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Article

Description of the Composition of Mixed and Pure Stand of Atrush Forest in Northern Iraq

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Abstract: Describing the trees of mixed and pure forests is of great importance to determine the various products and services they provide, so (12) samples were taken from each of the three densities, which were selected randomly, thus the total samples taken for the study amounted to (36) samples with a radius of (30) m. It was noted that there are (11) types of trees present in the study area (Atrush) and they vary in numbers the two dominant types are (Brutian pine and oak in its three types). Brutian pine was present in high proportions in samples (1, 4, 6, 33) and did not appear in other samples while it appeared in the sample (35) in a tiny proportion. As for the oak Quercus aegilops, it is dominant in most of the samples followed by Quercus infectoria while Quercus libani appeared in only one sample. As for the Crataegus azarolus, it spread in several locations and low proportions (0.47-25.25). As for the rest of the species, they appeared in very small proportions and limited samples. It was also found that there are different age stages for the pine as in sample (1), while the rest of the samples are mixed from pine and oak for samples (4, 6, 33). This indicates the modernity of these trees and the ability of the site and species to regenerate naturally. While we find that sample no. (35) contains different age numbers of oaks, which is the most widespread and is in the form of scattered and distributed branches, while pine trees are spread in small proportions and are in different age stages. As for the remaining samples, we find them to be pure oak trees.

Keywords: Mixed trees, uneven age forest stand, Pinus brutria Ten., Quercus spp.

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1. Introduction

Forests are classified among the important renewable natural resources and have a major role in preserving the environment and providing various products and services to society. Therefore, managing these resources requires a lot of complexity and using modern scientific methods to carry out activities in these resources (Sonti, (2015). and, it is necessary to know the type of relationship between the elements of the ecosystem to determine the development processes that need to be carried out to develop and sustain these resources on an ongoing basis (Liu et al., 2018). We note that there is a relationship between the richness of species and their productivity. This relationship leads to a balance in water, recycling of nutrients, carbon fixation, and photosynthesis that occurs (Qaro, 2020). There is a relationship between the elements of the tree structure and the movement of the tree itself. Therefore, we find that knowing the structure of this tree, whether represented by the number of species and their occupancy rate of the site, in addition to the different stages of the ages of these trees that affect their movement from one stage to

another, therefore knowing the number of species, their structure, and their age stages is the basis for understanding the structure of the tree and thus preserving its biological diversity (Motz et al., 2010). Tree structures are characterized by their dependence on the type of renewal that occurs in them. They are high forests for trees from a seed origin, while low forests For those arising from the offspring. In addition, the composition of the trees varies between pure forests where one type is dominant, there are mixed forests where the number of trees varies, in proportions and different compositions (Ashton and Hall 1992). Mixing species strongly affects growth and depends largely on the composition of the tree (Forrester 2013). Mixed species trees can meet many economic and environmental goals, such as land rehabilitation, erosion control, carbon sequestration, water level stabilization, and habitat provision (Koyee, 2023). They may also be more resistant to disturbances (Pequette and Messier 2010), in addition to protection from diseases and insect outbreaks, resistance to wind damage and abiotic stress, risk reduction, compensatory growth, and response to increased growth, maintaining landscape aesthetics, and preserving local plant and animal species (Kelty, 1992). To understand the composition of and mixed forest trees and to know their movement and their impact on the products and services they provide, this study came to describe the composition of pure and mixed forest trees growing in the Troche area.

2. Materials and Methods

The study area is located in the northeastern part of Iraq in the Al-Shekhan district, Atrush sub-district, Dohuk Governorate, between longitudes 43°10'0" - 43°40'0") east and latitudes 37°0'0" - 36°30'0") north. The altitude above sea level for the studied samples ranged between (588 and 1189) m. The area of the district is (496.364638) km2. The study area is covered by Atrush forests and the studied area occupies (25201.858951) hectares. It consists of different types of pure and mixed forests. The three types of oak Quercus aegilops, Quercus infectoria, and Quercus libani are the most dominant species in the site, Pinus brutia Ten. In addition to other species *Crataegus azarolus, Juniperus oxycedrus L., var. pyramidalis Cupressus sempervirens, Cupressus sempervirens var. horizontal, Acer cinerascens Boiss, Pyrus syriaca, Rhus coriaria L., Paliurus spina-christi, Pistacia*, and data for the study were collected through a survey of the study site and was found that tree species are distributed in different densities and are present on different topographies in terms of heights, depressions and slopes (Tran, 2024). To determine the densities and the number of samples required. A grid of squares (10 × 10) m was created, based on the NDVI index, which ranges from +1 to -1. Table (1) was prepared.

Table (1) Density values according to their classification in ArcMap based on NDVI for the growing season 2021

No.	class	NDVI value
1	water	(– 0.9090) – (– 0.1755)
2	Other uses	(⁻ 0.0.1755) – (0.1986)
3	Low density	(0.1986) – (0.3184)
4	Medium density	(0.3184 – 0.4905)
5	High density	(0.4905 – 0.9995)

Based on the classification in table (1) in which the three forest densities were determined, (12) samples were taken from each density that were randomly selected, so the total samples taken for the study amounted to (36) samples including the three densities, and from each sample its center was determined and its coordinates were taken and fixed on the ground with a radius of (30) m because these forests are located in rugged mountainous areas, so the area of the plot amounted to (2826) m^2, and from each sample the following data were taken: geographical coordinates and height above sea level and facades and slope, Diameter at Breast high (dbh), Total height (m), Crown center height

(m), Crown Diameter (m), Basal area (m^2), Form Point ((FP), as well as Stand Density Measures, and we also measured the growing stock of forest trees quantitatively based on the characteristics of the tree itself, represented by the number of trees per unit area (N) and the basal area (BA), in addition to each of Crown cover area, tree biomass (W) and volume of those trees (V) in cubic units. These measures are easy-to-measure indicators and are widely used by foresters (Majumdar, 2024).

3. Results

There are many tree species in the unit area in mixed forests of uneven age. These species and their multiplicity also contribute to the diversity of natural resources available on the site. They are a shelter for many organisms and food for them (Zhang, 2024). Therefore, knowing their numbers and the overlap of species with each other in the proportions of these numbers is an important matter for the management of these resources because of the ability of these trees to restore degraded ecosystems, produce food and medicine, and provide environmental and economic benefits (Xu, 2024). Their role in reducing deterioration and poverty increases and helps in sustainable development (Sadio and Negreros 2006). Therefore, (36) random samples were taken covering the study area in the mixed forest of Atrush to know the numbers and proportions of species, as in table (2).

Table (2) Plant characteristics represented by the percentage of tree numbers in mixed forest trees in the Atrush area.

	N% Species											Total
	Pinus brutia Ten.	*Quercus infectoria*	*Quercus aegilops*	Quercus libani	Juniperus oxycedrus	Crataegus azarolus	Acer platanoides	Rhus coriaria	*Pyrus syriaca*	Anagyris foetida	Paliurus spania-christi	
1	90	4	—	—	—	6	—	—	—	—	—	100
2	—	—	98.11		1.26	0.47	—	—	—	—	—	100
3	—	—	74.76	—	—	25.24	—	—	—	—	—	100
4	95.62	—	—	4.38	—	—	—	—	—	—	—	100
5	0	76.04	—	—	20.88	—	—	—	—	—	3.08	100
6	97.28	2.72	—	—	—	—	—	—	—	—	—	100
7	—	62.54	—	—	25.09	—	—	—	—	12.37	—	100
8	—	0	95.49	—	—	4.51	—	—	—	—	—	100
9	—	100	—	—	—	—	—	—	—	—	—	100
10	—	17.72	—	—	—	—	—	—	—	—	82.28	100
11	—	—	100	—	—	—	—	—	—	—	—	100
12	—	—	81.14	—	—	18.86	—	—	—	—	—	100

13	—	—	86.05	—	—	2.91	—	—	—	11.04	—	100
14	—	—	100	—	—	—	—	—	—	—	—	100
15	—	—	100	—	—	—	—	—	—	—	—	100
16	—	—	100	—	—	—	—	—	—	—	—	100
17	—	—	100	—	—	—	—	—	—	—	—	100
18	—	—	96.55	—	—	3.45	—	—	—	—	—	100
19	—	—	93.89	—	0.23	5.88	—	—	—	—	—	100
20	—	—	91.22	—	—	8.78	—	—	—	—	—	100
21	—	—	100	—	—	—	—	—	—	—	—	100
22	—	—	100	—	—	—	—	—	—	—	—	100
23	—	—	100	—	—	—	—	—	—	—	—	100
24	—	91.5	—	—	—	6.8	—	—	—	—	1.7	100
25	—	70.97	—	—	—	9.27	—	—	19.76	—	—	100
26	—	79.17	—	—	—	20.83	—	—	0	—	—	100
27	—	77.68	—	—	—	5.51	—	—	16.81	—	—	100
28	—	71.74	—	—	—	—	—	—	28.26	—	—	100
29	—	57.99	—	—	—	4.73	—	—	—	—	37.28	100
30	—	24.5	—	—	—	—	—	—	27.82	32.45	15.23	100
31	—	0	72.7	—	—	5.37	—	—	—	21.93	—	100
32	—	0	100	—	—	—	—	—	—	—	—	100
33	67.65	4.9	—	—	—	17.16	—	—	10.29	—	—	100
34	—	—	76.65	—	—	1.67	—	—	—	21.68	—	100
35	4.28	—	54.09	—	—	—	2.72	0.78	—	38.13	—	100
36	—	—	93.33	—	0.25	—	—	2.47	3.95	—	—	100
Var	814.83	1151.99	2144.41	0.56	29.47	43.50	0.22	0.19	61.55	96.24	237.31	
SD	28.19	33.64	46.54	0.74	5.36	6.54	0.46	0.43	7.75	9.69	15.19	
Kour	5.33	-0.23	-1.90	34.0	15.38	3.21	34.00	27.65	5.20	5.40	21.61	
SK	2.62	1.22	-0.31	5.83	4.04	1.95	5.83	5.16	2.50	2.48	4.52	

We note from table (2) that (11) types of trees and shrubs spread in different numbers in this forest. It was seen that two species were dominant in the site, represented by the brutian pine Pinus brutia Ten, as well as the oak Quercus sp. with its three types Quercus infectoria, Quercus aegilops, and Quercus libani. It is also clear that Juniperus oxycedrus has the highest percentage of its presence in the sample (5, 7), and Crataegus azarolus has the highest percentage of its presence in the sample (3, 26). The rest of the species varied in their percentage of presence in the plots. In sample (30), we note the presence of a high percentage of each of Pyrus syriaca, Anagyri s foetida, and Paliurus spania-christi. Through what we notice regarding *Pinus brutia* Ten, there is a wide variation in addition to the standard deviation, and this is what we notice in the distribution of some pieces with high percentages as in samples (1, 4, 6, 33) with high percentages, and it appears with a small number in the sample (35) and the other does not appear, and this indicates a clear

variation in the distribution of this forest, and this is confirmed by the high standard slope in addition to the flatness and asymmetry measures that we notice and also applies to all of the oaks in its three types Quercus infectoria, Quercus aegilops, and Quercus libani (Zhao, 2024). We notice from the table its appearance in different samples, as Quercus infectoria appears with high percentages in samples (5, 7, 9, 10, 24, 25, 26, 27, 28, 29, 30) and a high deviation and variation percentage, and this applies to Quercus aegilops. What we notice in this type is that it covers a large percentage of the samples and is almost dominant for most The studied samples where it appears only in a few low pieces, while we notice the appearance of Quercus libani in sample (4) only, as for the species Juniperus oxycedrus and Crataegus azarolus appeared in generally low proportions and in specific pieces, the species Juniperus oxycedrus was present in sample (2, 5, 7, 19, 36), while the species Crataegus azarolus was widespread in different locations and constituted a low proportion but distributed over the forest area where it appeared more than half of the samples and its numbers in these pieces varied (0.47 - 20.83) While the species Acer platanoides, Rhus coriaria, Pyrus syriaca, Anagyris foetida and Paliurus spania-christi we found them in varying numbers, as they appear in only one sample, as in the species Acer platanoides, which appeared in sample (35) with a numerical proportion of (2.72), as well as the species *Rhus coriaria* appeared In the same sample (35, 36) and at a rate of (0.78 and 2.47) respectively, while we notice that Pyrus syriaca appeared in samples (25, 27, 28, 30, 33, 36) and at a range of (3.95- 28.26). This applies to *Anagyris foetida and Paliurus Spania-Christi*, as they appear at low rates and in few samples. Table (2) shows us that there is a variation in the plant covers represented by trees spread in the study site and that this variation is a result of the effects of some geographical factors and the topography of the site, most notably the facades, as the samples were distributed over the various northern, southern, eastern and western facades and the directions between them, in addition to the elevations of the samples, which ranged from (570-1189) m above sea level, as well as the degrees of slope of the sites, which ranged from (3.33-28.56)% (Ghimire et al. 2010), in addition to the soil properties, which varied greatly from mixed, mixed clay, mixed sandy clay, clay, and clay sand). We also note a decrease in nitrogen in the soil for most of the samples taken for the study, as ranged between (0.015-0.078). As a result of this variation in the various properties in which these trees grew, we note its reflection on the growth of the trees and their densities (Palm-Hellenurm, 2024).

Size distribution: The size distribution between species in mixed trees varies widely between pure trees in the same location due to the interaction between the species spread in the mixed tree, and production in these sites is usually higher than the sites of pure trees. However, we need real data to prove this hypothesis. Condés et al. (2013) indicated the changes in Fagus sylvatica and Pinus ssylvestris trees and the mixing between beech and pine affected growth and production. Growth was observed in beech trees to a large extent at the expense of pine trees. This study showed that the interaction between the two species increases the growing stock in the trees. Therefore, data on the uneven-aged, pure, and mixed trees growing in the Atrush area were taken (36) samples with different densities, and we arrived at table (3).

Table (3) Distribution of sizes of different trees spread in the Atrush forest.

Sample	Types stand	Species	Range dbh(cm)	Range الارتفاع (m)	Range V(m^3)	sum V(m^3 sample)
1	Pure	*Pinus brutia* Ten.	12.4 - 60.5	5.40 -11.0	0.035 - 1.244	9.829
2	Pure	*Quercus infectoria*	2.5- 38.2	0.20- 8.52	0.009 - 0.890	20.106
3	Pure	*Quercus aegilops*	4.7 - 12.7	2.30-5.70	0.042 - 0.092	5.6364

4	Mix	*Quercus libani*	4.4-8.9	1.18-11.21	0.040 - 0.067	20.07
		Pinus brutia Ten.	3.1-77	1.85-3.18	0.003-1.986	
5	Pure	*Quercus infectoria*	2.2-13.3	2.00- 6.10	0.025-0.096	40.124
6	Mix	*Pinus brutia* Ten.	1.2- 79.6	0.88- 11.70	0.003-2.214	45.2812
		Quercus infectoria	6.3-8.9	4.24-6.25	0.051-0.066	
7	Pure	*Quercus infectoria*	4.5-12.7	1.84 - 4.85	0.039-0.091	9.095
8	Pure	*Quercus aegilops*	6.3-20.7	1.75- 6.00	0.051-0.162	16.783
9	Pure	*Quercus infectoria*	4.7-25.4	1.60 - 4.36	0.041-0.238	7.950
10	Pure	*Quercus infectoria*	2.5-14.3	1.62 -5.50	0.027-0.103	17.820
11	Pure	*Quercus aegilops*	6.6-36.9	3.55-8.00	0.053-0.838	5.51
12	Pure	*Quercus aegilops*	3.1-8.9	1.85 -3.70	0.031-0.066	6.581
13	Pure	*Quercus aegilops*	3.1-35.0	0.36-2.70	0.031-0.764	30.855
14	Pure	*Quercus aegilops*	4.7-14.3	1.20 - 4.75	0.041-0.103	10.594
15	Pure	*Quercus aegilops*	3.1-8.9	2.40 – 4.35	0.031-0.066	28.408
16	Pure	*Quercus aegilops*	2.5- 8.9	0.30 – 4.35	0.027-0.066	31.417
17	Pure	*Quercus aegilops*	9.5-40.4	3.55 - 8.00	0.071-0.982	5.30
18	Pure	*Quercus aegilops*	5.7-12.7	3.00 – 5.23	0.047-0.091	21.130
19	Pure	*Quercus aegilops*	4.4-8.2	2.50 - 2.95	0.039-0.062	0.0168
20	Pure	*Quercus aegilops*	6.3-12.7	1.12 – 3.75	0.051-0.091	27.73
21	Pure	*Quercus aegilops*	2.5-23.2	1.25 – 4.67	0.027-0.197	26.847
22	Pure	*Quercus aegilops*	1.9-28.0	1.58 – 5.00	0.022-0.311	59.009
23	Pure	*Quercus aegilops*	6.6-54.1	1.92- 8.46	0.053-1.657	11.192
24	Pure	*Quercus infectoria*	2.5-14.3	0.80 – 4.50	0.028-0.103	12.500
25	Pure	*Quercus infectoria*	6.6-29.6	2.35 – 7.72	0.053-0.930	28.24
26	Pure	*Quercus aegilops*	0.9-15.2	0.90 – 4.00	0.014-0.110	8.35
27	Pure	*Quercus infectoria*	4.7-22.2	1.50 – 4.52	0.041-0.182	24.639
28	Pure	*Quercus infectoria*	1.9-9.5	0.75 – 3.52	0.022-0.070	25.46
29	Pure	*Quercus infectoria*	3.8-12.1	1.50 – 3.00	0.035-0.087	7.878
30	Pure	*Quercus infectoria*	10.1-79.5	1.87 – 3.40	0.032-0.067	3.543
31	Pure	*Quercus aegilops*	1.27-34.31	0.85 – 9.00	0.018-1.109	34.150
32	Pure	*Quercus aegilops*	6.6-36.9	1.33 – 4.80	0.053-0.838	13.140

33	Mix	*Pinus brutia Ten.*	3.2-59.6	2.30 – 11.00	0.004-1.208	7.807
		Quercus aegilops	3.1-56.6	1.40 – 6.50	0.031-1.801	
34	Pure	*Quercus aegilops*	3.1-7.9	1.80 – 9.95	0.032-0.061	34.468
35	Mix	*Quercus aegilops*	4.4-10.1	2.00-4.60	0.039-0.074	16.649
		Pinus brutia Ten.	5.7-35	3.75 – 10.50	0.008-0.443	
36	Pure	*Quercus infectoria*	6.6-36.9	2.50 – 6.00	0.053-0.838	31.35

Table (3) shows that there are differences in the distribution of diameters and heights of the trees spread in the study samples, and this led to differences in the sizes of these trees. In addition, there are differences in the number of trees present in these samples, which affected the total volume of the trees present in the samples. There are low samples (1, 3, 7, 9, 11, 12, 17, 19, 26, 29, 30, 33), in which we notice that the total volume is less than 10 cubic meters for the sample, while we see that the remaining samples were fluctuating in size, ranging from (10.5944 - 59.009). This indicates differences in the densities and ages of these trees, in addition to the fact that they are low trees of unequal age, with oaks constituting the largest part of the density spread in them (Tang, 2024).

Age composition of trees: Age composition Stand Species overlap in their mixed growth in trees either in separate groups or randomly, and this depends on the requirements of the species and the state of competition between them. Mixed forest stand of pine and oak species are spread in the Atrush area in a mixed manner, and shown in different forms. Using mathematical equations for the relationship between the diameter growth of trees and the diameter at the chest level, as well as the relationship between the age of trees and the diameter growth of each of the pine and oak trees prepared by (Sallh 2020) and (Kalkhan 1980), and applied to the study samples, the ages were calculated for each of (Quercus spp. and *Pinus brutia* Ten) as shown in Table (4).

Table (4) Distribution of the ages *Pinus brutia* Ten and oak *Quercus spp*. in the Atrush forests stand for the studied samples.

NO	**Class** *Pinus brutia* Ten					**Class** Quercus spp.				
	10 <	**11-20**	**21-30**	**31-40**	**40>**	**10 <**	**11-20**	**21-30**	**31-40**	**40>**
1	0	7	19	14	5	—	—	—	—	—
2	—	—	—	—	—	111	458	28	—	26
3	—	—	—	—	—	1	56	11	—	—
4	126	205	20	19	—	1	16	—	—	1
5	—	—	—	—	—	59	631	1	—	—
6	408	102	37	—	36	—	18	—	—	—
7	—	—	—	—	—	34	142	1	—	—
8	—	—	—	—	—	—	195	36	2	—
9	—	—	—	—	—	11	96	16	—	1

10	—	—	—	—	—	30	218	26	—	—
11	—	—	—	—	—	—	32	12	1	3
12	—	—	—	—	—	47	95	—	—	—
13	—	—	—	—	—	83	285	49	16	11
14	—	—	—	—	—	4	168	9	—	—
15	—	—	—	—	—	59	430	—	—	—
16	—	—	—	—	—	30	517	—	—	—
17	—	—	—	—	—	—	3	14	7	6
18	—	—	—	—	—	—	319	17	—	—
19	—	—	—	—	—	42	373	—	—	—
20	—	—	—	—	—	—	451	5	—	—
21	—	—	—	—	—	159	230	69	1	—
22	—	—	—	—	—	166	657	99	1	3
23	—	—	—	—	—	—	21	47	—	6
24	—	—	—	—	—	135	124	10	—	—
25	—	—	—	—	—	—	154	83	52	2
26	—	—	—	—	—	31	118	3	—	—
27	—	—	—	—	—	7	120	107	34	—
28	—	—	—	—	—	329	200	—	—	—
29	—	—	—	—	—	49	99	3	—	—
30	—	—	—	—	—	33	41	—	—	—
31	—	—	—	—	—	301	311	—	—	11
32	—	—	—	—	—	58	183	6	—	—
33	75	59	—	2	2	3	6	—	—	—
34	—	—	—	—	—	180	552	—	—	—
35	—	4	5	2	11	32	246	—	—	—
36	—	—	—	—	—	—	232	126	20	—

It is clear to us from table (4) that sample no . (1) pine trees grow in the form of uneven-aged, pure trees, and age groups are distributed in it, as we notice different age stages throughout the life cycle of these trees, and most of the trees are concentrated in the maturity stage since the life cycle of pine trees is (60) years. Therefore, we did not see any renewal in such a sample due to the high coverage rate in it and the dominance of this type mainly over other types, also, in the samples (4, 6, 33, 35) the spread of both pine and oak trees of all kinds, but what we notice is that in samples (4, 6, 33) is the dominance of pine in its various age stages, especially in the juvenile and seedling stages. This indicates the modernity of these

trees and the ability of the site and species to renew naturally, especially for the brutal pine, and that these differences in ages lead to differences in the spatial distribution of these trees, which gives different indicators that can be relied upon to know the vertical and horizontal distribution of these trees and thus estimate the extent of biodiversity specific to that Location, (Barbeito et al. 2009). We find oaks of all types at low densities and grow in scattered, randomly distributed successions in this sample. We also in sample no. (35) that the different age numbers of oaks are the most widespread and they are scattered, distributed successions, while pine trees are spread in small proportions and are in different age stages. We did not notice natural renewal due to the density of plant cover growth in this sample. This is what (Reis et al. 2018) indicated that there is a relationship between the ages of trees and the variables of the tree and that this relationship depends on the characteristics of the tree cover and the spectra taken to indicate different ages of the tree, as these give estimates of the different densities. As for the remaining samples, except for what was mentioned, we note that they are pure, low oak trees exposed to continuous cutting operations, and most of these trees are confined to the age groups below 10 years and the category (11-20) years. As a result of these trees being exposed to continuous cutting, we find trees aged (21-30) and (31-40) years and over 40 years old, constitute lower numerical proportions relative to the lower age groups, which indicates that this site is constantly exposed to the influence of local communities and there no organized administrative plans to preserve and grow trees. From the above, we note that most of this site is a site where oak trees grow with pure low trees that need different service operations to sustain them, as it is clear from the distribution of their ages that they are not economically feasible, but can be used for different environmental purposes. (Tesfaye et al., 2016) stated that the productivity of mixed natural forests depends on the distribution of ages along their production period so that production is approximately equal during the different periods of growth of these trees.

4. Conclusion

It was noted that there were (11) types of trees and shrubs spread in the samples. There are two main dominant types, namely the pine brut and the oak in its various types, while the remaining types are present in small proportions, as they do not constitute a high proportion of the spread area. It was found that there were trees of unequal age, pure of pine, so that it was dominant, while in other locations, the dominance was clearly for oak and in other locations mixed between them. It was found that there are different stages for both pine and oak trees which indicates the modernity of these trees and the ability of the site to renew, whether naturally by seeds or by succession.

وصف تركيب الغابات المختلطة والنقية في غابة أتروش في شمال العراق

الخلاصة :

إن وصف أشجار الغابات المختلطة والنقية له أهمية كبيرة لتحديد المنتجات والخدمات المتنوعة التي تقدمها، لذا تم أخذ (12) عينة من كل من الكثافات الثلاث والتي تم اختيارها عشوائياً وبذلك بلغ مجموع العينات المأخوذة للدراسة (36) عينة بنصف قطر (30) متراً. وقد لوحظ وجود (11) نوعاً من الأشجار في منطقة الدراسة (أتروش) وتتفاوت في أعدادها والنوعان السائدان هما (الصنوبر البروتي والبلوط بأنواعه الثلاثة) حيث تواجد الصنوبر البروتي بنسب عالية في العينات (1، 4، 6، 33) ولم يظهر في العينات الأخرى بينما ظهر في العينة (35) بنسبة ضئيلة، أما البلوط *Quercus aegilops* فهو السائد في معظم العينات يليه *Quercus infectoria* بينما ظهر *Quercus libani* في عينة واحدة فقط. أما بالنسبة لاشجار *Crataegus azarolus* فقد انتشرت في عدة مواقع وبنسب قليلة (0.47-25.25) أما بقية الأنواع فقد ظهرت بنسب ضئيلة جداً وعينات محدودة كما وجد أن هناك مراحل عمرية مختلفة لأشجار الصنوبر كما في العينة (1) أما باقي العينات فهي مختلطة من الصنوبر والبلوط للعينات (4، 6، 33) وهذا يدل على حداثة هذه الأشجار وقدرة الموقع والنوع على التجديد الطبيعي بينما نجد أن العينة رقم (35) تحتوي على أعداد عمرية مختلفة لأشجار البلوط وهي الأكثر انتشاراً وتكون على شكل أحلاف متناثرة وموزعة أما أشجار الصنوبر فهي منتشرة بنسب صغيرة وبمراحل عمرية مختلفة في أما باقي العينات فهي أشجار بلوط نقية

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