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# THE INTERNATIONAL EVENT "DAYS OF MOUNTAIN WATER", TETEVEN, BULGARIA, MICROBIOLOGICAL AND PHYSICOCHEMICAL RESEARCH OF MOUNTAIN SPRING WATER

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This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## ABSTRACT

In Bulgaria there are the following mountains – Stara Planina (Balkan), Rila, Pirin, Rodope etc. The name of the Balkan Peninsula is from the old name of the mountain Stara Planina – Balkan. In Bulagria there are 139 peaks more than 2000 m above sea level. The biggest peak in Balkan Peninsula is Mousala (2925 m). Teteven municipally has big part of Stara planina mountain with the highest peak Vezhen (2198 m).

The event "Days of mountain water" is one of a kind in Bulgaria. It takes place on 11$^{th}$ June and lasts for several days in the Municipality of Teteven, Bulgaria. Its beginning dates from 2010, and it is a joint undertaking between Ignat Ignatov, Scientific Research Center of Medical Biophysics and Municipality of Teteven, Bulgaria.

The event is connected with research of microbiological and physicochemical parameters of mountain spring waters from Municipality of Teteven, Bulgaria. The applied spectral method is „NES". The analyses show the optimum quantity among the minerals of Calcium ($Ca^{2+}$), Magnesium ($Mg^{2+}$), Potassium ($K^{+}$), Sodium ($Na^{+}$), Manganese ($Mn^{2+}$) and Zinc ($Zn^{2+}$) that provide the right balance in the human body for health and longevity.

Considered is the history of the event and what is achieved by the organizers. The emphasis is on the main objectives set out by the event, and the accomplished tasks for its successful delivering. Representatives of 15

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states have participated in it – Bulgaria, Austria, Germany, Switzerland, Russia, USA, France, Israel, Czech Republic, Denmark, Turkey, Greece, Hungary and Serbia.
A survey was conducted regarding the event "Days of mountain water" in the Facebook group "Teteven Balkan". 66 people responded on a random basis. The aim of the survey was the people to estimate how useful stay in Teteven municipality is.
In the present article are listed in more detail the natural assets of municipal area of Teteven, located in "Fore-Balkan" in the central part of Stara planina Balkan range. The possibilities are shown for development of tourism in the region, its particular characteristics and specific features. Analyzed are the water resources, the mountain water as a factor for health and longevity. The information helps for development of tourism in the region. Described are the springs and fountains of mountain water in Teteven and its surrounding municipal areas. It is conducted quantitative and qualitative analysis of the chemical and physical parameters of the springs. On six of the springs are placed information signs about the chemical composition, physical parameters and properties relating to health.

**Keywords:** Mountain water; event days of mountain water; spring; microbiological and physicochemical research.

## 1. INTRODUCTION

There are 225 mineral springs in Bulgaria – 148 of them are in southern and 77 in northern Bulgaria. There are mountain springs in the upland regions of Bulgaria [1]. Mountains have always attracted attention with the large number of long livers and centenarians. In Municipality of Teteven the figure is 173 long livers over the age of 90 out of total population of 21 220 citizens. During the scientific studies there have been 4 centenarians, and that equals to 200 per 1 million. In areas with a small number of centenarians the figure is 50, and with a large number it is over 150 per 1 million [2-4]. Analyses reveal that the balance among the minerals of Calcium ($Ca^{2+}$), Magnesium ($Mg^{2+}$), Potassium ($K^{+}$), Sodium ($Na^{+}$), Manganese ($Mn^{2+}$) and Zinc ($Zn^{2+}$) in the water are determining for health and longevity [5,6]. The reliable studies illustrate the effects of trace elements on human health and longevity (7-10). The amounts of Calcium ($Ca^{2+}$) and Magnesium ($Mg^{2+}$) in water were subject to different studies on human health [11-13]. A study from China shows a positive correlation between Metasilicic Acid ($H_2SiO_3^{-}$), Calcium ($Ca^{2+}$) and Iron ($Fe^{2+}$; $Fe^{3+}$), and the number of centenarians in Hechi, China [14]. The results of some studies show that amounts of calcium ions - up to 20 $mg.L^{-1}$ are typical for areas, where centenarians live. In the regions where most centenarians live in Russia (350 per million), the amount of calcium ions in the water is 10 $mg.L^{-1}$ [15-17]. Statistical information shows that the most centenarians in Canada per million inhabitants are in Nova Scotia (210 per million). The calcium content in the water from Nova Scotia is 6.8 $mg.L^{-1}$ [5].

To organize the event was required a municipality at a distance of around 100 km from Sofia and Fore-Balkan or Stara planina (The Balkan). It was necessary for it to have traditions with mountain springs and water that are integral part of the way of life of the local population. We were looking for a place with abundance of mountain springs, which have the right balance among the minerals of Calcium ($Ca^{2+}$), Magnesium ($Mg^{2+}$), Potassium ($K^{+}$), Sodium ($Na^{+}$), Manganese ($Mn^{2+}$) and Zinc ($Zn^{2+}$). For the tourism it is important that the springs are easily accessible. We needed a place with already built eco-trails leading to the springs, so we can combine the event with mountain tourism and outdoor nature recreation.

Our requirements were satisfied by Teteven Municipality, in whose territory there were plenty of springs, mountain landscape, and climate very suitable for tourism. The Municipality of Teteven is located in Fore-Balkan [18-21]. The town itself is in a mountain area, in the valley of river Beli Vit, between two ranges of Stara Planina mountain – Zlatishko-Tetevenska and Vassiliov's mountain. It is surrounded by the mountain peaks – Petrachilia (1179 m), Treskavetz (1152 m), Ostrich (1050 m), Cherven (1221 m) and Kon (1186 m).

On Treskavetz peak is found an ancient settlement with archaeometallurgy at 3200 years. The findings are similar to those ones in the region of Lydia, Asia Minor. There is a chapel built on Ostrich peak called "Pokrov Bogorodichen (Protection of the Mother of God)". A famous place is "Skoka" waterfall with a scenic eco-trail leading to it. The altitude of the territory of Teteven and its surrounding areas varies from 340 to 2198 meters measured at Vezhen peak. In its center the altitude is around 415 m. The big difference in altitude provides the opportunity to develop both light transitional routes from the town to the mountain, and alpine tourism to Echo lodge, Vezhen peak and the surrounding mountain peaks. Zlatishko-Tetevenska mountain has peaks reaching height of 800 to 1200 m. Behind them are located

peaks with a height of 1800 to 2198 m. The height of Vezhen peak is 2198 m. The climate is moderate continental with relatively mild winter and cool summer due to the proximity of Stara planina Balkan range. Mostly because of the cool climate in the summer months, a large number of tourists visit the town for recreation purposes. In order to promote Teteven Municipality as a tourist destination, the Council has built several eco-trails with different lengths and elevation gains. By the eco-trails the tourists are able to reach the landmarks of the area – peaks, waterfalls, fountains, historical sites, monasteries and chapels.

There are more than 30 mountain springs, and 7 have been object of study. The following springs were examined [22]. All of the springs have fountains. The data shows the year of research.

1. Dolnata cheshma (2011)
2. Gornata cheshma (2011)
3. Klindyovoto (2011)
4. Sondata (2011)
5. Babintzi (2017)
6. Vezhnitza (2021)
7. Borisova cheshma (2022)

The built eco-trails by Municipality of Teteven are:„Under the waterfall splashes“, „Ostrich“, „Forest path“, “Tzarichina“, “Treskavetz“, „Shelter dangerous edge – peak Petrachilia “, „Black ridge“ and others.

The route of some of the eco-trails passes through mountain springs and fountains. The water of mentioned springs has been studied for physicochemical parameters in accredited laboratory „Eurotest control“. The microbiological studies have been performed from accredited laboratory „Eurotest control“ and Nedyalka Valcheva, Trakia University, Stara Zagora, Bulgaria. The standards of microbiological studies are in the following articles [23-29]. The applied spectral method is „NES“ by Antonov and co-authors [30-33]. The analyses show the optimum quantity among the minerals of Calcium ($Ca^{2+}$), Magnesium ($Mg^{2+}$), Potassium ($K^{+}$), Sodium ($Na^{+}$), Manganese ($Mn^{2+}$) and Zinc ($Zn^{2+}$) that provide the right balance in the human body for health and longevity [5,6]. The effects from mountain waterfall aerosols on human health were shown [34]. The biggest waterfall is „Skoka“. For its composition and taste, the water is preferred by locals and tourists in Teteven.

In the municipal area of Teteven there are eco farms with quality dairy products, fresh fruit and vegetables. Fishing is associated with mountain barbel, trout etc.

The main purpose of the event “Days of mountain water” is to familiarize participants with the properties of the water as one of the factors for health and longevity. The other factors are – heredity, body weight, physical activity, preventative medical care, clean air, mental stability. Provided are analyses of the event history with studies of mountain springs and a questionnaire.

## 2. METHODS

### 2.1 Methods for Physicochemical Analysis

The physicochemical analysis were performed according the Ordinance No. 9/2001, Official State Gazette, issue 30, and Decree No. 178/23.07.2004 regarding the quality of water intended for drinking and household purposes. The following methods are applied (Ordinance No. 9/2001) [35,36]:

The determination of color was according to Rublyovska Scale – method by Bulgarian State Standard (BDS) 8451: 1977;

Method for determination of smell at 20 °C – method BDS 8451: 1977 technical device – glass mercury thermometer, conditions No. 21;

Method for determination of turbidity – EN ISO 7027, with technical device turbidimeter type TURB 355 IR ID No 200807088;

Method for determination of pH – BDS 3424: 1981, technical device pH meter type UB10 ID NoUB10128148;

Method for determination of oxidisability – BDS 3413: 1981;

Method for determination of chlorides – BDS 3414: 1980;

Method for determination of nitrates – Validated Laboratory Method (VLM)-$NO_3$-No. 2, technical device photometer "NOVA 60 A" ID No. 08450505;

Method for determination of nitrites – VLM $NO_2$ – No. 3, technical device photometer "NOVA 60 A" ID No. 08450505;

Method for determination of ammonium ions – VLM – $NH_4$ – No. 1, technical device photometer "NOVA 60 A" ID No. 08450505;

Method for determination of general hardness – BDS ISO 6058;

Method for determination of sulphates – VLM – $SO_4$ – No. 4, technical device photometer "NOVA 60 A" ID No. 08450505;

Method for determination of calcium – BDS ISO 6058;

Method for determination of magnesium – BDS 7211: 1982;

Method for determination of phosphates – VLM - $PO_4$ – No. 5, technical device photometer "NOVA 60 A" ID No 08450505;

Method for determination of manganese – VLM – Mn – No. 7, technical device photometer "NOVA 60 A" ID № 08450505;

Method for determination of iron – VLM – Fe – No. 6, technical device photometer "NOVA 60 A" ID No. 08450505;

Method for determination of fluorides – VLM – F – No. 8, technical device photometer "NOVA 60 A" ID No. 08450505;

Method for determination of electrical conductivity – BDS EN 27888, technical device – conductivity meter inoLab cond 720 ID No 11081137.

Table 1 illustrates the parameters of Ordinance No. 9/2001, Official State Gazette, issue 30, and Decree No. 178/23.07.2004 regarding the quality of water intended for drinking and household purposes.

## 2.2 Nutrient Media

1. Nutrient agar (MPA) with contents (in %) – meat water, peptone – 1%, agar – agar – 2% . Endo's Agar (for defining of *Escherichia coli* and *coliform* bacteria) with contents (ing/L) – peptone – 5,0 ; triptone – 5.0; lactose – 10.0; $Na_2SO_3$ – 1.4; $K_2HPO_4$ – 3.0; fuchsine– 0,14; agar – agar – 12,0 pH 7.5-7.7 [37].
2. Nutrient gelatine (MPD) (for defining of *Pseudomonas aeruginosa*) with contents (in %) – Peptic digest of animal tissue; 25 % gelatin; pH = 7.0-7.2.
3. Medium for defining of enterococci (esculin – bile agar).
4. Medium for defining of sulphite reducing bacteria (Iron Sulfite Modified Agar).

**Table 1. Parameters of Ordinance No. 9/2001, Official State Gazette, issue 30, and Decree No. 178/23.07.2004 regarding the quality of water intended for drinking and household purposes**

| Controlled parameter | Measuring unit | Maximum Limit Value |
|---|---|---|
| 1. pH | pH values | ≥ 6,5 and ≤ 9,5 |
| 2. Electrical conductivity | µS/L | 2000 |
| 3. Total hardness | mgekv. $.L^{-1}$ | 12 |
| 4. Color | Chromaticity Values | Acceptable |
| 5. Turbidity | FNU | Acceptable |
| 6. Permanent Oxidation | $mgO_2.L^{-1}$ | 5.0 |
| 7. Odour | force | Acceptable |
| 8. Calcium ($Ca^{2+}$) | $mg.L^{-1}$ | 150 |
| 9. Magnesium ($Mg^{2+}$) | $mg.L^{-1}$ | 80 |
| 10. Iron ($Fe^{2+}$)($Fe^{3+}$) | $\mu g.L^{-1}$ | 200 |
| 11. Manganese ($Mn^{2+}$) | $\mu g.L^{-1}$ | 50 |
| 12. Ammonium ion ($NH_4^+$) | $mg.L^{-1}$ | 0.50 |
| 13. Sulphates ($SO_4^{2-}$) | $mg.L^{-1}$ | 250 |
| 14. Phosphates ($PO_4^{3-}$) | $mg.L^{-1}$ | 0.5 |
| 15. Fluorides ($F^-$) | $mg.L^{-1}$ | 1.5 |
| 16. Nitrates ($NO_3^-$) | $mg.L^{-1}$ | 50 |
| 17. Nitrites ($NO_2^-$) | $mg.L^{-1}$ | 0.5 |
| **Additional parameters** | | |
| 18. Sodium ($Na^+$) | $mg.L^{-1}$ | 200 |
| 19. Potassium ($K^+$) | $mg.L^{-1}$ | - |
| 20. Hydrocarbonates ($HCO_3^-$) | $mg.L^{-1}$ | - |
| 21. Metasilicic acid ($H_2SiO_3^-$) | $mg.L^{-1}$ | - |
| 22. Hydrogen sulfide ($H_2S$) | $mg.L^{-1}$ | - |

5. Wilson-Blair medium (for defining of sulphite reducing spore forming anaerobes (*Clostridium perfringens*) with contents ($g.L^{-1}$) – 3% Nutrient agar; 100 mL 20% solution of $Na_2SO_3$; 50 mL 20% glucose solution; 10 mL 8% solution of $Fe_2SO_4$ [38,39].

## 2.3 Methods for Determination of Microbiological Indicators

1. Methods for evaluation of microbiological indicators according to Ordinance No. 9/2001, Official State Gazette, issue 30, and decree No. 178/23.07.2004 about the quality of water, intended for drinking purposes.
2. Method for determination of *Escherichia coli* and coliform bacteria – BDSEN ISO 9308-1: 2004;
3. Method for determination of enterococci – BDS EN ISO 7899-2;
4. Method for determination of sulphite reducing spore anaerobes – BDS EN 26461-2: 2004;
5. Method for determination of total number of aerobic and facultative anaerobic bacteria – BDS EN ISO 6222: 2002;
6. Method for determination of *Pseudomonas aeruginosa* – BDS EN ISO 16266: 2008.
7. Determination of coli – titre by fermentation method – Ginchev's method
   Determination of coli – bacteria over Endo's medium – membrane method.
8. Determination of sulphite reducing anaerobic bacteria (*Clostridium perfringens*) – membrane method.

The number of the isolated bacteria was presented in colony forming units per mL ($CFU.mL^{-1}$) of the tested waters [40-42].

## 2.4 Tables for Plates with Research Results of Mountain Springs

Plates with physico-chemical parameters and health properties are placed on the fountains of six mountain springs in Teteven Municipality. The results show that the tested water is suitable for drinking purposes according to Ordinance No. 9 /2001, Official State Gazette, issue 30, and decree No. 178 / 23.07.2004 about the quality of water, intended for drinking purposes. Research with health effects is performed using spectral methods NES and DNES [30-33]. Analyses for health influence are carried out with mathematical models of the water [43,44]. The mountain springs with information signs are "Dolnata Cheshma – The lower fountain", "Gornata Cheshma – The upper fountain", "Klindyovoto", and "Sondata" in Zlatishko-Tetevenska mountain. "Vejnitsa", "Babintsi" and "Borisova cheshma" and are in Vassiliovska mountain.

## 2.5 Survey

A survey was conducted regarding the event "Days of mountain water" in the Facebook group "Teteven Balkan". 66 people responded on a random basis.

# 3. RESULTS AND DISCUSSION

## 3.1 Physicochemical Composition and NES Spectral Analysis

Here is the information signs of "Vejnitsa" (Table 2) and "Borisova cheshma" (Table 3) mountain springs.

**Table 2. Physicochemical composition and NES spectral analysis of mountain spring "Vejnitsa"**

The water has a stimulating effect on the nervous system
Spectral analysis: Prof. Ignat Ignatov
Composition: Accredited laboratory "Eurotest control" JSC

| **Name of the indicator** | **Research result ($mg.L^{-1}$)** |
|---|---|
| Sodium (Na) | 2.3 |
| Potassium (K) | < 1.0 |
| Calcium (Ca) | 133.0 |
| Magnesium (Mg) | 7.9 |
| Iron (Fe) | < 1.0 $\mu g.L^{-1}$ |
| Manganese (Mn) | < 1.0 $\mu g.L^{-1}$ |
| Zinc (Zn) | < 0.001 |
| Sulphates ($SO_4$) | 13.8 |
| Chlorides (Cl) | 1.2 |
| Carbonates ($CO_3$) | < 12.0 |
| Hydrocarbons ($HCO_3$) | 408.0 |
| **Other values** | **Result** |
| Active reaction (pH) | 7.28 alkaline |
| Electrical conductivity | 692 µS/cm |

**Table 3. Physicochemical composition and NES spectral analysis of mountain spring "Borisova cheshma"**

The water has a relaxing effect on the nervous system
Spectral analysis: Prof. Ignat Ignatov
Composition: Accredited laboratory "Eurotest control" JSC

| **Name of the indicator** | **Research result (mg.L$^{-1}$)** |
|---|---|
| Sodium (Na) | 2.6 |
| Potassium (K) | < 1.0 |
| Calcium (Ca) | 65.0 |
| Magnesium (Mg) | 6.8 |
| Iron (Fe) | < 1.0 µg.L$^{-1}$ |
| Manganese (Mn) | < 1.0 µg.L$^{-1}$ |
| Zinc (Zn) | < 0.001 |
| Sulphates ($SO_4$) | 19.7 |
| Chlorides (Cl) | 1.1 |
| Carbonates ($CO_3$) | < 12.0 |
| Hydrocarbons ($HCO_3$) | 214.0 |
| **Other values** | **Result** |
| Active reaction (pH) | 7.54 alkaline |
| Electrical conductivity | 342 µS/cm |

## 3.2 Microbiological Parameters

### 3.2.1 Mountain Springs "Vejnitsa" and "Borisova cheshma"

Table 4 illustrates the microbiological parameters of examined mountain spring waters "Vejnitsa" in Teteven and "Borisova cheshma"

**Table 4. Microbiological parameters of examined mountain spring waters "Vejnitsa" in Teteven and "Borisova cheshma" in village of Ribaritsa, Munisipality of Teteven according to their microbiological indicators**

| Indicators | Measuring unit | Maximum limit value | Result Water from "Vejnitsa", t=16.7 °C | Result Water from "Borisova cheshma", t=15.5 °C |
|---|---|---|---|---|
| Coliforms | $CFU.mL^{-1}$ | 0/100 | 0/100 | 0/100 |
| *Escherichia coli* | $CFU.mL^{-1}$ | 0/100 | 0/100 | 0/100 |
| Enterococci | $CFU.mL^{-1}$ | 0/100 | 0/100 | 0/100 |
| Suphite-reducing anaerobes *(Clostridium perfringens)* | $CFU.mL^{-1}$ | 0/100 | 0/100 | 0/100 |
| *Pseudomonas aeruginosa* | $CFU.mL^{-1}$ | 0/250 | 0/250 | 0/250 |

## 3.3 Photos of mountain springs and fountains

The photos in Fig. 1 show fountains with mountain springs and information plates.

### 3.3.1 Zlatishko-Tetevenska Mountain, Teteven, Bulgaria




**Fig. 1. Mountain source "The lower fountain – Dolnata Cheshma"**




**Fig. 2. Mountain source "Klindiovo"**




**Fig. 3. Mountain source "Sondata"**




**Fig. 4. Mountain source "The upper fountain – Gornata Cheshma"**

### 3.3.2 Vasiliovska Mountain, Teteven, Bulgaria




**Fig. 5. Mountain source "Vejnitsa"**

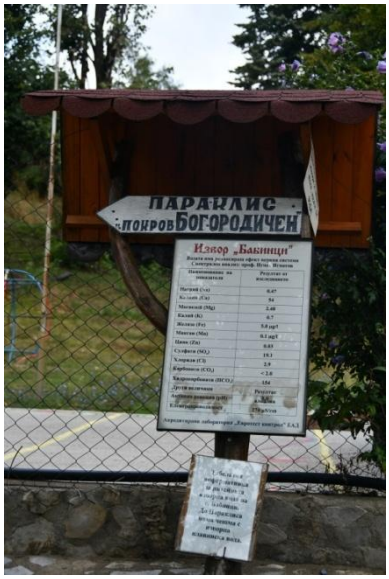



**Fig. 6. Mountain source "Babintsi"**



**Fig. 7. Mountain source "Borisova cheshma"**



**Fig. 8. Mountain source "Kalinovoto" as architecture achievement**



**Photos: Alexander Ignatov**

### 3.4 Survey Results

The survey included 12 questions:

1. What is your sex:
a/ Male – 45.5 %
b/ Female – 55.5 %
2. What is your education?
a/ Basic education
b/ Secondary education – 16.7 %
c/ Higher education – 83.3 %
3. Have you visited the Municipality of Teteven in the past?
a/ Yes – 93.9 %
b/ No – 6.1 %
4. What is the purpose of your visit?
a/ Ecotourism – 12.7 %
b/ Mountain tourism – 11.1 %
c/ Sport and recreation – 7.9 %
d/ Relaxation – 17.5 %
e/ Other – 50.8 %
5. Are you familiar with the event "Days of mountain water"?
a/ Yes – 87.9 %
b/ No – 12.1 %
6. How did you learn about the event?
a/ Internet – 13.8 %
b/ Media and television – 15.4 %
c/ Friends – 67.7 %
d/ Promotional material – 3.1 %
7. Did you visit the Municipality of Teteven because of the event "Days of mountain water?

a/ Yes – 35.9 %
b/ No – 64.1 %
8. As a result of the event "Days of mountain water", would you recommend Teteven as a tourist destination?
a/ Yes – 79.4 %
b/ No – 20.6 %
9. Did you find useful the information on the signs placed at mountain fountains?
a/ Yes – 90.5 %
b/ No
в/ I can't decide – 9.5 %
10. Did you change your attitude towards the water as a result of the event?
a/ Yes – 84.6 %
b/ No – 4.6 %
c/ I can't decide – 10.8 %
11. Do you consider mountain water as one of the main factors for health and longevity?
a/ Yes – 96.9 %
b/ No
c/ I can't decide – 3.1 %
12. Would you visit the event again?
a/ Yes – 92.3 %
b/ No
c/ I can't decide – 7.7 %

The survey carried out shows a high level of education of the participants in the event "Days of Mountain Water". 83.3 % have higher education, and 16.7 have secondary education. The participants are interested to learn more about the properties of mountain water, and its health benefits in a combination with mountain walks and clean mountain air. The participants like the mountain fountains as an achievement of Teteven craftsmen. 87.9 % are familiar with the event "Days of Mountain Water". Mostly interesting is that 67.7 % have learned about the event from friends. 15.4 % are informed about it from different media and television.

"Days of Mountain Water" has provoked 35.9 % to visit Teteven Municipality for the first time. Also high 79.4 % is the percentage of participants, who have recommended to others to visit Teteven Municipality after participation in the event. Plates with physico-chemical parameters and health properties are placed on the fountains of mountain springs in Teteven Municipality. 90.5 % of the respondents consider the information on the plates to be useful. As a result of the event 84.6 % have changed their attitude towards water. 96.9 % accept water as a factor for health and longevity. Excellent post evaluation of the usefulness of the event "Days of Mountain Water" is the readiness of 92.3 % of participants to visit it again.

The parameters of the research are connected with the quantitate analyses with physicochemical and microbiological parameters of mountain springs. The building of fountains of the places with waters, which are corresponding according to the Ordinance No. 9/2001, Official State Gazette, issue 30, and Decree No. 178/23.07.2004 regarding the quality of water intended for drinking and household purposes shows that the people 80-90 years ago have been able to select quality water empirically. The results from the survey illustrate that the modern people accept the culture with mountain water for a healthy manner of life and fountains for tourism.

## 4. CONCLUSIONS

Teteven Municipality is in Stara Planina with mountainous climate and water [44]. For hydration of human body it is important not only the amount of water intake [45], but the quality of water is essential [6] for health and recovery [46-48].

The event "Days of Mountain Water" is held in the Municipality of Teteven, Bulgaria since 2010. It is organized by Ignat Ignatov, Scientific Research Center of Medical Biophysics and Municipality of Teteven, Bulgaria.

The event "Days of Mountain Water" is connected with physicochemical and microbiological studies of mountain spring sources in Teteven, Municipality. The applied spectral method is „NES" by Antonov and co-authors [29-32]. The analyses show the optimum quantity among the minerals of Calcium ($Ca^{2+}$), Magnesium ($Mg^{2+}$), Potassium ($K^{+}$), Sodium ($Na^{+}$), Manganese ($Mn^{2+}$) and Zinc ($Zn^{2+}$) that provide the right balance in the human body for health and longevity.

The event "Days of Mountain Water" reflects the specifics of Teteven Balkan with variety of fountains with mountain water. They are combined with the beauties of Teteven mountain peaks. The survey carried out proves that the event is considered as useful. Many long-lived people inhabit Teteven Municipality. When interviewed, they describe the mountain water as very beneficial. They have spent many years in regular walks and work in Teteven Balkan. The held seminars for health and longevity provide the opportunity for many people to change their lifestyle. Hikes are organized for students on eco trails, and they are being acquainted with mountain springs. In the program of the participants in the event "Days of Mountain Water" are included tourist trips to fountains and landmarks in Teteven Balkan.

The results from the survey and analyses of mountain waters illustrate that the modern people accept the culture with mountain water for a healthy manner of life and fountains for tourism.

The analyses reveal that “Days of Mountain Water” is a useful event related to mountain tourism.

## COMPETING INTERESTS

Authors have declared that they have no known competing financial interests or non-financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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