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Physicochemical Characterization of Geophytes Soil Habits in Sidi Bel Abbes area (Algeria, NW)

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ABSTRACT

Geophytes are plant which survive periods of environmental stress such as summer drought or winter cold by dying back to these underground storage organs (bulbs, corms, tubers or rhizomes). the present study concern the characterization of physicochemical parameters of soil habitats when grow geophytes species common in Tessala mountains, we have characterized the physicochemical parameters of the soil habitat of this plant like Texture, structure, pH, Conductivity, limestone, organic matter and moisture.
Our results show that soils are characterized by sandy loam predominance texture, highly rich in organic matter, Low humidity, slightly alkaline pH, with medium strongly calcareous soils.
Our study is important for the conservation of natural habitats of geophytes of Tessala Mountain.
KEYWORDS: Geophytes, Tessala Mountain, Soil, conservation.

INTRODUCTION

geophytes have high diversity in the Mediterranean-type ecosystems, where they are considered as most common in seasonal climates [1, 2.]. These species are evergreen, many of them survive periods of environmental stress such as summer drought or winter cold by dying back to these underground storage organs (bulbs, corms, tubers or rhizomes)[3]. The leaves of these plants die annually. Then they sprout new foliage in the following growing season. Inflorescences may be produced before, during or at the end of the vegetative growing season, a phenology that is constant for most species. The economic value of these species is attributed to collection and exporting their natural bulbs as ornamental plants. In addition, geophytes are used in medicine and food industry[4].
Biogeographically, geophytes are wide spread around the world in many habitats, but nowhere are they more diverse and abundant than in the five Mediterranean-climate ecosystems of the world [5], [6]. In fact, Different studies have focused on the potential area of distribution of forest species. A survey of the ecology of wood species with physiographic, climatic and soil parameters has been trained as a research line in the Mediterranean area [7, 8].
The aim of this study is to characterize the soil habits of geophytes which grow in the Mountain of Tessala (Algeria, NW).

MATERIALS AND METHODS

Study area

Tessala Mountain is located in the western of Algeria (Figure 1), the elevation ranges from 500 to 1000 m above sea evel, reaching 1061m at Djebel Tessala. The geology is dominated with Eocene marls. The whole study area belongs to the *Pinus halepensis* L. formations [8]. The Tessala Mountain receive around 400 mm/yr of rain. The pluviometrical minimum is recorded in July, while the maximum occurs in February. The season al regime of rain is typical of the sub-littoral Mediterranean climate. The relative atmospheric humidity at 13h.00 in July is about 50% on the northern slopes and 40% in the southern slopes. The duration of the dry season is on average 6 months, it covers the last week of April until the beginning of the second decade of October. The index of aridity in our region is estimated at 12.73 and determines a semi-arid Mediterranean type climate [7, 8].

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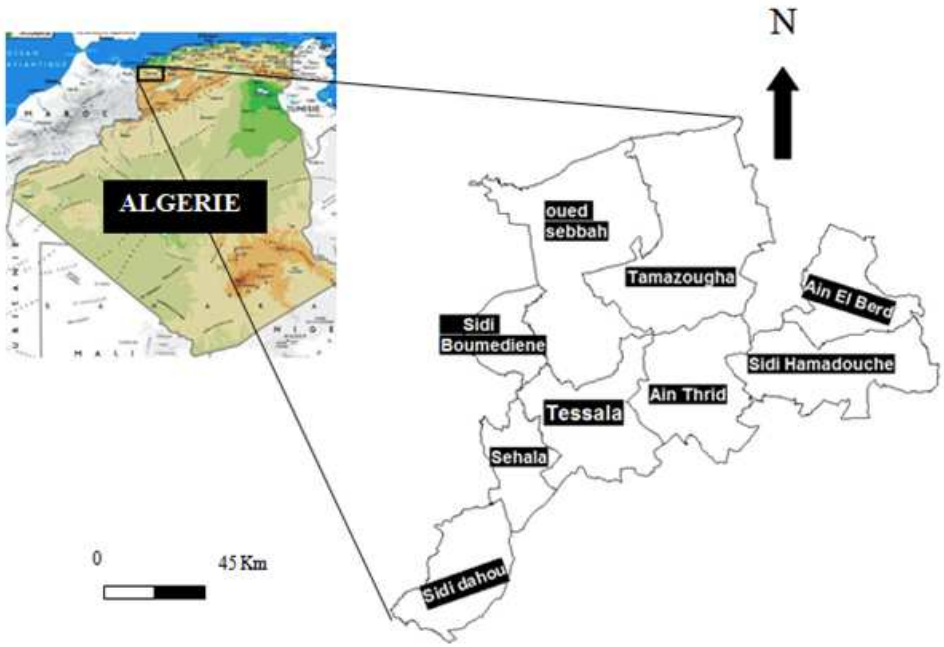

Figure 1 - The localization of Tessala Mountain [9].

Sampling method

Seven station were selected in two exposure (North and south) of Tessala Mountain depending on the presence of geophytes species (Table 1). We have taken a sample of soil with the deep from 8 to 30 cm.

TABLE 1 - Geographic situation of different stations

	Geographic coordinates	Altitude (m)	Exposition
Station 1	N : 35015,9240 W : 000046,1900	735	South-East
Station 2	N : 35016,1770 W : 000046,2270	841	South-East
Station 3	N : 35016,3880 W : 000046,7690	1042	South-East
Station 4	N : 35016,0880 W :000046,8050	908	South
Station 5	N : 35016,1300 W : 000045,9260	787	South-East
Station 6	N : 35016,7610 W : 000046,1830	849	North
Station 7	N : 35015,9790 W : 000045,9570	774	South

Physicochemical analyzes of soil

The texture of the soil is indicated by its size analysis. Its principle is based on the rate of sedimentation of dispersed particles and separated by destruction of their cement (lime and organic matter), percentages of clay, silt and sand. Determination of total limestone $CaCO_3$ characterized based on the reaction of calcium carbonate ($CaCO_3$) with hydrochloric acid (HCl), the total dosage of the lime stone is carried out using the calcimeter [10]. The dose of active lime is carried out with a specific reagent (ammonium oxalate), which drives a fraction only of the total limestone.

The carbon in the organic material is oxidized by potassium dichromate in the presence of sulfuric acid. By recognizing of the total required for this dichromate oxidation, one can work out the percent of organic C in soil humus [10]

For pH, the rule is to measure the electromotive force of an aqueous solution of stain (water/land ratio) using a pH meter. The electrical conductivity is measure a conductivity meter according to the absorption of electrolytes in the aqueous extraction solution [10].

For moisture subjecting a sample of fine soil, saturated with water is measured by weighing before and after drying in the shield for one month the stabilization of the soil weight [10].

RESULT

From the observed results of physicochemical parameters characterize the surface horizon of the soil habitat of geophytes in the studied seven stations ; we found the following results :

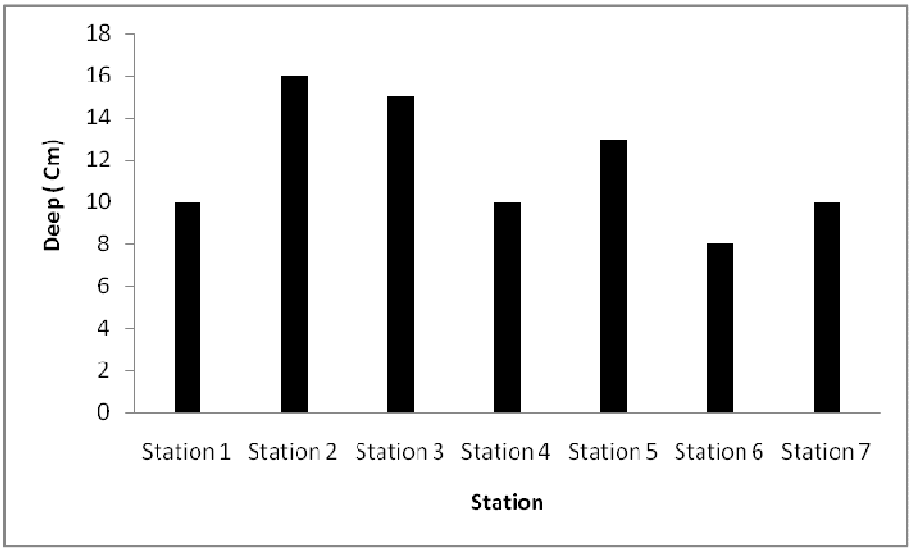

Figure 2 - Deeps values of the soil of different stations which characterize the geophytes habitats of Tessala Mountain

Results of soil deep high light differentials characters between studied stations thus 1, 4, 6, 7 station present a low deep determinant surface soil show ever station 2 and 3 present soils more deeper.

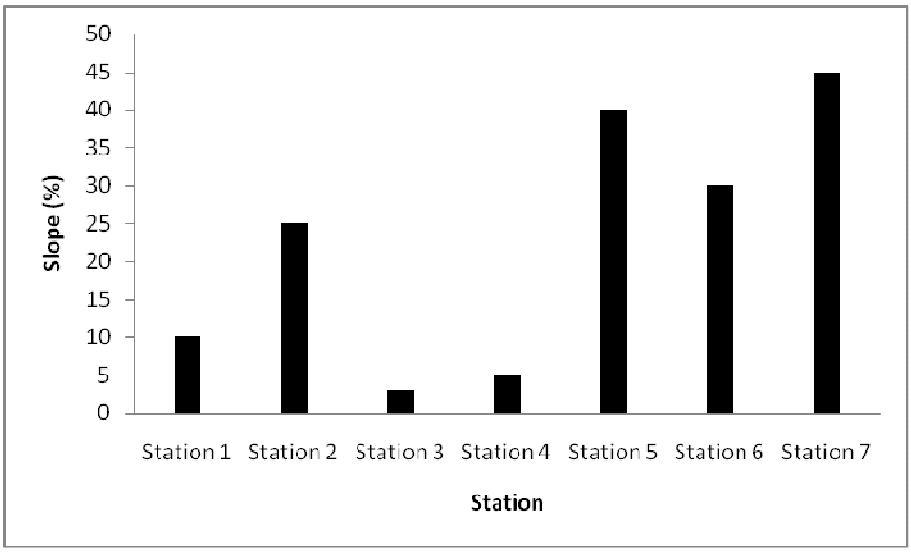

Figure3 - Slope percentage of the soil of different stations which characterize the geophytes habitats of Tessala Mountain

Slopes change between stations, were mark stations that has low slope for 1, 2, 3, 4 stations from 3 to 25%, high slopes of 30 to 45% characterize 5, 6 and 7 station.

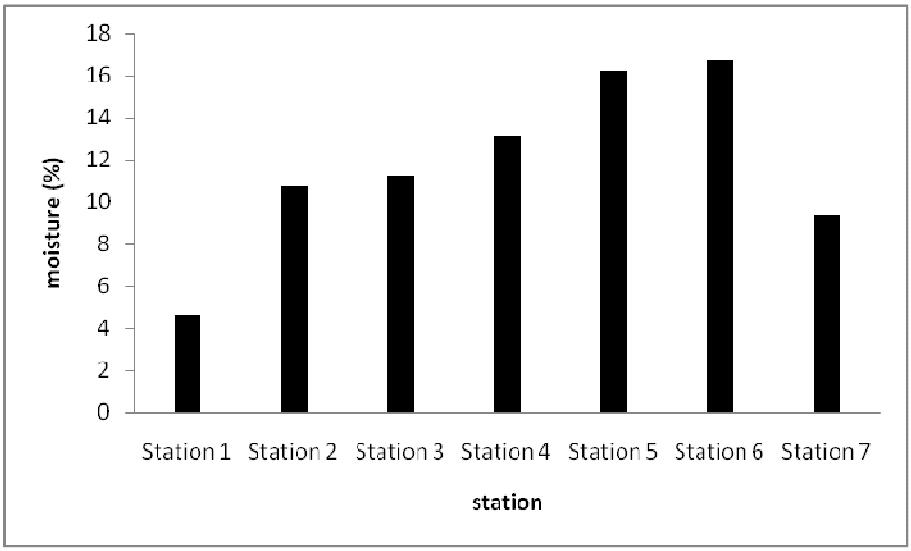

Figure 4 - Moisture percentage of the soil of different stations which characterize the geophytes habitats of Tessala Mountain

Moisture rate change between different station, the low value characterize Station 1 (4.6%) and the highest value (16.75%) characterize the station 6 in the north side.

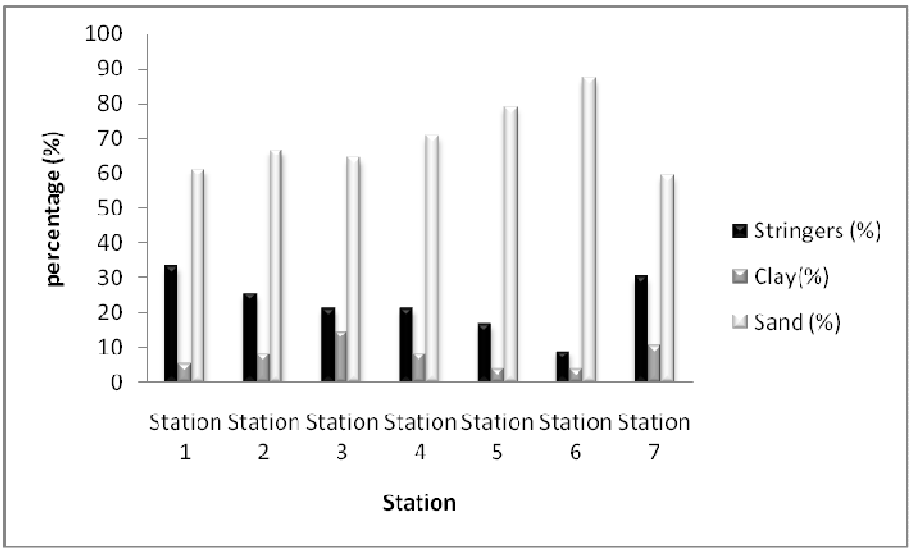

Figure 5 - Stringers, clay and sand percentages of the soil of different stations which characterize the geophytes habitats of Tessala Mountain

The abundant element is the sand with 61.08% of values, 66.54%, 64.28%, 70.55%, 79.07%, 87 23%, 59.3% for stations 1,2,3,4,5,6 and 7 for stringers station 1 present the high value with 33.45% Regarding to soil texture, the stations (1, 2, 4, 5, 7) present sandy-loamy, a silty-sandy resort characterize Station 3 and a sandy resort characterize Station 6.

The color of the soil samples change from dark brown (Station 4 and 5), Brown (Station 2, 3 and 7) and yellow for Station 6.

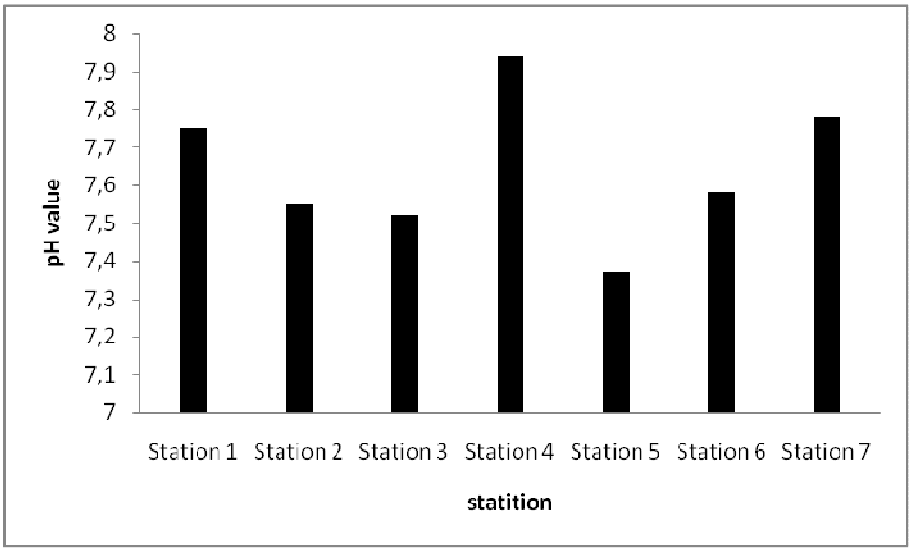

Figure 6 - pH values of the soil of different stations which characterize the geophytes habitats of Tessala Mountain

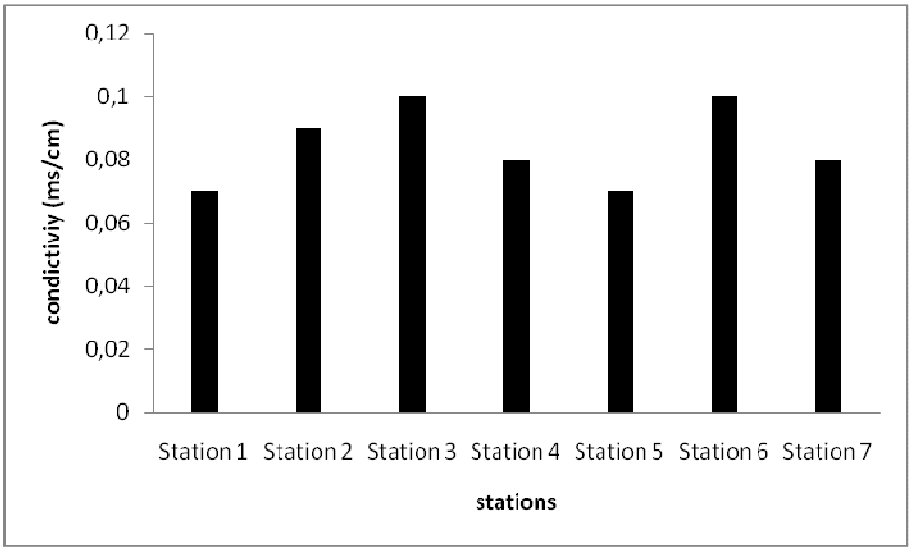

Figure 7 - Conductivity values of the soil of different stations which characterize the geophytes habitats of Tessala Mountain

Electric conductivity results obtained show unsalted soils (C.E< 0,6ms / cm) because all the stations characterize by 0.07 to 0.1 ms / cm values. pH value are an average alkaline, the important value characterize station 4 with 7.94.

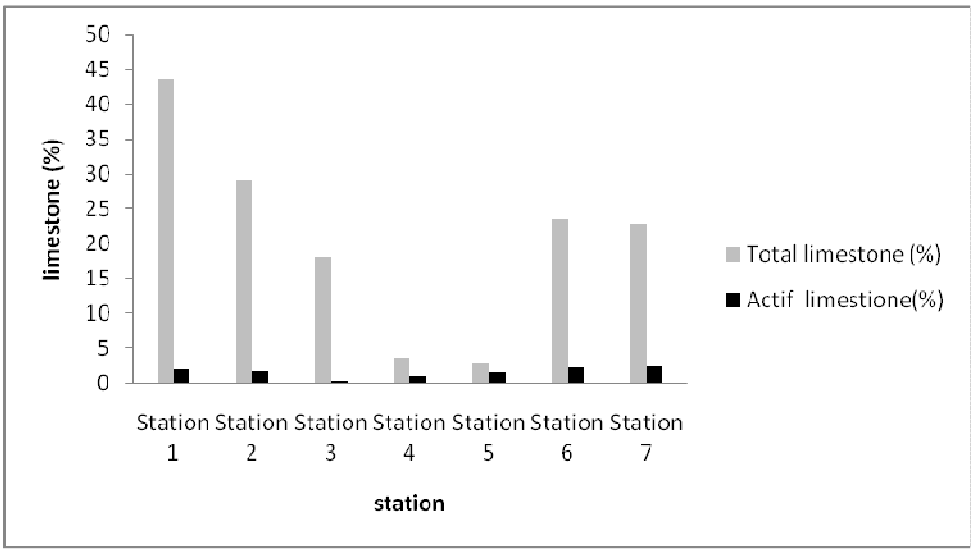

Figure 8 - Total and active limestone percentages of the soil of different stations which characterize the geophytes habitats of Tessala Mountain

Total limestone rate change between 2.72% to 43.63% with slightly Station 4 and 5 characterize a chalky soil with 3.63% and 2.72%. A station 3, 7, 6, 2 and 1 have strongly moderately limestone with 18, 18%, 22.9%, 23.63%, 29.09%, 43.63%

The contents of active lime displays maximum values of 2.37% for the station7 and station 3 has a minimum rate (0.37%).

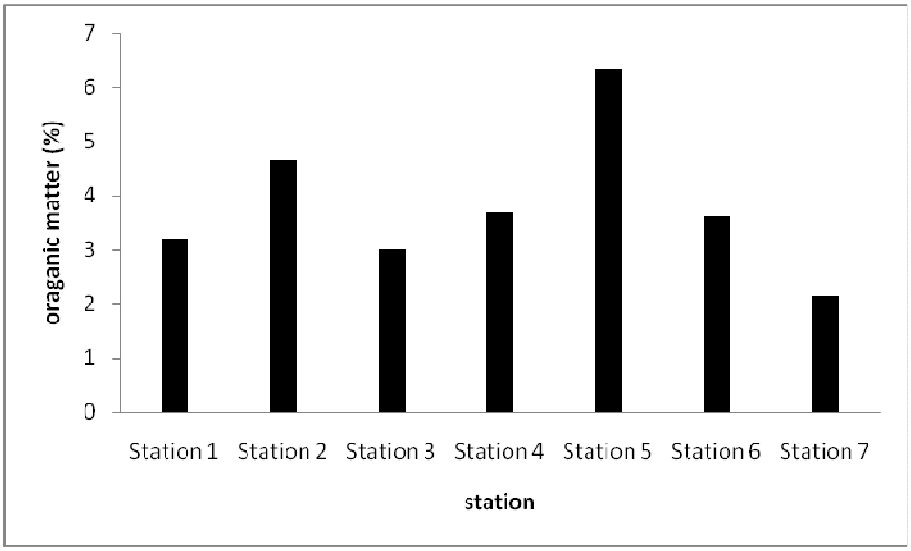

Figure 9 - Organic matter values of the soil of different stations which characterize the geophytes habitats of Tessala Mountain

The projection of the results of the organic matter content is important in Station 2 and 5 with values of 4.67% and 6.33%. For remaining stations (1, 3, 4, 6 and 7), the soil is moderately rich in organic matter with a percentage between 2.15% to 3.69%.

DISCUSSION

Physicochemical analysis of geophytes soil profiles of Tessala Mountain highlights that soil colors studied of different stations are heterogeneous and change from yellow color to brown and dark brown. these results are confirmed by another studies in the region [11]. This diversity of soil colors due to the nature of the rock, the

complex mechanisms of pedogenesis in the Mediterranean area, the nature and rate of organic matter, accumulation or not of salts, iron and their localization [12].
The humidity is higher in the North slope station (Station 6) then the south side, we can explain that by the exposure North slope to humid winds coming from the sea, which favors the increase of the water in the soil, while the south side is exposed to the sun and warm winds, resulting in evaporation of moisture [13], thus The moisture content in fact depends on the type of soil, its richness in organic matter, and the period of the sampling location [12].
Regarding to the texture, we noticed that the sandy-loam texture and the silty-sandy texture predominate. These two textures are typical of soils in the study site,
Determined mainly by the nature of the original soil material and soil environmental properties [13].
The pH is slightly basic in most soil samples, the pH is not a stable characteristic of the floor, but it is dependent on different cations absorbed also by the nature of the plant cover and climatic conditions [11].
The organic matter is very variable (medium to strong). Depending on the position of the stations, the amount of the high organic matter recorded in a station depends on the age and vegetation type, but also the abundance of coarse elements [11]. The form of organic matter change due to the diversity and richness of vegetation cover, weather conditions and the nature of the substrate [14].
the total and actif limestone content present in the soil samples are very heterogeneous where we support slightly calcareous soils, low calcareous, moderately calcareous and finally highly calcareous soils which depend to the rock nature. This explains one of the major causes of installation of scrubland from degradation of Mediterranean forest formations [11],

CONCLUSION

The study of geophytes in Tessala Mountain highlights the characteristic of soil habitats of these species. We noted that geophytes at Tessala Mountain of our study are grown at altitudes between 735 and 1042 m, with an important division in the southern slope from north slope, with sandy loam predominance texture, highly rich in organic matter, Low humidity, slightly alkaline pH, with medium strongly calcareous soils.
Finally, geophytes have high diversity in the ecosystems and are used for various economic ornamental plants, medicine and food. Therefore, the conservation of natural habitats of Tessala Mountain is important as well as the need for judicious utilization and sustainable development.

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