



ORIGINAL ARTICLE

Evaluation of Quantitative and Qualitative Natural *Juglans regia* L. Stands in Northern Zagros (Case study: Piranshahr - West Azerbaijan)

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ABSTRACT

Many tree species in Zagros produce fruits that local residents use them as fruit. In the Zagros forests *Juglans regia*, *Pyrus sp.*, *Crataegus sp.*, etc. can be mentioned that nowadays are widely used. Among that mentioned species *Juglans regia*, this is found naturally abundance in these forests. The *Juglans regia* species has high quality wood and is an excellent fruit that are both economically high value. Therefore, this forest tree species from the past until today have been heavily exploited. In Piranshahr forests many natural stand of *Juglans regia* are exist that was their products irregular and unplanned with degradation by various people including local residents and residents of other areas (tourists) utilized. This Study was done in five natural stands of *Juglans regia* located in Piranshahr forests, due to being far away from the villages, this stands and other parts of the forests, almost as dense and natural forests remain. The results showed that a total of five stands utilizable product was about 2000 kg walnut, and totally average of trees per hectare for total species, *Juglans regia* and other species were 118.9, 66.96 and 51.93 corresponding. Although the percentage of canopy was vary in different slopes but average of canopy was 85% in the total stand. Generally, due to massively dense stand of these trees and because *Juglans regia* is a light demander species, total production and mean production was fewer than naturally and it was 400 kilograms per stand.

Keywords: *Juglans regia*, Piranshahr, yields (product), quantitative and qualitative properties

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INTRODUCTION

Iran's forest only could produce wood productions in northern forests and other forests haven't power to generate wood production. Among the Iran forests, Zagros forests may be cited as the vastest areas of forest. One characteristic of Mediterranean forests in the world and the Iranian Zagros forests are somewhat distinct from other forests, edible fruit of the trees in that forests. This means that many tree species in these forests, which produce fruits that usable for humans as fruits, such species In the Zagros forests like *Juglans regia*, *Pyrus sp.*, *Crataegus sp.* etc. can be mentioned that nowadays are widely used, among that mentioned species *Juglans regia*, which is found naturally in abundance in these forests. This species has high quality wood and is an excellent fruit that are both economically high value. Therefore, forest tree species from the past until today have been heavily exploited [7]. It causes to the stand of some species in danger of extinction in many parts of the Zagros, therefore, the law of conservation of forests and grasslands have been introduced such as protected species. *Juglans regia*, one of the trees that are grown in the valleys of freshwater in Zagros region, Prdanan valley is one of the valleys around Qabr-E-Hosseini village (at a distance of 28 km from the Piranshahr road connecting Piranshahr to Sardasht) located, due to the permanent springs on the slopes of the valley around the river, in the valley and surrounding springs, *Juglans regia* tree has growth in single trees and stands. *Juglans regia* tree economically is very important, it has an edible, medicinal, industrial characteristic and this makes it a product that comes in the form of an economic good, the wood of *Juglans regia* is a precious product in

the world scale that usable form of fine and very delicate and precious wood applications [3]. Product of the *Juglans regia* stand in this area every year utilized by local and non-residency people, but their utilization is non-licensed and non-operating principles that they break the branches, and even regeneration and young trees have been destroyed. Also, local and other people have the opportunity at any time to the stand of trees to sell the wood of *Juglans regia* trees have been cut. These two factors caused the annual level of *Juglans regia* stand will be reduced. So firstly planning a predetermined plan and program is need and secondly operation for the conservation and restoration of *Juglans regia* trees in this stand seems necessary. So the main aim of this study was to investigate and study the natural stands of *Juglans regia* in Piranshahr.

BACKGROUND RESEARCHES

Yosofali et al. [5] research in the identification and evaluation of superior trees (*Juglans regia* l.) in Fars province and 101 top tree was selected with the desired properties. Shape; mean weight, average weight of flesh, average weight of shell, average percentage of the flesh, average length and average diameter of walnuts characters that were selected for evaluation of the quality of the selected trees were studied. Analysis of correlation of traits showed that significant positive correlation in each walnut, between average weight, length and diameter of each walnut, average weight of shell and average weight of flesh. The average percentage of the brain of every walnut show negative significant correlation with average weight of each walnut and average weight of each shell, but average percentage of the brain of every walnut show positive significant correlation with average weight of each walnut flesh.

Hasanzad Nawroodi [2] explores the qualitative and quantitative characteristics of *Alnus subcordata* trees in three elevation regions of Asalem forest and characteristic of species, DBH and height of trees, quality of the trunk, trunk length without branches, intensity forked trunk, shape of canopy, parallelism of canopy and regeneration in each region, were studied. The results obtained indicate that between diameter and height curves of the studied regions showed that the probability of 99% didn't have significant difference, but there was a significant difference between region 2 and 3 at the level of 0.05. In terms of the length of the trunk without branches and intensity forked trunk, the status of a region 1 and 2 in comparison with the region 3, was more desirable. Regeneration of region 1 more desirable than other regions. According to the results, moreover the elevation that has effect on regions quality some characters such as slope, pH and soil moisture content and positions of stands have effects on quality and quantity of regions [2].

Hassani et al. (2009) research in the qualitative and quantitative characteristics of natural *Fagus orientalis* stands in sequence the optimal phase (case study: part2 Simersi, Sangdeh forest of Iran). Study was done by the six plots with 36 Ares area in a stand that was 3 hectares area with a distance about 25 meters from each other and along at an altitude of 1900 to 1950 meters from sea level, in order to test a thinning deployment plan was studied by 100% survey of 1244 trees. The quantitative characteristic of the average diameter of the stand consists of 35 cm. mean diameter, mean basal area was 53.59 square meters per hectare, average of trees was 562 in hectare, mean height was 27.8 meters, dominant height was 30.3 meters, mean standing volume of stand was 677.9 cubic meters per hectare. The results showed that in terms of quality, only 48% of trees were unhealthy and 52% of them were health also 70% of the trees in the stand has a defect (402 trees per hectare) and 30% (160 trees per hectare) were without any defect that 23% of them (30%) were "good elite" and 7 percent of them were «excellent elite». Also in terms of twin stem, 28 percent of them were twin stem trees and 72% of them were not twin stem [3]. Parse et al [1] explores the evaluation of qualitative and quantitative characteristics of forest reserve, Dorag in Lorestan, Aligoodarz, in terms of quantitative, reserve area, number of trees per hectare, DBH, average height and percent mixture of important tree species was investigated, Also, in terms of qualitative, percentage of standard trees and healthy rate of trees are assembled and analyzed. For this purpose, based on the random regular inventory with a 100 × 150 meters network, 38 plots with 20 Ares area in rectangular shape, was established. The results showed that the average number were 76 trees per hectare, in terms of mixture, *Juglans regia* was 17.8% and *Fraxinus* SP. was 25.4 percent, Also the 57.3% of trees was standard and 42.7% of them was coppice trees and 3.2% of total trees was damaged by human activities.

MATERIALS AND METHODS

Study area

There are many natural stands of *Juglans regia* that distributed naturally in Piranshahr Forest, for this study, 5 stand in the forest belongs to the Qabr-E-Hosseini village, located at 28 km. south Piranshahr road Piranshahr to Sardasht inside Prdanan Valley of (the village of Qabr-E-Hosseini starts and continues until the Qandil mountains range) were selected.

In order to study, forests were surveyed with local guides, then stands position recorded by using GPS receiver. The stand area once was taken by a GPS device, and once was calculated by AutoCAD software, the mean of these two area was intended as area of the stand. Figure 1 shows Location of the stand in the country, province and city.



Figure 1: Location of the study area

The annual rainfall in the study area from June to early September, rainfall is almost zero, so the months of June and July and August and September are dry. The average elevation of 1550 meters above sea level in this region.

Stand characteristics

dze, Seko, Khwedawe, Nelehasl and Nelemala that respectively slopes of North, West, South, North and South, and the average percent slope on the stand, respectively, 70, 75, 35, 80 and 90% in the table (1) is obtained.

Table 1 stand names and their characteristics

No	namestands	Area (square meter)	Domain aspect
1	Kanidze	12555	North
2	Khwedawe	2359	South
3	Seko	7061	Western and southwestern
4	Nelehasl	8281	North
5	Nelemala	22309	South

Method

All stands inventoried by 100% method, the DBH, height, trunk height, canopy height, and two perpendicular diameter of canopy and yield rate was measured and recorded. DBH of each tree using a diameter tape accurately measured and recorded in centimeters, then height, trunk height, canopy height using in Suunto clinometer are calculated and recorded.

To Measuring the diameter canopy, In two directions perpendicular to each other in any direction from the point where canopy begins end up on the other side of the tree canopy so that the meter pass next to stump Measured and recorded. Thus the diameter canopy is measured in two directions perpendicular, the mean diameter as the diameter canopy will be recorded in the form.

Measuring annual yield

In order to measure the annual yield (product) per tree is as follows:

The basic rate for each tree product (yield) according to the diameter canopy and trunk and position in stand by observing trees completely was measured. To estimate the product (yield), firstly using expertise and common operator’s experts are used simultaneously, secondly average stand yield of three years before that recorded ago divided to all trees and average annual yield (product) of each tree was calculated. Finally average of estimated annual yield (described above) and average yields (product) of the three years before estimated (two above described average) as the product of the tree yield (product) in this year has been considered.

RESULTS

The highest average altitude was Nelemala stand and the lowest was Kanidze stand.

- Quantitative data on the number and product amount per stand:

Statistics relating to the status of a number of trees and amount of product(yield) in stands showed overall product yields more than other stands was the Nelemala stand and average yields was 411.8 kilograms per year, Maximum number of tree species was in Kanidze stand (224).

Table 2 statistics related to the product and the number of tree in stand

Quantity Stand	Total product in stand(kilograms)	Mean product per tree (kilograms)	Total number of <i>Juglans regia</i>	Total number of Other species	Total trees	stand Area (hectare)	number of <i>Juglans regia</i> per Hectare	number of other species per Hectare	number of total trees per Hectare
Seko	183	3.73	49	41	90	0.7061	69.39	58.06	127.46
Kanidze	490.5	5.01	98	126	224	1.2555	78.06	100.35	178.41
Nelehasl	430	7.05	61	34	95	0.8281	73.66	41.05	114.72
Nelemala	670.5	5.99	112	53	165	2.2309	50.20	23.75	73.96
Khewdawe	285	8.91	32	19	51	0.2359	135.65	80.54	216.20
Total in stand	2059	---	352	273	625	5.2565	66.96	51.93	118.9
Average instand	411.8	6.14	70.4	54.6	125	1.0513	66.96	51.93	118.9

The composition and number of species in the stand:

Statistics relating to the composition and number of species in the stand showed the highest and lowest number in *Juglans regia* trees in stands, respectively were Nelemala and Khewdawe. The maximum and minimum numbers of other species in Nelemala stand (45 *Quercus libani*) and Nelehasl stand (*Fraxinus sp.*), respectively.

Table (3) statistics related to the number and composition of different species in stands

Stand Species	Seko	Kanidze	Nelehasl	Nelemala	Khewdawe
<i>Juglans regia</i>	49	98	61	112	32
<i>Quercus libani</i>	22	19	26	35	8
<i>Fraxinus sp</i>	14	73	3	4	4
<i>Crataegus sp</i>	5	32	5	19	7
<i>Malus sp</i>	--	2	--	--	--
total	90	224	95	165	51
Total except <i>Juglans regia</i>	41	126	34	58	19

Characteristics of trees:

Characteristics of trees showed that the biggest tree had 103 cm in diameter (Nelehasl), and the tallest trees, 17.5 m height (Kanidze).

Table (4) Statistics relating to the characteristics of a stand of trees

stand	Quantity Amount	perimeter	D.B.H.	Trunk height	Canopy height	Total height	North-South canopy diameter	West-East canopy diameter	Average of Canopy diameter
Seko	maximum	190	60.47888	5.5	7	11.5	12	12	3.136869
	minimum	26	8.276057	0.3	0	1.2	1.1	1	
	Average	61.78788	19.66769	2.086869	3.436364	5.523232	3.146465	3.727273	
Nelemala	maximum	371	118.093	10	15	17	11	14	5.45
	minimum	35	11.14085	0.5	2	3.5	1	1	
	Average	110.8421	35.28214	4.372632	6.515789	10.88842	5.384211	5.515789	
Kanidze	maximum	353	112.3634	10	17	17.5	14	14	5.587662
	minimum	31	9.867606	0.4	1	2.3	1	1	
	Average	101.5758	32.33257	3.987013	7.299567	11.28658	5.318182	5.857143	
Nelehasl	maximum	325	103.4507	10	14	1+	10	14	5.048193
	minimum	35	11.14085	0.4	1	2.3	1	1	
	Average	98.16867	31.24806	4.044578	6.222892	10.26747	4.813253	5.283133	
Khewdawe	maximum	220	70.02817	10	14	16	10	14	5.15
	minimum	31	9.867606	0.4	1	2.3	1	1	
	Average	74.36923	23.67246	4.147692	6.592308	10.74	5.1	5.2	

Average of D.B.H. (cm) of trees in the stands:

Compare of D.B.H. in trees showed that the highest and lowest values respectively for Nelemala (35.74 centimeters) and Seko (19.67 centimeters).

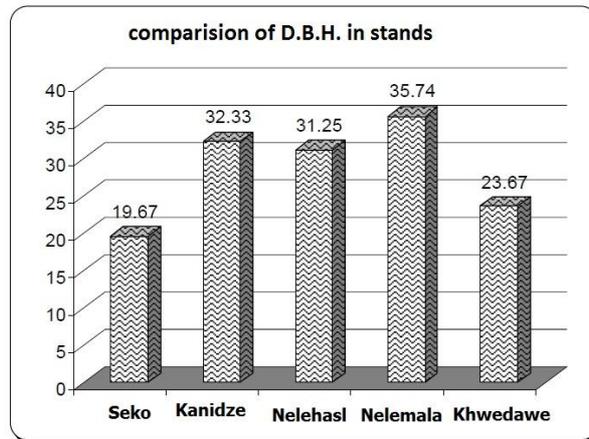


Figure 2: Histogram of mean of D.B.H. in stands

Average height (meters) of trees in the stands:

The mean height of the trees in stand showed the highest and lowest values respectively stand for Kanidze (11.29 meters) and Seko (5.52 meters).

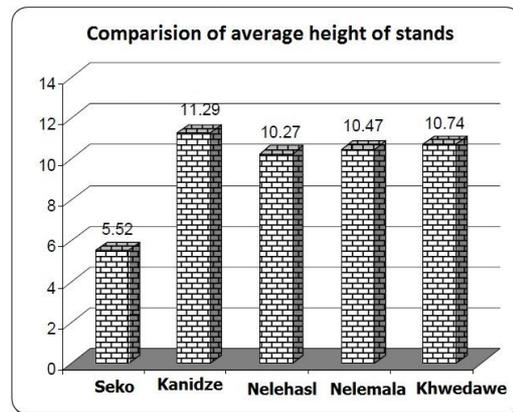


Figure 3 Histogram of Average height (meters)

Average diameter of canopy (meters) of the stand:

The mean diameter of canopy at the stands showed the highest and lowest values respectively for Nelemala stand (7.67 meters) and Seko stand (3.44 meters).

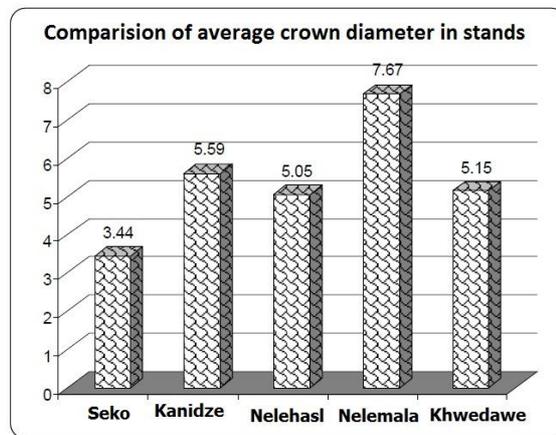


Figure 4 Histogram of Average diameter of canopy

Average yield (kilograms) of individual trees in the stands:

The mean values of Average yield (product) of individual trees showed that the highest and lowest values respectively for Khwedawe stand (8.91 kilograms) and Seko stand (3.73 kilograms).

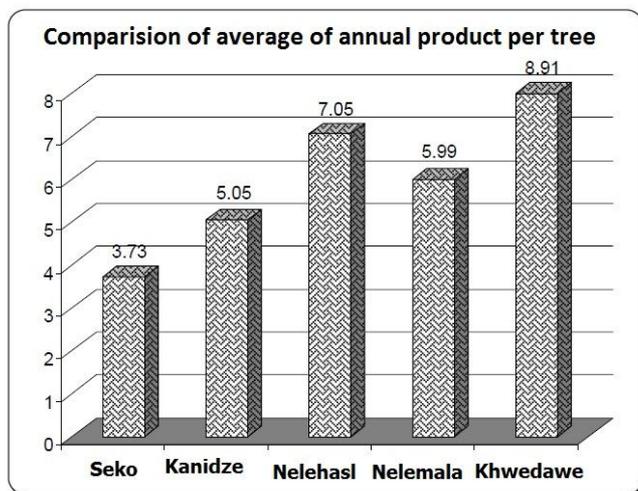


Figure (5) Histogram comparing Average yield of individual trees

Average of total yield (kilograms) of the stand:

The mean values of total product in stands showed the highest and lowest values respectively for Nelemala stand (670.5 kilograms) and Seko stand (183 kilograms).

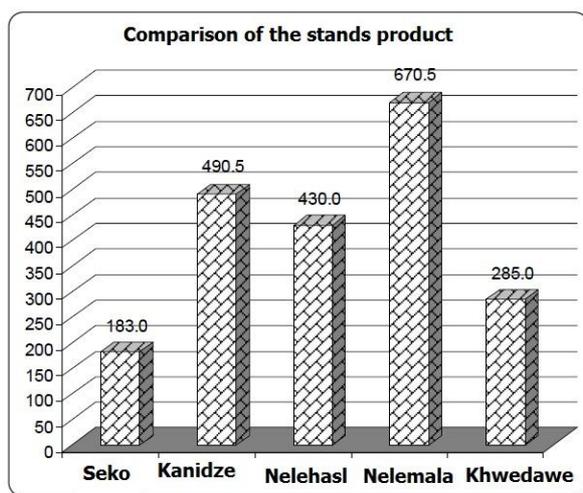


Figure 6 histogram of compares the entire product stand

Qualitative characteristics of the product and amount trees in stand:

Results showed the average product, average product per tree, number of *Juglans regia* and number of other species, respectively, 411.8, 6.14, 70.4, and 54.6 it has been stated in Table 5.

Table (5) table of the product and amount trees in stand

Quantity Stand	Total product (K.g)	average product per tree (K.g)	Total number of <i>Juglans regia</i>	Total number of Other species
Seko	183	3.73	49	41
Kanidze	490.5	5.01	98	126
Nelehasl	430	7.05	61	34
Nelemala	670.5	5.99	112	53
Khwedawe	285	8.91	32	19
sum	2059	-----	----	---
Average	411.8	6.14	70.4	54.6

DISCUSSION AND CONCLUSION

Increasing population caused to more need, so the number of cattle grazing in forests across the area pushing more and more. In addition, the population increase was caused to people use more and more of forest especially "By Products" or NWFP (Non Wood Forest Products) products such as the utilization of *Juglans regia* and turpentine gum trees was cut with greater intensity. This study belongs to the Qabr-E-Hosseini village forests located in 28 km south Piranshahr road Piranshahr to Sardasht is provided. After the Islamic revolution and the start of war and lack of adequate security in the region lead to lack of adequate supervision on forests, also fuel problems in rural areas, unfortunately, trees for cooking and heating homes and other uses of rural were cut. So severe was the destruction of forests, standard and thick trees intensively were cut for rural purposes and fuel, so the forests became coppice forest and in some areas near the villages forests became agricultural lands.

In this study, five natural stands of *Juglans regia* with an irregular and unplanned degradation by various people including local residents and residents of other areas (tourists) are utilized and destroyed were inventoried and analyzed. In total, five stands product was about 2000 kg usable walnut. Each year, as continuous operation of the stand should be. Due to the remoteness of the reach by local residents, these forests approximately remained naturally, totally the average of total trees, *Juglans regia* and other species number per hectare were 118.9, 66.96 and 51.93 respectively. Although the percentage of canopy in different slopes was vary, but average canopy of the total stand was 85%. Generally, because of massively dense stand of these trees, and at the other hand *Juglans regia* is a kind light demand species, so total production of these stands were fewer than normal and stand product average was 400 kg.

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