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THE GENUS *GUENTHERA* ANDR. IN BESS. (BRASSICACEAE, BRASSICACEAE)

by

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Resumen

GÓMEZ-CAMPO, C. (2003). El género *Guenthera* Andr. in Bess. (Brassicaceae, Brassicaceae). *Anales Jard. Bot. Madrid* 60(2): 301-307 (en inglés).

Un grupo de nueve especies actualmente incluidas en *Brassica* difiere de todas las demás por varios caracteres, sobre todo por la porción estilar de sus pistilos, que siempre carece de primordios seminales. Además, por su tallo subterráneo ramificado, que forma un cáudex con varias rosetas; sus hojas de enteras hasta profundamente pinnatífidas, pero nunca pinnatisectas; sus cotiledones solo muy ligeramente escotados, y sus semillas, que tienden a ser elipsoidales o aplanadas. Se propone agruparlas todas bajo la denominación genérica *Guenthera* Andr. in Bess. Se detallan los nuevos nombres para las especies y subespecies y se añade una clave para diferenciar las especies.

Palabras clave: taxonomía, *Guenthera*, Brassicaceae, *Brassica*.

Abstract

GÓMEZ-CAMPO, C. (2003). The genus *Guenthera* Andr. in Bess. (Brassicaceae, Brassicaceae). *Anales Jard. Bot. Madrid* 60(2): 301-307.

A group of nine species –now included in *Brassica*– differ from all the other species in several characters, mainly in the stylar portion of their pistils always without seed primordia. Also in their branched subterranean stem (caudex) with several leaf rosettes, their leaves entire to deeply pinnatifid but never pinnatisect, their shallowly notched cotyledons and their flattened, elliptic or ovoid seed contour. It is suggested to include these species under the generic denomination *Guenthera* Andr. in Bess. New names for the species and subspecies are provided, as well as a determination key for the species.

Key words: taxonomy, *Guenthera*, Brassicaceae, *Brassica*.

INTRODUCTION

Initially (xviii century), *Brassica* was an ample and polymorphic genus, from which many species were soon withdrawn to form other new genera (*Conringia*, *Eruca*, *Hirschfeldia*, *Moricandia*, etc.) or to enlarge other existing ones (*Coincya*, *Diploaxis*, *Erucastrum*, etc.) occasionally through some now abandoned intermediate generic denominations. By 1860, Pomel still finds *Brassica*

highly polymorphic and suggests its splitting into no less than five genera: *Brassica*, *Erucastrum*, *Brassicaria*, *Nasturtiops* and *Melanosinapis*, although he does not provide proper validations. In line with this view, it can be observed that *Brassica* and *Erucastrum* siliques show a seeded beak, while the stylar portion of *Brassicaria*, *Nasturtiops* and *Melanosinapis* is asperm. Although GILLET & MAGNE (1879) recognise *Brassicaria* as a genus, the last three names have been, in gen-

eral, used to define either sections or subgenera (GODRON, 1848; O.E. SCHULZ, 1916; SALMEEN, 1979; GÓMEZ-CAMPO, 1999a).

The seedless styler portion of *Brassica nigra* L. has always been a cause of confusion. In fact, the creation of sect. *Melanosinapis* DC. (under *Sinapis*) was largely endeavored to fit this odd species. However, it is evident that, apart from the lack of a beak, all other characters showed by *B. nigra* are those of *Brassica*, particularly those observable in sect. *Micropodium* DC. which includes for instance *B. fruticulosa*, *B. cossoniana*, *B. maurorum*, *B. spinescens*, etc. Everything suggests that *B. nigra* is a true *Brassica*, simply renouncing to its fertile beak during the evolutionary process leading to a strong shortening of its fruit.

When the species corresponding to the Pomel's groups *Brassicaria* and *Nasturtiops* are considered together and *B. elongata* is added, the resulting complex of species shows a series of important characters in common (table 1). In our opinion they deserve the application of a generic denomination (*Guenthera*).

DIFFERENTIAL CHARACTERS

Among all the other differential characters, the absolute absence of seeds –or even seed primordia– within the styler portion of the pistil should be emphasised (character 5 in table 1). The absence or presence of a seeded beak has always been considered a relevant character to distinguish genera within the tribe *Brassicaceae*, where each option occurs in approximately one half of the 55 existing genera. Species with and without a beak had been maintained together up to the present only in *Brassica* and *Diplotaxis*. The existence of a seeded beak (heteroarthrocarpy) is both phylogenetically and taxonomically important (GÓMEZ-CAMPO, 1999b) because it is a singular morphogenetic achievement which appears exclusively within the evolutionary radiation of the tribe *Brassicaceae*, while it is completely absent in all other cruciferous tribes. *Guenthera* (as *Eruca*, *Sinapidendron*,

Vella, etc.) is anterior to this evolutionary development while *Brassica* (as *Erucastrum*, *Coincya*, *Raphanus*, etc.) is posterior. We avoid to call a sterile styler portion “beak”, since this is the general case with fruits in the Crucifer family.

The absence of a beak shows correlations with at least five other significant characters. The presence of a caudex is commonplace in *Guenthera* but never observable in *Brassica*. A caudex is a vertical buried stem branched under the soil surface, with leaf rosettes at soil level, at the tip of each branch. Leaf scars or leaf remainings demonstrate its caulinar condition. A caudex is like a buried bush and it represents an intermediate situation between chamaephytes and mono-rossette hemicriptophytes. The unique exception is the annual habit showed by *Guenthera amplexicaulis*. However, all other characters of this species are those of *Gunthera* and, particularly, *G. amplexicaulis* shows strong affinities to *G. dimorpha*. Apart from this case, *Gunthera* species are hemicriptophytes with several rosettes, although there might be a single one in the juvenile stage or sometimes in the adult stage (mostly in *G. elongata*). The scapiform habit for floriferous stems is very extended though species with scarcely branched leafy aerial stems also exist. Rosette-forming habit is already conspicuous in the seedling development, a stage where *Guenthera* is already easy to distinguish from *Brassica*.

The typical lyrate-pinnatisect leaf silhouette –so common in *Brassica* and most other related genera with seeded beak–, can never be found in *Guenthera*. *Guenthera* leaves are normally entire, lobed or pinnatifid, often deeply so. Only within the high variability present in the leaves of the *G. repanda* subspecies it is possible to find individual cases approaching a pinnatisect contour.

POMEL (1860) already observed clear differences in cotyledon shape which can be “emarginate or not”. Such differences are very patent and they were quantified by GÓMEZ-CAMPO & TORTOSA (1974). In other words, the cotyledon notch in *Guenthera* is much shallower than in *Brassica*. The cotyledon petiole is also shorter.

TABLE 1
MAIN DIFFERENCES BETWEEN THE GENERA *GUENTHERA* AND *BRASSICA*

<i>Guenthera</i>	<i>Brassica</i>
1. Mature seeds flattened, ovoid, elipsoidal or subglobose to globose.	1. Mature seeds globose to spherical.
2. Cotyledons only slightly emarginate (notch 3-8% of the lamina length).	2. Cotyledons more deeply emarginate (notch 10 y 25% of the lamina length).
3. Plants perennial, with floriferous stems arising from a caudex with several leaf rosettes.	3. Plants annual, biennial or perennial but never with a caudex.
4. Leaf entire to deeply pinnatifid (but never pinnatisect).	4. Leaves lyrate-pinnatisect, sometimes runcinate or becoming entire by reduction in the number of lateral segments.
5. Styler portion asperm (seedless).	5. Styler portion forming a beak with 1 to several seeds (heteroarthrocarpy).
6. Chromosome number $n = 10, 11$.	6. Chromosome number $n = 7, 8, 9$ or 10 .

With respect to the contour of mature seeds, overlappings may exist among the species of both genera (BENGOECHEA & GÓMEZ-CAMPO, 1975), but a tendency to sphericity is always much more marked and constant within the species of *Brassica*.

Chromosome number $n = 11$ is present in *Guenthera* and absent in *Brassica*. Chromosome number $n = 10$ exists in both genera but the deep morphological differences among the species belonging to *Brassica* and *Guenthera* (as for instance *Brassica rapa* and *Guenthera repanda* both with $n = 10$) suggest that it is a mere coincidence.

Not all molecular studies with *Brassica* include *Guenthera* species. However, dendrograms obtained by WARWICK & BLACK, (1991, 1993) with c-DNA, by PRADHAN & al. (1992) with c-DNA and m-DNA, or by INABA & NISHIO (2002) with sequences of nuclear genes do include a number of species here ascribed to *Guenthera*. Constantly, they appear clearly separated from typical *Brassica* species and, significantly, they are often closer to other taxa with asperm styler portion belonging to genera as *Eruca*, *Diplotaxis*, etc. On the other hand, differences showed by *G. elongata* and *G. amplexicaulis* are still deeper, a fact that is correlated to other morphological trends and reinforces the distribution into sections proposed below.

Brassica balearica Koch has a seeded beak and its polyploid nucleus includes the $n = 9$ genome shown by *B. oleracea* and other close Mediterranean relatives (SNOGERUP & PERS-SON, 1983). However, its dwarfing facies and compressed seeds suggest that it might be the product of a possible intergeneric cross *Brassica* × *Guenthera*. Further cytogenetic studies would be necessary to elucidate this case. The position of *Brassica somalensis* Hedge & Miller—a suffruticose plant (without a caudex) with asperm styler portion and elipsoidal seeds—is more difficult to interpret. HEDGE & MILLER (1977) suggest a possible relationship with the genus *Sinapidendron* from Madeira Island. In our opinion, this hypothesis is probable.

Guenthera Andr. in Bess.* Enum. Pl. Volhyn.: 83 (1822)

Typus: *Guenthera elongata* (Ehrh.) Andr. in Bess.

Guenthera [*Günthera*] (1922) antecedes other possible generic names as *Brassicatrum* (1831) or *Brassicaria* (1879).

Hemicriptophytes with a caudex (vertical subterranean branched stem) with several leaf

* Besser explicitly attributes the generic name and description to Andréanszky.

rosettes, more rarely biennial (*G. elongata*, partly) or annual (*G. amplexicaulis*). Floriferous stems leafy or leafless growing annually from the rosettes. Leaves entire, sinuate, or deeply pinnatifid, never pinnatisect. Siliques with a prominent mid-nerve in each valve and a stylar portion always sterile. Mature seeds somehow flattened, ovoid, ellipsoidal or subglobose, rarely globose. Cotyledons only very slightly notched. Chromosome number $2n = 20$ or 22 , with some cases of polyploidy.

Three sections are distinguished and are defined by the characters which are expressed in the proper place.

Sections, species and subspecies

Sect. *Guenthera*

Aerial stems branched and leafy with leaves not amplexicaul. Gynophore 1,5-6 mm.

Guenthera elongata (Ehrh.) Andr. in Bess. Enum. Pl. Volhyn.: 83 (1822)

Bas.: *Brassica elongata* Ehrh., Beitr. Naturk. 7: 159 (1790)

Syn.: *Brassicastrum elongatum* (Ehrh.) Link, Handb. 2: 318 (1831)

Guenthera elongata (Ehrh.) Andr. subsp. ***elongata***

Guenthera elongata subsp. ***imdrahsiana*** (Quézel) Gómez-Campo, **comb. nov.**

Bas.: *Brassica elongata* subsp. *imdrahsiana* Quézel, Bull. Soc. Sci. Nat. Maroc 34: 304 (1955)

Guenthera elongata subsp. ***integrifolia*** (Boiss.) Gómez-Campo, **comb. nov.**

Bas.: *Brassica elongata* var. *integrifolia* Boiss., Fl. Orient. 1: 394 (1867)

Syn.: *Brassica elongata* subsp. *integrifolia* (Boiss.) Breistr., Not. Syst. Bot. 13 (1942)

Guenthera elongata subsp. ***pinnatifida*** (Schmalh.) Gómez-Campo, **comb. nov.**

Bas.: *Brassica elongata* var. *pinnatifida* Schmalh., Fl. Sredn. Jushn. Rosii 1: 80 (1895)

Syn.: *Brassica elongata* subsp. *pinnatifida* (Schmalh.) Greuter & Burdet, Willdenowia 15: 64 (1985)

Guenthera elongata subsp. ***subscaposa*** (Maire & Weiller) Gómez-Campo, **comb. nov.**

Bas.: *Brassica subscaposa* Maire & Weiller, Bull. Soc. Hist. Nat. Afrique N. 31: 9 (1940)

Syn.: *Brassica elongata* subsp. *subscaposa* (Maire & Weiller) Maire, Fl. Afrique N. 12: 168 (1965)

Sect. *Nasturtiops* Gómez-Campo, **sect. nov.**

Caules floriferi parce tantum ramosi, foliosi, foliis ovatis, amplexicaulibus. Gynophorum breve (infra 1.5 mm longum).

Typus: *Guenthera dimorpha* (Coss. & Dur.) Gómez-Campo.

Aerial stems only slightly branched, leafy with leaves ovate in contour, amplexicaul. Gynophore < 1.5 mm.

Guenthera amplexicaulis (Desf.) Gómez-Campo, **comb. nov.**

Bas.: *Sisymbrium amplexicaule* Desf., Fl. Atlant. 2: 81 (1798)

Syn.: *Brassica amplexicaulis* (Desf.) Pomel Mat. Fl. Atlant. 15 (1860), non A. Richard, Ten. Fl. Abyss. 1: 23 (1847), nom. illeg.

Syn.: *Brassica souliei* subsp. *amplexicaulis* (Desf.) Greuter & Burdet, Willdenowia 13: 86 (1983)

Guenthera amplexicaulis (Desf.) Gómez-Campo subsp. ***amplexicaulis***

Guenthera amplexicaulis subsp. ***souliei*** (Batt.) Gómez-Campo, **comb. nov.**

Bas.: *Camelina souliei* Batt., Bull. Soc. Bot. France 36: 218 (1889)

Syn.: *B. souliei* (Batt.) Batt., Bull. Soc. Bot. France 40: 262 (1893); *B. amplexicaulis* subsp. *souliei* (Batt.) Maire & Weiller in Maire, Fl. Afrique N. 12: 191 (1965) (nom. illeg.)

Guenthera dimorpha (Coss. & Dur.) Gómez-Campo, **comb. nov.**

Bas.: *Brassica dimorpha* Coss. & Dur., Bull. Soc. Bot. France 2: 306 (1855)

- Sect. **Brassicaria** (Godr.) Gómez-Campo, **comb. nov.**
 Bas.: *Brassica* sect. *Brassicaria*, Godr. in Gren & Godr., Fl. Fr. 1: 78 (1848)
 Plants scapose with aerial stems either aphyll or with 1-2(3) poorly developed leaves. Gynophore < 1.5 mm.
- Guenthera desnottesii** (Emb. & Maire) Gómez-Campo, **comb. nov.**
 Bas.: *Brassica desnottesii* Emb. & Maire, Pl. Marocc. Nov. 2: 1 (1929)
- Guenthera gravinae** (Ten.) Gómez-Campo, **comb. nov.**
 Bas.: *Brassica gravinae* Ten., Fl. Napol. 1: 39 (1811)
- Guenthera loncholoma** (Pomel) Gómez-Campo, **comb. nov.**
 Bas.: *Brassica loncholoma* Pomel, Nouv. Mat. Fl. Atlant.: 360 (1875)
 Syn.: *Eruca loncholoma* (Pomel) O.E. Schulz, Bot. Jahrb. Syst. 54(119): 56 (1916)
- Guenthera nivalis** (Boiss. & Heldr.) Gómez-Campo, **comb. nov.**
 Bas.: *Brassica nivalis* Boiss. & Heldr., Diagn. Pl. Orient., Ser. 2, 1: 32 (1854)
 Syn.: *Brassicella nivalis* (Boiss. & Heldr.) O.E. Schulz, Bot. Jahrb. Syst. 54(110): 53 (1916)
- Guenthera nivalis** (Boiss. & Heldr.) Gómez-Campo subsp. **nivalis**
- Guenthera nivalis** subsp. **jordanoffii** (O.E. Schulz) Gómez-Campo, **comb. nov.**
 Bas.: *Brassica jordanoffii* O.E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 10: 111 (1927)
 Syn.: *Brassica nivalis* subsp. *jordanoffii* (O.E. Schulz) Akeroyd & Leadlay, Bot. J. Linnean Soc. 106: 102 (1991)
- Guenthera repanda** (Willd.) Gómez-Campo, **comb. nov.**
 Bas.: *Sisymbrium repandum* Willd., Sp. Pl. 3: 497 (1800)
 Syn.: *Brassica repanda* (Willd.) DC., Syst. Nat. 2: 598 (1821)
- Guenthera repanda** (Willd.) Gómez-Campo subsp. **repanda**
- Guenthera repanda** subsp. **africana** (Maire) Gómez-Campo, **comb. nov.**
 Bas.: *Brassica saxatilis* subsp. *africana* Maire, Bull. Soc. Hist. Nat. Afrique N. 20: 13 (1929)
 Syn.: *Brassica repanda* subsp. *africana* (Maire) Greuter & Burdet, Wildenowia 13: 86 (1983); *Brassica repanda* subsp. *nudicaulis* (Lag.) Heywood, Feddes Repert. Spec. Nov. Regni Veg. 69: 121 (1964)
- Guenthera repanda** subsp. **almeriensis** (Gómez-Campo) Gómez-Campo, **comb. nov.**
 Bas.: *Brassica repanda* subsp. *almeriensis* Gómez-Campo, Anales Inst. Bot. Cavanilles 33: 154 (1976)
- Guenthera repanda** subsp. **blancoana** (Boiss.) Gómez-Campo, **comb. nov.**
 Bas.: *Brassica blancoana* Boiss., Diagn. Pl. Orient. ser. 2, 1: 29 (1854)
 Syn.: *Brassica repanda* subsp. *blancoana* (Boiss.) Heywood, Feddes Repert. Spec. Nov. Regni Veg. 66: 153 (1962)
- Guenthera repanda** subsp. **cadevallii** (Font Quer) Gómez-Campo, **comb. nov.**
 Bas.: *Brassica saxatilis* var. *cadevallii* Font Quer, Cavanillesia 7: 72 (1935)
 Syn.: *Brassica repanda* subsp. *cadevallii* (Font Quer) Heywood, Feddes Repert. Spec. Nov. Regni Veg. 66: 154 (1962)
- Guenthera repanda** subsp. **cantabrica** (Font Quer) Gómez-Campo, **comb. nov.**
 Bas.: *Brassica saxatilis* var. *cantabrica* Font Quer, Cavanillesia 7: 73 (1935)
 Syn.: *Brassica repanda* subsp. *cantabrica* (Font Quer) Heywood, Feddes Repert. Spec. Nov. Regni Veg. 69: 151 (1964)
- Guenthera repanda** subsp. **confusa** (Emb. & Maire) Gómez-Campo, **comb. nov.**
 Bas.: *Brassica saxatilis* subsp. *confusa* Emb. & Maire, Cat. Pl. Maroc: 1007 (1941)
 Syn.: *Brassica repanda* subsp. *confusa* (Emb. & Maire) Heywood, Feddes Repert. Spec. Nov. Regni Veg. 66: 153 (1962)

Guenthera repanda subsp. **dertosensis**
(Molero & Rovira) Gómez-Campo, **comb. nov.**

Bas.: *Brassica repanda* subsp. *dertosensis* Molero & Rovira, Collect. Bot. (Barcelona) 17(1): 99-101 (1987)

Guenthera repanda subsp. **diplotaxiformis**
(Maire) Gómez-Campo, **comb. & stat. nov.**

Bas.: *Brassica saxatilis* subsp. *repanda* var. *diplotaxiformis* Maire, Bull. Soc. Hist. Nat. Afrique N. 19: 82 (1928)

Guenthera repanda subsp. **galissieri** (Giraud) Gómez-Campo, **comb. nov.**

Bas.: *Diplotaxis galissieri* Giraud, Bull. Assoc. Pyrén. Échange Pl. 1-2: 21 (1892)
Syn.: *Brassica repanda* subsp. *galissieri* (Giraud) Heywood, Feddes Repert. Spec. Nov. Regni Veg. 69: 150 (1964)

Guenthera repanda subsp. **glabrescens**
(Poldini) Gómez-Campo, **comb. nov.**

Bas.: *Brassica glabrescens* Poldini, Giorn. Bot. Ital. 10: 181 (1973)
Syn.: *Brassica repanda* subsp. *glabrescens* (Poldini) Gómez-Campo, Anales Jard. Bot. Madrid 56: 379 (1998)

Guenthera repanda subsp. **gypsicola**
(Gómez-Campo) Gómez-Campo, **comb. nov.**

Bas.: *Brassica repanda* subsp. *gypsicola* Gómez-Campo, Anales Jard. Bot. Madrid 50: 145 (1992)

Guenthera repanda subsp. **humilis** (DC.)
Gómez-Campo, **comb. nov.**

Bas.: *Brassica humilis* DC., Syst. Nat. 2: 598 (1821)
Syn.: *Brassica saxatilis* subsp. *humilis* (DC.) Maire, Fl. Afrique N. 12: 202 (1965) (nom. inval.)

Guenthera repanda subsp. **latisiliqua**
(Boiss. & Reut.) Gómez-Campo, **comb. nov.**

Bas.: *Brassica latisiliqua* Boiss. & Reut. in Boiss., Diagn. Pl. Orient., ser. 2, 1: 30 (1854)
Syn.: *Brassica repanda* subsp. *latisiliqua*

(Boiss. & Reut.) Heywood, Feddes Repert. Spec. Nov. Regni Veg. 66: 153 (1962)

Guenthera repanda subsp. **maritima**
(Willk.) Gómez-Campo, **comb. nov.**

Bas.: *Diplotaxis brassicoides* var. *maritima* Willk., Ill. Fl. Hisp. 1: 141 (1885)
Syn.: *Brassica repanda* subsp. *maritima* (Willk.) Heywood, Feddes Repert. Spec. Nov. Regni Veg. 66: 153 (1962)

Guenthera repanda subsp. **saxatilis** (DC.)
Gómez-Campo, **comb. nov.**

Bas.: *Diplotaxis saxatilis* DC., Syst. Nat. 2: 636 (1821)
Syn.: *Brassica repanda* subsp. *saxatilis* (DC.) Heywood, Feddes Repert. Spec. Nov. Regni Veg. 69: 151 (1964)

Guenthera repanda subsp. **silenifolia**
(Emb.) Gómez-Campo, **comb. nov.**

Bas.: *Brassica saxatilis* subsp. *silenifolia* Emb., Bull. Soc. Sci. Nat. Maroc 15: 200 (1936)
Syn.: *Brassica repanda* subsp. *silenifolia* (Emb.) Greuter & Burdet, Willdenowia 13: 86 (1983)

Guenthera repanda subsp. **turbonis**
(P. Monts.) Gómez-Campo, **comb. nov.**

Bas.: *Brassica saxatilis* subsp. *turbonis* P. Monts., Pirineos 28-30: 181 (1953)
Syn.: *Brassica repanda* subsp. *turbonis* (P. Monts.) J.M. Monts. & Romo, Willdenowia 15: 64 (1985)

Guenthera setulosa (Boiss. & Reuter)
Gómez-Campo, **comb. nov.**

Bas.: *Eruca setulosa* Boiss. & Reuter in Boiss., Diagn. Pl. Orient., ser. 2, 5: 26 (1856)
Syn.: *Brassica setulosa* (Boiss. & Reuter) Cosson, Ill. Fl. Atlant. 1: 32 (1882)

KEY TO THE SPECIES OF *GUENTHERA*

1. Aerial stems branched, leafy 2
- Aerial stems unbranched, aphyll or with some small leaves 4

2. Cauline leaves sessile, not amplexicaul, gynophore 1.5-6 mm **G. elongata**
 – Cauline leaves amplexicaul; gynophore < 1.5 mm 3
3. Caudex well developed, with branches up to 5-10(15) cm **G. dimorpha**
 – Caudex absent; plant annual **G. souliei**
4. Valves linear, 25-70(90) mm in length 5
 – Valves ellipsoidal, up to 20(25) mm in length ... 7
5. Leaves all basal **G. repanda**
 – Some small caulinar leaves present 6
6. Plant glabrous or subglabrous. Silique up to 2 mm wide **G. nivalis**
 – Plant hairy. Silique more than 2 mm wide
 **G. gravinae**
7. Flowers purple or violaceous **G. setulosa**
 – Flowers yellow 8
8. Plant 4-20 cm. Siliques c. 15 mm on pedicels of 4-7 mm **G. loncholoma**
 – Plant up to 40 cm. Siliques < 10 mm on pedicels 10-17 mm **G. desnottesii**

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