

المملكة العربية السعودية
وزارة التعليم العالي
جامعة الملك سعود
كلية العلوم
برنامج ماجستير العلوم في التنوع الأحيائي

التنوع الشجري في غابة وادي غنب في جبال تمنية بمنطقة عسير

Tree Diversity in Ghonb Valley Forest in Tamnia Mountains, Asir Region.


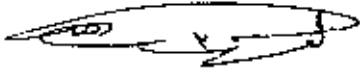

إعداد

مسفر مشيب سعيد القحطاني

نوقشت وأجيزت هذه الرسالة في يوم الأربعاء بتاريخ ٢٧/٥/١٤٢٨ هـ الموافق

١٣/٦/٢٠٠٧ م

أعضاء لجنة الحكم على الرسالة

	مشرفاً	أ.د. إبراهيم بن محمد عارف
	عضواً	د. يوسف بن صالح سراج علي
	عضواً	د. سعود بن ثلثي الرويلي

Summary

This study was performed at the forest of Ghonb Valley in Tamnia mountain, Asir region, located at the south western side of Saudi Arabia. The study included the climatic characters of the forest area, forest description, tree number and density, tree height and diameter, and stem volume as well as the number of young seedlings. All the plants grown in the forest site were collected and identified, and the seed bank for the forest was studied. The total aboveground dry biomass for juneptr trees (*Juniperus procera*) was estimated and trees age was determined by counting the annual rings of the disk samples. The physical and chemical properties of the soil were analyzed at three levels: zero-15cm, 15-30cm, 30-45cm; respectively in all the studied plots. All the field and laboratory data were statistically analyzed using SAS computer programme.

The most important results can be summarized as the following:

First: The forest site and climate

It is clear from this study that the Ghonb Valley's forest is located at Tamnia mountain, Asir region, about 40km south Abha city, at $17^{\circ} 59' 0.782$ North and $42^{\circ} 44' 0.509$ East and at altitude of 2400m above sea approximately. The climatic study of Emberger equation revealed that the forest climate is located in the semi dry region, and the mean annual rain fall in this forest was 349.43 mm/year, while in Abha and Soda regions were 330.3 385.6 mm/year; respectively.

Second: The characteristics of tress grown in Ghonb Valley's forest

The study showed that tree number per plot sample varied from 15.7 to 28 tree/100m² which can be transformed to a tree density of 156.7 – 280 tree/1000m², while the seedlings number ranged between 56.7 to 133.3 seedlings/1000m². The maximum tree height and diameter were 4.97m and 9.47cm; respectively and the stem volume ranged from 0.21 to 0.74 m³/tree.

The forest survey revealed that it has special stand cover dominated by *Juniperus procera* trees as 80% at the higher altitudes followed by *Acacia Origena* and *Olea europacea* trees at percentage of 17.58% and 2.42%; respectively at the lower altitudes.

The forest survey of the upnormal tree cases also showed that the trees of both *Juniperus procera* and *Acacia origena* have been subjected to cutting with a percentage of 20% and

2.86%; respectively from the total cases. Die-back, also contributed with a high serious percentage for both these species recording 68.57% and 8.57%; respectively from the upnormal tree cases under study. The plant samples collected from the forest sites recorded 45 plant species belong to 22 families. These plant species were classified as 3 tree species, 23 shrubby species and 19 species of annual and perennial grasses.

Third : The forest seed bank

The study of seedlings growth for the seed bank experiment showed that there were no significant differences between the different sectors under study, except sector (L4). This sector had recorded the highest mean value for seedlings growth of 10.5 seedlings per soil sample.

Forth: The above-ground dry biomass and the age of juniper trees of the forest

It is obvious from the study of the above-ground dry biomass for *Juniperus procera* trees that the mean value of the total dry biomass for the old (big) trees was 331.5kg/tree which can be distributed into 105.7kg for the stem, 179.7kg for branches, and 46.1kg for the foliage. On percentage basis, these tree biomass components recorded 31.9%, 54.2%, and 13.9%; respectively of the total tree biomass.

For the middles size trees, the total dry biomass was 215.4kg/tree which can be distributed into 84.3kg for the stem, 104.7kg for branches, and 26.8kg for the foliage. These values resembles 39.1%, 48.5%, and 12.4%; respectively of the total tree dry biomass. On the other hand, the total dry biomass for the small trees was 89kg/tree which can be distributed into 23.9kg for the stem, 47.1kg for branches, and 18.0kg for the foliage. These values resembles 26.8%, 53.0%, and 12.4%; respectively of the total tree dry biomass.

The counting of the annual rings (in two different directions) at the desk samples of juniper trees showed that the range of the annual records of old, middle, and small trees were 67-78, 58-87, and 30-37 rings; respectively. The eldest juniper trees in age had 78 years while the youngest had 30 years old.

Fifth: Soil characteristics

The result of soil analysis revealed that there were clear differences in most of the physical and mechanical properties. The common texture was sandy loam, because of the dominance of sand component. The highest sand percentage was 77.33%, while the highest for the clay and silt were 28.48% and 22.06%; respectively, in all soil samples.

It is also clear from this study that the organic matter (O.M.%) percentages have high values ranged between 1.77% and 10.68%, while the percentage of the calcium carbonate ($\text{CaCO}_3\%$) recorded low values ranged between zero% and 16% in all levels of soil samples. The moisture content percentages ($\theta.W.\%$) ranged between 2.07% and 4.54%.

Results showed that (pH) had low values ranged between 6.69% and 7.21% under standing trees and a little higher up to 7.57% in sites clear from trees. Electric conductivity had low values ranged between 0.12 and 0.41 dsm^{-1} in all the studied soil samples.

The analysis of total elements (cations) soluble in soil revealed low values concentration of potassium cation (K^+) which ranged between 0.4 to 0.25 meq/liter and high values for cations of calcium (Ca^{++}), magnesium (Mg^{++}), sodium (Na^+) which had values ranged between 2.8- 11.57, 0.79-6.99, and 0.31-1.99 meq /liter; respectively.

The results of solvent anions in soil showed disappearance of carbonate anion (CO_3^-) at any soil depth. Values of bicarbonate concentrations (HCO_3^-) were the highest which ranged between 5.67 and 11.5 meq/liter, followed by chloride (Cl^-) which ranged between 1.21 and 5.33 meq /liter, and sulphate (SO_4^{--}) which ranged between 2.43 and 4.30 meq /liter in all soil samples.

The analysis of fertilizer macro elements showed high concentration of both nitrogen (N) and phosphorus (P) which they recorded 24.65 and 2.9 ppm; respectively as highest value in the available condition, while they reached to 2905.0 and 693.75 ppm; respectively as highest value in the total determination. The concentration of available potassium (K) ranged between 20.23 ppm as lowest value and 202.54 ppm as highest value, while the concentration of total potassium ranged between 2740 and 3743 ppm in the soil samples.

The analysis of micro elements revealed that the highest concentrations of copper (Cu), manganese (Mn), iron (Fe), and zinc (Zn) values were 0.96, 7.88, 35.29, and 0.73 ppm, respectively in the available condition, while they were 18.27, 486.8, 1745, and 40.70 ppm; respectively, as the highest values in the total determination.

The analysis of the heavy metals (trace) showed disappearance of both cobalt (Co) and molybdenum (Mo) in the available condition, while the highest concentration values for

both nickel (Ni) and lead (Pb) were 0.69 and 0.36 ppm; respectively in the available condition. The highest concentration values in the total determination for Co, Ni, Pb, and Mo were 7.95, 29.33, 4.95, 0.97 ppm; respectively.