and Soba seedlings recorded no significant difference in stem height under full shade. Mixed soil conditions in Elkhajlab seedlings recorded the highest shoot (8.38 cm) while the mixed soil showed better results than sand.

Root length:

Under full shade conditions, Elobeid seedlings showed higher performance in root length after the seventh week from sowing (3.07 cm) compared to Soba seedlings (2.82 cm) and Elkhajlab (2.6 cm). In addition, sand soil gave longer roots than mixed soil while irrigation interval had no significant effects. However, under half shade, Elkhajlab seedlings had longer roots (4.23 cm) compared to the other two sites, and sand soil still has better results.

After the 13th week from sowing the three sites had no significant difference in root length. Also soil types and irrigation intervals had no significant difference. However, Elkhajlab seedlings and sand soil resulted in significantly longer roots under half shade (Table 5).

Table (2) : Effects of different sites, shade and soil types irrigated at different intervals on stem length (cm) of *Capparis decidua* seedlings after the 7th week from sowing

Treatment	Full shade				Half shade			
	Elobeid	Elkhajlab	Soba	Mean	Elobeid	Elkhajlab	Soba	Mean
T1	4.033f	4.266e	3.933g	4.077c	3.700c	4.060b	3.466d	3.744b
T2	4.833b	4.566c	4.766bc	4.721a	3.466d	4.533b	3.300de	3.610c
T3	5.033a	3.733h	4.366d	4.377b	3.666c	3.266e	3.900b	4.277a
T4	4.133e	4.333d	3.900a	4.488a	3.666c	3.700a	3.466d	4.277a
Mean	4.510g	4.236c	3.420h		3.630b	4.390a	3.530c	

S.E for S (A)

0.001

0.03

S.E for T (B)

0.003

0.03

S.E for S xT

0.006

0.006

Means with the same letter are not significantly different at probability Level 0.05 according to Duncan's multiple range test.

Table (3): Effects of different sites, shade and soil types irrigated at different intervals on stem length (cm) of *Capparis decidua* seedling after the 13th week from sowing

Treatment	Full shade				Half shade			
	ElObaid	EIkhoj/ab	Soba	Mean	ElObaid	EIkhoj/ab	Soba	Mean
T1	4.900c	4.533c	4.533c	4.677b	6.700cd	7.633b	6.300de	6.877b
T2	4.666c	5.000c	5.000c	5.110a	6.166de	7.500bc	5.600fg	6.422bc
T3	4.800cd	4.666cd	5.066a	5.066a	4.866g	8.100b	1.833def	6.266c
T4	4.866cd	5.633ab	5.066a	5.100fg	10.300a	9.766a	8.388a	8.388a
Mean	5.100a	4.880b	5.030a		5.710c	8.380a	6.880b	

S. E for S (A) 0.048 0.13

S. E for T (B) 0.056 0.15

S. E for S xT 0.100 0.27

Means with the same letter are not significantly different at probability Level 0.05 according to Duncan's multiple range tests.

Table (4): Effects of different sites, shade and soil types irrigated at different intervals on root length (cm) of *Capparis decidua* seedlings after the 7th week from sowing

Treatment	Full shade				Half shade			
	ElObaid	EIkhoj/ab	Soba	Mean	ElObaid	EIkhoj/ab	Soba	Mean
T1	2.866cd	2.900cd	3.100bc	2.955a	4.500a	4.800a	3.300d	4.200a
T2	3.066bc	2.566ef	3.166b	2.932a	3.466cd	4.100ab	3.733bc	3.766b
T3	3.733a	2.600def	2.800cd	3.044a	3.966b	4.766a	3.200d	3.977b
T4	2.600def	2.333fg	2.200g	2.377b	3.333d	3.233d	3.266d	3.277c
Mean	3.070a	2.600c	2.820b		3.820b	4.230a	3.380c	

S. E for S(A) 0.03 0.16

S. E for T(B) 0.03 0.19

S. E for SxT 0.06 0.32

Means with the same letter are not significantly different at probability Level 0.05 according to Duncan's multiple range test.

Table (5): Effects of different sites, shade and soil types irrigated at different intervals on root length (cm) of *Capparis decidua* seedlings after the 13th week from sowing

Treatment	Full shade				Half shade			
	Elobeid	Elkhozlab	Soba	Mean	Elobeid	Elkhozlab	Soba	Mean
T1	3.500bc	3.900abc	4.500ab	3.966a	8.733a	6.466bcd	8.333ab	7.844a
T2	3.600bc	4.600abc	5.166a	4.355a	4.966cd	8.433ab	8.333ab	7.244ab
T3	4.300abc	3.666bc	3.566bc	3.844a	5.500cd	7.333abc	5.166cd	5.999ab
T4	3.700bc	4.033abc	3.200c	3.644a	3.900d	6.666ab	5.700cd	5.422b
Mean		3.980a	4.110a		5.780b	7.250a	6.880a	

S. E for S(A)	0.19	0.42
S. E for T(B)	0.24	0.59
S. E for SxT	0.38	0.83

Means with the same letter are not significantly different at probability Level 0.05 according to Duncan's multiple range tests.

Stem weight

After the seventh week there were no significant differences between the three sites, types and irrigation intervals under full shade. However, under half shade Elkhozlab seedlings gave significantly higher weight (0.129) also, mixed soil recorded higher seedlings weight (Table 6)

After the 13th week from sowing there were also no significant differences in stem weight between the three sites types and irrigation interval under full shade conditions. However, under half shade condition (Table 7) Elkhozlab seedlings had higher stem weight (0.251g) and mixed soil was better than sand results. Also, four days irrigation interval was better than two days interval.

Discussion

Germination percentage: Data in table (1) indicated that germination percentage of seeds grown under full shade was higher than that grown under half shade conditions, this may be due to less evaporation of water from soil under full shade which resulted in better growth of seeds.

The superiority of Elkhozlab seeds for most of measured parameters can be attributed to the larger size of Elkhozlab seeds than Elobeid and Soba ones. Mixed soil recorded significantly better results relative to sand soil. This result was similar to that recorded by Hussein *et al* (1996)⁴ in their study on *Ziziphus spina-Christi*, Linn.

Generally two days irrigation interval gave significantly higher germination percentage than four days interval

Table (6): Effects of different sites, shade and soil types irrigated at different intervals on stem weight (g) of *Capparis decidua* seedlings after the 7th week from sowing

Treatment	Full shade				Half shade			
	EJObeid	EIKhojlab	Soba	Mean	EJObeid	EIKhojlab	Soba	Mean
T1	0.80	0.072	0.077	0.076a	0.088c	0.128b	0.096c	0.104b
T2	0.668	0.054	0.081	0.067a	0.084c	0.121b	0.068d	0.088c
T3	0.64	0.071	0.069	0.068a	0.088c	0.153a	0.098c	0.131a
T4	0.058	0.072	0.063	0.064a	0.081d	0.129a	0.077d	0.130a
Mean	0.068a	0.067a	0.073a		0.085b	0.129a	0.085b	

S. E for S(A) 0.05 0.002

S. E for T (B) 0.05 0.003

S. E for SxT 0.092 0.005

Means with the same letter are not significantly different at probability Level 0.05 according to Duncan's multiple range test.

Table (7): Effects of different sites, shade and soil types irrigated at different intervals on stem weight (g) of *Capparis decidua* seedlings after the 13th week from sowing

Treatment	Full shade				Half shade			
	EJObeid	EIKhojlab	Soba	Mean	EJObeid	EIKhojlab	Soba	Mean
T1	0.109b	0.187a	0.187a	0.61ab	0.146i	0.182f	0.209e	0.179d
T2	0.094b	0.170a	0.179a	0.147b	0.142j	0.192f	0.250d	0.194c
T3	0.16a	0.195a	0.171a	0.175a	0.136j	0.290	0.271c	0.252b
T4	0.183a	0.187a	0.183a	0.184a	0.175f	0.340a	0.021e	0.241a
Mean	0.137b	0.185a	0.180a		0.150c	0.251	0.235b	

S. E for S (A) 0.007 0.002

S. E for T (B) 0.008 0.002

S. E for S x T 0.014 0.004

Means with the same letter are not significantly different at probability Level 0.05 according to Duncan's multiple range test.

Stem length: Data in tables (2-3) revealed that shoot height of *Capparis decidua* seedlings grown under full shade conditions, was superior to that of seedlings grown under full shade condition. This is in agreement with Ballal (1996), who reported that use of 50% light intensity in form of overhead shade significantly increased initial height of *Acacia senegal* seedlings.

The significant difference observed between the three locations for most of the measured parameters may be attributed to differences in sites where seeds were collected since they received similar cultural practice and were

grown under same climatic and environmental conditions. The results indicated that sand: clay loam mixture was the most suitable soil media for production for the fact that sand: clay loam mixture supplies reasonable amount of nutrient and has good water retention capacity as found by Kozłowski (1971)⁵. Under full shade condition, four days watering interval gave significantly better result than two days interval. However, under half shade condition two days interval recorded higher shoot length relative to four days interval. This may be due to less water evaporation under full shade compared with half shade.

Root length: Data in table (4-5) indicated that the root performance under half shade condition was better than under full shade condition. This might be attributed to the fact that plants with half shade receive more light which is essential for photosynthesis. Thus partitioning of carbohydrates is more in half shaded plants. This is dependent on photoperiod and genetics of plant. As far as rooting is concerned, seedlings showed different responses towards different soil types. The root length was taller in sand soil than the other media. This may be explained by the fact that deficiency of such nutrients in sand soil has led to roots elongation to satisfy shoot needs for production of photosynthates. This result is in line with Hussein *et al* (1996) in their study on *Zizphus spina*. Christi Linn.

Two days irrigation interval under full and half shade condition gave significantly better result than four days irrigation interval. This clearly indicates that irrigating *Capparis decidua* seedlings more frequently will improve seedling growth. This results is in agreement with El Khalifa *et al* (1995) in their study on *Tamarinds indica*.

Stem dry weight: As can be noticed from tables (6-7) stem weight of seedlings grown under half shade condition is high. This is because sun light provided to seedlings under half shade lead to more production of photosynthates which resulted in better growth of shoots.

The shoot dry weight of seedling at early growth stage was not significantly affected by soil types. This indicates that reserved food in cotyledons has balanced possible differences that could have been due to soil types. Nonetheless, at late stages of seedlings growth, in mixed soil gave significantly better result compared with sand soil. This may be due to availability of nutrients in mixed soil. (El Khalifa *et al* 1995).

The superiority of two days irrigation interval over four days irrigation interval increased with increase in seedlings age.

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