

Assessment of natural regeneration status of woody species: A case study Wadi Burma, Western District, K.S.A

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Abstract:

This study **has been** carried out to investigate the natural regeneration of woody species at Wadi Burma, Western District, K. S. A. The natural regeneration of woody species in the study area is composed of *Acacia ehrenbergiana*, *Acacia tortilis* and *Acacia raddiana* seedlings. The density of natural regeneration was differing **differs according to** seasons, **as** in season 2018 was found 200 seedlings/ha, **while** in season 2019 was 1427 seedlings/ha. Seedlings' density in year 2018 found to be highest for *Acacia ehrenbergiana* (134 seedlings/ha), moderate for *Acacia tortilis* (60 seedlings/ ha) and the lowest for *Acacia raddiana* (16 seedlings/ha) in season. The density of natural regeneration of season 2019 **increased for all of the three species to amount to** 995 , 313 and 120 seedlings for *Acacia ehrenbergiana* , *Acacia tortilis* and *Acacia raddiana*, respectively. **The study also revealed an overall season effect. It shows difference in seedlings' regeneration according to the rainfall took place in the seasons (2018 and 2019).** In season 2019(with rainfall range of 4.2, 70.9mm), resulted in an overall density of 1427seedlings/ha, which revealed statistically to be significantly higher than that of season 2018 of 22.3, 36.2mm rainfall range and only 200seedlings/ha density. The average density of natural regeneration of woody species in the study area was found to be 814 seedlings /ha.

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INTRODUCTION

Natural regeneration is a fundamental component of tropical forest ecosystem dynamics and is essential for the conservation and maintenance of biological diversity. The knowledge of the floristic composition, regeneration, population structure of a plant community is a prerequisite to understanding the overall structure and function of any ecosystem (Singh et al 2016). The patterns of regeneration is important because it will ultimately determine the floristic composition of the remnant (Laurance et al 1998). The density value of seedlings and saplings are considered as an indicator of the regeneration potential of the species (Arya and Ram, 2011). The decline of vegetation cover is one of the most serious challenges facing humankind today (Reynolds et al, 2007). Forest stands in the semi-arid environment of northern Mongolia have an essential role in controlling ongoing desertification in the surrounding landscape. Over the last decade, the total forest area has decreased dramatically (David et al, 2019). The average density of natural regeneration of woody species *Acacia tortilis subsp. spirocarpa* and *Acacia tortilis subsp. raddiana* was 421 seedlings/ha in arid and semi-arid lands, (Elsafori, 2006). Seydack *et al* (2000) defined the regeneration individuals as plants between 50cm and 1.5m. in height.

Kirkpatrick *et al* (2000) counted the advantages of natural regeneration as: it occurs from plant material that is already present so it will be best suited to the environment and it will help to protect the genetic make-up of the bush on one's property.

Steward (2004) studied a community woodland and defined natural regeneration as: "is the nature doing its own thing without human intervention". It usually refers to the process by which native species return to the area of

land that has been degraded (usually by human activities). Ibrahim *et al* (2013) reported that the tree density ranges between 90 and 892 trees/ha in East Jazan and El-Namas, respectively, and number of seedlings/ha ranges between 49 and 382 in East Jazan and Ballasmar sub-region, respectively.

The main or dominant woody species of the study area are three Acacias, namely *Acacia ehrenbergiana*, *Acacia tortilis*(var. *spirocarpa*) and *Acacia raddiana*.

The aim of this study was to assess the natural regeneration of woody species in arid and semi-arid lands, with specific objective of comparing the seedlings' density of *Acacia* (as main trees) according to species, and season in 2018-2019 in Wadi Burma district, western Saudi Arabia.

Materials and Methods:

The study area lies between (210 48/ 3//N, 390 43/ 25// E), Western district, Saudi Arabia. This area has an arid climate and rainfall apart from its scantiness, is irregular and variable. The mean annual rainfall (2018-2019) varies from 4.2mm to 70.9mm/annum in this area. The Climate of the area understudy is generally characterized by high temperatures in summer and warm in winter.

Two – years monitoring of natural regeneration (2018 and 2019) by using sampling technique and a total of 14 sample plots with a size of 20X20m (400m²) was laid out for the woody species.

Natural regeneration was calculated as follows:

$$\frac{\text{Total number of seedlings}}{\text{Number of quadrats X area/m}^2}$$

$$\text{Number of quadrats X area/m}^2$$

$$\text{Relative density (R.De)} = \frac{\text{Number of individuals of species}}{\text{Total number of individuals}} \times 100$$

$$\text{Total number of individuals}$$

Results:

Table (1) : Total number of seedlings Season 2018:

Quadrats

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
<i>Acacia ehrenbergiana</i>	-	-	-	12	-	6	3	-	7	11	9	17	8	2	75
<i>Acacia tortilis</i>	-	-	-	-	-	-	-	7	3	4	-	8	4	2	28
<i>Acacia raddiana</i>	-	-	-	-	-	-	-	-	-	-	6	3	-	-	9
Total															112

$$\text{N.S./m}^2 = \frac{112}{14 \times 20 \times 20} = 0.02 \text{ seedlings /m}^2$$

$$14 \times 20 \times 20$$

$$\text{N.S./ha} = 0.02 \times 10000 = 200 \text{ seedlings/ha.}$$

$$\text{R.D. of (} \textit{Acacia ehrenbergiana} \text{)} = \frac{75 \times 100}{112} = 67\%$$

$$\text{R.D. of (} Acacia \text{ tortilis)} = \frac{28 \times 100}{112} = 25 \%$$

$$\text{R. D. of (} Acacia \text{ raddiana)} = \frac{9 \times 100}{112} = 8\%$$

Table (2): Total number of seedlings Season 2019:

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
<i>Acacia ehrenbergiana</i>	36	1	100	100	15	6	120	49	29	7	70	15	5	4	557
<i>Acacia tortilis</i>	-	2	50	25	-	-	45	-	-	4	20	12	10	7	175
<i>Acacia raddiana</i>	-	2	5	15	-	-	15	-	-	-	18	7	-	5	67
Total															799

$$\text{N.S. / m}^2 = \frac{799}{14 \times 20 \times 20} = 0.1427 \text{ seedlings/ m}^2$$

$$\text{N.S./ha} = 0.571 \times 10000 = 1427 \text{ seedlings/ ha.}$$

$$\text{R.D. of (} Acacia \text{ ehrenbergiana)} = \frac{557 \times 100}{799} = 69.7\%$$

$$\text{R.D. of (} Acacia \text{ tortilis)} = \frac{175 \times 100}{799} = 21.9\%$$

$$\text{R. D. of (} Acacia \text{ raddiana)} = \frac{67 \times 100}{799} = 8.4\%$$

The average density of natural regeneration of the study area = $\frac{1627}{2} = 814$ seedlings/ha.

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The natural regeneration of woody species in the study area was composed of seedlings of *Acacia ehrenbergiana*, *Acacia tortilis* and *Acacia raddiana*, the density of which differed according to season and species, where is found as 200 seedlings/ha in season 2018, and 1427 seedlings/ha in season 2019. This was correlated to the range of rainfall in both seasons (which was 4.2, 70.9mm in 2018 and 22.3, 36.2mm in 2019). This difference in seedlings' density proven statistically to be significant. As far as species is concerned, the highest density of seedlings was found for *Acacia ehrenbergiana* (134 seedlings/ha), moderate for *Acacia tortilis* (50 seedlings/ha) and the lowest for *Acacia raddiana* (16 seedlings/ha).

The relative density was high for *Acacia ehrenbergiana* in two seasons (2018 and 2019) 67% and 69.7% respectively, compared to the other two *Acacias*.

It was noted that the woody species were scattered and in patches in study area, but lead to a moderate regeneration.

Discussion:

The natural regeneration was studied in the area and the findings revealed that the most dominant naturally regenerating woody species were *Acacia ehrenbergiana*, *Acacia tortilis* and *Acacia raddiana*. These species *Acacia*

ehrenbergiana, and *Acacia tortilis* have large and moderate numbers of seedlings, which indicates that they have adaptability to the site conditions. The species *Acacia raddiana* reported small wild seedlings in the two seasons. This may be attributed to small number of viable seeds and lack of resistance to adverse conditions and browsing. The density of *Acacia ehrenbergiana* seedlings was higher than the other species in the area, which can be considered as an indicator of regeneration potential of the species. The relative density of *Acacia ehrenbergiana* was higher than other species in the area. This may be due to adaptability to site conditions, viable seeds and tolerance to browsing. **Moreover, the pods of this species are indehiscent which shutter the seeds immediately after ripening and be liable to germination instantly.**

It is very important to enrich the vegetation cover, with considering the environmental factors prevailing in the study area. That is in order to facilitate the natural regeneration of woody species. In addition, it is essential to protect the vegetation cover from any destruction in the study area.

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