

## System-Ecological Analysis of Soils of the Southern Slope of the Great Caucasus and their Geobotanic Characteristics on the Example of the Shekinsk Region of Azerbaijan

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### Abstract

The paper presents the results of soil-ecological and geobotanical studies of the main soil types in the Sheki region, characterizes the natural conditions and diagnostic indexes of soils along vertical zonality from intrazonal landscapes to subalpine meadows.

**Keywords:** Humus; Granulometric Composition; Hygroscopic Moisture; Absorption Capacity

“It must be clearly recognized that the anthropogenic transformation of the biosphere in a certain sense has the character of a global catastrophe and anthropogenic landscape is the landscape of the future. In all likelihood, after 100 - 200 years it will occupy the entire territory of the earth's surface with the possible exception of eternal ice and mountain peaks. The reasons for this lie in the uncontrolled and progressive growth of the population of the Earth, in the nonstop expansion of industry and agriculture, in the constant need of man for energy sources, other processes that accompany the “triumph of civilization” [1].

Measures taken by individuals, stakeholders and governments are important, mutually reinforcing steps aimed at protecting life support systems that not only ensure human well-being but also the richness of the diversity of life on this planet [2].

Soil, as an integral part of the ecosystem, is also an important component, the formation of which occurs in the interconnection and interaction of environmental factors in the Sheki region, which corresponds to vertical zoning.

Selected in the form of an object of study Sheki region, located on the southern slope of the Greater Caucasus (Figure 1), borders on the north and north-east by the Main watershed ridge of the Greater Caucasus, in the west by Gakhsky, in the east by Oguz regions, between elevations of 500 - 850m, sometimes reaching up to 3000-3500 m above sea level on snowy peaks and occupying a total area of 2432.75 km<sup>2</sup>.



Figure 1

Geologically and geomorphologically, the region has a rather complex structure, where high mountains and steep slopes alternate with foothill areas and plains, which in turn contributes to the development of a fairly variegated climate that is a variety of vegetation cover.

The complexity of the geomorphological structure, the presence of steep slopes, as well as the anthropogenic impact, exerts a significant importance to the intensity of surface runoff, which in turn enhances the development of erosion processes, resulting in the creation of wide ravines, which in the final stage are represented by beams, changing the geomorphological appearance of the region as a whole.

The highlands are located at an altitude of 2000 - 3500m above sea level. The relief is represented by a strongly dissected erosion-denudation form. Soil-forming rocks mainly consist of clays, limestones and shales. For this zone is characterized by intense mudflows, causing significant damage to the environment, especially in the destruction of soil fertility.

The middle-altitude region is located at an altitude of 1000 - 2000m above sea level and is characterized by the presence of a dome-shaped and stepped watershed. The slopes of the mountains are strongly dissected and the erosion-denudation relief predominates. Soil-forming rocks are represented by shales, limestones and sands, basalts, gabbros, hydromica, andesites are found.

The low mountain range is located between isohypses 600 - 1000m above sea level. The surface is represented by narrow belt islands, separated by wide valleys. Soils are formed on deposits of the Jurassic and Cretaceous periods of the Mesozoic and 3-fold (Paleogene, Neogene) and 4-period Cenozoic.

The plain zone is located at an altitude of 200 - 600m above sea level, where mainly alluvial-proluvial deposits are located, on which fertile soils intensively used in agriculture are developed.

In general, Shikhlinisky [1] singles out 3 types of climate according to the Sheki-Zagatala zone: 1) a moderately warm, zone characteristic of flat areas with a relatively mild winter; 2) a moderately warm wet type with a uniform distribution of precipitation throughout the year, covers the foothills of the zone and 3) a cold climate with humid winters typical of the foothill and mountain areas of the zone.

The minimum air temperature is 0.5°C in January, and the maximum temperature is 23.6°C for July. The average monthly temperature of the soil varies within the limits of -1°C -30,7°C. The minimum soil temperature in -10C is in January, the maximum is 30,0°C (July) and August is 30,7°C months. The annual precipitation is 692 mm, the greatest amount of which falls in April-June months. The annual value of volatility is 825 mm. The average annual relative air humidity is 71% fluctuating over the time of year from 59 to 87% [1].

In the hydrogeographic aspect, the rivers of the Sheki region are characterized by mudflows. The source of the rivers of the region is located on the Main Caucasian ridge.

Large rivers of the zone also include the rivers. Irishchay, Kishchay, Ohutchay, Garasu, Beyuk gobu, Shinchay, etc. These rivers with sleeves, especially on steep slopes, erode the soils under forest and meadow formations, which is especially intense in the period of prolonged and intensive precipitation.

The complexity of natural conditions and the diversity of the hydrothermal regime contributed to the formation of various types of soil, differing in genetic properties. The soils of the region under investigation were studied in detail by Academician GA Aliev [3,4].

Based on field and laboratory studies on the mountain pastures of the region, the following types and subtypes of soils are distinguished: 1. Leached primitive mountain meadow; 2. Leached sod mountain-meadow; 3. Leached dense sod mountain-meadow, which in turn are subdivided into varieties according to the granulometric composition and thickness.

The leached primitive mountain meadow soils are spreading on different sites of summer pastures, covering 1893.0 hectares or 0.76% of the total area of the region.

The relief of the region under study is strongly dissected by a ravine-beam network, where the soil-forming rocks are represented by deluvial deposits and the soils are used for grazing.

The soils of the granulometric composition are medium and easily loamy. The content of physical clay (< 0.01 mm) along the profile varies from 28.44 - 40.08, and physical silt (< 0.001 mm) 7.88 - 11.24% [5,6].

In accordance with the granulometric composition, hygroscopic moisture according to the profile tracking fluctuates between 2.7 - 4.2%. The leached primitive mountain meadow soils are sufficiently provided with organic substances, where the humus content in the upper layer is 5.37 - 5.67%, and in the lower layers 5.02%, the total nitrogen value for the soil profile 0.27 - 0.38%.

The absorptive capacity of leached primitive mountain - meadow soils is different, where the sum of the absorbent bases (per 100g of soil) along the profile is 24.50 - 32.98 mg. Eq.

Leached soddy mountain meadow soils amounting to 6781.6 hectares or 2.73%, are distributed in different parts of summer pastures. The relief of the territory is expressed by gradually declining to the northeast slopes.

Leached soddy mountain meadow soils are also rich in organic substances, where the presence of humus varies between 7.35 - 10.0%, and total nitrogen 0.37 - 0.50%.

The sum of absorbed bases along the soil profile was 16.98 - 35.88 mg. Eq.

Leached dense soddy mountain meadow soils make 4033.9 ha or 1.62% and are distributed in different places of summer pastures.

The terrain of the territory is dismembered in various directions. Soil-forming rocks are represented by proluvial-deluvial deposits. The territory is used only for grazing.

This type of soil by the granulometric composition is medium loamy. The presence of fractions (< 0.01 mm) of physical clay along the profile fluctuates between 42.12 - 45.65%, physical sludge (< 0.001 mm) 9.40 - 11.80%, and hygroscopic moisture 4.3 - 4.5%. Has sufficient supply of organic substances. The presence of humus in the upper layer of soils is 10.37%, slightly decreasing to the lower layers of 9.51%, the content of total nitrogen along the profile is 0.46 - 0.52.

The absorption capacity of leached dense soddy mountain meadow soils is different, the sum of which varies from 30.40 - 40.60 mg. Eq. Over the soil profile.

After gaining independence in the Republic of Azerbaijan on 16.06.1996 the Milli Majlis passed the Law "On Land Reforms" on the basis of which three forms of ownership were singled out: a) state; b) municipal; c) private property [5,6].

Summer pastures being state property, in exceptional cases according to the established legislation, can be used and provided for rent. The allocation of these soils to the municipality and to private property is also established by law.

Along with other factors of soil formation, the vegetation cover also plays a significant role. Vegetable residues creating humus, which is the basis of soil fertility, also plays a significant role in soil formation, taking on the destructive effects of atmospheric precipitation, neutralizes their actions.

Absorbing the main part of precipitated precipitation, the vegetation cover creates the conditions for their further absorption into the soil, preventing the effect of surface runoff.

In the formation of vegetation in the territory in accordance with climatic conditions, there is a certain vertical zoning: a) alpine and subalpine meadows; b) forests; c) semi-desert (dry steppe).

These zones are also subdivided into subzones. Such in the alpine and subalpine zone (high mountains) is divided into subalpine and alpine meadows, alpine cover and subnival (alpine and rocky plants).

Summer pastures are mainly represented by leached primitive mountain meadow, leached dense sod meadow-meadow, sod mountain-meadow and mountain meadow-steppe varieties of soils, where erosion processes are widespread.

| N   | Name              | Area, hectares | N   | Name            | Area, hectares |
|-----|-------------------|----------------|-----|-----------------|----------------|
| 1.  | Tylkuu var        | 700            | 14. | Beyukchelenkok  | 30             |
| 2.  | Dabanıbzuzlugoyun | 850            | 15. | Haran           | 100            |
| 3.  | Salavat           | 370            | 16. | Widget          | 60             |
| 4.  | Tokegoşun         | 320            | 17. | Gully Send      | 130            |
| 5.  | Büquireurlu       | 610            | 18. | Gases yaylag    | 70             |
| 6.  | Kıçıkgeyurlu      | 200            | 19. | Kichikchilengaz | 70             |
| 7.  | Guy landscapes    | 1580           | 20. | Beukbitlige     | 70             |
| 8.  | Meal              | 380            | 21. | Kichikbitlige   | 70             |
| 9.  | Chagyl            | 845            | 22. | Han Tails       | 250            |
| 10. | Gaga              | 410            | 23. | Shan-shan       | 640            |
| 11. | Gateway           | 150            | 24. | Sure            | 680            |
| 12. | Yesterday         | 530            | 25. | Goturlu         | 50             |
| 13. | Will goşun        | 530            | 26. | Gully Done      | 50             |
|     |                   |                | 27. | Toogo           | 9755           |

Table 1: Summer pasture area.

As noted above, the summer pastures of the Sheki zone are located in the highland zone at an altitude of 2000 - 3000m above sea level and differ sharply from the neighboring regions of the zone according to the species composition of the plants. Since the area under study is from north to south, at a distance of 50 km vertically. Along with the desert vegetation, there are meadow, alpine and subalpine plants. It should be noted that about 70 - 80% of plant communities of all plants of the republic can be found on the territory of the zone. Vegetative groups of the region are formed in accordance with the soil-climatic belt. Xerophytic plants, shrubs and rare forests are common in the dry steppes of the lowland part of the semi-desert (lowland belt and foothills), subalpine and alpine meadows in the highland zone, where regular zoning is observed in the plant cover.

However, in the Sheki region, introsonality is also traced in the Ghanyh - the Irichay valley, whose vegetation is to a certain extent cultural and marsh plants. Moreover, in the lower tier at an altitude of 400 - 600m above sea level, it is rare to find cultivated plants. At an altitude above 600 m. Above the sea level, mountain forests (the lower and upper tiers of the belt) are widespread, and above (1800 - 3000m). There are subalpine and alpine meadows, and even higher rocky landscapes, which because of the severity of the climate and the presence of steep slopes are less susceptible to anthropogenic impact [7,8].

## Conclusion

The analysis of the foregoing concludes a certain conclusion about the peculiarity and isolation of the Sheki region among all the regions of the Sheki-Zagatala cadastral area located on the southern slope of the Greater Caucasus, where the presence of biodiversity exceeds all regions of the Greater Caucasus within the Azerbaijan Republic.

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