

**ORIGINAL ARTICLE**

## **Considering the Quantitative Characteristic of *Pterocarya fraxinifolia* (Lam) spach Species in North forests of Iran**

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### **ABSTRACT**

*Pterocarya fraxinifolia* (Lam) spach is one of the valuable species of north forests of Iran in the coastal regions and plains of Caspian sea. In order to study the *Pterocarya fraxinifolia*(Lam) spach species quantitative features in Siyahkal forests in north of Iran 50 circle shape sample pieces with a 10R measurement(100m<sup>2</sup>) were selected in number 6 series of these forests. According to the site situation and the existence of *Pterocarya fraxinifolia* (Lam) spach in particular places of the forest, determining sample pieces was done electively in different places of this forest and it was tried that the selected pieces to be in the selected places where the *Pterocarya fraxinifolia* (Lam)spach is the majority and has the maximum number. Studying the qualitative and quantitative characteristics of *Pterocarya fraxinifolia*(Lam)spach showed that the minimum and maximum *Pterocarya fraxinifolia* (Lam)spach tree diameter is in order 14 and 100 cm, average diameter 32/87cm and the maximum and minimum height of these trees are in order 33.43 and 6.97m and their majority height was evaluated as 24m. The crown diameter average was evaluated as 5.92m and the average of the crown length equaled 9.6m. The number of *Pterocarya fraxinifolia* (Lam)spach trees regeneration in each sample piece on the average was 42 trees. After drawing the number of distribution curve in different diameter classes the diameter seemed to be decrescent and similar to disorganized uneven- aged forests and the correlation test also showed that the correlation among diameter breast height and height the correlation among diameter breast height and crown diameter is significant at the level of 5 percent.

**Keywords:** *Pterocarya fraxinifolia* (Lam)spach, quantitative characteristics, north forests of Iran

**Received 05.04.2013 Accepted 09.06.2013**

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### **INTRODUCTION**

Different climate and ecosystems, indicates the very rich biodiversity in Iran, that for their recognition and protection proper techniques should be selected and performed. North forest from the view point of the number of shrub and tree species are counted as rich species forests. These forests are actually the remaining forests from the third geology age that species such as *Pterocarya fraxinifolia*(Lam)spach are abundantly found in these forests [1]. Natural fields richness from the view point of botanical species diversity on one hand and these ecosystems being threatened on the other hand cause the necessity of profound and multilateral observance. Forests as an important part of renewing sources have an important role in economic development and stable development of every country. Performing appropriate plans that is the requisite of abundant recognition of these resources changes the potential capacity of each country to the actual capacity [2].

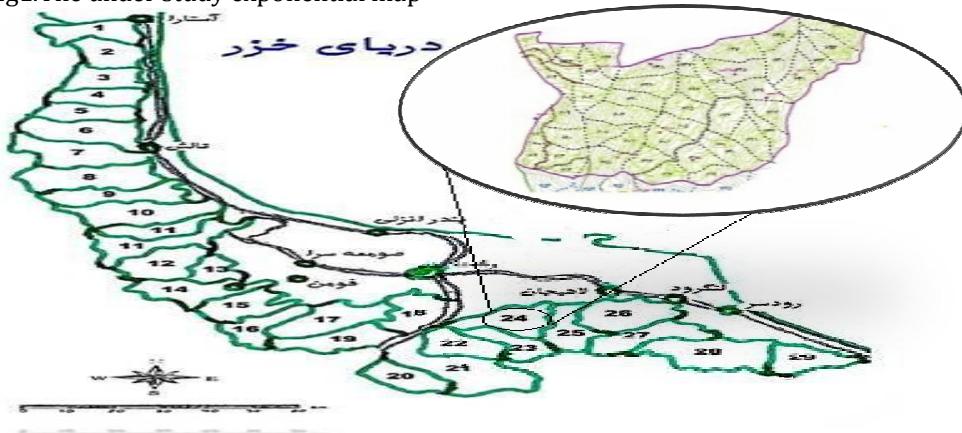
Caspian forests of Iran have appeared narrow, high strip on North Slope of the Elburz chain of mountains, in these forests different species have appeared in different site conditions and different areas. This existence is surprising and inconceivable for some tree species in some areas. One of these species is *Pterocarya fraxinifolia* (Lam)spach that has unique site in these areas. *Pterocarya fraxinifolia* (Lam)spach from ecological view point and genetic importance, certainly is among forest areas genetic resources of these areas. *Pterocarya fraxinifolia*(Lam)spach is one of the beautiful trees of Caspian coasts and requires the damp and coastal areas of Caspian sea, and from Astara to Minoodasht it could be seen in all plain forests of Iran. *Pterocarya fraxinifolia* (Lam)spach covers 0.33 percent of the total volum of north forests(Guilan 0.28 percent, Noushahr area 0.19 percents ari area 0.5 percent, Gorgan area 0.18 percent) [3]. *Pterocarya fraxinifolia*(Lam) spach is a species with a considerable need to soil humidity and air. *Pterocarya fraxinifolia* (Lam) spach with Illuvial origin grows with deep-water stable periods.(4Browics,1982). *Pterocarya fraxinifolia* (Lam)spach is a type of species that grows on deep to semi-deep clay loam to clay sand where the soil acidity fluctuates among weak to alkali [5]. The main goal of this research was recognizing the quantitative characteristics of *Pterocarya fraxinifolia* (Lam) spach

species settled in series 6 surround in Siyahkal in north of Iran. These forests with a spread of different species and specific site conditions, cause an appropriate situation for studying about forest science.

#### MATERIALS AND METHODS

From the view point of geographical situation the under study area is between  $49^{\circ} 46' 58''$  longitude and  $36^{\circ} 53' 42''$  latitude and its minimum height above the open seas level equals 900m and it's maximum height is 1800m and its general slope is towards north(fig1).This area is mauntanious and it's are latively slopy to slopy area ,its annual rainfall is 1264.5mm that prepares Elluviation condition in a way that land with calcareous mother rock have pH less than 7 and soil has been made acidic and shrub species of this area are Crataegus, Gleditschia caspica, Prunes,Mespilus Germanica, Laurocerasus officinalis Roemer, Ilex hyracana Pojark.

Fig1.The under study exponential map



#### RESEARCH METHOD

After sprayer forest and recognizing the forest and area's species from the view point of blending and forest type and the style of pterocarya fraxinifolia(Lam)spach species settlement in different directions, inventory was randomly selected.In the way that in the research group sight where ever pterocarya fraxinifolia(Lam)spach stand were observed by the help of GPS the area's coordinates were taken, for this reason the forest measurement wasn't necessarily done on a straight line and it was trid for sample pieces to be in different height directions and situations so that the ecological situation of this species(*Pterocarya fraxinifolia*(Lam)spach) could accurately be studied. In this study 50,10R circle shape sample pieces were selected ( $1000m^2$ ). (6zobeiri,2000). In order to study restoration to life situation also, from under the 1R piece and with a circle shape and with 5.64m radius as a nested plot was used in the sample pieces. In each sample piece, the number, diameter breast height, total height and the trees small and big average diameter of the crown were measured.

After obtaining the desired quantitative characteristics all information was saved in Excel software and were analyzed by the use of SPSS statistical software.

#### RESULTS

The measurement of diameter at breast height in the under study area shows that the *Pterocarya fraxinifolia* (Lam)spach average mean is 32.81Cm, the minimum diameter equals 14, and the maximum diameter equals 100cm. The results obtained from measuring 737 *Pterocarya fraxinifolia* (Lam)spach trees in the under study area has been shown in Fig2.

The trees distribution diameter in diameter classes shows competition among tree stands. And this shows an uneven-aged stand. In this diagram the most frequency also belongs to 20cm diameter class and the least are in the above diameter classes.

The measurement of all *Pterocarya fraxinifolia* (Lam)spach in the unther study area shows that the average mean is 22.52m, the minimum height is 6.97m and the maximum height equals 33.43m.Trees distribution diameter in height classes has been shown in figure3 that shows the under the study *Pterocarya fraxinifolia* (Lam)spach is a disorganized uneven-aged stand and its prevailing height has been evaluated as 24m.

Fig2. Frequency distribution in diameter classes in *Pterocarya fraxinifolia* (Lam)spach in the under study area.

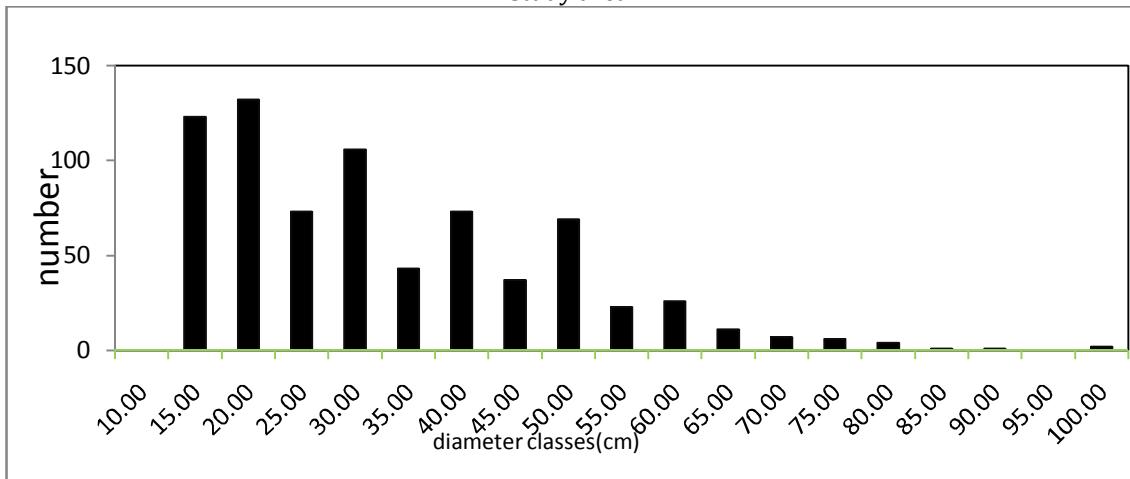
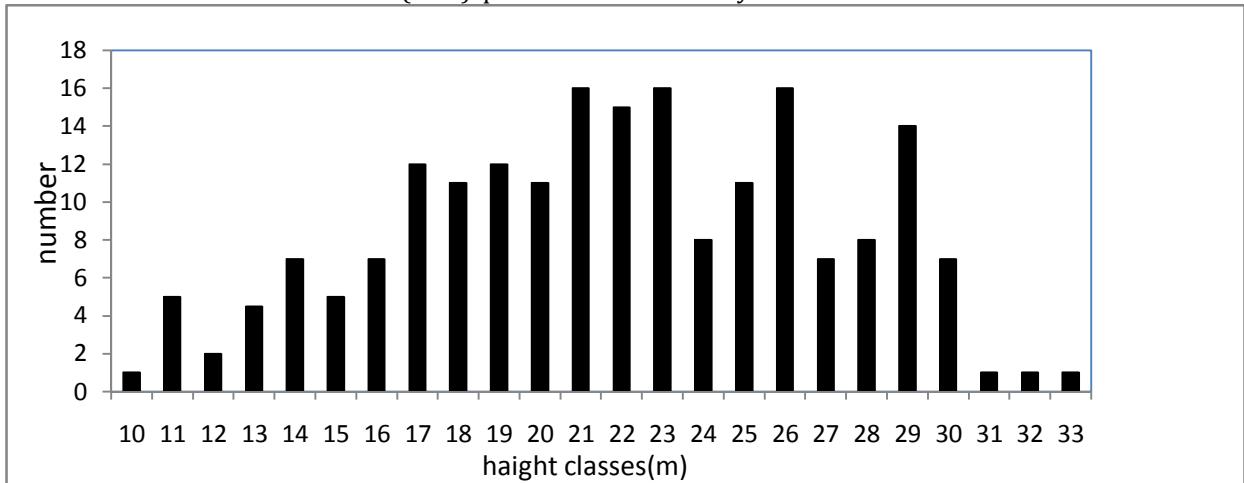


Fig3. Distribution diagram of the frequency number in height classes of *Pterocarya fraxinifolia* (Lam)spach in the under study area



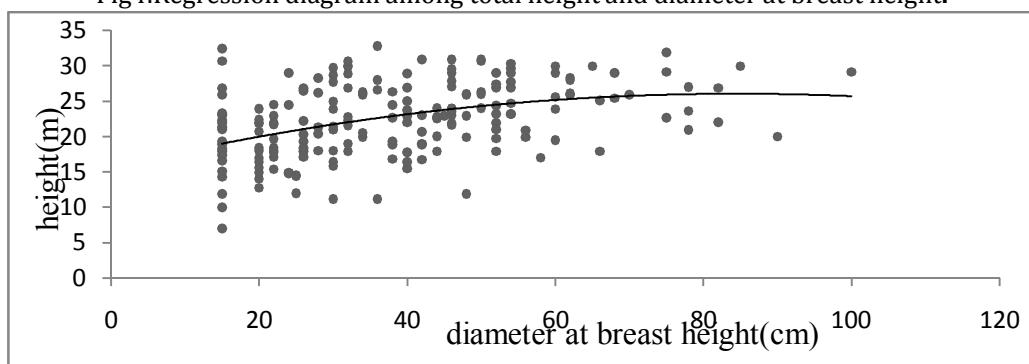
Also the scatter diagram and regression equation among diameter at brest height and total height has been shown in Fig4. As seen a slight positive regression exists among diameter at breast height and total height. And according to the test that was done, regression among diameter at brest height and total height at 95 percent level of confidence is significant. Linear regression equation among total height and diameter at b rest height and the relevant test table is as follows (table1)

$$H = -0.001d^2 + 0.248d + 15.57$$

Table1. Regression test among total height and diameter brest heigh

Equation	R <sup>2</sup>	F	df1	df2	Sig.
Power	.179	41.763	1	192	.000

Fig4:Regression diagram among total height and diameter at breast height.



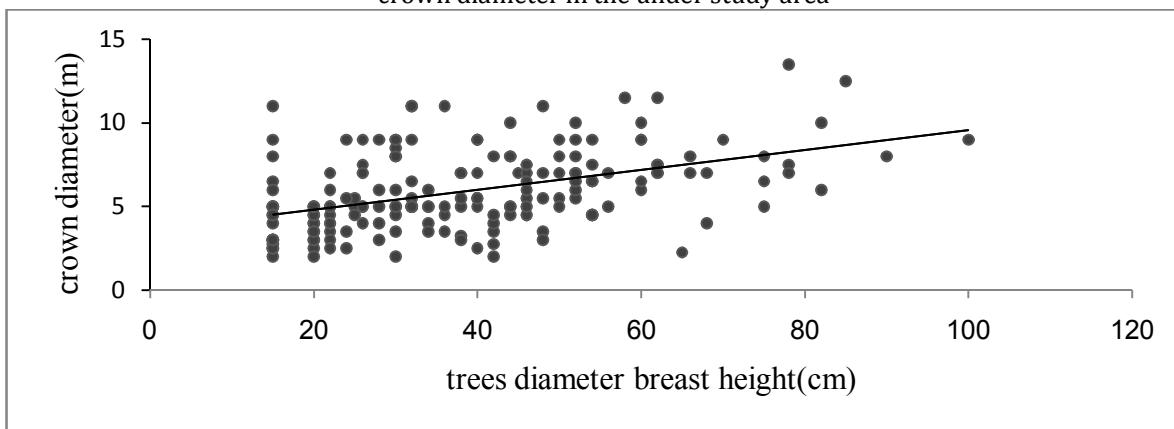
The results obtained from measuring trees crown length in the under study area shows that the average crown length *Pterocarya fraxinifolia*(Lam)spach is 9.62m and The minimum crown length equals .85, and The maximum equals 21.22m. The average crown diameter of these trees is evaluated 9.84m and crown diameter at its least amount equals 1m and in its most amount equals 15m. Fig5 shows regression equation among trees diameter at breast height and crown diameter regression test also among tree's diameter at breast height and crown diameter at 95 percent level of confidence is significant. Regression equation and the relevant test table is as follows:

$$Y=950.0x+26.3$$

Table2:Regression test of tree's diameter at breast height and crown diameter

equation	R <sup>2</sup>	F	df 1	df 2	Sig.
Power	.214	51.349	1	189	.000

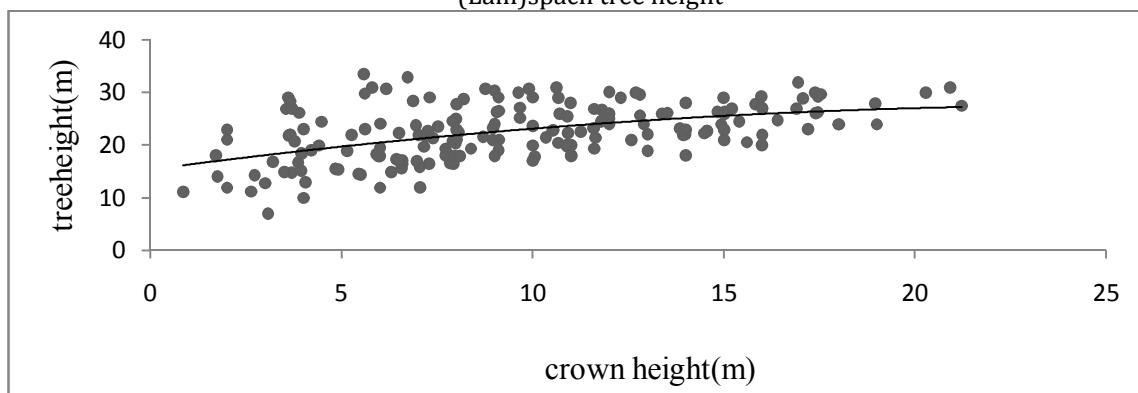
Fig5. Regression among trees diameter at breast height and *Pterocarya fraxinifolia*(Lam)spach trees crown diameter in the under study area



In figure 6 also the correlation among crown length and *Pterocarya fraxinifolia*(Lam)spach trees height has been shown. The regression test shows that the correlation among tree's height and crown height is significant at the 95 percent level of confidence and it's equation is as follows(3)

$$Y=0.019x^2+0.971+15.33$$

Fig6: The diagram of the correlation among crown height and total height *Pterocarya fraxinifolia* (Lam)spach tree height

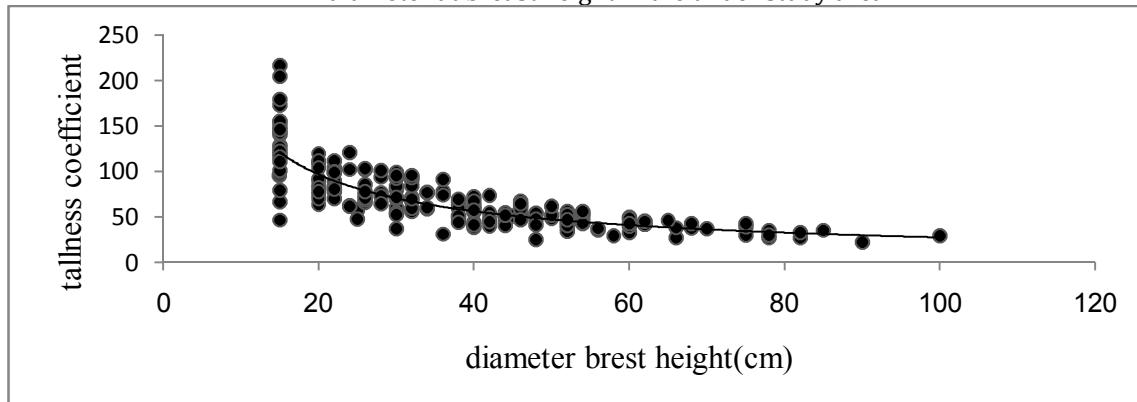


The most important characteristics of a tree or a stand to judge the stability quantity of it is the thinness coefficient or tallness. This coefficient for the *Pterocarya* trees under study by considering the stand diameter and height mean equals 62.65. According to Burschel and Huss (1987) it is among 40-80 percent coefficient and the stand is stable.

Figure7 also shows the correlation among tallness coefficient and diameter at breast height of *Pterocarya fraxinifolia* (Lam)spach in the under study area. As seen tallness coefficient decreases by the increase in

trees diameter. OR in other words tallness coefficient is quickly reformed. Also in lower diameters the ascendancy of tallness coefficient is justifiable according to *Pterocarya fraxinifolia* (Lam)spach and intense light rivalry among young trees.

Fig7. Correlation diagram among tallness coefficient and *Pterocarya fraxinifolia* (Lam)spach species diameter at breast height in the under study area



## DISCUSSION

The result of this study showed that *Pterocarya fraxinifolia* (Lam)spach tree height and diameter distribution curve in this study is similar to uneven-aged curve and the results of this study conforms to those of Ebrahimi [3]. That were done on research forest in Mazandaran in north of Iran. Also in Shikholeslami's [5] studies *Pterocarya fraxinifolia* (Lam)spach in Noushahr Mashalkarea from the view point of height and diameter structure was traduced as uneven-aged stand. Sohrabi [8] also in his studies on *Pterocarya fraxinifolia* (Lam)spach species taught that the curve being pulled towards a side in unevenaged stands by considering that trees grow and would need more space which causes the decrease in the number of them in thicker classes. In this study, the maximum diameter of *Pterocarya fraxinifolia* (Lam)spach tree stand is 100cm and the minimum diameter is 14cm .the trees average diameter of this site is 32.81cm with a 15.429 standard of deviation. And also the maximum height of the stand trees has been 33.43m and the minimum height has been 6.97 and the height mean is also 22.52m with 5.097 standards of deviation. In Ebrahimi studies[3]the maximum height as 40m and the minimum height 7m and the height mean 22.2m. And the *Pterocarya fraxinifolia* (Lam)spach average diameter was measured as 36.6 and the minimum diameter was 8 cm and the maximum diameter was 100cm. In Shaikholeslami's studies [5] also, the average diameter was evaluated as 49.7cm and the total height mean was 28.9m.In Sohrabi's studies [8] also, the maximum trees diameter has been 128cm and the minimum diameter has been 2.3cm. The average diameter of these trees has been evaluated as 42.9cm with a 24.9 standard of deviation. Measuring the trees height also showed that the maximum height is 28m and the minimum height is 2.3m.While, Browics [4] in southwest Asia has mentioned *Pterocarya fraxinifolia* (Lam)spach trees with 1.5 to 2m diameter breast height, he has also mentioned trees with 35m height. Mitchel [9],also mentioned about the biggest man made basis which was the result of *Pterocarya fraxinifolia* (Lam)spach hibridisation in Kiw botanical garden of London with 22m height and 3 m diameter.

The result of research shows that the tallness coefficient of this species equals 69.54. In Sohrabi's studies [8] tallness coefficient has been evaluated as 44.3. This shows the more desirable correlation among diameter and tallness of *Pterocarya fraxinifolia*(Lam)spach in under study stand. This explains *Pterocarya fraxinifolia*(Lam)spach stands compressedness in these areas and also *Pterocarya fraxinifolia* (Lam)spach being light tolerant that causes rivalry among young stands with less diameter, for reaching higher height classes that causes trunks with less diameter but more height. Since tallness coefficient of trees depend on species nature, light, rivalry, fertility, site and stands compression, and in forests with less compression if the stands compression and blending is maintained as desired, trees tallness coefficient is gradually reformed and the height respected to the tree's diameter study in a more stable position.

*Pterocarya fraxinifolia* (Lam)spach belong to the plant species of third geology era that is found frequently in north forests, most *Pterocarya fraxinifolia* (Lam)spach sites in Caspian forests have been weakening for various reasons or are even being destructed. The results of this study showed that many quantitative parameters such as trunk length, trunk length without branch in central trees of the stand have more desirable position compared to trees on the border of the road. Regeneration quantity also about trees of this species is totally assessed to be well, but because of the presence and continual traffic

of domesticated animals and the presence of tourist and residents in the stand's area the regeneration process isn't satisfactory. So there is the fear that in future years by the presence of domesticated animals and tourist in this area which result is soil contusion in future years regeneration will become very weak and the stand will be destructed. As mentioned in trees number of distribution diagram in diameter classes the form of forest is disorganized uneven-aged but in 15 diameter class no tree exists and this is caused for different reasons. One is that *Pterocarya fraxinifolia* (Lam)spach is a light tolerant species that has the tendency to form even-aged groups and it could be due to infirmity in regeneration. The study of vertical structure and stratification of the stand also showed that these forest in most cases are double strata that in most cases *Pterocarya fraxinifolia*(Lam)spach along with species such as *Alnus subcordata* are placed in the top strata . A cording to the results of this study it is suggested that this species site in Iran's forests to be more supported and protected.

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#### **How to cite this article**

Mina Hoseinpour, Hamid Payam, Mir Mozaffar Fallahchai. Considering the Quantitative Characteristic of *Pterocarya fraxinifolia* (Lam) spach Species in North forests of Iran. Bull. Env. Pharmacol. Life Sci., Vol 2 (9) August 2013: 65-70