

***Cicadatra pazukii*, a new cicada species,
with an identification key to the species of *Cicadatra* in Iran
(Hemiptera: Cicadidae)**

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Abstract. This study presents the morphological description of a new species, *Cicadatra pazukii* sp. nov., collected from Iran, also providing the diagnosis of the new species with closely related species. An identification key for the *Cicadatra* species of Iran is submitted. Adding the new species to the list of recorded species of the family Cicadidae in Iran, the number of cicadas in the country becomes 44, including 18 species of the genus *Cicadatra*.

Key words. Auchenorrhyncha, Cicadomorpha, Cicadoidea, cicadas, taxonomy, morphology, Iran, Middle East, Palearctic Region

Introduction

The genus *Cicadatra* Kolenati, 1857 was originally erected as a subgenus of *Cicada* Linnaeus, 1758 with the type species *Cicada atra* Olivier, 1790 (KOLENATI 1857). The genus is widely distributed across the Palearctic (northern Africa; western, southern, central, eastern and south-eastern Europe; western, south-western and central Asia, Mongolia and Siberia) and Oriental (Pakistan and India) Regions (NAST 1972, AHMED & SANBORN 2010). Classified in the subfamily Cicadinae and tribe Cicadini, the original characters outlined for *Cicadatra* by KOLENATI (1857) and expanded upon by DISTANT (1914) are rudimentary covering of the timbals, hyaline wings, a wide basal cell of forewing, the interior ulnar area wider than the base, six apical areas of the hind wings, the length of forewing more than twice but less than three times as long as broad, ordinary structure of opercula and cruciform elevation, and short male opercula. Due to the high degree of morphological variation across the wide range of geographic distribution of the genus, a more detailed study and a revision of the genus would be a welcomed addition to the literature.

MELICHAR (1902) was the first person to mention the occurrence of species of the genus *Cicadatra* in Iran. He recorded *Cicadatra alhageos* (Kolenati, 1857) and described *Cicadatra ochreatea* Melichar, 1902 as a new species (currently valid as *Chloropsalta ochreatea*), both from a locality named Hosseinabad. The locality name is quite a common name but regarding the location of the trips of the collector (Zarudny) in Iran, it should be in south-eastern Iran. Since the previously mentioned date, *Cicadatra* species of Iran have been the subject of several publications, mostly by J. Dlabola as the results of his trips to Iran in the 1970s and some earlier collaboration with the Hayk Mirzayans Insect Museum (DLABOLA & HELLER 1962; DLABOLA 1970, 1979, 1981). Further publications recorded species of *Cicadatra* in Iran (MIRZAYANS 1995), described new species (MOZAFFARIAN & SANBORN 2010, 2013; MOZAFFARIAN et al. 2010) and studied the biology (BABAI 1967, SHEKARIAN & REZWANI 2001, ZAMANIAN et al. 2008), and morphometric characters of some species of the genus (AGHAGOLI MARZIJARANI et al. 2013). A total of 17 species of *Cicadatra* have been recorded from Iran with two of them (*Cicadatra alhageos* and *Cicadatra atra* Olivier, 1790) having been recorded as pests for agricultural and wood ecosystems (RAJABI 1991, ABANI 2000, SHEKARIAN & REZWANI 2001, KOLYANI et al. 2012). In this study a new species of the genus is described bringing the number of recorded species of *Cicadatra* to 18 of the 44 species (41 %) of the family Cicadidae reported in Iran. For the first time, an identification key for the species of *Cicadatra* in Iran is also provided which can be also used for much of the Middle East.

Material and methods

The specimens examined for the description of the new species were two male specimens found among undetermined material of the Hayk Mirzayans Insect Museum (HMIM), collected from southeastern Iran. The morphological terminology used in the description follows MOULDS (2005). The illustrations were prepared using a drawing tube attached to an Olympus stereoscopic microscope and the morphological measurements were obtained with Vernier calipers. The type material was deposited in HMIM and the Sanborn collection, Miami Shores, Florida, USA (AFSC). The identification key for *Cicadatra* species in Iran was made according to the specimens in HMIM and AFSC and also original description of the species.

Taxonomy

Cicadatra pazukii sp. nov.

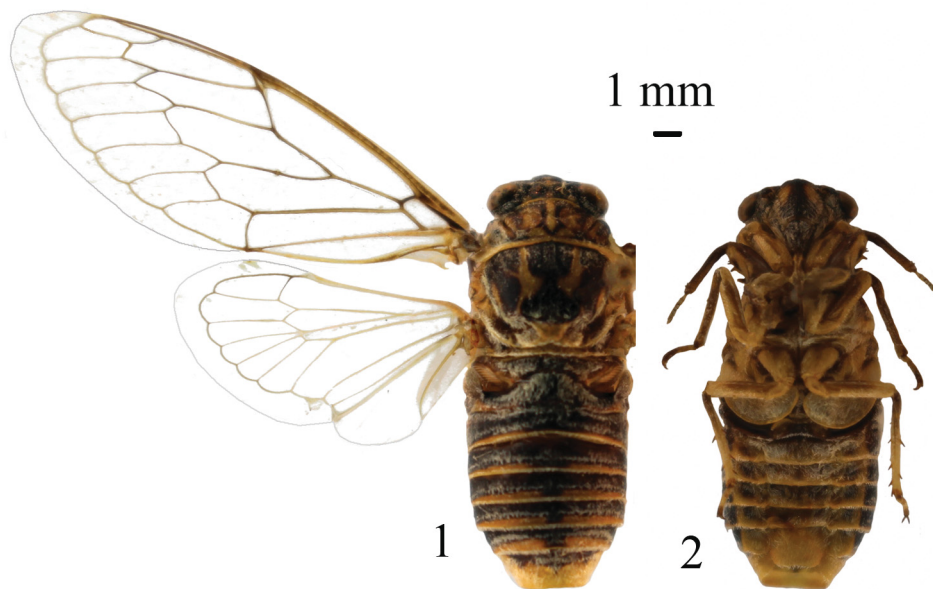
(Figs 1–10)

Type locality. Iran, Sistan va Baluchestan Province, Khash.

Type material. HOLOTYPE: ♂, "IRAN / Sistan va Baluchestan / Khash, 300m / 3.5.1996 / leg. Mirzayans / Borumand" (HMIM, dry-mounted). PARATYPE: 1 ♂, "IRAN / Baluchestan / Saravan, Suran / 2.5.1996 / Leg. Mirzayans / Borumand / F" (AFSC, dry-mounted).

Description. General color of body black with yellowish and orange marks and patches.

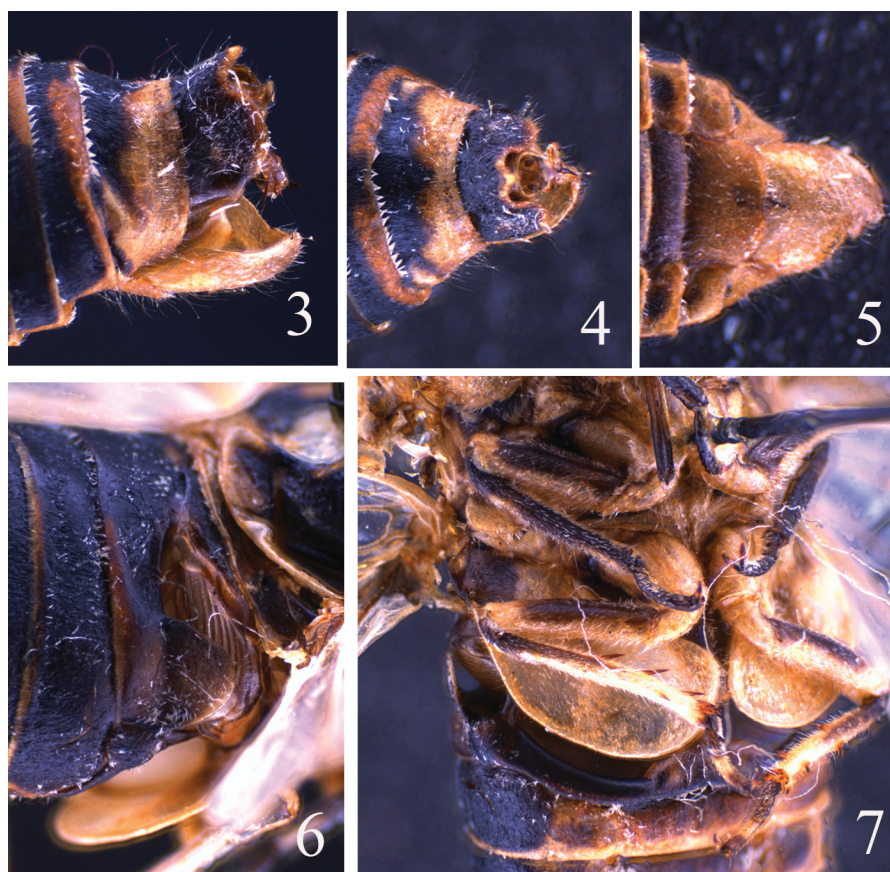
Head (Figs 1–2). Vertex black with scattered yellowish and white pile. Eyes brown. Ocelli shiny orange. Two yellowish circular marks, as large as each ocellus laterally, near in posterior cranial depressions. Similar but ovoid yellow mark at posterior base of epicranial suture. The



Figs 1–2. *Cicadatra pazukii* sp. nov., holotype (pygofer dissected). 1 – dorsal view 2 – ventral view.

distance between posterior ocelli as long as the distance between lateral ocellus to compound eyes. Supra-antennal plate black with a median orange triangular pattern. Scape dark brown at base, orangish at the apex, remaining antennal segments black. Postclypeus in dorsal view completely black. Postclypeus in ventral view black with semi-circular yellow patches on both sides of the midline. Scattered white pile present on the postclypeus. Lorum and gena black, covered with dense white pile. Yellow transverse mark across lorum and gena border and along lateral lorum in the paratype. Anteclypeus black with white pile laterally. Rostrum tawny at base, darkening to black towards the apex, reaching the posterior edge of the second coxae.

Thorax. General color of pronotum (Figs 1–2) black with yellow or light brown patterns and patches and scattered white pile. Anterior edge of pronotum and pronotal collar yellow. Lateral angle of pronotal collar yellow. A yellow median fascia present on pronotum, attaching to the yellow area on anterior edge, broadening in posterior part but not reaching pronotal collar. Two small circular patches posteriolaterally of median fascia, connecting with yellow area in pronotal collar. Large circular discs on both sides of median fascia. Yellow or tawny areas more or less present on paramedian and lateral fissures and on the lateral parts of the pronotum. Black ambient fissure extends laterally onto pronotal collar. Mesonotum (Fig. 1) generally black with scattered white pile, denser on the anterior edge, anterior to the cruciform elevation and on the lateral and posteriolateral surfaces of the mesonotum. Two J-shaped yellow marks along parapsidal sutures extending posteriorly onto disc to varying degrees. Lateral sigilla black with yellow longitudinal area laterally on the sigillae and on the posterior and posterolateral edges of mesonotum. Cruciform elevation yellow in center, posterior arms and

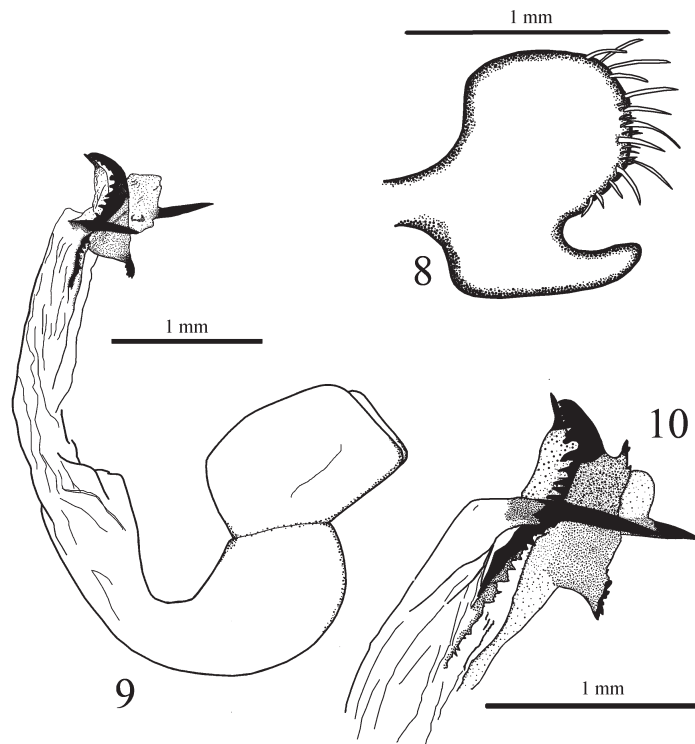


Figs 3–7. *Cicadatra pazukii* sp. nov., paratype. 3 – male pygofer, lateral view; 4 – male pygofer, dorsal view; 5 – male pygofer, ventral view; 6 – male timbal; 7 – male operculum.

first half of anterior arms. Metanotum exposed, black with yellow posterior edge and scattered white pile. Thoracic sternites yellow, variably marked with black, and with dense white pile.

Operculum. Male opercula (Figs 2, 7) semi-circular, black with yellow posterior edge and very dense white pile on the surface, approaching one another but not meeting medially; yellow with black base in the paratype. Meracanthus triangular, yellow with black base and dense white pile.

Legs (Fig. 2) generally yellow, marked with brown areas and rather dense white pile. Coxae yellow with a light brown longitudinal fascia on fore coxae. Trochanters yellow with light or dark brown stick-like mark posteriorly. Femora yellow with longitudinal brown areas. Fore femora with three spines, decreasing in size from primary to tertiary spine. Primary spine with a 45 degree angle to femur, secondary and apical spines erect and rather right angled. Fore tibiae completely brown or yellow with dark brown area at the junction with femora and brownish in apical half area. Middle tibiae yellow or brown, hind tibiae yellow with brownish



Figs 8–10. Male genitalia of *Cicadatra pazukii* sp. nov. 8 – left clasper; 9 – aedeagus, lateral view; 10 – detail of aedeagus apex, lateral view.

area at the junction with femora with orange spurs and tibial combs. Tarsi brown or yellow, brownish at the apex, claws brown.

Wings. Forewing (Fig. 1) hyaline with generally yellow veins. Forewing basal membrane white. Forewing costal vein yellow, blackish in node area. Basal part of radius & subcostal vein and arculus blackish, forming two sides of the hyaline basal cell. Median and cubitus anterior veins not fused at base, closer together than in most members of the genus *Cicadatra*. Forewing with eight apical cells. Hindwing (Fig. 1) hyaline with yellow veins and darker ambient vein. Anal vein 3 brownish with light infuscation area around the vein. Hindwing with six apical cells. Radial posterior fused with median vein at the base.

Abdomen (Figs 1–2). Abdominal tergites generally black with rather thick white pile. Anterior margins of tergites tawny. Posterior margins of tergites yellow. A median black area present on the yellow area of tergites 2 to 7. Yellow area on the posterior edge of tergite 8, wider than on other tergites. Timbal cover incomplete, semi-circular. Timbal (Fig. 6) exposed, with eight ribs. Abdominal sternites yellow or tawny with scattered white pile. Epipleurites yellow with scattered white pile. Epipleurites with black area in center. Hypopleurites yellow with white pile.

Male genitalia (Figs 3–5, 8–10). Male pygofer (Figs 3, 4) black dorsally with yellow posterior edge and scattered white pile. Sternite VIII completely yellow. Uncus extremely short. Dorsal beak short, separated by a depression from upper lobes of pygofer. Upper lobes

of pygofer with a wide circular lateral edge, connecting to smaller basal lobes at the pygofer venter. Claspers (Fig. 8) with a circular disc anteriorly and a finger-like extension posteriorly, attached to the lateral portion of the disc, curving and pointing medially, forming a 90 degree angle. Long hairs present on the inner lateral surface of the circular disc. Claspers surround the stem of aedeagus but not meet each other medially. Aedeagus (Figs 9, 10) with two semi-circular basal plates. Theca becomes narrower in the middle and bifold at the apex. One of the branches with two membranous extensions and a brown apical spine at the apex of each one. Two rows of small brown teeth present at the junction of the two membranous extensions. The other branch of the apex of the aedeagus with two diverging brown spines, one is strongly curved and with about ten small teeth inside the curve and a few other small teeth on the edges of a wide rather chitinized membranous extension at the base. The other spine simple with a membrane extension attached to the base.

Female unknown.

Measurements (2 males, mean (range) in mm). Length of body: 17.78 (17.56–18.00). Length of forewing: 20.15 (19.80–20.50). Width of forewing in widest part: 7.90 (7.80–8.00). Width of head including eyes: 4.90 (4.80–5.00). Length of abdomen: 10.74 (10.00–11.48). Width of abdomen in widest part: 6.37 (6.30–6.44).

Differential diagnosis. Male genitalia structure of *Cicadatra pazukii* sp. nov. is unique with respect to pygofer, uncus, clasper, and aedeagus shape. The new species can be distinguished from *C. atra* (Olivier, 1790), *C. xantes* (Walker, 1850) and *C. walkeri* Metcalf, 1963 by the lack of infuscation on the radial and radiomedial crossveins of the tegmina. *Cicadatra shapur* Dlabola, 1981 has long, narrow wings and is smaller than the new species. *Cicadatra platyptera* Fieber, 1876 has truncated apical cells in the tegmina and the pronotal and mesonotal markings are yellow. There are truncated apical cells in the tegmina of *C. adanai* Kartal, 1980 which also has an expanded proximal portion of ulnar cell 2. *Cicadatra alhageos* (Kolenati, 1857) is ochraceous, yellow, green or brown; in the latter case, with big light areas on pronotum in contrast of the dark body. *Cicadatra reinhardti* Kartal, 1980 is green, *C. mirzayansi* Dlabola, 1981 is yellow-chestnut in color with longer male opercula, while *C. hyalina* (Fabricius, 1798) is yellow, green or brown without pronotal markings, *C. hagenica* Dlabola, 1987 is green with the lateral pronotal margins indented, *C. glycyrrhizae* (Kolenati, 1857) is yellowish green with yellow pronotal spots and truncated apical cells in the tegmina, and *C. zehandica* Dlabola, 1970 is monochromatic tawny. *Cicadatra abdominalis* Schumacher, 1923 is smaller with castaneous marking on the abdomen, *C. raja* Distant, 1906 is testaceous with a more heavily marked mesothorax, a castaneous head and pronotum and narrow wings. *Cicadatra appendiculata* Linnavuori, 1954 lacks pronotal and abdominal markings, *C. karachiensis* Ahmed, Sanborn & Hill, 2010 has tawny medial and testaceous lateral abdominal sternites and only the posterior margin of the pronotal collar is marked with testaceous, *C. sankara* (Distant, 1904) has castaneous pronotal markings and abdomen, *C. vulcanica* Dlabola & Heller, 1962 has brown abdominal sternites, lacks pronotal markings and a yellow postclypeus, *C. inconspicua* Distant, 1912 is smaller and has a pale brown abdomen, *C. pallasii* Schumacher, 1923 has a yellow abdomen, a black pronotal disc and a head marked with yellow, and *C. gregoryi* China, 1925 has castaneous markings on the abdominal sternites and the claval fold of the tegmina is heavily marked.

The more heavily striated pronotal disc and tawny abdomen distinguish *C. lorestanica* Mozaffarian & Sanborn, 2010 and *C. ramanensis* Linnavuouri, 1962. *Cicadatra naja* Dlabola, 1979 has a castaneous head with a yellow apex of the postclypeus and a yellow pronotum possessing a horseshoe shaped mark. *Cicadatra genoina* Dlabola, 1979 has a shorter head that is brown, the pronotal margins spreads widely posteriorly, and the abdominal sternites are darker than the tergites. The larger body size (more than 20 mm) and body markings of *C. barbodi* Mozaffarian & Sanborn, 2013, *C. bistunensis* Mozaffarian & Sanborn, 2010, *C. kermanica* Dlabola, 1970, and *C. persica* Kirkaldy, 1909 distinguish them from the new species. Finally, the smaller (body length 11 mm) *C. tenebrosa* Fieber, 1876 has a greater density of pronotal markings.

Etymology. The species is named in honor of Ali Pazuki, a pioneer entomologist in the Insect Taxonomy Research Department who was instrumental in the foundation of the Hayk Mirzayans Insect Museum and supporter of numerous expeditions of the Czech scientists who described multiple new species and records of Auchenorrhyncha for Iran.

Distribution. The examined specimens had been collected from southeastern Iran. Although the land of Iran mostly belongs to the Holarctic floristic kingdom, southeast of the country is considered as Paleotropical kingdom along with coastal areas of the Persian Gulf (FREY & PROBST 1986) which is influenced by Oriental faunal elements (FIROUZ 2005, HÁJEK 2006).

Key to the Iranian species of *Cicadatra*

- 1 Body coloration green, yellow or ochraceous. 2
 - Body coloration tawny, black and brown. 5
- 2 Body yellowish grey. Lateral pronotal margins anteriorly parallel.
 - *C. mirzayansi* Dlabola, 1981
 - Body green, yellow or ochraceous. Lateral pronotal margins angled or arched anteriorly. 3
- 3 Body pale green or yellow, mesothorax lightly marked with testaceous. Body length about 19–20 mm. *C. alhageos* (Kolenati, 1857)
 - Body green or ochraceous, with variable to no mesothoracic markings. Body length less than 19 mm. 4
- 4 Anterior postclypeus forming smooth curve with anterior head. Lateral pronotal margin angled laterally to pronotal collar lateral angle. Head, pronotum and mesothorax variably marked with brown or black. Apical cells 1 and 2 of forewing about the same length. ...
 - *C. hyalina* (Fabricius, 1798)
 - Anterior postclypeus bulbous in dorsal view. Lateral pronotum arched laterally forming a well-defined angle at the anterior of the pronotal collar lateral angle. Body primarily green. Apical cell 1 of forewing reduced, about half the length of apical cell 2.
 - *C. hagenica* Dlabola, 1987
- 5 Radial and radiomedial crossveins of tegmina infuscated.
 - *C. atra atra* (Olivier, 1790)
 - Radial and radiomedial crossveins of tegmina without infuscation. 6

- 6 Body a monochromatic tawny. Body length about 31 mm. *C. zehandica* Dlabola, 1970
 – Body black and brown. 7
- 7 Body length 20 mm or more. 8
 – Body length less than 20 mm. 12
- 8 Posterior pronotal collar black. 9
 – Posterior pronotal collar yellow or ochraceous. 10
- 9 Body length 22–24 mm. Basal cell of forewing hyaline. *C. persica* Kirkaldy, 1909
 – Body length 32 mm. Basal cell of forewing brown. *C. kermanica* Dlabola, 1970
- 10 Pronotal collar mostly yellow or ochraceous with a brown spot on either side of the anterior midline. *C. platyptera* (Fieber, 1876)
 – Pronotal collar mostly black with yellow or ochraceous hind margin. 11
- 11 Abdomen brown, postclypeus yellow with median dark brown fascia, head marked with yellow fascia dorsally. *C. barbodi* Mozaffarian & Sanborn, 2013
 – Abdomen shiny black or dark brown, postclypeus castaneous medially, head almost entirely black dorsally. *C. bistunensis* Mozaffarian & Sanborn, 2010
- 12 Body length less than 18 mm. *C. hyalina* (Fabricius, 1798)
 – Body length about 18–20 mm. 13
- 13 Pronotum with two large light discs on lateral sides of the median line, in contrast with the dark body. *C. alhageos* (Kolenati, 1857)
 – Pronotum not as above. 14
- 14 Body pale greyish brown with thick silvery-white pubescence, black on mesonotum except H-shaped mark and most of cruciform elevation. *C. ramanensis* Linnavouri, 1962
 – Body black or heavily marked with black. 15
- 15 Postclypeus black. 16
 – Postclypeus with lateral patches of lighter color. 17
- 16 Pronotum with brown patches on disc, mesonotum brown. Male claspers straight with tips almost touching. *C. shapur* Dlabola, 1981
 – Pronotum with castaneous patches on disc, mesonotum black. Male claspers curved laterad. *C. genoina* Dlabola, 1979
- 17 Postclypeus lightly marked with brownish-yellow along lateral edge and in lateral transverse grooves. *C. vulcanica* Dlabola & Heller, 1962
 – Postclypeus with large lateral yellow patches. 18
- 18 Head castaneous with yellow apex. Pronotum yellow with horseshoe-shaped mark on disc. *C. naja* Dlabola, 1979
 – Head black. Pronotum black without horseshoe-shaped mark on disc. 19
- 19 Abdominal tergites tawny. Head without spots dorsally. *C. lorestanica* Mozaffarian & Sanborn, 2010
 – Abdominal tergites black. Head with yellow spots near posterior cranial depressions. *C. pazukii* sp. nov.

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