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A NEW SPECIES OF *ZIZIPHUS* (RHAMNACEAE) FROM NEPAL HIMALAYAS

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ABSTRACT

A tree belonging to *Ziziphus* (Rhamnaceae) from Timal region of Kavrepalanchok district, Central Nepal is illustrated and described as a new species *Ziziphus budhensis* KR. Bhattarai & Pathak, a narrow endemic from central Nepal. This species did not match with the *Ziziphus* species reported from this region. Although the new species is similar to *Z. montana* W.W.Sm. from Yunan, China with trinerved leaves lacking conspicuous secondary veins, it differs tree habit, shape and size of leaves, length of peduncle, carpel, and shape and size of fruits and seeds as well as distribution range. Detailed taxonomic description, illustration, photographs, ecology and its economic and religious value are discussed.

Keywords: *Ziziphus*, Rhamnaceae, Timal, New Species, Endemic, Nepal

INTRODUCTION

Ziziphus has about 100 species reported from warm-temperate and subtropical regions throughout the world (Mabberley 2008), among them 17 species are from India (Bhandari and Bhansali, 2000), 12 species from China (Zao, 2007), seven species from Bhutan (Grierson and Long, 1991) and six species are already reported from Nepal (NHPL, 2011).

The unidentified species belongs to genus *Ziziphus* and family Rhamnaceae. Due to its economical importance local people from the Timal region of Kavrepalanchok district brought material to the National Herbarium and Plant Laboratories (KATH) for identification.

However, this material could not be identified as it was found to differ from the species already reported from Nepal, namely, *Ziziphus incurva* Roxb., *Ziziphus mauritiana* Lam., *Ziziphus nummularia* (Burm. f.) Weght & Am., *Ziziphus oenoplia* (L.) Mill. *Ziziphus xylopyrus* (Retz.) Willd. and *Ziziphus rugosa* Lam. Therefore fieldwork was carried out by KATH staff during April 2013 to the subtropical part of Kavrepalanchok, district (Figure 1) to collect herbarium specimens of the unknown *Ziziphus* at the time of flowering and fruiting and observe its morphology and ecology in the natural habitat.

This region has been collected rather little compared with other parts of Nepal (NHPL, 2010, 2011 & 2012).

After examining reference *Ziziphus* collections at KATH and Tribhuvan University Central Herbarium (TUCH), Kathmandu, Nepal and Indian *Ziziphus* collections in Dehradun Herbarium (DD) India as well as checking the characteristic features of the species in Flora of British India (Hooker, 1875), Flora of India (Bhandari and Bhansali, 2000),

Flora of China (Zao, 2007), Flora of Bhutan (Grierson and Long, 1991), Flora of British Burma (Kurz, 1974), Flora of Pakistan (Nasir *et al.*, 1972), Flora of Bangladesh (Ara *et al.*, 2008) and Flora of Japan (Ohwi, 1965) the species was described as a new species which is here named *Ziziphus budhensis* KR. Bhattarai & Pathak.

Ziziphus budhensis is clearly different from the species of *Ziziphus* growing in Nepal (see key below). The *Ziziphus budhensis* did not match with the *Ziziphus* species reported from India, Pakistan, Bhutan, Bangladesh with respect to habit, branching types, leaf characters, flower and fruit characters, seed morphology and distribution (Nasir *et al.*, 1972; Grierson and Long, 1991; Bhandari and Bhansali, 2000; Ara *et al.*, 2008), but shows little similarities with *Ziziphus montana* W.W.Sm. of Yunnan, China in some vegetative and flowering characters (Zao, 2007). However it differs in tree size, types and size of spines, fruiting branch and fruit size (Table 1).

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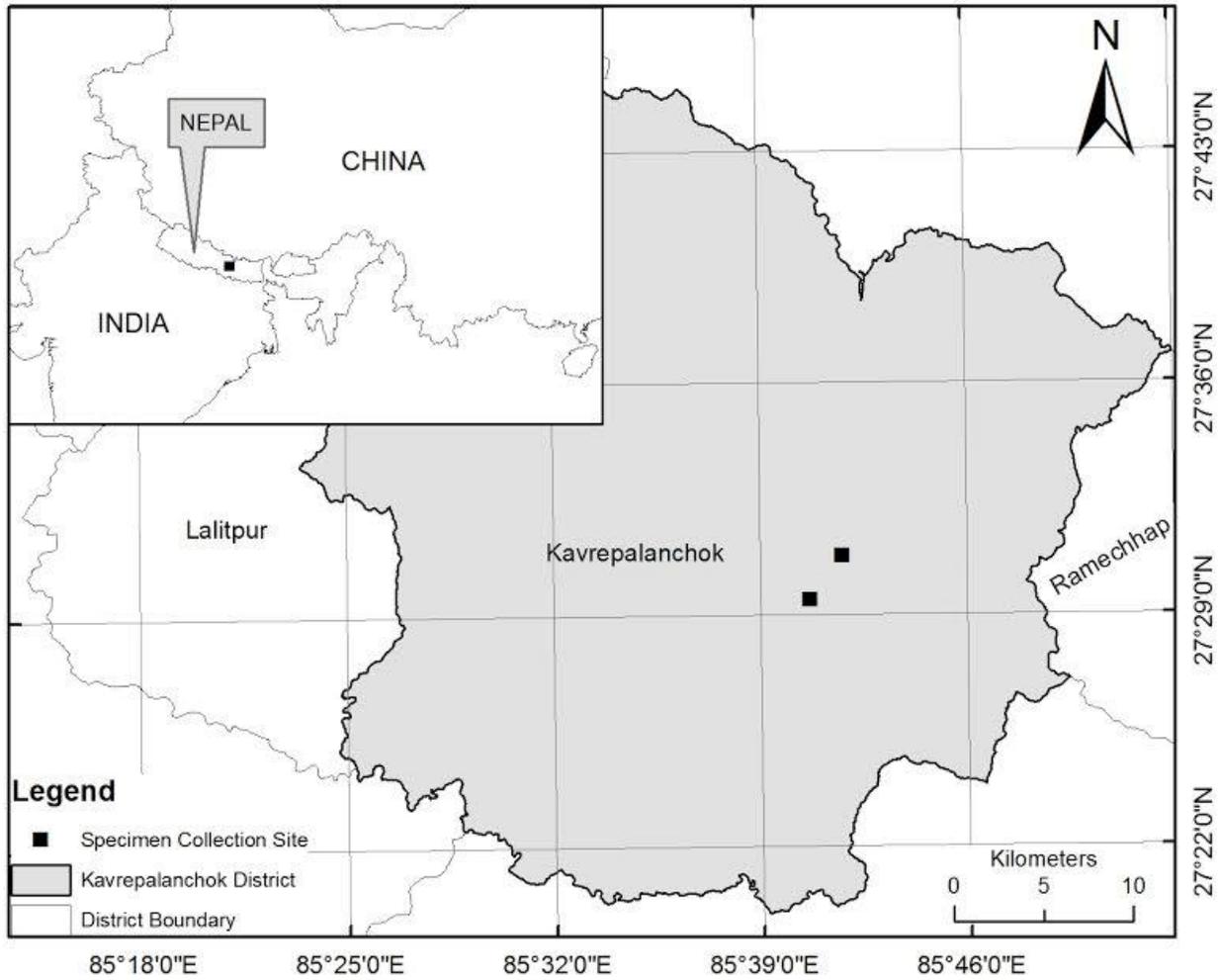


Figure 1: Specimens Collection site

Key to the *Ziziphus* Species of Nepal

1. Flowers in peduncle cymes arrange in large panicle2
 + Flowers fascicles or sessile axillary cymes3
2. Petals present*Z. xylopyrus*
 + Petals absent*Z. rugosa*
3. Leaves acuminate.....4
 + Leaves obtuse or sub acute6
4. Tree usually more than 10 m in height.....5
 + Usually shrub*Z. oenplia*
5. Usually armed, leaves 2-7x1.5-5 cm, glabrous on both sides*Z. mauritiana*
 + Usually unarmed, leaves 5-14x 2-6 cm, glabrous only upper surface*Z. incurva*
6. Red or black fleshy Drupe less than 1 cm in diameter, seeds usually 2 without any facet
 *Z. nummularia*

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+ Red drupe 2.5 -3 cm in diameter, seeds 1 or 2 with remarkable facet 2-7 (-10)
*Z. budhensis*

Table 1: Distinguishing morphological characters of *Ziziphus montana* and *Z. budhensis*

Attributes	<i>Ziziphus montana</i>	<i>Ziziphus budhensis</i>
Tree size	Tree up to 14 m	Tree up to 10 m
Branches	Monomorphic	Dimorphic, with sterile and fertile branches. The sterile branches have with long spines while fertile branch has shorter spines or spineless.
Petiole	Petiole 7-15 mm	Petiole 5-10 mm
Leaves	Elliptic with long apex 5-8 × 3-4.5 cm, notch absent	Less elliptic than <i>Z. montana</i> or ovate and some leaves are with notch at apex 4-7 x 3-5 cm
Leaf margin	Crenulate	Less crenulate
Flowers	Few to 10	6 -12 (-14)
Peduncle	1-2 mm	3-10 mm
Carpel	Bifid	Bi- or trifid
Fruit size	2.5-3 cm in diameter	1.5-2.5 cm in diameter
Mesocarp	Thick, up to 2 cm	Thin, up to 1 cm
Seed size	0.9-1 cm	0.7-1.5 cm
Seed shape	Spherical or Hemispherical	Spheroid or hemispheroid with 1-7 (-10) flattened surfaces
Seed faced	No remarkable faced on seed	Seed with remarkable facet
Distribution	1400-2600 m, in open forest	1200-2000 m, near forest and edge of marginal and cultivated land

Taxonomic Description

Ziziphus budhensis KR. Bhattacharai & Pathak.

A small spinose tree to 8-10 m (Figure 2A). Stem glabrous, stipular spines 2, both erect, brown 1-2 cm in young shrubs and reduced up to 0.3 mm in mature trees. In rare case old branches are without spines. Young and annual branches are red brown and tomentose. Leaves simple, alternate, apex notched when young and acute after maturation. Ovate, elliptic, petiolate, petiole (5-10mm), pilose, pubescent on major vein, 3-veined from base, veins prominent abaxially impressed adaxially. Midvein without conspicuous secondary veins. Base asymmetric, sub-rounded, margin crenulate, apex sub rounded rarely shortly acute. Flowers creamy white, mostly few to 10 crowded (rarely to 14) in auxiliary dichotomous cymes. Peduncles densely pilose. Sepals 5 triangular ca. 3mm inserted to the disc (Figure 3d). Abbatial brownish pilose, apex acute.

Petals -5 creamy white, cucullate clawed, ca. 2mm, initiated along with stamen. Disk thick, fleshy 5 lobed. Stamens pentandrous extrose, exserted, ca. 2 mm, anther 2 lobed cordate dorsi fixed, bicarpellate, styles short, ca. 2 mm, bifid (sometimes tri-fid), ovary globose, immersed in disc. Fruit yellow brown, globose or subglobose, 1.5 -2.5 cm in diameter. Fruiting pedicle of ten curved 3-10 mm, sparsely pilose mesocarp 0.5-1 cm thick, and endocarp woody wall 1-2 mm, located with 2 seeds compressed obovoid, seed 0.5- 1.0 mm in diameter.

Flowering in March-April and fruiting in May-August.

The holotype, here designated, C.N. 20701, , Kavrepalanchok District, Kharpakot 1900 m, 17 April, 2013; K.R. Bhattacharai, M.L. Pathak, D.R. Kandel and K. Dahal (Figure 3) and isotype here designated as C.N. 20701, Kavrepalanchok district, Kharpakot, 1900 m, 17 April, 2013; K.R. Bhattacharai, M.L. Pathak, D.R. Kandel and K. Dahal (Figure 4). The holotype and isotyp are deposited in National Herbarium and Plant Laboratories (KATH) Kathmandu, Nepal. These speciemens were collected at 27° 30'42.6" N and 85 ° 41' 46.1" E.



Figure 2: A. Tree of *Ziziphus budhensis* B. Flowering branch of the *Ziziphus budhensis*

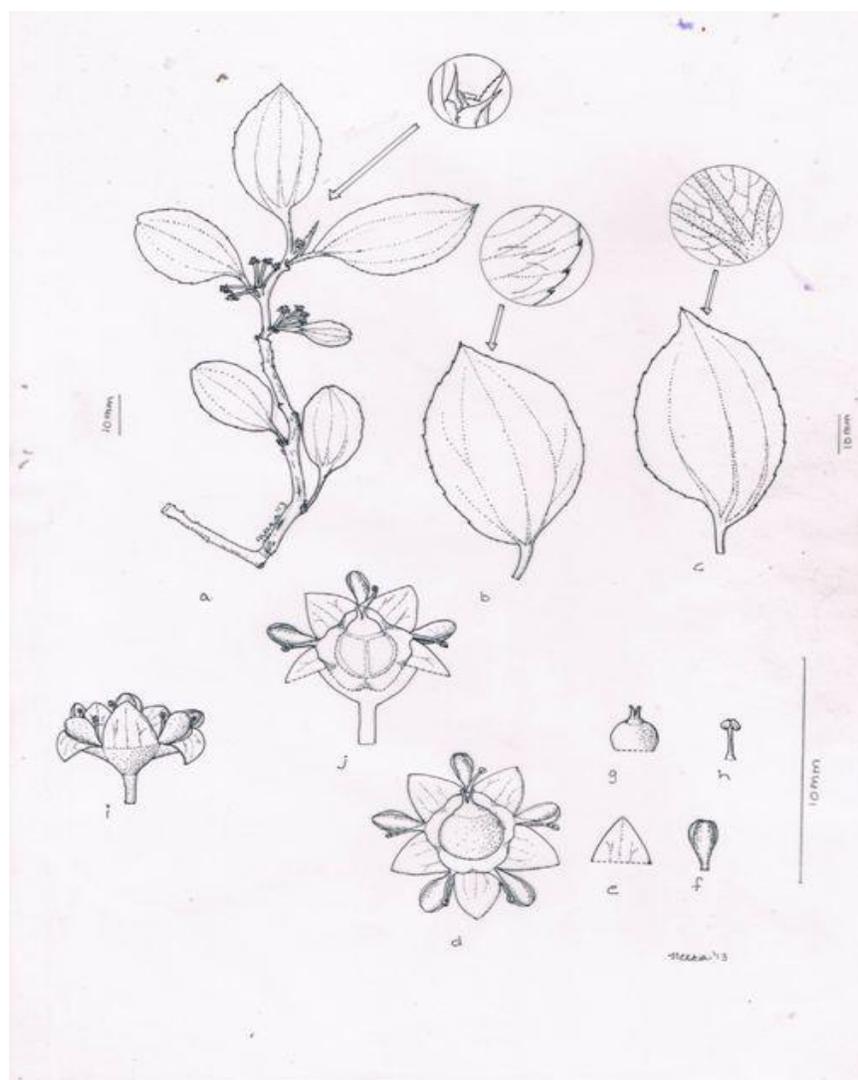


Figure 3: a. Fertile branch of *Ziziphus budhensis* with flowers, b. Leaf dorsal side X1, c. Leaf ventral side X1, d. Flower X6, e. Sepal X6, f. Petal X6, g. Gynoecium and Ovary X6, h. Stamen X6, i. A flower with sepals and petals with stamens x6, j. Longitudinal section of a flower X6. KATH Holotype: C.N. 20701, 1900 m, 17 April, 2013; K.R. Bhattacharai, M.L. Pathak, D.R. Kandel and K. Dahal

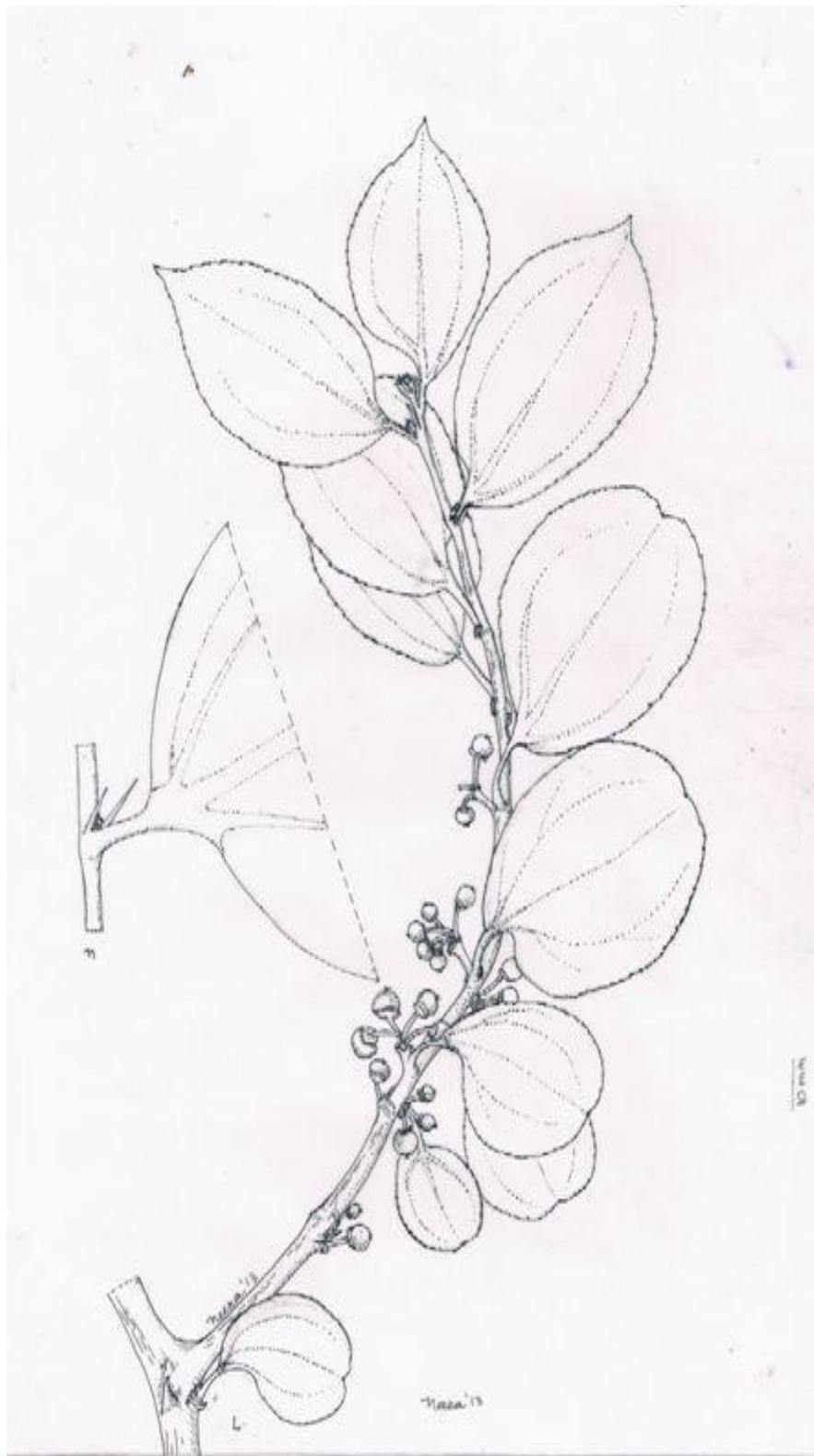


Figure 4: Fertile branch of *Ziziphus budhensis* with immature fruit. X, KATH Isotype: C.N. 20701, Kavrepalanchok district, Kharpakot, 1900 m, 17 April, 2013; K.R. Bhattarai, M.L. Pathak, D.R. Kandel and K. Dahal

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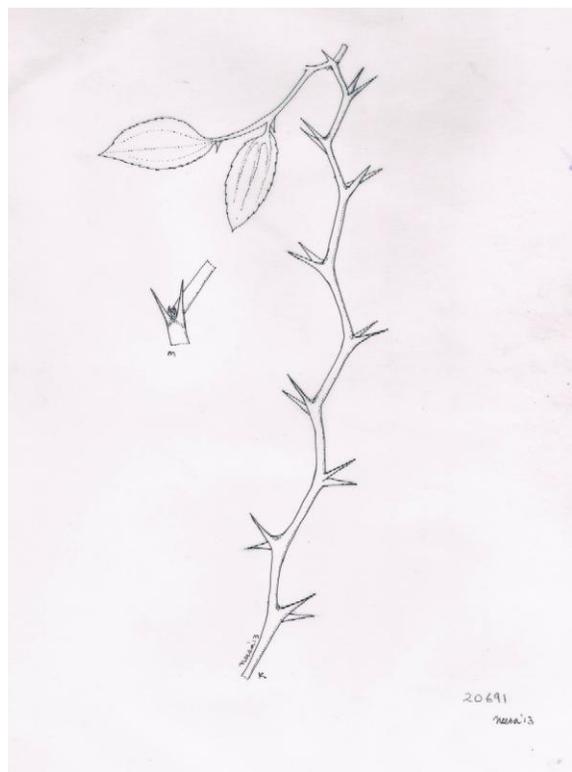


Figure 5: Sterile branch with spines X1 C.N. 20691, Timal, Kavreplanchok, 2000 2000 m, Feb.10, 2013, K.R Bhattacharai in KATH

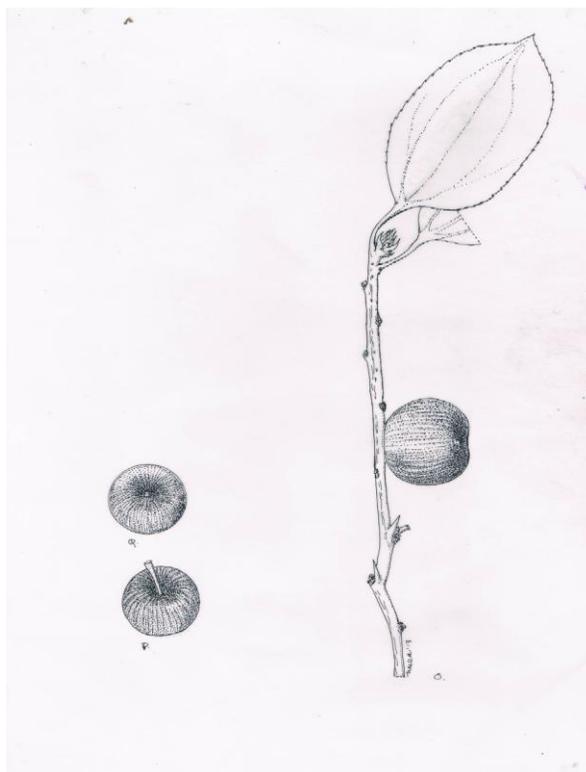


Figure 6: Spineless fertile branch with mature Fruit X1. C.N.03, Mecksha, Kavreplanchok , 1800 m, Jan. 9. 20. 2010, J. Pradhan in KATH

Ecology: It is found in subtropical region 1200-2000 m especially in marginal and cultivated land near forest. It is known so far only from a small area of Kavrepalanchok district in Central Nepal. The tree resembles with dwarf *Prunus* tree species (Figures 4-6). It prefers to grow on sandy and rocky fragile soil. Due to its narrow geographical range in Nepal and found nowhere else it is an endemic to Nepal.

Economic and Religious value: The fruit of *Ziziphus budhensis* is edible. The tree is also used as fodder for cattle. The seeds are highly valued and are used to make garlands. The garlands made by beads are used by Buddhist people for worship to 'delight Lord Buddha' and for spiritual peace and locally called Bodhichita. Smaller seeds are more highly prized than larger ones, and a garland of 108 beads of high values seeds costs up to 80 thousand Nepalese Rupees (ca. \$800).

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Research Article

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