Soil type of Oriental Beech Stands in Elevation Levels of Hyrcanian Forests

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ABSTRACT: The study of soil type in forest stands is important factor for future natural stands planning. The present study examine soil type in Hyrcanian beech stands at different levels of height above sea level by using American Classifieds, in the Seyahkal forests, Guilan province and the north of Iran. For this purpose, 15 soil profiles, ranging from the slope below 30%, and to the north, was drilled, to measure some soil physico-chemical parameters, of the profiles, one kg of soil was sampled, and were transported to the soil analysis laboratory. The results of the classification of Soils in these *Fagus orientalis* Lipsky Communities showed that from 600 to 1800 meter above sea level (m.a.s.l.), the soil type is acidic brown and forest brown (Inceptisols category, Ochrepts Subcategory), and from 1800 to 2100 (m.a.s.l.), soil type is Rendzine with brown calcareous soil (Mollisols category, Rendolls subcategory).

INTRODUCTION

Beech (*Fagus orientalis* Lipsky) is one of the most important of Caspian forest trees in northern Iran, which due to the nature of popular shade, good regeneration, competition and high mortality in most habitats has become dominant on other forest trees. In terms of appearance, beech trees in Europe, is one of the young trees, in Central Europe, from about 3000 to 5000 years ago has occupied forested areas (Homasius, 1992). Of the five different ecological regions, only Hyrcanian mixed forests in northern Iran, with a similar area of 9.1 million hectares, are considered as productive forests, the design has been under the management of forestry, and Part of wooden products are needed to provide. These forests are dense and have high economic value, and have maximum number of trees per unit area (Delfan Abazari, 2005). Caspian beech, with the frequency of 23.6 percent, has allocated to itself about 30 percent of the volume of woods of Hyrcanian forests in northern Iran, and at altitudes ranging from 700 to 2400 (m.a.s.l.), has created pure and mixed *Fagus orientalis* Lipsky Communities (Mosadegh, 1999; Marvi Mohajer, 2014; Sagheb-talebi and Schuetz, 2002). Forest habitat is emerged from two major climate and soil categories. Formation and evolution of the soil, under the influence of climatic factors, topography conditions, Type and density of plant growth in a region and it Is a very important factor in the growth and distribution of forest trees including beech (Mohajer, 2014). So, knowing that, in particular, its physical and chemical properties are the most important factor in the planning and management of forestry projects, and many silviculture options are affected by that (Elias Azar, 2009). This study attempts to Soil types of oriental beech stands in Elevation levels of Hyrcanian forests.

MATERIALS AND METHODS

A. Study area

Shenrood Seyahkal forests are located in 25 watershed of the Forests of northern Iran, longitude 49047'49", and latitude 36055'30", at altitudes ranging from 700 to 2400 (m.a.s.l.), and general aspect is North, Northeast and Northwest. This area has an average annual rainfall of 1264 mm (40.8 mm as minimum in May and maximum in October 188.5 mm), average annual temperature of 16 degrees Celsius (the warmest is in July with an average 24.5°C and the coldest is January with an average of 7.6 °C?), and has no dry season and has a Caspian temperate climate (Binam, 2011).

Fig. 1. Geographical location of the study area.

B. Methods

According to available maps were identified 6 forest types in the Shenrood forests. (Pure Beech, Beech-Alder-Hornbeam, Beech-Hornbeam-Alder, Beech-Hornbeam, Hornbeam-Beech-Alder, Hornbeam-Alder-Beech). Total of 15 soil profiles, according to forest type, area and region topographic (aspect, slope and height) on the map of the region were designed as selective. Sampling of soil profiles was performed on the slope below 30% and in the North. Describe the soil profile was performed by profiles description cards (determination of the soil color, determination of the soil horizons, the presence of active lime, etc.). The site has been excavated profiles One kilogram of soil, for the measurement of soil chemical and physical properties such as: texture, bulk density, true density, percentage of porosity, pH, EC, CEC, C%, N%, C/N, P and K were transferred to the laboratory. Identification of soil type in each forest stand was done according to the American classification (based on physical and chemical and morphological properties).

RESULTS

The results of this study showed that, in the *Fagus orientalis* Lipsky communities in the Shenrood Seyahkal forests in northern of Iran are developed at altitudes ranging from 700 to 2100 (m.a.s.l.), that soil type in these communities is evolved (ABC) in altitudinal range from 700 to 1800 (m.a.s.l.), known as forest brown and washed brown And from 1800 meters above (timberline of pastureland and forest), is incomplete (AhC) known as Rendzine. Despite the *Fagus orientalis* Lipsky forest communities in climax With thick trunk, cylindrical base and good form with depth rooting on developed soils in elevation ranging 700 to 1800 (m.a.s.l.) and Field gradients below 50%, Upon increasing the field gradient in the region above 50% The deformation of the Caspian climax beech forest communities and of good form, the beech trees with low height, the area around the root protrusion Soils also become incomplete and the Rendzine type. Thus, in these areas, lower porosity and C/N ratio is higher (table 1). The results showed that the mixed beech forest communities ranging in elevation from 700 to 1200 (m.a.s.l.), and pure beech forest communities ranging in elevation from 1200 to 2100 (m.a.s.l.) appear. Despite the limestone, siltstone, shale, basalt with limestone and sandstone in the area of study, 90% of the soil types in the study area were Acidic brown and washed brown, and according to the American classification, they are in Inceptisols and AlfiSols categories and only in areas above 2000 (m.a.s.l.), and areas with slopes greater than 50 percent, soil type was Rendzine with forest brown, which according to the US classification, they are in Mollisols and Rendolls subcategory, summary results of the study about Various types of beech forest soils in Shenrood Seyahkal forests in northern Iran are given in Table 1 and Fig. 2.

| Rendzine soil | Root protrusions | Acidic Brown soil | Forest Brown soil |

Fig. 2. Different types of soil in the study area.

Table 1: Type of beech forest soils in the Shenrood Seyahkal forests with increasing altitude from sea level.

Height from Sea level (m)	Forest types	Soil type (US Classify)	Rock	%Porosity	C/N
600	Hornbeam- Beech- Alder	Acidic Brown	Basalt and limestone	46.8	18.2
800	Hornbeam- Beech- Alder	Acidic Brown	Sandstone, siltstone, shale	32.12	10.25
	Pure Beech	Forest Brown	Limestone with an average gradient	38.28	11.1
850	Beech- Hornbeam- Alder	Washed Brown	Sandstone, siltstone, shale	36.28	0.53
	Hornbeam- Alder- Beech	Acidic Brown	Basalt and limestone	43.47	12.6
900	Beech- hornbeam	Rendzine with forest brown	Limestone with high rocky protrusions	33.17	10.83
1150	Beech- Alder- Hornbeam	Acidic Brown	Basalt and limestone	44.93	14.87
	Beech- Hornbeam - Alder	Acidic Brown	Basalt and limestone	38.3	16.4
	Beech- Hornbeam - Alder	Washed Brown	Sandstone, siltstone, shale	40.3	4.7
	Beech- Hornbeam	Rendzine with forest brown	Limestone with high rocky protrusions	44.4	21.4
1250	Pure Beech	Acidic Brown	Sandstone, siltstone	42.5	10.1
1400	Beech- Hornbeam	Rendzine with forest brown	Limestone with high rocky protrusions	29.85	33.9
1500	Pure Beech	Brown forest	Limestone with an average gradient	48.7	11.1
1850	Pure Beech	Brown forest	Limestone with an average gradient	36.6	11.1
2050	Pure Beech	Rendzine with forest brown	Limestone with high rocky protrusions	42.9	11.1

DISCUSSION AND CONCLUSION

Forest Brown soils (ABC), usually are specifying the mixed hardwood forests. In these soils is difficult to detect the B horizon with normal eyes. these soils despite placement on the limestone have been washed completely from carbonates, and Due to mull humus, strong biological activity and very fast feeding cycle, very good for the trees, And supply the nitrogen needs of trees well (Guia *et al.,* 2002). These soils have a depth of 90 cm are good to excellent evolution, and appear in the climax forest conditions. In this study, this soil type was observed in elevation classes 800, 1500 and 1850 (m.a.s.l.), and in the pure beech with the climax conditions.

Limestone with ABC horizon, porosity more than 35%, and carbon to nitrogen ratio of 11% in these soils in the study area, shows the fertility of the soil, and soils with Pedoclimax conditions (Abrari and Azizi, 2003). When reduced alkaline elements of forest brown soils, environment Acidic are is increased, and soil leaching will be favorable. As a result, brown soils tend to leached soils (Habibi Kaseb, 1993). Acidic brown soils (AhBC), specifying the mixed hardwood forests. They have a depth greater than 90 cm and appear to the climax conditions. In this study, these soils were observed in areas with forest types of Beech-Hornbeam-Alder and the elevation 600, 800, 850, 1150, 1250, 1500, 1850 (m.a.s.l.). Because of the leaching of lime from Rendzine and limestone brown soils, after gradual formation of vague layer B, are created acidic brown soils with a relatively large depth. B newly formed layer, because of secretion of Gel-shaped and iron oxides hydroxides compounds becomes brown. Horizon of Ah has poor Humus, which in the next stages of leaching, has weak acidic reaction. Layer C, which is distinct from B with uncertain boundaries mostly is as basalt, granite, stone, sand, and the deposit and glacial sands. Pieces of rock decomposed in the layer B is quite visible (Habibi Kaseb, 1993). In these areas, the soils have a chance for formation, and while the accumulation of litter on the forest floor, frequency of micro-organisms is increased, and while the decomposition litter into smaller particles and formation of humus, mixing organic and inorganic particles is done better, and with time and leaching of materials from the higher horizons to the lower horizons, soils formed appear as form evolved. Rendzine Soils (AhC), with the incomplete evolution, mostly in steep mountainous areas in semi-arid and sub-humid, and sometimes land upstream and flat wet spots are found, layer A in these soils were Thick, high quality, and often gray humus, and are created along with calcium carbonate released from Limestone stone, fertility humus. C layer in these soils as calcareous and bright differs from the A horizon with unclear boundary from the A horizon (Habibi Kaseb, 1993). In this study, the presence of this type of soil in beech- hornbeam forest areas with elevation 900 and 1400 (m.a.s.l.), pure *Fagus orientalis* Lipsky with altitude of 2000 (m.a.s.l.), and the slope above 50%, shows the deficient evolution of soils in harsh climate conditions (cold and cold winds), flows of water weeds and erosion, lack of micro-organisms and Massive forest and humus, which is the case of acidic brown forest has been transformed into Rendzine, and appears beech's that have shallow roots, which these factors have caused the degradation of rocks later and soils which appear, have incomplete profile and type of them is Rendzine (AC).

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