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ORIGINAL ARTICLE

Assessment of area tourist-recreational potential with honey palinological research

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The article summarized an experience of analysis of the development of ideas in the methodological sphere of recreational geography in connection with the problem of studying the quality of the human environment. And also due to the active development of rural tourism and increased interest in food quality, the most important of which is honey. We applied the generally accepted methods for assessing the tourist and recreational potential of the territory and the results of additional melissopalinological analysis on the example of the Charysh district of the Altai region. An expanded approach in assessing tourism and recreational potential is important for the development of rural tourism, interested administrative and economic entities to create coordinated decisions on the economic development of the Altai region.
Keywords: Tourist and recreational assessment, rural tourism, melissopalynological analysis, honey resources, Altai region, Charyshsky district.

Introduction

The problem of environmental quality is becoming one of the leading in modern science and practice. Its relevance is so great that at present it is difficult to name science that would remain away from solving a wide variety of related problems. The development of science in general requires understanding the basic principles and methods that various sciences apply in research on the problem, and how these principles and methods relate to those specific to a given science and constantly used in it. It is especially important to do this for sciences such as recreational geography, which in recent decades has been interpreted as the science of a comfortable environment. The object model of thinking, in which the main attention is focused on certain characteristics that are inherent in natural phenomena, gradually transformed into a subject-object model. The latter allowed us to move from identifying the characteristics of natural objects themselves to studying and evaluating the properties of the environment manifested through the recreational potential of the territory. The idea of the recreational potential of the territory may be subject to additional analysis by including melissopalinological analysis of honey in the recreational assessment of the territory. The deterioration of the environmental situation contributes to an increase in interest in the quality of products, including honey. Analysis of honey products reveals a variety of features of the territory, which define it as environmentally pure, and allows you to classify honey products as organic pure. This is especially important for the development of the territory as a promising center of tourism, including agrotourism, rural tourism, where the role and existence of clean food products of local production sometimes plays one of the leading roles in attracting customers.

Material and Methods

In world practice, for identification of honey by geographical origin, pollen spectrum is determined according to palinological data (Maurizio, 1951; Louveaux et al., 1978; Moar, 1985; Ramalho et al., 1991; Anklam, 1998; Bogdanov, Martin, 2002; Ruoff, 2006; Salonen et al., 2009). The melissopalinological method of analysis is an important tool used in solving a number of problems related to determining the botanical and geographical origin of honey and other beekeeping products.
The results of melissopalinological research can serve as a reliable basis for establishing a honey base both in individual regions and throughout the country. Based on an assessment of plant attendance by bees, impressive lists of melliferous plants for individual territories are compiled. According to literary data, the number of melliferous plants in Russia calculates in thousands (Kurmanov, Ishbirdin, 2014). However, it is impossible to draw reliable conclusions about the resource role and real contribution of individual plants to the honey harvest collection without conducting melissopalinological studies.
The purpose of this study was to conduct a comprehensive assessment of the recreational potential in conjunction with the melissopalinological indicators of the Charyshsky district for the development of rural tourism.
Generally accepted methods of assessment of tourist and recreational potential are considered in detail in the works of Kolotova E.V. (Kolotova, 1999), Kuskov A.S., Preobrazhensky V.S. (Kuskov, 2005; Preobrazhensky, 1972), etc. Some of the latest works, which examined the methodology for evaluating the natural recreational system and the system for ranking points, are

the works of Gudkovsky M.V., Korolev A.Y. and others (Gudkovsky, 2017; Korolev, 2019; Assessment of the recreational..., 2013; Main approaches to the methodology..., 2013).

Results

The authors performed a recreational assessment of the Charyshsky district on the basis of a factor assessment of the natural, social-economic and cultural-historical components of the landscape (Table 1). Each component consists of interconnected evaluation components. The block of natural factors includes geomorphological, climatic, hydrological indicators, as well as a landscape assessment indicator. Social-economic and cultural-historical components are united in a single block. Components contain a group of evaluation criteria. The sum of points for each group of evaluation criteria gives the total number of points of the component. The total potential consists of the sum of points of each block. As operational-territorial units, acting as elementary units of assessment with subsequent cartographic interpretation, landscape sections are used.

Table 1. Scale of points of recreational assessment of the territory by natural, social-economic and cultural-historical indicators (Gudkovsky, 2017; Landscape map of..., 2017).

	Evaluation criteria	Scale of points		
		1b	2b	3b
		Geomorphological indicator		
1	Height above sea level, m	0-1000	1000-2000	2000<
2	Relief depth, m	150-450	800-1000	1000<
3	Relief density, km	0,8-0,6	0,6-0,5	>0,4
4	Slope steepness, grad	3-6	6-12	12-20
		Climatic indicator		
5	Precipitation per year, mm	0-200	200-400	400-600
6	Temperature in January, °C	Below -21	From -13 to - 21	From 0 to -13
7	Temperature in July, °C	Below +4, above +25	From +4 to +12	From +12 to +25
		Hydrological indicator		
8	Density of rivers network, km/km2	Lack of rivers	Less 0,1	0,1
9	Water mineralization, mg /l	200-450	450-700	700-1000
10	Approach to water	Precipice	Marshland	Sandy pebble land
		Landscape assessment indicator		
11	Territory ploughing	Lack	Middle	Strong
12	Type of forest	Steppe	Cedar forest	Subalpine meadow
13	Number of species of wild ornamental plants, %	10	60	30
14	Number of species of wild medicinal plants, %	5	25	70
		Social-economic and cultural-historical indicators		
15	Transport connection	Lack	Roads of local significance and railways	Roads of regional and federal significance
16	Entrepreneurial placement	Lack	Self-organized campings	Children camps, motels, hotels
17	Food enterprises	Lack	Fast food cafes, canteens	Cafes and restaurants
18	Objects of cultural and historical value	Lack	Scientific and technical complexes; small and large historic towns or rural settlements	Objects of ethnography, crafts, decorative art centers, monuments of archeology

Table 2. Integral point recreational assessment of the territory by natural, social-economic and cultural-historical indicators

Scale of points	Sum of points	Degree of the territory favourability
1	0-20	Less favourable
2	21-36	Relatively favourable
3	More than 36	Most favourable

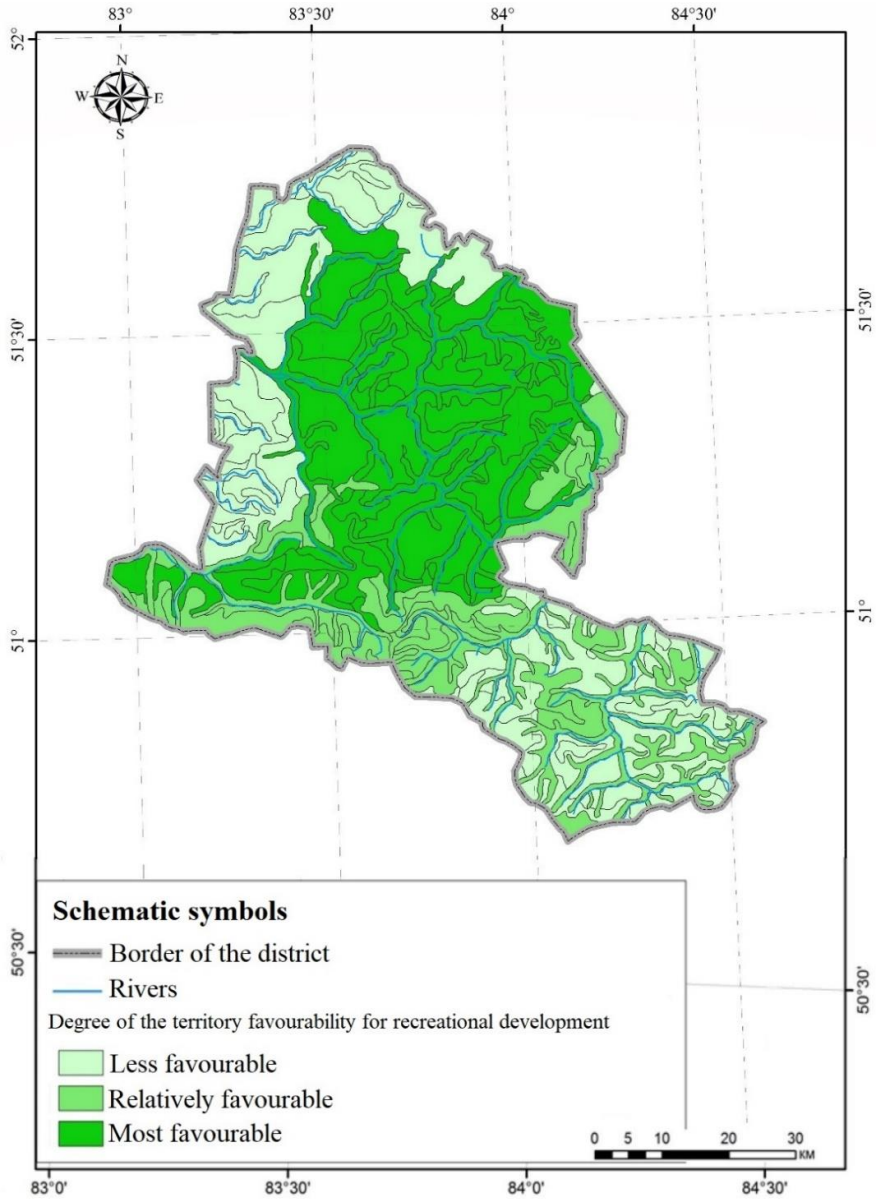

Fig. 1. Integral recreational assessment of the Charyshsky district territory

As a result of the recreational assessment of the Charyshsky district, favourability zones were identified (Table 2, Figure 1). In general, the entire territory of the district has the potential for the development of various types of tourism. The most favorable conditions for the development of tourism are the central part of the Charyshsky district, the relatively favorable - the southern part and the least favorable northern and northwestern part.

The most favorable for the development of tourism, both functionally and aesthetically, are medium-pitched, sloping and hilly-walled dissected surfaces. Within the floodplains of the rivers are dry, steep banks that do not require complex structures for descending to the water. Landscapes are characterized by average values of the average annual precipitation and the amplitude of average annual temperatures, which, together with the developed roadside infrastructure and transport accessibility, are favourable factors for the development of rural tourism in the district.

The southern part of the Charyshsky district is relatively favorable. Mainly, these are steep and flat-convex watershed mid-mountain surfaces with V-shaped valleys and gorges. Elevation marks of relief and inclination angle of surface more than 12 ° make it possible to organize active recreation. The lack of plowing, a large number of wild medicinal and ornamental plants in subalpine meadows create an aesthetic variety of landscapes. The landscapes of this zone are characterized by the smallest amount of average annual precipitation and the largest amplitude of average annual temperatures. The lack of transport accessibility and catering facilities is the big problem. The least favorable areas are located within the northern and northeastern parts of the district, where there are hilly and weary mid-mountain surfaces with short and straight lodges, providing an aesthetic and landscape monotony of relief perception. This is the territory of the steppe and forest-steppe zones, located in the area of insufficient moisture, and it provides functional low-suitability of landscapes. At the same time, this territory has transport accessibility, a relatively wide network of food outlets and objects of cultural and historical significance.

The authors conducted additional field studies: herbarium collections and samples were collected. In field studies, model sites were selected, where the methodology of field (natural) geobotanical studies, profound knowledge and further extrapolation of the identified characteristics into less studied natural-territorial complexes was worked out in detail. The applied methodological methods for describing model vegetation areas were focused on determining the floristic composition of honey

plants of the Charyshsky district of the Altai region. The methodology of botanical and palinological research is fully developed and described in detail on the example of model sections of the mountain-forest zone (Charyshsky district) with a description of the flora and vegetation of the studied territory, type of vegetation (steppe, meadow, subalpine and alpine meadow, forest). 940 species of vascular plants are allocated in the district, which belong to 93 families and 353 genera. 185 species of honey plants (19.6% of the total number of species) exist in the Charyshsky district. The most honey plants include families: Apiaceae, Asteraceae, Brassicaceae, Fabaceae, Lamiaceae, Ranunculaceae, Rosacea (Krasnoborov et al., 2003).

Analysis of honey of model sections of the Charyshsky district located in the mountain forest zone of the Altai region showed that pollen of families Apiaceae, Asteraceae, Brassicaceae, Fabaceae, Ranunculaceae, Rosaceae prevails, in model sections of the third type located in agrocenoses, pollen of the family Polygonaceae (Fagopyrum sp.) is quite common.

Thus, the Charyshsky district belongs to the mountain-forest zone and is distinguished by the most stable honey collection, due to the diverse combination of vegetation (Nenasheva, 2017). Cameral melissopalinological studies of honey indicate that, despite the wide variety of flowering plants in the territory under study, few plants act as the main sources of nectar and pollen. It is shown that the honey of the mountain-forest zone is polygrassed. The peculiarity of the pollen spectra of polygrassed Altai honey is that despite the domination of the leading taxon, the pollen of plants of 10-12 representatives of families is present in the spectrum in a significant percentage ratio. This fact, in the opinion of the authors, gives it a special compositional taste.

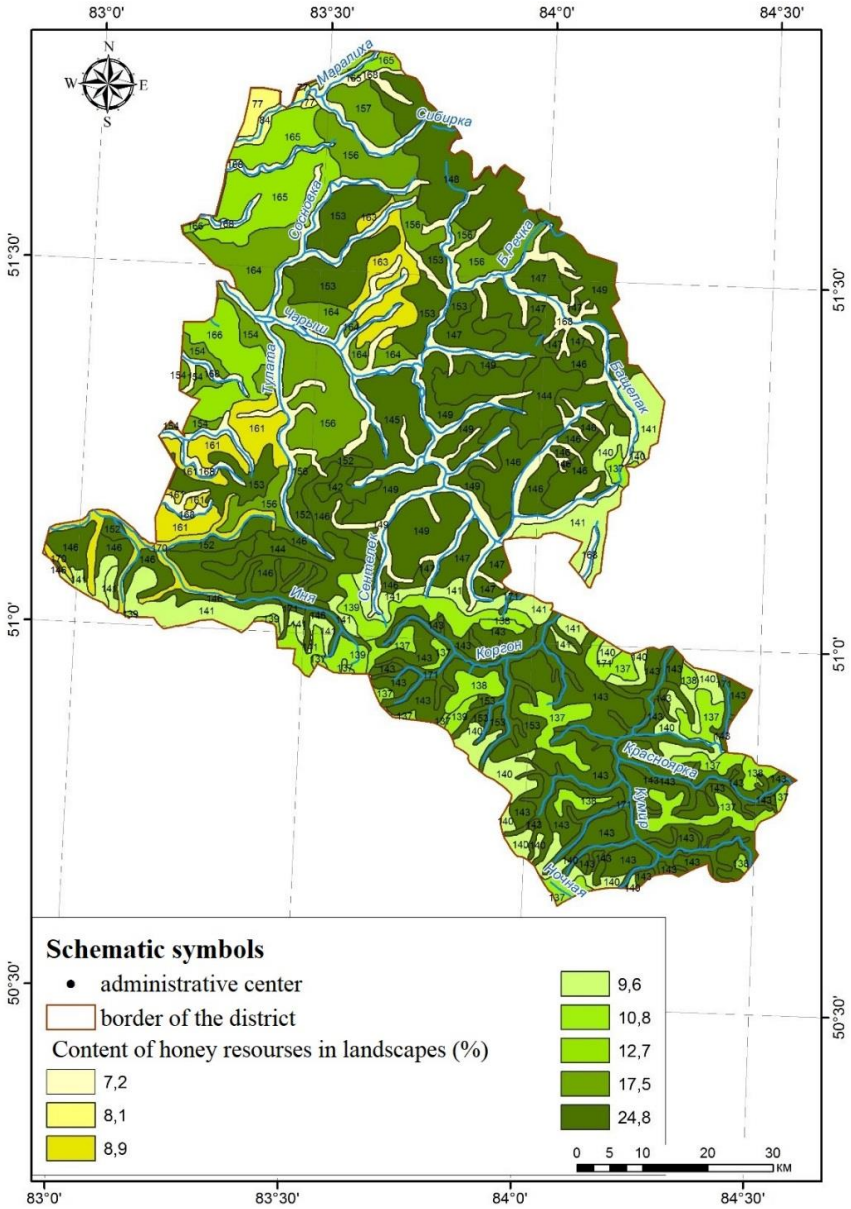

Fig. 2. Content of honey resources in landscapes of Charyshsky district

Considering the landscape differentiation of heights of mountain and foothill zones (Nikolaev, 1986) and using the landscape basis (Landscape map of the..., 2017) the authors showed the percentage of honey resources in the landscapes of the Charyshsky district (Fig. 2). The smallest content of honey resources (7.2%) falls on the foothill plains with different herbs-cereals-feather grass meadow steppes on leached typical chernozems. Honey flora is few on steep dissected surfaces with meadow shrubs and rocky steppes on black-earth meadow soils (8.1 - 8.9%). A slightly higher content of species of honey plants (9.6-10.8%) is characteristic of convex watershed surfaces with alpine and alpine-subalpine small-grassed meadows on mountain-meadow, turf-podzolic soils. 12.7% of honey resources are contained on low-mountain hilly surfaces with meadow forest-steppes on mountain leached chernozems. From 17.5 to 24.8% of honey resources are found on medium-mountain and low-mountain surfaces with aspen-fir high-grassed (dark coniferous) forests on mountain-forest turf-deep-submerged soils.

Conclusion

The study of honey plants is of great importance for the productive use of the territory, which is based on the skillful use of honey resources both cultivated plants and natural ones. The natural landscapes of the Charyshsky district are characterized by a low and moderate degree of change, mainly associated with grazing and forest usage. Plowed lands occupy a small percentage of the area of the entire district (no more than 25%), extensively used lands with a significant share of natural landscapes occupy (50%), landscapes with a high degree of variation - less than 15% of the total area.

The model sections of the Charyshsky district belong to the mountain-forest zone and are distinguished by the most stable honey collection, due to the diverse combination of vegetation. Melissopalinological studies have shown that the honey of the Charyshsky district is polygrassed. The pollen composition of honey reflects the type of vegetation of the area where honey was collected. The most attractive and meaningful honey resources are mid-mountain and low-mountain landscapes with aspen-fir high-grassed (dark coniferous) forests. Honey resources, like other types of plant resources, are disrupted by human economic activities (arable land, grazing, forestry), therefore, it is necessary to conduct rational environmental usage of territories.

The integrated approach in assessing the territory showed the most comfortable conditions for the development of rural tourism in the central part of the Charyshsky district, which coincides with the presence and distribution of the main fodder base of beekeeping. Honey products of the Charyshsky district are classified as organic pure.

The introduction of botanical and palinological analysis in the assessment of the tourist and recreational potential of the territory of agroterritories can be useful for the development of rural tourism. Melissopalinological analysis will make it possible to carry out more reasonably constructive environmental activities for the development and integrated transformation of the human environment in the optimal direction of environmental management. It will also help to identify confirmed scientific results and specific features of the territory, in particular for the development of rural tourism.

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