



## Botanical Criterions of Quchan Baharkish pastureland in Khorasan Razavi Province, Iran

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**ABSTRACT:** Rangelands are natural ecosystems containing a range of resources of genetic reserves and numerous plant species and its evaluation has always been essential. However, biodiversity is one of the most important components of Habitat assessment and the identification and introduction of the flora of an area is one of the significant operations that can be used in order to optimize the utilization of the available natural resources. Baharkish rangeland is located at a distance of about 60 km south of the city of Quchan. The rangeland's average elevation is about 2069 m above sea level, with its lowest at 1740 m and highest at 2440m. Baharkish rangeland in over a ten year period has had the average annual rainfall of 337 mm and 998.2 mm evaporation as well as average annual temperature of 9.4°C, respectively. The results of the research conducted in the spring of 2014, showed that the total study area includes 22 species from 78 families with Poaceae, Asteraceae, Lamiaceae, Apiaceae, Brassicaceae, Caryophyllaceae and Papilionaceae being the dominant families with respectively 19, 15, 12, 9, 8, 7, and 5 frequencies. Classification of biological Form according to Raunkiaer method showed the dominance of the hemicryptophytes with the greatest frequency (42%), followed by Therophytes, Chamaephytes, Cryptophyte, and Phanerophytes with 30%, 15%, 8% and 5% of species are the dominant life forms of the area. In terms of geographical distribution, the Iran-Turanian plant species with the frequency of 63% obtained the maximum value.

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**Keywords:** Biological Form, Flora, Geographical distribution, plant vegetation, Raunkiaer.

Due to the importance of the subject in Iran, a lot of studies have been conducted on the flora and species composition in different regions of the country, all of which centralized on the preparation and measurement of the floristic list (number of species) and plant cover structure in terms of family and bioforms. Study on vegetation has been useful in the resolution of ecological problems such as biological conservation and natural resource management. Based on the results, future changes can be predicted. Moreover, the understanding of herbal elements contained in one area is considered as the underlying principle for other researches. Iran, due to its remarkable climatic variations, is confronted with different ecosystems each having specific characteristics and different inter-relationships. Recognizing the immense resources and understanding the relationships between plants and factors affecting them, are important in order to maintain the consistency and stability of this part of the national wealth. In the case of shrubs and their impact on the community, it suffices to note their role in the expansion of production in the community, providing the possibility to use rangelands multi-purposely, and increasing ecological stability (Koocheki et al., 2008). (Mousavi, 2004) in a floristic study in Khanchay Tarom watershed in Zanjan came

to the conclusion that 71 percent of plants belonged to the Iranian-Turanian region. Among the life forms Hemicryptophytes and Therophytes respectively had accounted for the highest percentages. (Ashrafi et al., 2004) by the assessment of the flora in Varamin region identified 202 plant species, in which Iran-Turanian plants showed the highest distribution. (Kashipazha et al., 2004) by studying the the flora of Bagheshad found that 85.29% of the species belonged to the Iran – Turanian region. In the assessment of life-forms, they concluded that Hemicryptophytes and Therophytes were the most frequent life forms of the region. A great deal of previous research could be found on vegetation studies in different climates and locations which testify to the significance of this research, among which the readers are kindly referred to (Atashgahi et al., 2004; Dolatkahi et al., 2011; Tovichi, 2011; Dolatkahi et al., 2011; Kazemian et al., 2004; Gholami et al., 2006; Ghollassi Mood et al., 2006; Memarian et al., 2009; Dinarvand et al., 2015).

On account of the importance of the botany in different sciences such as agriculture, biology and pharmacy, with careful and thorough identification of the flora, this study set out to evaluate vegetation characteristics in Baharkish rangeland which is

important in terms of medicine plants and forage production for a large part of the livestock in Khorasan Razavi Province for the first time. These studies are important for accessing specific plant species in a certain time and location, determination of rangeland's potential vegetation growth, the possibility of increasing vegetation density, identification of resistant, threatened or endangered species, determining the country's vegetation, the possibility of achieving new plant species, and identification of destructive factors for vegetation cover of the given area. The aim of this study is to provide basic floristic information to identify plant species for preservation, restoration and development of Quchan Baharkish Pastureland in Khorasan Razavi Province, IRAN.

## MATERIALS AND METHODS

**Geographical location and climatic conditions of the region:** Baharkish rangeland lies between 58 40 and 58 36 E and 39 44 and 36 42 N, 60 Km away from south Quchan and the central part of Doghaei rural district, with an area of 1035 ha (Figure 1). The average height of the area is about 2069 meters above sea level (with minimum of 1740 m maximum of 2440 m). To undertake this study, an area of approximately 200 ha was selected in Baharkish rangeland with average grazing intensity with cutting and weighting method was choiced (Mesdaghi, 2003), proper species richness and diversity.

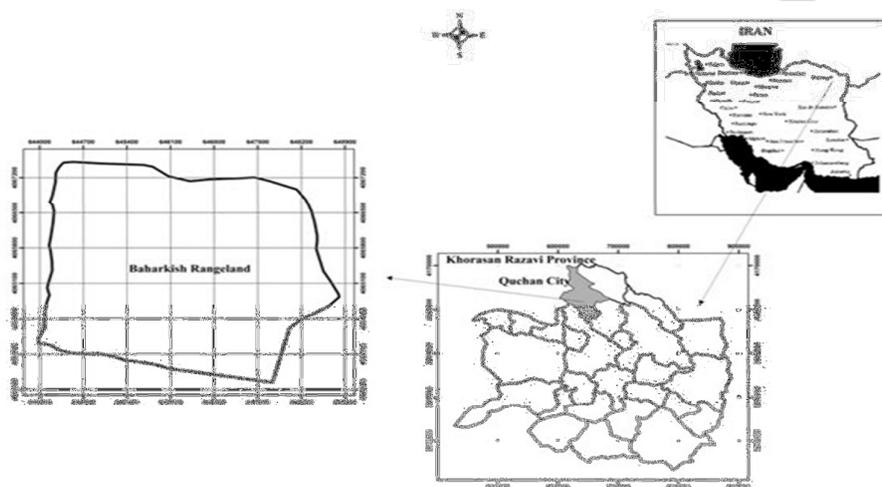


Fig. 1- Location of Baharkish rangeland in Quchan, Khorasan Razavi Province, IRAN

According to the long-term climate data from synoptic stations of Quchan city (data record from 25 years period in Evaporation measuring station of Aryeh and rain gauge station of Akhlamad), average annual precipitation and annual evaporation were estimated at 337 mm and 998.2 mm, respectively. Average annual temperature is 9.4°C with the lowest

and highest monthly values in January as well as July and August. Figure 2 shows the Ombrothermic diagram of Baharkish pasture. It can be seen that the dry period in Baharkish pasture is about 5 months, which starts from mid-May until late October (Annual report meteorological organization, 2013; Ministry of energy, 2013).

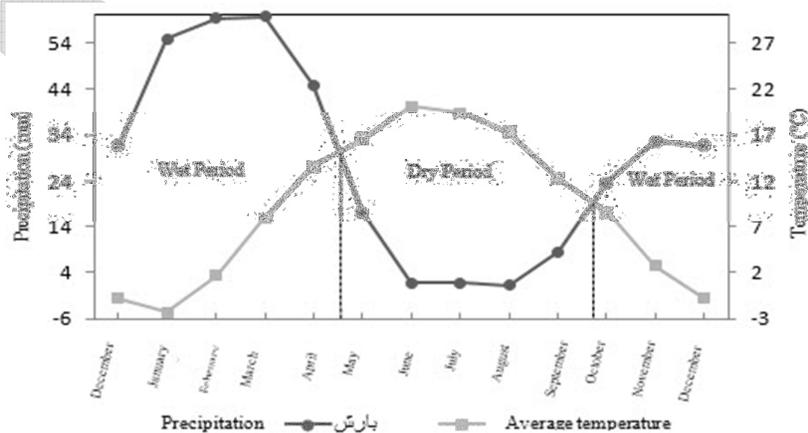


Fig. 2- Ambrothermic curve of Baharkish rangeland based on long-term climatic data

**Sampling Method:** All maps (topographic map in the scale of 1:25000; geological map in the scale of 1:100000; Aerial photos in the scale of 1:20,000; and satellite images related to Baharkish rangeland in Quchan) were superimposed on four maps of slope gradient, aspect, hypsometry, and geological formations in the GIS software Arcmap 10.2 software environment, to produce working unit map, and 13 working units were determined. During the field surveys and vegetation sampling that took place in spring 2014 a total of 10 plots were placed randomly systematically in each unit. Plots with 2 square meters were used for vegetation sampling according to the Minimal area method (Aghaalikhani & Qushchi, 2005). The number of plots in each working unit. Parameters of cover, and number of plant species were determined for every plant species in each plot. Plot positions were also recorded using GPS in the U.T.M (Universal Transverse Mercator) Coordination system.

**Identification of Life form and chorology of plant species:** During the field surveys in the spring of 2014, plants were collected, and dried using newspaper under pressure and then transferred to the Herbarium of the Ferdowsi University of Mashhad for further identification. This stage was accomplished according to the available resources and conventional methods using identification keys. (Rechinger, 1967-1998; Townsend & Guest, 1966-1985; Zohary, 1966-1972; Davis, 1965-1988; Boissier, 1867-1888; Komarov, 1934-1954; Assadi et al., 1988-2011; Ghahreman, 1979-1992; Maassoumi, 1986-2000; Ghahreman, 1994; Mobayen, 1975-1996; Mozaffarian, 2003 & Mozaffarian, 2005). Classification of plant life forms was performed

based on the Raunkiaer (1934) system. In this system, plants are classified into five categories of phanerophytes, Chamaephytes, Hemicryptophytes, Geophytes and Therophytes. In addition, the geographical distribution of plants were obtained following (Léonard, 1988), (Zohary, 1963-1973), and (Takhtajan, 1986).

## RESULTS AND DISCUSSION

The floristic study in baharkish rangelands resulted in the identification of 22 families and 78 species. These families include poaceae (19), Asteraceae (15), Lamiaceae (12), Brassicaceae (9), Apiaceae (8), Papilionaceae (7), and Caryophyllaceae (5). Hemicryptophytes represent the most frequent life form in the area, with the Phanerophytes as the least frequent life form. Roughly 42% of the plant species are hemicryptophytes, 30% Therophytes, 15% Chamaephytes, and 8% Cryptophytes, and 5% Phanerophytes. In terms of geographical distribution, 63% of the plant species belong to the Iran-Turanian geographical growth form, while other species could be found in other vegetation growth areas throughout the country. Based on the findings of this study, 78 plant species have been identified which have formed different plant communities in response to their ecological requirements and applied managements over the years. Flora of a given area develops as the result of the interactions in the vegetation community and their reactions to the environmental parameters during eras. The study area here, given its vast expansion, ecosystem diversity and appropriate climatic condition, enjoys high floristic diversity which per se demands extensive and detailed studies to identify plant species (table 1).

**Table 1-** List of scientific names of species, life forms and geographical distribution of plants in Baharkish rangeland Quchan

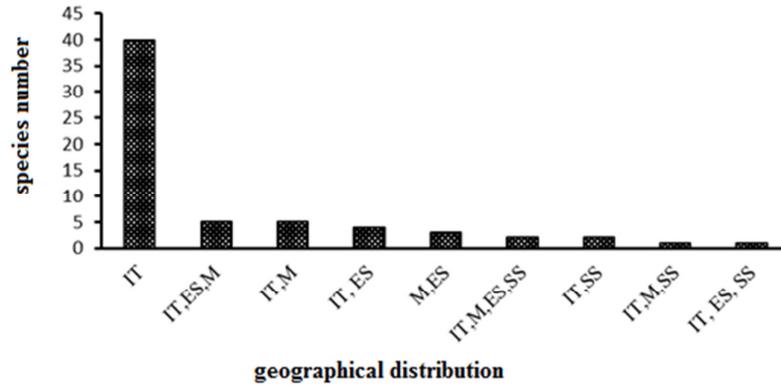
Scientific name	Plant family	Life forms	Chorology
<i>Acantholimon khorassanicum</i>	Caryophyllaceae	Ch	IT(End)
<i>Acanthophyllum bracteatum</i>	Caryophyllaceae	Ch	IT
<i>Acroptilon repense</i>	Asteraceae	He	IT
<i>Aeluropus litoralis</i>	Poaceae	He	IT
<i>Agropyron trichophorum</i>	Poaceae	He	IT
<i>Allium. xipinopetalium</i>	Alliaceae	Cr	IT, ES, SS
<i>Alyssum linifolium</i>	Brassicaceae	Th	IT, M
<i>Anchusa ovata</i>	Boraginaceae	He	IT, ES
<i>Arrhenatherum kotschi</i>	Poaceae	Ge	IT
<i>Artemisa. aucheri</i>	Asteraceae	Ch	IT
<i>Artemisia khorassanica</i>	Asteraceae	Ch	IT
<i>Asperula glomerata</i>	Rubiaceae	Th	IT,M
<i>Astragalus podolobus</i>	Papilionaceae	Ch	IT
<i>Astragalus heratensis</i>	Papilionaceae	Ch	IT
<i>Atraphaxis. spinosa</i>	Polygonaceae	Ph	IT
<i>Avena fatua</i>	Poaceae	Th	IT,M
<i>Boissiera squarosa</i>	Poaceae	Th	IT
<i>Brassica. napus</i>	Brassicaceae	Th	IT,M
<i>Bromus tectorum L.</i>	Poaceae	Th	Cosm
<i>Bupleurum exaltatum</i>	Poaceae	Th	IT
<i>Carex stenophylla</i>	Cyperaceae	He	Cosm
<i>Carthamus lanatus</i>	Brassicaceae	Th	IT
<i>Ceratocarpus arenarius</i>	Chenopodiaceae	Th	IT

<i>Cirsium lntybus</i>	Asteraceae	He	ES, M
<i>Colutea buhsei</i>	Papilionaceae	Ph	IT (End)
<i>Convolvulus arvensis</i>	Convolvulaceae	Th	IT, M
<i>Cotoneaster Ovata</i>	Rosaceae	Ph	IT (End)
<i>Cousinia eryngiodes</i>	Asteraceae	Th	IT (End)
<i>Crambe kotschyana</i>	Brassicaceae	He	IT
<i>Dactylis glomerata</i>	Poaceae	He	IT, M, ES
<i>Dianthus orientalis</i>	Caryophyllaceae	Ch	IT
<i>Dorema amoniacum</i>	Apiaceae	He	IT
<i>Echinops ritrodes</i>	Asteraceae	He	IT
<i>Ephedra major</i>	Ephedraceae	Ph	IT
<i>Ephorbia aucheri</i>	Apiaceae	Th	IT, M
<i>Eremurus luteus</i>	Liliaceae	Ge	IT (End)
<i>Eruca sativa</i>	Brassicaceae	Th	IT, M, ES
<i>Eryngium caucasicum</i>	Apiaceae	He	IT
<i>Erysinum latifolium</i>	Brassicaceae	He	ES, M
<i>Eurotia ceratoides</i>	Chenopodiaceae	Ch	IT
<i>Ferula ovina</i>	Apiaceae	He	IT
<i>Festuca ovina</i>	Poaceae	He	IT, M
<i>Glycyrrhiza glabra</i>	Fabaceae	He	IT, M
<i>Gundelia tournefortii</i>	Asteraceae	He	IT, M
<i>Heliotropium khorassanicum</i>	Boraginaceae	Th	IT, M, ES
<i>Hordeum bulbosum L.</i>	Poaceae	Cr	IT, M
<i>Lagochilus cabulicus</i>	Lamiaceae	Ch	IT
<i>Linaria lineolata</i>	Rutaceae	He	IT
<i>Malcolmia strigosa</i>	Brassicaceae	Th	IT, M, SS
<i>Medicago rigidula</i>	Papilionaceae	Th	IT, ES
<i>Melica persica Kunth</i>	Poaceae	Cr	IT, ES, M, SS
<i>Nepeta praectata</i>	Lamiaceae	He	IT
<i>Noea mucronata</i>	Capparidaceae	He	IT
<i>Nonnea caspica</i>	Boraginaceae	He	IT
<i>Onopordon leptolepis</i>	Asteraceae	He	IT, SS
<i>Perovskia abratanoides</i>	Lamiaceae	He	IT, ES
<i>Phalaris minor</i>	Poaceae	Th	IT, M
<i>Phlomis concellata</i>	Lamiaceae	He	IT
<i>Pimpinella tragium</i>	Apiaceae	He	IT
<i>Plantago major</i>	Plantaginaceae	Th	M, ES
<i>Poa bulbosa</i>	Poaceae	Ge	IT, M, ES, SS
<i>Prangos latiliba</i>	Apiaceae	He	IT (End)
<i>Reseda aucheri</i>	Resedaceae	Th	IT, SS
<i>Salvia limbata</i>	Lamiaceae	He	IT
<i>Sanguisorba minor</i>	Rosaceae	He	IT, M, ES
<i>Scariola orientalis</i>	Asteraceae	He	IT
<i>Serratula latifoli</i>	Lamiaceae	Cr	IT
<i>Silene chaetodonta</i>	Caryophyllaceae	He	IT
<i>Stachys lavendulifolia</i>	Lamiaceae	He	IT
<i>Stipa barbata</i>	Poaceae	He	IT
<i>Thymus transcaspicus</i>	Lamiaceae	Cr	IT
<i>Trifolium repens</i>	Papilionaceae	He	IT, ES
<i>Trigonella monantha</i>	Papilionaceae	Th	IT, ES, M
<i>Teucrium polium</i>	Lamiaceae	He	IT, M
<i>Verbascum agrimonifolium</i>	Scrophulariaceae	He	IT
<i>Veronica khorassanica</i>	Scrophulariaceae	He	IT
<i>Vulpia persica</i>	Poaceae	Ch	IT

Ph: Phanerophyte, Cr: Cryptophyte, Ch: Chamaephyte, Th: Therophyte, He: Hemicryptophyte  
 ES: Europe-Siberian, IT: Iran-Turan, M: Mediterranean, Cosm: Cosmopolite (cosmopolitan), SS: Sahara-Sandy

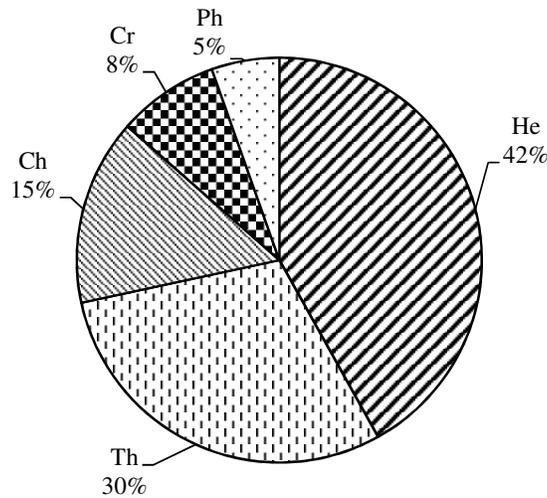
There have been identified 22 families and 78 plant species in the floristic list for the area. On account of geographical distribution (Figure 3), identified plants

could be categorized in Iran-Turanian with 63% (greatest proportion); Iran-Turan-Mediterranean with 8%; Iran-Turan-Mediterranean and Euro-Siberian with 8%; Iran-Turanian and Euro-Siberian with 6%; Mediterranean and Euro-Siberian with 5%; Iran-Turanian, Sahara-Sendian and Iran-Turanina and Euro-Siberian with 3%; plants with global distribution with 3%; Iran-Turanian, Euro-Siberian and Sahara-Sendian with 2% of the total area.



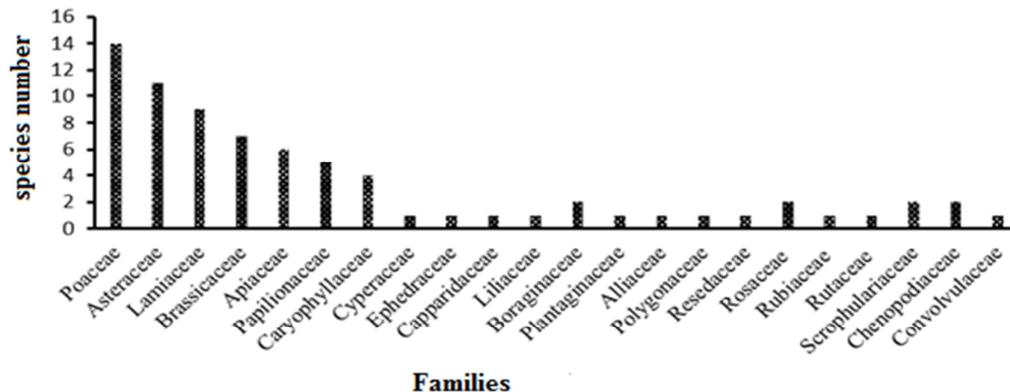
**Fig. 3-** Frequency of geographical distribution of plants in Baharkish rangeland  
 ES: Europe-Siberian, IT: Iran-Turan, M: Mediterranean, Cosm: Cosmopolite (cosmopolitan), SS: Sahara-Sandy

Classification of vegetation types according to the (Raunkiaer, 1934) showed that Hemicryptophytes plants accounted for the largest share with 42%, followed by Therophytes 30%, Chamaephytes 15%, Cryptophytes 8% and phanerophytes 5% (Figure 4).



**Fig. 4-** The relative percentage of plant life forms in Baharkish rangeland

From the 78 species identified, 22 families were prevalent in the study area, including Poaceae with 19%, Asteraceae 12%, Lamiaceae 15%, Brassicaceae 9%, Apiaceae 8%, Papilionaceae 7% and Caryophyllacea 5%, (Figure 5).



**Fig. 5-** Frequency distribution of plant species from different families in Baharkish rangeland

Actual floristic composition of a vegetation community forms in response to different environmental conditions and vegetation's reactions based on its ecological potential. The flora of Baharkish rangeland in Quchan has been firstly evaluated in this study and 78 species from 22 families have been identified.

Existence of 78 plant species reflects high species richness in the area. Here, there are remarkable differences in terms of precipitation, temperature, and other climatic parameters. This remarkable variation has resulted in current species richness, since climatic, edaphic, and topographic factors are the major influencers for vegetation cover in different natural domains (Moghadam, 2005; Baghestani Meibodi, 1997). The study of vegetation and geographical distribution of different plant species could help identify the area's ecological potential from different aspects, and yet is an influential factor in the assessment of status quo and future condition, and hence it could inform a better management. Baharkish rangeland is located in the southern boundaries of Quchan urban district, and in the central parts of the Doghaei rural district. Given the 22 families identified, current study has shown that Poaceae with 19% and Asteraceae with 15% are the dominant plant families in the area. These families, at the same time, constitute a major share of plant communities in Iran. Studies conducted by (Naghypour Bourj et al., 2011) on the floristic condition of desert rangeland in arid parts of Iran has showed the relative dominance of these two families. The presence of Asteraceae could be regarded as an alarm, threatening the destruction of vegetation cover in the area. (Mehrnia et al., 2014) by applying the Raunkiaer life form assessment method showed the important share of the Hemicryptophytes. In this regard, (Archibold, 1995) relates the existence of Hemicryptophytes to the cold and mountainous climate the area which could partly explain the dominance of this life form in Baharkish rangeland. (Zarezade et al., 2007) also found that Hemicryptophytes shape a large part of life forms in Damghan rangelands in Yaz Province. In terms of geographical distribution, Iran-Turanian region with 63% had the largest proportion. (Javanshir, 1980) believed that geographical distribution of a plant community reflects the influence of different vegetation growth areas. (Sabeti, 1993) argued that the prevalence of Iran-Turanian plant species provides the ground to conclude that the vegetation of interest belongs to the corresponding vegetation growth area. The low proportions of other plant species of other growth areas is due to the large distance between these areas and the fact that Iran-Turanian area originates from the central plateau of Iran. Given the chorological study, Iran-Turanian vegetation forms the largest proportion (Habibi et al., 2013) which is consistent with the findings of

(Vaseghi et al., 2008). In the latter study on the life-forms and geographical distribution of plant species in the highlands of Kalat-Zirjan, Gonaban, it was shown the prevalence of Therophytes and Hemicryptophytes life forms and Iran-Turanian vegetation growth area.

*Conclusion:* Iran with a wide diversity of topography, geology and climate conditions is considered as one of the most important areas in terms of plant diversity and speciation. In general, the study results showed that Baharkish region has a rich flora of pasture, medicinal and industrial plants. Most of these plants are very important in terms of health benefits. The domestication of these plants can not only eliminate the pharmaceutical industry's need for natural active ingredients, but can also reduce the risk of extinction by decreasing the utilization pressure.

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