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### RESEARCH ARTICLE

## EVALUATION OF EARLY GROWTH AND PHOTOSYNTHETIC PIGMENTS OF SOME SPECIES OF ACACIA GROWING IN AL - BAHU REGION IN SAUDI ARABIA.

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*Acacia species*, germination percent, seed elongation, chlorophyll a, chlorophyll b, total chlorophyll.

### Abstract

The scope of this study is to evaluate the germination percentage and early growth as well as photosynthetic pigments contents of five species of *Acacia* viz (*A.asak*, *A. ehrenbergiana*, *A.etbaica*, *A.hamouloosa*, and *A. fortilis*). Regarding germination percentage, the obtained data showed that *A.asak* recorded the highest value (100%) as compared to relative control (untreated), while *A.fortilis* recorded the lowest value (66%). Concerning to the early seedling growth, the highest value (4.3 cm) was recorded in *A.asak* while the lowest value (1.4cm) was measured in *A.ehrenbergiana*. Concerning photosynthetic pigments, The highest value of chlorophyll a (1.6 mg/g.fr. wt. was found in *A.etbaica* while the lowest value (0.98) mg/g. fr. wt. was recorded in *A. fortilis*. The obtained results clearly showed that the highest value in chlorophyll b (1.1) mg/g. fr.wt. was recorded in *A. asak* while the lowest content (0.86) mg/g.fr.wt. was detected in *A. hamouloosa*. Regarding total chlorophyll content. The highest amount of total chlorophyll (2.6) mg/g.fr.wt. was determined in *A.asak* while the lowest content (1.98) mg/g.fr.wt. was determined in *A.ehrenbergiana*.

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### Introduction:-

Generally, *Acacia* genus distributed naturally in Kingdom of Saudi Arabia especially in western and southern regions. This study was carried out in Al-Baha region which constitutes different species of *Acacia*. Many studies were carried out on the growth of *Acacia* trees and its importance to the environment (Palmberg, 1981, Aref, 1996). Al- Mefarrej (2012) studied different species of *Acacia* in Al-Baha region and reported clearly variation between these species. Aref and El-Atta (2013) carried out a study on some *Acacia* species. Walyet. al, (2012) stated clearly variation in some morphological characters of some species of *Acacia* seeds. Al-Gohary and Mohamed (2007) carried out a morphological study on seed size, color, texture as well as seed dimensions on some species of *Acacia* growing in Egypt (*A.fortilis*, *A. oerfota*, *A. asak*, *A. ehrenbergiana* and *A. etbaica*). Regarding seed germination, (Aref et al., 2011) reported that seed germination percentages were increased after treatment of some *Acacia* species (*A. asak*, *A. ehrenbergiana*, *A. etbaica*, *A. gerradii* and *A. origena*) with sulfuric acid (98%) for 15 min. Presence of chlorophyll in green plants makes them unique in living world for they only can capture the solar energy and convert it into chemical energy. It is a phenomenon of utmost significance for the existence of the entire life on this plant (Tiwari and Raj, 2002). Since animals and humans obtain their food supply by eating plants, so photosynthesis can be said to be the source of our life (Devilin, 1983). The leaf may be viewed as a photosynthetic machine, superbly engineered to carry out photosynthesis efficiently (Hopkins et al., 2003). Chlorophyll content in leaf tissue varies

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with species ,age of plants and growing season . Among the climatic factors light and temperature during the growth period have more pronounced effect on chlorophyll content (Bhatt and Sinha , 1990). The present investigation was conducted to study the variations in photosynthetic pigments as well as early seedling growth of some species of *Acacia*(*A.asak* ,*A. ehrenbergiana* ,*A.etbaica* , *A.hamouloosa*, and *A. fortilis*) .

#### Study site:-

*Acacia* species distributed naturally in Kingdom of Saudi Arabia, but the density of these species increased in Western and Southern regions .This study was carried out in Al-Baha region(about 12000Km<sup>2</sup>) which, Geographically, located between longitude 41-42°E and latitude 19-20° N, to study naturally growing *Acacia* species.

#### Materials and Methods:-

##### Seeds Collection:-

Seeds of *Acacia* species ( *A.fortilis* , *A. ehrenbergiana*, *A.asak* ,*A.hamouloosa* and *A.etbaica*) were collected during spring season from different localities in AL-Baha region in Kingdom of Saudi Arabia.

##### Seed germination and early growth:-

Seeds of equal sizes were sterilized by soaking in 10% sodium hypochlorite for 10 minutes then soaked in Sulfuric acid (98%) for 10 minutes. After washing with distilled water, seeds allowed to germinate at (25°C) in Petri dishes of equal sizes. One piece of filter paper and 5 ml of distilled water were put in each Petri dish. Seeds were then transferred into the filter paper, with 10 seeds per dish and 1 cm or larger distance between each seed .For untreated experiments (control), distilled water only was used. For the germination rate and root growth investigation, seeds were allowed to germinate for 2 days for all treatments and 10 days for untreated (control), and then seed germination percent (%) was calculated as well as seedling root length (cm) was measured for treatments and their respective controls. At least, three replicates were carried out for each treatment and related control. A seed was considered to have germinated when radical emerged from the seed coat. The germination percent was calculated as the proportion of the seeds that germinated to total number of seeds multiplied by 100.

##### Photosynthetic Pigments:-

The amount of chlorophyll a, chlorophyll b, and total chlorophyll in terms of mg/g. fr .wt .were calculated by using the following formula given by Goodwin (1965).Three replicates were carried out for each experiment.

- $Chl.a = 12.7(A_{663}) - 2.69(A_{645}) \times V / 100XW$  mg/g fr.wt.
- $Chl. b = 22.9(A_{645}) - 4.68(A_{663}) \times V / 100XW$  mg/g fr.wt.
- $Total\ chl. = 22.2(A_{645}) + 8.02(A_{663}) \times V / 100xW$  mg/g fr.wt.

#### Results and Discussion:-

##### Germination and growth performances:-

Results of the present investigation (Table 1. and Fig.1) clearly revealed markedly variation regarding seed germination percent among *Acacia* species. The highest percentage of seed germination (95%) was recorded in case of *A. asak*, while the lowest one (66%) was observed in *A. fortilis*. Regarding seedling growth ,the obtained data cleared revealed that the highest reading of root elongation (4.5cm) was recorded in case of *A.fortilis*, while the lowest value(1.8cm) was observed in *A. ehrenbergiana*. In this regard ,some investigators reported that seed germination and seedling emergence may be affected by internal factors as seed coat dormancy and seed embryo (Agrawal and Dadlani, 1995 ; Olmez et al., 2008), or external factors as light intensity , temperature, water and oxygen (Mehrafarin et al.,2011; Hartmann et al.,2007 ; Kogeret et al.,2004). Many authors demonstrated that some materials as waxes, lipids, cellulose and lignin may prevent seed coats permeability to water (Turner et al. , 2005; Jayasuriya et al.,2007). Some previous studies stated that the seeds of some plants which having hard seed coats must be treated with different treatments of sulfuric acid or some organic solvents for enhancement their germination development (Ren and Tao , 2004 ; Okunomo and Bosah,2007; kassa et al.,2010). Results of the present work clearly showed that treatments of all tested seeds with sulfuric acid for 10 minutes resulting in enhancement of seed germination and seedling growth as compared to untreated experiments (control). Our results consistent with those reported out by Aref et al. (2011), Aref and EL-Atta (2013) Okunomo and Bosah (2007) and Kassa et al.(2010).In this concern ,Legesse (2010) stated that treatment of seeds with sulfuric acid or boiling water overcoming the hardness of seed coat resulting in easily water permeability of seed coats to water.

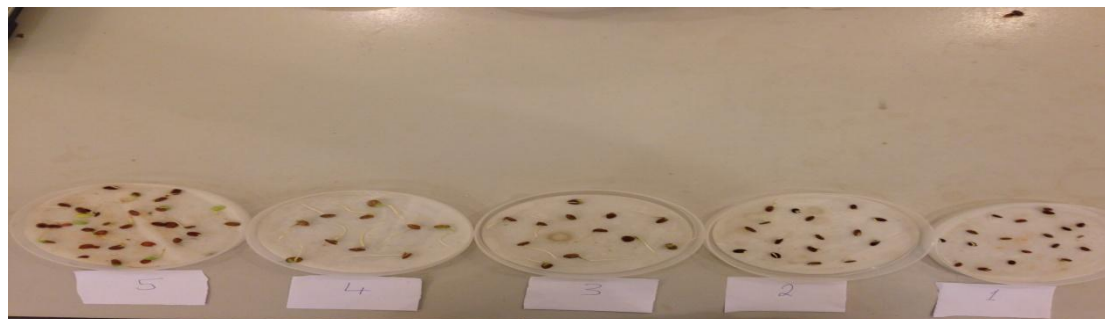
**Table 1:-**Seed germination percent (%) of different *Acacia* species for treatments and related controls.

seicepS	lortnoc	tnemtaerT
<i>A.asak</i>	90	100
<i>A.ehrenbergiana</i>	43	69
<i>A.hamouloso</i>	72	87
<i>A.fortilis</i>	20	66
<i>A.etbaica</i>	68	80

**Table 2:-**Elongation of root (cm) of the different species of *Acacia* for treatments and related controls.

seicepS	control	Treatment
<i>A.asak</i>	2.9±0.19	4.3±0.32
<i>A.ehrenbergiana</i>	0.7±0.17	1.4±0.11
<i>A.hamouloso</i>	2.3±0.28	3.6±0.32
<i>A.fortilis</i>	0.8±0.18	1.7±0.22
<i>A.etbaica</i>	1.3±0.54	2.8±0.19

( standard deviation ±Mean value)

**Fig 1:-***Acacia* ampliceps seedlings for different species:

1. *A.asak*.
2. *A.ehrenbergiana*.
3. *A.hamouloso*.
4. *A.fortilis*.
5. *A.etbaica*.

**Photosynthetic pigments:-**

The results of the present investigation (Table 3) clearly showed that the average chlorophyll a was observed the maximum (1.6) mg/g.fr.wt. in *A.etbaica* while the minimum average content (0.98) was detected in *A.fortilis*. As regard to chlorophyll b content, the obtained data revealed that the maximum average value (1.1) mg/g.fr.wt. was recorded in *A.asak* while the minimum (0.86) mg/g. fr.wt. was observed in *A.hamouloso*. The maximum average value of total chlorophyll (2.6) mg/g.fr.wt. was observed in *A.asak* while the minimum content (1.98) mg/g.fr.wt. was recorded in *A.ehrenbergiana*. The present study indicates that there was wide variation in photosynthetic pigments among the studied species. By comparing the values of total chlorophyll among the investigated five species of *Acacia*, the higher content was observed in *A.asak*. The obtained data of this work consistent with reported out by CHARU GUPTA and VANDANA MISHRA (2010). Studies on estimation of photosynthetic pigments indicate clearly variation in their contents and exhibit seasonal alteration among three species of *Mesembryanthemum* (Tantawy et al., 2004). So it was conducted from present investigation that the higher value of total chlorophyll of *A.asak* exhibits a potential productivity than the other species. Additionally, the higher contents of photosynthetic pigments can be used as precursors of some vitamins and play an important function of protecting the photosynthetic apparatus from destruction by light (Lea and Leegood, 1999).

**Table 3:-**Photosynthetic pigment contents (mg/g.fr.wt.) of five species of *Acacia*.

Species names	Chlorophyll a	Chlorophyll b	Total chlorophyll
<i>A.asak</i>	1.2±0.87	1.1±0.92	2.6±0.66
<i>A.ehrenbergiana</i>	1.4±0.78	0.93±0.74	1.98±0.95
<i>A.hamouloa</i>	1.3±0.49	0.86±0.77	2.3±0.57
<i>A.fortilis</i>	0.98±0.96	1.0±0.46	2.2±0.49
<i>A.etbaica</i>	1.6±0.59	0.97±0.12	2.4±0.87

( standard deviation ±Mean value )

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