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The Spatial Distribution Pattern of Naturally Developing (*pinus brutia*. Ten) Trees in The Atrush Region

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ABSTRACT

(*Pinus brutia.* Ten) trees grows naturally in the Atrush region, on a wide range location from 31´36° - 51´C 36°N and a longitude ranging from 20´ 43° - 21´ 43° E and above sea level (728-1127) meters, and the average decline between(3.65% - 18.91%).These forests are renewable natural resources and must be preserved, sustained and managed efficiently, and these require the preparation of basic preliminary data on what exists from these resources and how they interact with each other in the forest ecosystem. In this study, the coordinates of the sites of the spread of trees were measured in (20) samples in the research area.Three variables represented by the base area, height, diameter at chest height, crown diameter, crown height and other variables that measured for three stages of the life of trees that are initiatives (height less than 2 m), seedling (height more than 2 m and diameter less than 10 cm) and diameter(10 cm and more).Results showed that the pattern of distribution of communities is dominated by random pattern and for most distances and for three stages of life (initiatives, seedling and trees) with a little aggregate pattern with some sites heading to a state of regulator when there is little competition between species or between different stages of life, especially at locations in the east and northeast and long distances with the exclusion of Oak, (*Quercus* spp) from *Pinus brutia*, the random distribution pattern was reduced to about 50% and the melee went to the aggregate pattern.

Keywords: Spatial Distribution, *Pinus brutia*, Trees, Atrush

INTRODUCTION

Atrush region contains many types of trees, primarily *Pinus brutia* Ten. Oak (*Quercus* spp) of all kinds, in addition to other species spread to a lesser extent, this area represents one of the areas where these species are naturally spread to be mixed forests and to maintain these types and their permanence requires us to per Figure many development and administrative processes, so we must know the nature of the growth of individual trees and their environmental requirements of soil and climatic factors in order to grow well away from competition and at the same time exploit the site with various elements of production.

Knowledge of the spatial identification of species, which determines the composition of the wooded, in addition to investigating the quality of spatial distribution, gives the forest administrator a higher accuracy than traditional statistical methods, than during the use of Geostatistics, a branch of spatial statistics that looks for the spatial continuity of the variable that is widely used in biological sciences, especially in the study of plant covers, and for this type of statistic the ability to identify variables in the site and their extension, the geographical statistic is prepared for use for continuous spatial variables and often provides us with an unbiased estimate of sample values for an unspecified location of the number of samples such as trees in the forest, and the growth and change in size of trees reflects on the spatial continuity of these trees as a result of competing processes as well as the presence of many other factors that undermine the spatial continuity of trees such as (moisture, soil properties, above sea level, interfaces, etc.) (Akhavan, *et al*, 2010).

Geographical statistics are defined as a study of the phenomenon of variations in a particular place and time, and take into account methods of collecting numerical data relating to spatial characteristics or phenomena, and one of the elements of geographical statistics is pattern analysis.

The application of geographical statistics is still specific in the field of forests, so its deployment and application is a necessity in regulating forests, identifying spatial variations of species or species and determining the changes in these covers as a result of their influence on various development processes that reflect on the spatial composition of the forest, the understanding and understanding of the environmental processes that occur within these stands as well as their composition and evolution between species in the current and future period. In mixed- Species stands, there is an overlap between different tree species and the same species, which compete for the natural resources available on the site. There is a positive overlap between species as well as negative (Simard, Marc, *et al* 2006). Therefore, participation in living in one location is important from the growth and development of overlapping species, and this overlap leads to a mixed quarrel with a complex and balanced ecosystem, so this study aims to describe the characteristics of the spatial composition of the main tree species in the brawl of broad-leaf Mixed forests, determining the distribution of mixed species in mixed woodwork at the intersection with each other (random- clustered - regular). The type of participation between mixed species found in mixed stands (random, attracting, and competing).

Therefore, this study aims to explore spatial models and recipes for the spatial continuity of trees in Atrush, and

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this allows us to better understand the composition, movement and continuity of the forest, which encourages us to choose the best educational and administrative Processes and apply them to manage this forest through the exploitation of natural resources efficiently. (Beseiky, 2011).

MATERIALS AND METHODS

This study was conducted in the natural forests in northern Iraq in the Atrush which is 70 km north of Mosul and an area of 39,872 hectares for the study area, and the area has a geographical and environmental diversity, which led to a large plant diversity, and there are many factors play an important role in the distribution and spread of forest cover, one of these topographic factors and the height and decline, they represent (Müller-Nedebock *et al*., 2013), *Pinus brutia* occupy the largest proportion of forest cover in the region as initiatives, seedling.

And the trees of mothers or advanced ages, oak represents the second place after pine, in addition to other species and in a few proportions such as hawthorn (*Crataegus kurdistanca*), sumac (*Rhus coriaria*), almendron (*Prunus amygdalus*) and willow hawthorn (*Crataegus azarolus*), with very few proportions of other species such as western juniper (*Juniperus occidentalis*), wild Syrian pear (*Pyrus suriaca*), mt.atlas mastic tree (*Pistacia khinijuk*), figs (*Ficus carica*), and others.

In order to obtain and evaluate the preliminary inhalation of the study process, the site survey was conducted to obtain this data, where the size of the piece taken in the sample plays a very significant role in the field work, and therefore the images were relied upon for the space statement and ground maps in order conduct the survey on the different points in the site where the various points were determined based on the coordinates of these points using GPS locating the samples from which this data will be collected, where the sample system was used. Systemic sampling in the process of stabilizing samples as the location is somewhat homogeneous in its geographical characteristics and therefore random samples were used in the sampling process for this study, and since the area with a mountain topography depended on the Figure of these samples in a circular Figure, which is more accurate in the representation of that community than square-Figured samples (Acharya, 1999). The location of the samples was determined based on coordinates, and from the study site took twenty circular samples and four locations (five samples per site) and half a diameter (35 m) per sample.

There is no measure to determine the size of the sample, but in general the larger the area, the more representative of the site, so the large pieces we need to determine the contrast between the large trees, while the seedling and the initiatives resulting from the renovation is less space, and the size of the samples is usually larger to include at least 20-30 measurable trees and small enough (Gebrehiwot Kindeya *et al*, 2003).The size of our samples was with a radius of (35) meters and an area (3846.5) square meters per sample. Prior to the measurement, we determined the center of the sample and took the central longitudinal and transverse coordinates of the GPS device and installed a stake in the center of the sample, from which the measurements were taken with a measuring strip and a distance of (35) meters and in multiple directions.

Before making measurements for each tree (seedling, seedling, large trees) the geographical coordinates of each one within the sample were determined by a GPS device and indicated by dye after taking its data in order to avoid being recorded again, and measurements related to the tree and wood were taken.

To measure the variability in the spatial distribution, we used geographical distribution to give a better understanding of the spatial distribution of natural regeneration of *Pinus brutia* trees using Ripley's K (r) models and that changing the composition of the wooded occurs as a result of interferences between members of the community from the growth, death, cutting of trees or environmental disturbances, so it is the number of dead or cut trees that determine the size of the gaps between the trees and thus affect the natural regeneration PASSaGE V.2 software was Used for data analysis.

This program is used to analyze the pattern of a particular geographical phenomenon and is used in most biological studies, whether fixed or animated (Dimov, 2004) and developed by (Anderson & Rosenberg, 2011) in the United States, University of Arizona, and to work with the Program shift coordinates to UTM for each sample individually in the excellent program and copied to the program, the first column is defined by coordinate X and the second column is known as coordinate Y.

RESULTS AND DISCUSSION

Spatial Point Pattern Analysis:

This analysis shows the degree of distribution of trees in one location without another, in other words explains the distribution of community densities to a particular type of tree in the unit of an area of land, and this analysis can be based as a basis in determining the pool of the Phenomenon and testing it statistically, through the data of the phenomenon we can determine the degree of assembly of the community, and from the functions used in the analysis of Ripley's k (r) function pattern. And derived from it the function L (r), and we can test the typical distribution of trees in a certain space in light of the value of L (r), when the value is zero, the Figure of distribution, is a random distribution of a whole spatial, symbolized by (CSR), and here the location is varied by changing the location of one tree without another, while if the value of L (r) is greater than zero, the trees appear in a group distribution, while if they are worth less than zero, the distribution is regular (distances are almost equal between the trees), and all tests their morale at a moral level of 95%, which is prepared through the method (Monte Carlo) which Was estimated through the use of passage V.2 (Anderson & Rosenberg, 2011) is a way to test the morale of views(Bohling, 2005), and through Table (1) the results of the test can be seen.

Through Table 2, we find that the 20 study samples showed different Figures in the distribution pattern, and mainly receded in the random pattern of distances, this corresponds to what(Hao, Lu, *et al* ,2014), reached for studying four different types of four types of height (5) - More than 25 m) and that Mongolia oak is more random in distribution than Korean pine (*P. koraiensis*), while the regular pattern of distances in the twenty samples of trees within the radius of 19.62 m only in samples (2, 3,4 and 10), as well as the appearance of the Aggregate Pattern in three samples (9,16 and 20), and there are many examples of samples that can be observed through the following Figures.

Table 1. Pattern analysis test results for sample trees at 19.62 m semi-circle

Sample	No. of Trees	Spaced Aggregate (m)	Total (m)	Spaced Random (m)	Total (m)	Spaced Regulator (m)	Total (m)
1	6	2-Jan	1	9-Feb	7	8-Jun	2
2	15	6-Jan	5	8-Jun	2	0-8.75	8.75
3	11	-	-	6-Jan	5	-	-
4	16	-	-	-	-	-	-
5	3	5-Jan	4	8-Jan	7	-	-
6	13	-	-	7-Jan	6	-	-
7	6	-	-	6-Jan	5	-	-
8	11	-	-	7-Jan	6	2-Jan	1
9	23	6.5-7	0.5	1-6.5	5.5	-	-
10	10	-	-	6-Feb	4	-	-
11	27	-	-	8-Jan	7	-	-
12	8	-	-	6-Jan	5	-	-
13	17	-	-	7-Jan	6	-	-
14	15	-	-	8-Jan	7	-	-
15	16		-	7-Jan	6	-	-
16	5	7-Jan	6	-	-	-	-
17	13	-	-	8-Jan	7	-	-
18	8	-	-	9-Jan	8	-	-
19	8	-	-	4-Jan	3	-	13.75
20	3	5-Jan	4	-	-	-	-
Total	244	-	11.5	-	99.5	-	-

Table 2. Results of the pattern analysis test for sample seedling at a radius of 28.18 m.

Sample	No. of Seedling	Spaced Aggregate (m)	Total (m)	Spaced Random (m)	Total (m)	Spaced Regulator (m)	Total (m)
1	53	-	-	-	-	8-Jan	7
2	47	-	-	3-Jan	2	-	-
3	18	-	-	7-Jan	6	-	-
4	17	-	-	5-Jan	4	-	-
5	7	-	-	1-1.5	0.5	1.5-7	5.5
6	40	-	-	1-3.5 7-May	4.5	3.5-5	1.5
7	15	-	-	-	-	7-Jan	6
8	11			7-Jan	-	-	-
9	5	2-Jan	1	6-Feb	4	-	-
10	49	-	-	5-Jan 8-Jul	5	7-May	2
11	22	-	-	7-Jan	6	-	-
12	8	-	-	1-2.25	1.25	2.25-7	4.75
13	10	-	-	7-Jan	6	-	-
14	13	-	-	2-Jan	1	6-Feb	4
15	13	2-Jan	1	7-Feb	5	-	-
16	26	-		8-Jan	7	-	-
17	7	4-Jan	3	6-Apr	2	-	-
18	11	2-Jan	1	7-Feb	5	-	-
19	75	-		7-Jan	6	-	-
20	79	-	-	1-1.75 9-Jun	3.75	1.75-6	4.25
Total	526	-	6	-	69	-	35

Through Figure (1) of the first sample trees, the L (r) function appeared to be a group distribution at short distances 1-2 m and random distribution at distances 2-9 m, which is due to the direction of the sample northward and a state of competition between the trees, and recorded its highest value at the distance of 8 m and the lowest value at the distance 4 m, whiles Figure(2) (tenth sample) the melee seemed to be in a state of regulator at distance 1-2m and when there was a state of competition between the trees where The northward sample interface (availability of high humidity content) led to the trend of trees to random state at 2-6 m, from the total of the above we find that the spatial composition obtained in the natural forest brawl in the uterus and through the analysis of the pattern and function L (r), Table (2) that the general Figure of the pattern of distribution of trees is random for most Distances, with a tendency to a state of regulator at some locations in the east and northeast and at long distances (samples 2,3 and 4) this corresponds to what(Peter *et al*, 1996) in southeastern Spain for two semi-arid regions (average annual rain) 200-400 mm) for the land of two types of shrubs *(Nerium oleander* and *Juniperus occidentalis*) and using ripley k function in spatial analysis where they found that the distribution pattern changed from very clustered to random and then to regular

In light of the above results from these models, it is necessary to avoid the total pieces and resort to electoral pieces as an attempt to implement the development foundations to reach Such results. As for the spatial distribution in the seedling, which represents the stage of faster growth in the various growth functions of pirate pine trees, the distribution was as in Table (2).

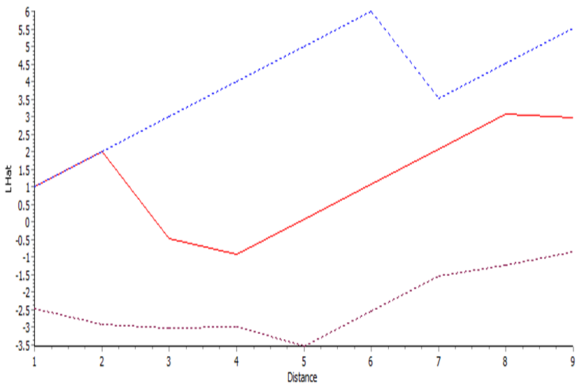

Figure 1. The first sample trees show a group pattern and random distances

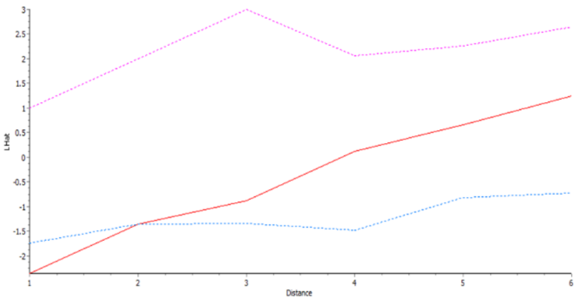

Figure 2. The tenth sample trees show two regular and random patterns of distances.

Table (3) of sample activations shows that most samples (18 samples) appeared in a random pattern and this pattern may be single to the sample or common with the other two types (aggregated and regular), while too samples appeared in a single pattern, the regular distances (first and seventh sample) and a common (regular) back with seven samples with the random pattern, while the group pattern appeared shared by four samples (6,15,17 and 18) with random pattern These variations in patterns and their overlap with each other are evidence of the state of competition between species in melee, and these species seek to reach regular patterns, especially in long distances, as in Figures (4) and (5) for the sites of the fifth and twelfth samples, respectively, which It went from randomization in short distances to regular in long distances, while Figure 3 appeared in a regular pattern of long and short distances, and this is consistent with the findings of (Barot *et al*, 1999) in West Africa by studying savanna trees by taking five samples of different size and adopted spatial analysis of the study using Daggle function, the results of the study showed that the modern stands are in the Figure of random models converging The survival of young trees in total for a long time has a sudden death as a result of the process of Competition between them, which can be observed through the distances between the young groups as well as because of the collective inhibition of the root groups of trees when they overlap with each other.

Table 3. Results of the pattern analysis test for sample seedling at a radius of 98.14 m

Sample	No. Seedling	Spaced Aggregate (m)	Spaced Random (m)	Total (m)	Spaced Regulator (m)	Total (m)
1	63	-	-	-	5-Jan	4
2	47	-	1-2.5 3.5-6	4	2.5-3.5	1
3	18	-	6-Jan	5	-	-
4	17	-	5-Jan	4	-	-
5	7	-	5-Jan	4	-	-
6	40	-	1-1.5	0.5	1.5-6	4.5
7	15	-	4-Jan	3	-	-
8	11	-	4-Jan	3	-	-
9	5	-	6-Jan	5	-	-
10	49	-	1-1.65	0.65	1-5.65	3.35
11	22	-	-	-	6-Jan	5
12	8	-	6-Jan	5	-	-
13	10	-	5-Jan	4	-	-
14	13	-	3-Jan	2	6-Mar	3
15	13	-	5-Jan	4	-	-
16	26	-	1-2.25	1.25	2.25-7	4.75
17	7	-	5-Jan	4	-	-
18	11	-	4-Jan	3	-	-
19	75	-	1-1.25	0.25	1-7.25	5.75
20	79	-	1-1.75	0.75	1-7.75	5.25
Total	536	-	-	53.4	-	36.6

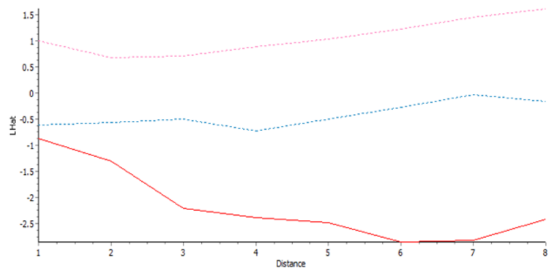

Figure 3. The seedling of the first sample shows a regular pattern of distances.

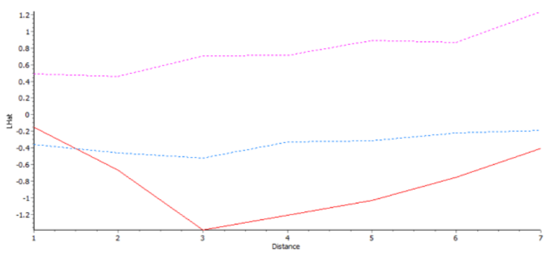

Figure 4. The fifth sample seedling show two random and regular distance patterns.

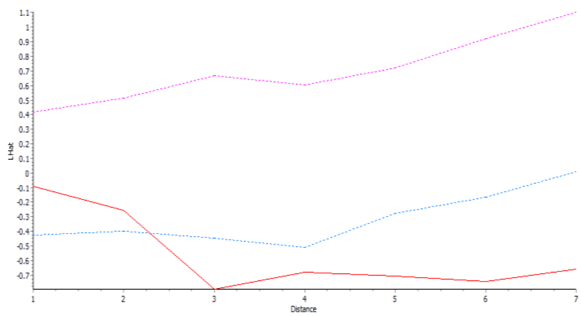

Figure 5. The seedling of 12 samples show two random and regular distance patterns.

From Table (3) of sample initiatives and Figures (6 and 7) the aggregate pattern did not appear in any of the 20 samples as it appeared to seedling and mature trees, and most of what appeared random pattern and short distances this is consistent with the findings (Li *et al*., 2008) with the emergence of random distribution of early life stages in China by studying three types of shade and four stages of life for a subtropical forest of 20 hectares While the regular pattern of distances appeared with longer distances of samples, this is evidence of the transfiguration of the melee from random to regular, this case appeared in nine samples out of twenty, six samples (1, 2, 6, 10, 19 and 20) from the nine locations in the north and northeast (with high humidity content), this confirms other evidence of facades by reducing the state of competition that arises between species in Relating to their needs for water or food requirements.

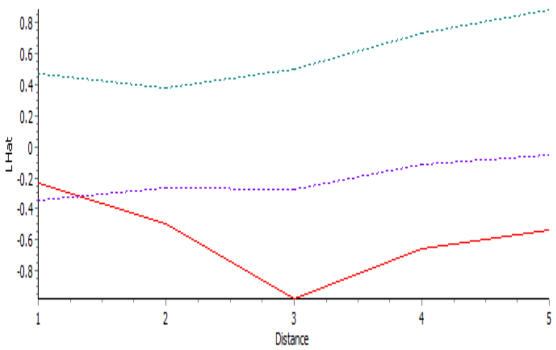

Figure 6. The first sample seedling shows a regular pattern of distances.

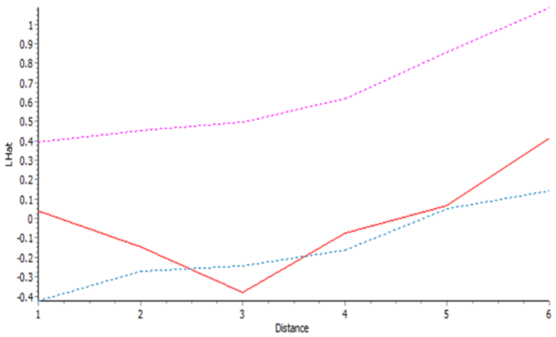

Figure 7. The second sample seedling appears in two random and regular distance patterns.

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نمط التوزيع المكانى لأشجار الصنوبر البروتي (زاويتا) النامية طبيعيا في منطقة أتروش

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ينمو صنوبر بروتيا (زاويتا) في منطقة أتروش بشكل طبيعي , والتي تقع على دائرة عرض تتراوح بين 31´ 36° - 51´ 36°شمالا وخط طول يتراوح بين 20´ 43° - 21´ 43°شرقا وارتفاع عن مستوى سطح البحر بين (728- 1127) متر , ومعدل نسبة انحدار بين (3,65% - 18,91%) , وتعد هذه الغابات من الموارد الطبيعية المتجددة والواجب الحفاظ عليها وإدامتها وإدارتها بكفاءة عالية , وهذه تتطلب إعداد بيانات أولية أساسية بما هو موجود من هذه الموارد وكيفية تفاعلها مع بعضها البعض في النظام البيئي الغاباتي . في هذه الدراسة تم قياس احداثيات مواقع انتشار الاشجار لعشرين عينة في منطقة البحث , ومتغيرات الشجرة المتمثلة بالمساحة القاعدية , الارتفاع , القطر عند ارتفاع الصدر , قطر التاج , ارتفاع التاج وغيرها من المتغيرات والتي قيست لثلاثة مراحل من حياة الأشجار التي هي البادرات (ارتفاع أقل من 2م) , اليافعات (ارتفاعها أكثر من 2م وقطر أقل من 10 سم) والأشجار البالغة (قطرها 10 سم فأكثر) . تبين من النتائج أن نمط التوزيع للمجتمعات يغلب عليه النمط العشوائي ولمعظم المسافات ولثلاث مراحل من مراحل الحياة (البادرات , اليافعات والأشجار) مع قليل من النمط التجميعي مع توجه بعض المواقع إلى حالة من التنظيم عندما تكون المنافسة قليلة سواء بين الأنواع أو بين مراحل الحياة المختلفة وخاصة عند المواقع الواقعة في الشرق والشمال الشرقي وللمسافات الطويلة , وباستبعاد البلوط عن الصنوبر البروتي نمط التوزيع العشوائي قل إلى نسبة 50% تقريبا واتجهت المشاجر إلى النمط التجميعي .