TWO NEW SPECIES OF DORYLAIMS (NEMATODA: DORYLAIMIDA) ASSOCIATED WITH BANANA FROM INDIA

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Summary. Two new dorylaim species belonging to the genus *Aporcelaimellus* Heyns, 1965 (Nematoda: Aporcelaimidae) and *Paractinolaimus* Meyl, 1957 (Nematoda: Actinolaimidae), collected from the rhizospheric soil of banana (*Musa paradisiaca* L. cv. Kanthali) from Paschim Medinipur district, West Bengal, India are described. *Aporcelaimellus subhasi* n. sp. closely resembles *A. chauhani* and *A. coomansi* Baqri *et* Khera, 1975 but differs significantly in total body length and in the values of other measurements (a and b in *A. chauhani* and a, c and V in *A. coomansi*). The tail length, tail shape and the shape of cardia are also different. *Paractinolaimus shamimi* n. sp. shows similarities with *P. aruprus* Khan *et al.*, 1994, *P. macrodentatus* Sukul, 1967 and *P. filipjewi* (Schneider, 1935) Meyl, 1957 in having a long tail but differs from these species in total length, tail length, dentition, structure in the vestibule, shape of cardia, and in other characters such as a, c and V.

Key words: *Aporcellaimellus subhasi* n. sp., *Musa paradisiaca* L., *Paractinolaimus shamimi* n. sp.

During a survey of nematodes from the rhizosphere of banana (*Musa paradisiaca* L. cv. Kanthali), during March 2004 to February 2005, two new species of dorylaims, belonging to the genera *Aporcelaimellus* and *Paractinolaimus*, were collected from the Paschim Medinipur district, West Bengal, India. Jairajpuri and Ahmad (1992) recorded 51 species of the genus *Aporcelaimellus* from all over the world, among which twelve species have been reported from India. Subsequently, Andrassy (2002) reviewed the genus and recorded 86 nominal species. This author also stated that only 41 of these species would stand as valid and genuinely representative of *Aporcelaimellus*. In India, Ahmad (1995) described two species, Khatoon and Sharma (2000) described one species and Singh *et al.* (2002) added three more to this genus. Globally, *Paractinolaimus* is one of the most widely distributed genera of which, in India, Sukul (1967) described two species, Khan and Ganguly (1988) one species and Khan *et al.* (1994) two species. Two new dorylaim species, *Aporcelaimellus subhasi* and *Paractinolaimus shamimi*, are described and illustrated below.

MATERIALS AND METHODS

Soil samples of 250 g were collected from a small area of about 10 cm × 10 cm, to a depth of 20 cm, in the rhizosphere of banana, at a distance of about 25 cm from the main bole of the plant. Nematodes were extracted from the soil by the sieving and decanting method (Cobb, 1918) combined with the modified Baerman's funnel method (Christie and Perry, 1951), and processed by Seinhorst's slow dehydration method (Seinhorst, 1959). The nematode specimens were measured with an ocular micrometer and diagrams were drawn with the aid of a camera lucida. The body dimensions were tabulated using de Man's formula (de Man, 1884).

DESCRIPTION

APORCELAIMELLUS SUBHASI **n. sp.**
(Table I; Fig. 1)

Female. Body cylindrical, curved ventrally, tapering slightly towards anterior end. Cuticle with fine transverse striations. Dorsal, lateral and ventral body pores indistinct. Lip region offset prominently by a constriction, wider than the adjoining area of the body. Oral aperture hexagonal in shape. Amphids stirrup-shaped. Odontostyle 19.0-21.4 µm long with a wide aperture (10.3-11.7 µm); odontophore 29-32 µm in length. Guide ring not sclerotised, 7.0-8.4 µm or about half of lip region width from anterior extremity. Basal expanded part of oesophagus occupying about 47-52% of its total length. Oesophago-intestinal disc present. Cardia tongue-shaped. Nerve ring at about 130-146 µm from anterior end. Vulva a transverse slit, 22-24 µm long, surrounded by a sphincter. Gonad amphidelphic and reflexed. Tail dorsally convex-conoid with acute terminus, 54.05 µm (53.6-66.7 µm) in length.

Male. Not found.

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Etymology. The proposed new species *Aporcelaimellus subhasi* is named after Subhas Chandra Ghosh, scientist of Nemathelminth Section of Zoological Survey of India, Kolkata (formerly 'Calcutta'), West Bengal, India.

Type habitat and locality. The specimens were collected by the first author in July 2004 from the rhizospheric soil of banana (*Musa paradisiaca* L. cv. Kanthali) from Murarichak village under Sabang Block in Paschim Medinipur district, West Bengal, India.

Type specimens. Types are deposited in the National Zoological Collections (NZC) of Zoological Survey of India, Kolkata, West Bengal, India, under the Registra-

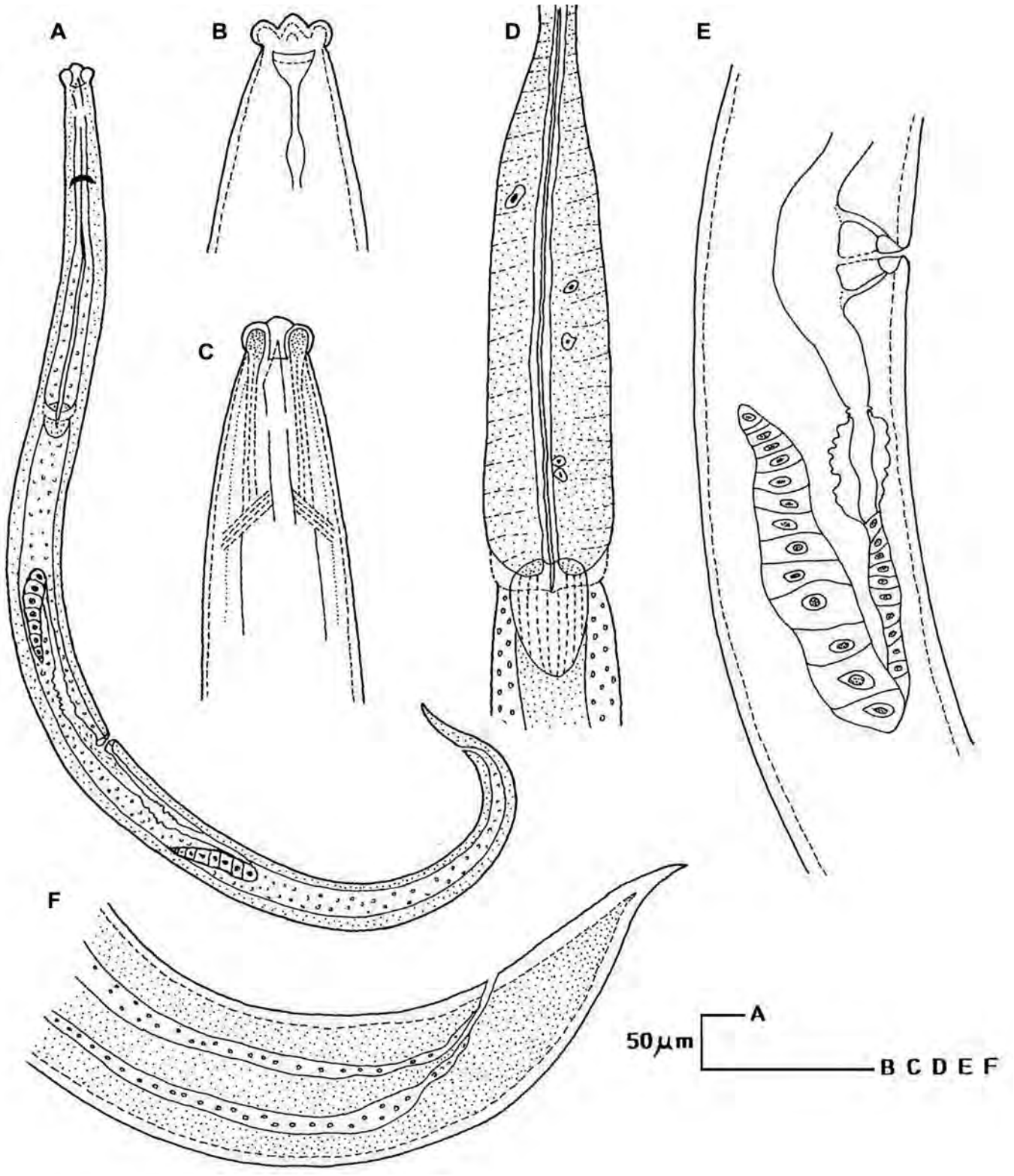

Fig. 1. *Aporcelaimellus subhasi* n. sp. A: Entire female, B: Surface view of anterior region, C: Anterior region, D: Basal expanded portion of oesophagus, E: Vulval region and posterior gonad, F: Posterior region.

Table I. Measurements of *Aporcelaimellus subhasi* n. sp. (All measurements in µm except L in mm).

Parameter	Holotype ♀	Paratype 17 ♀♀
L	1.50	1.48-1.71 (1.66 ± 0.06)
a	25.7	24.6-29.0 (27.6 ± 1.55)
b	3.9	3.1- 4.2 (4.0 ± 0.24)
c	27.9	26.5-29.0 (28.5 ± 0.79)
c´	1.64	1.61-1.66 (1.64 ± 0.02)
V	52.4	50.6-53.4 (52.9 ± 0.72)
Pharynx	382.15	381.7-387.4 (384.9 ± 2.15)
Odontostyle	19.83	19.0-21.4 (20.7 ± 0.68)
Odontophore	29.64	29.0-32.0 (30.9 ± 1.04)
Nerve ring	134.4	132.0-146.0 (140.91 ± 5.15)
Tail length	54.12	53.6-66.8 (62.47 ± 5.61)

tion Nos WN946 (holotype and three paratypes) and WN947 (paratypes).

Differential diagnosis and relationship. Among the already recorded species of the genus *Aporcelaimellus, A. subhasi* n. sp. comes closest to *A. chouhani* Baqri *et* Khera, 1975 and less to *A. coomansi* Baqri *et* Khera, 1975, but morphometric distinctions can easily be made between them. With reference to total length (L), *A. chouhani* is shorter; even the maximum of its range (L = 0.96-1.42 mm) is less than the minimum of the range of the new species (L = 1.48-1.71mm). Similarly, the tail of *A. subhasi* n. sp. is significantly longer than that of *A. chouhani* (= 34-45 µm).

The tail terminus of *A. chouhani* is subacute, whereas in *A. subhasi* n. sp. it is perfectly acute. The cardia is conoid with rounded terminus in *A. chouhani*, whereas it is tongue-shaped (hemispherical) in the new species. The ranges of the parameters a, b, c and V of these two species show some overlap but the overall size, tail length, the shape of the tail, cardia, etc., clearly discriminate *A. subhasi* n. sp. from *A. chouhani.* Andrassy (2004) proposed two new species under the genus *Aporcelaimellus* (*A. amazonicus* and *A. insularis*), emphasizing the difference of tail shapes in particular.

Aporcelaimellus coomansi differs significantly in the values of L, a, c, and V (1.74 mm, 30, 35 and 55, respectively) from the present species. In addition, the tail ends bluntly in *A. coomansi* and is acute in *A. subhasi* n. sp.

Thus, considering its shape and size, the new species can be distinguished easily from *A. chouhani* or *A. coomansi*, thereby justifying its proposition as a new species.

PARACTINOLAIMUS SHAMIMI **n. sp.**

(Table II; Fig. 2)

Female. After fixation, the specimens die in a arcuate form. Cuticle with fine transverse striae, longitudinal ridges absent. Lip region offset, lip more or less rounded in shape. Stoma entrance encircled by corrugated annulus. Buccal cavity contains four onchia, attached to a strongly cuticularised 'double' guide ring. Numerous minute denticles are present on the walls of the vestibule. Odontostyle 14 µm long (12-15 µm), with aperture about one-half of its length. Odontophore rod-shaped and more or less equal in size to the odontostyle. Oesophagus simple dorylaimoid type, 278.0 µm (277.5-278.9 µm) long. Oesophageal lumen convoluted. The post-extension constriction of the oesophagus is not

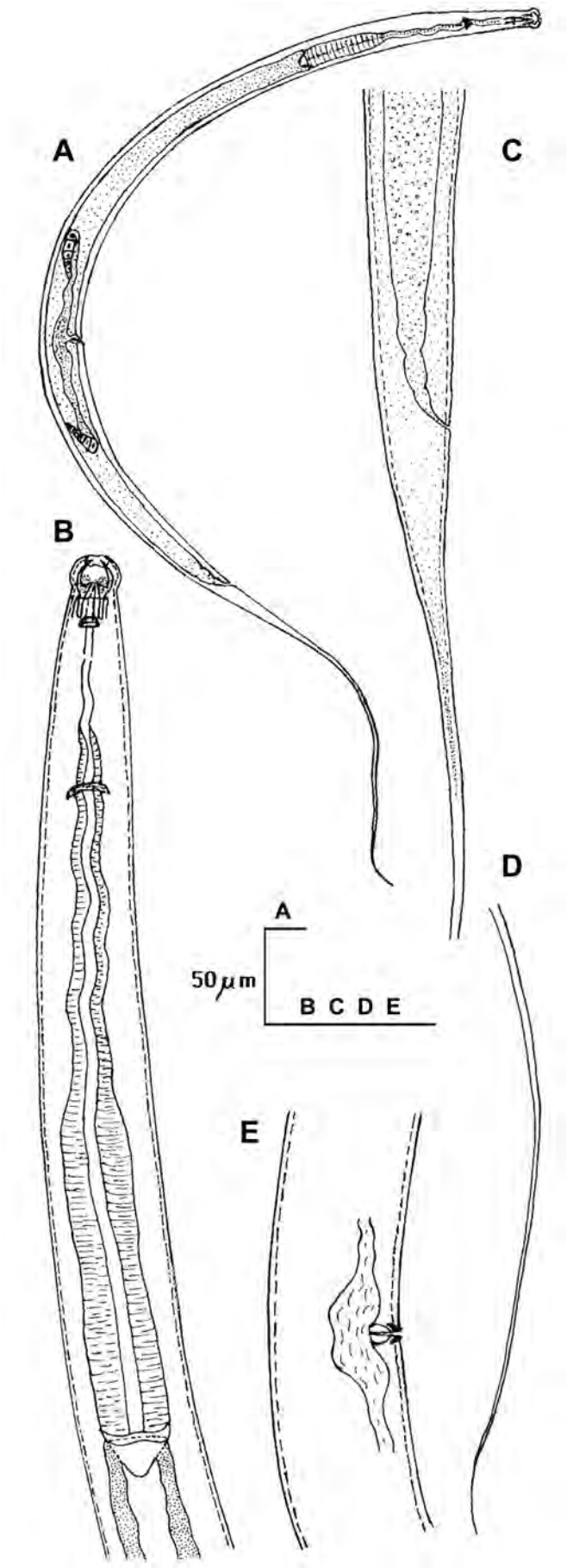

Fig. 2. *Paractinolaimus shamimi* n. sp. A: Entire female, B: Anterior region, C: Posterior region, D: Tail end, E: Vulval region.

prominent. Nerve ring at about 94.6 µm (94.0-95.1 µm) from anterior extremity. Oesophago-intestinal junction without glands. Cardia more or less rounded-conoid. Rectum and pre-rectum about 1.5 and 2.5 anal body widths long, respectively. Female reproductive system amphidelphic and with reflexed gonads. Anterior gonad 94.0 µm (92.5-96.0 µm) and posterior gonad 77.6 µm (75.4-78.2 µm) long. Tail convex-conoid and filiform, 453.6 µm (453.1-454.2 µm) in length.

Male. Not found.

Etymology. The proposed new species *Paractinolaimus shamimi* is named after Prof. Md. Shamim Jairajpuri, the renowned nematologist and Ex-Director of Zoological Survey of India, Kolkata.

Type habitat and locality. The specimens of *P. shamimi* n. sp. were collected by the first author in January 2005 from the rhizospheric soil of banana (*Musa paradisiaca* L. cv. Kanthali) from Jamdova village under the Block Garhbeta-1 in Paschim Medinipur district, West Bengal, India.

Type specimens. Types are deposited in the National Zoological Collections (NZC) of Zoological Survey of India, Kolkata, West Bengal, India, under the Registration Nos WN948 (holotype and three paratypes) and WN949 (paratypes).

Differential diagnosis and relationship. Paractinolaimus shamimi n. sp. shows an apparent resemblance with species of the genus *Trachactinolaimus* Andrassy, 1963 in terms of the vestibule with four large onchia and numerous fine denticles, odontostyle with large aperture etc. However, Andrassy (1963) erected the separate genus *Trachactinolaimus* on the basis of presence of glands in the oesophago-intestinal junction. As *P. shamimi* n. sp. does not possess such glands, it cannot be attributed to the genus *Trachactinolaimus* and, therefore, no comparisons are made with the species of this genus.

Paractinolaimus shamimi n. sp. shares a few characters with the only species of the genus *Dominicactinolaimus, D. dominicus* (Hunt, 1978) Jairajpuri *et* Ahmad, 1992, such as shape of the body, tail and cardia. Moreover, in both species the buccal cavity contains large onchia and numerous rasp-like minute denticles; the onchia are attached basally to a strongly cuticularised 'double' guide ring. However, these two species differ in total body length (L) and in the values of c and V (in *D. dominicus* L = 2.52 mm; c = 9.1 and V = 52.4). Moreover, the oesophageal lumen is more or less straight in *D. dominicus* but it is convoluted in *P. shamimi* n. sp. The post extension constriction of the oesophagus is present in *D. dominicus* but is absent in *P. shamimi* n. sp. Considering the significant differences in total length, in the parameters c and V, and in the other structures mentioned above, it would not be reasonable to place the new species under the genus *Dominicactinolaimus.* Moreover, the genus *Dominicactinolaimus* does

Table II. Measurements of *Paractinolaimus shamimi* n. sp. (All measurements in µm except L in mm).

Parameter	Holotype ♀	Paratype 14 ♀♀
L	1.41	1.39-1.52 (1.43 ± 0.05)
a	46	46-52 (48.7 ± 2.82)
b	4.2	3.9- 4.4 (4.2 ± 0.14)
c	3.9	3.7- 4.2 (3.9 ± 0.17)
c´	19.4	19.2-19.7 (19.4 ± 0.11)
V	41.7	41.3- 41.9 (41.7 ± 0.13)
Pharynx	278	277.5-278.9 (278.2 ± 0.38)
Odontostyle	14	12-15 (13.8 ±1.24)
Odontophore	13.5	12-15.4 (13.9 ± 1.14)
Nerve ring	94.6	94-95.1 (94.6 ± 0.37)
Tail length	453.6	453.1- 454.2 (453.6 ± 0.37)

not show sexual dimorphism in the tail and no males are available to check this feature in *P. shamimi* n. sp. Also, the genus *Dominicactinolaimus* was erected based on the description of a single species from Santo Domingo and has only ever been found on this island. Therefore, it is reasonable to consider *P. shamimi* n. sp. as another species of the genus *Paractinolaimus*, which is a widespread genus that is also reported from India.

The three species of the genus *Paractinolaimus*, namely *P. aruprus* Khan *et al.*, 1994, *P. macrodentatus* Sukul, 1967 and *P. filipjewi* (Schneider, 1935) Meyl, 1957, closest to the new species stand far from *P. shamimi* n. sp. owing to their very short tails (less than half that of the new species). Besides the tail length, many other characters, such as shape of cardia, arrangement of the lip region, vestibule, etc., differentiate the three species mentioned from *P. shamimi* n. sp. *Paractinolaimus aruprus* is longer and also different from *P. shamimi* n. sp. in other parameters (L = 2.25 mm, a = 31, c = 8, V = 45, and odontostyle is 23 µm in *P. aruprus*). The oesophago-intestinal junction is broad and the cardia is elongate conoid in *P. aruprus* while it is short and more or less rounded-conoid in *P. shamimi* n. sp. In *P. macrodentatus*, instead of minute rasp-like denticles (present in the new species), seven mural teeth in two rows are present in the vestibule. The cardia is elongate conoid in *P. macrodentatus*, whereas it is rounded conoid in *P. shamimi* n. sp., and a, c, and V are also different (a = 39.6, c = 13.2, and V = 58 in *P. macrodentatus*). *Paractinolaimus filipjewi* is longer (L = 3.3 mm) and also differs significantly from *P. shamimi* in other parameters (a = 43, c = 6.8, and V = 45). Moreover, the odontostyle is massive and longer (35 µm long and 5 µm wide) and the oesophagus starts its expansion slightly anterior to the middle in *P. filipjewi*.

The differences in tail length, dentition in stoma, structures in the vestibule, shape of cardia, oesophago-intestinal junction, and in the parameters L, a, c, and V, mean that *P. shamimi* n. sp. can definitely be considered as a new species of the genus *Paractinolaimus*.

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