

MORPHOLOGICAL CHARACTERIZATION OF CIPLUKAN (*PHYSALIS* L.) FAMILY SOLANACEAE, ENDEMIC IN SAND DUNES (GUMUK PASIR), KULON PROGO REGENCY, YOGYAKARTA PROVINCE, INDONESIA

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ABSTRACT

Physalis minima is a small species that is used by local people as fruits and medicines. It grows specially in sand dune forests. This study was based on an examination of the herbarium materials from Herbarium Biology Brawijaya University (HBUR), and the new materials from the sand dune area was obtained from Glagah and Karangwuni Villages, Kulon Progo Regency, Yogyakarta Province. The author studied the collection as detail parts and descriptions of the dry ingredients, except the size of the flowers and fruit, which are based on dehydrated ingredients (boiled in water). The results of this study are important to be used as a basic information on species variations found in sandbars on the southern coast of Yogyakarta Province, Java Island. Based on the research on the morphological characters of herbarium specimens, it was found that the species was known as *Physalis minima* L. Batoro var nov. Gumuk Pasir.

Key words: *Physalis*, sand dune, Kulon Progo regency

INTRODUCTION

Physalis spp. are the one of the small genus included in the *Solanaceae*, order Solanales (Parmar, Kaushal. 1982 & Axelius, 1992; De Moraes *et al.*, 2014). Characteristics of this family includes habit as herb or shrub are; leaves alternate; flower bisexual, solitary or in cymes. Calyx five-lobed persistent; corolla plicate and stamen epipetalous. Vernacular names of genus *Physalis* are cimplukan (central Java), ciplukan (Indonesian, Malay Peninsula), silad (Sabah), gerenis (Serawak), balatbad (Philippines), salu (Myanmar), kapho (Thailand) and luji (Vietnam) (Batoro, Arumningtyas, 2018). Madurese use it as a traditional medicinal herb and anti-inflammatory (Michoi and KwanHwang, 2003; Nurtit & Agra, 2005; Mastuti *et al.*, 2020). *Physalis* spp. has local name called ceplukan or ciplukan (East Java), yor-yoran (Madurese) and cecendet (Sundaense). This family consists of eighty-five genera mainly in tropical and warm parts of America (Keng, 1989). Eight common genera are found in Malaya, except genera *Physalis*, *Datura* and *Solanum* distributed from America origin (Keng, 1989; Backer and van de Brink, 1968) reported in Java three known species is *Physalis minima* L., *Physalis angulata* L. and *Physalis peruviana* L. *Physalis minima* is found at a height of about 473 m above sea level (ASL) while *Physalis angulata* at about 5-538 m ASL (Batoro & Arumningtyas, 2018). *Physalis peruviana* have distribution in UB Forest, Perhutani forest and Bromo Tengger National Park (BTS-NP), 1100-2350 m ASL. *Physalis angulata* and *Physalis peruviana* are herbs widely used in folk medicine (Wu, *et al.*, 2004; Perk *et al.*, 2013). In Australia *Physalis minima* spreads from the sea to an altitude of 800 m ASL and is considered a weed in agricultural land (Tropical Rain Forest Plants).

Backer and Bakuizen, 1968 reported description of the *Physalis* as, flowers terminal, seemingly axillary, nodding, actinomorphic; calyx campanulate, with impressed receptacle, acutely 5-lobed, much enlarged

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after anthesis; corolla-tube widely campanulate, very shallowly 5-lobed, (in Java) below each lobe with a brown spot, below the spot with a group of hairs from the margin of which rows of hairs run downwards; stamens at apex of corolla tube; filament glabrous; anther oblong; cell 2 longitudinally dehiscent; ovary glabrous, 2 celled; ovule very much; style filiform; stigma capitate; berry pendulous, enclosed by inflated, reticulate, narrowly-mouthed calyx, shortly stalked, globose or ellipsoid; seed numerous, compressed, tuberculate corrugate; embryo curved. Flowers, pedicellate having 1.2 cm long pedicel, hermaphrodite, complete, solitary, small campanulate (Parmar and Kaushal, 1982). Stem angular-ribbed upwards, lower leaves spirally arranged, higher ones pair-wise approximate, unequal, entire or shallowly repand-dentate. Leaves, petiolate 4.1 cm long, ovate to cordate, pubescent, delicate, exstipulate, acuminate, having reticulate palmate venation and undulate margins; dorsal surface of the leaves, dark green and the ventral surface, light green; 9.7 cm long and 8.1 cm broad (Parmar, and Kaushal 1982). Unarmed, erect, annual or perennial herbs. In this study, the morphological characters of the genus *Physalis* and the distribution in the sand dune area of the southern coast of Yogyakarta Province was carried out to clarify the confusion.

MATERIALS AND METHODS

This study is based on the examination of the herbarium material from Herbarium Biology of Brawijaya University (HBUR)'s collections, and the new materials collected from the sand dune area from Glagah and Karangwuni Villages, Kulon Progo Regency, Yogyakarta Province (Figure, 1). Standard plant specimen collection techniques were used to collect the samples. The collections studied by the authors are detailed sections and descriptions of the dry ingredients, except the size of the flowers and fruit, which are based on dehydrated ingredients (boiled in water). Terminologies follows (Radford 1986; Balgooy, 1987) and methods follows by De Vogel (1987) and Batoro & Rahardi (2019).



Figure 1. Map of Kulon Progo regency and star: locations of study sites

RESULTS AND DISCUSSION

Literature cited includes Flora of Java 2 (1968): 467-468. Tumbuhan Berguna Indonesia III (1927): 1706-1707. Sp. Pl (Species Plantarum) no. 2:183, 1753; Flora de la Nouvelle-Caledonie 7: 131 (1976).

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According to the Australian Rain Forest Plants *Physalis minima* L., the name was given by Linnaeus in 1753 in his book *Species Plantarum* 2: 183. Type: India; holo: BM. Fide H. Heine, *Flora de la Nouvelle-Caledonie* &: 131(1976). While other names (synonyms): *Physalis indica* Lam., In the journal *Encyclopedie Methodique, Botanique* 2: 102 (1786); *Physalis parviflora* R.Br., in the journal *Prodromus Florae Novae Hollandiae*: 447 (1810), Type Northern Australia, R. Brown; holo: Bm.

Recently based on herbarium specimen study (HBUR) one species *Physalis* sp. was recorded from sand dune Kulon Progo Regency, Yogyakarta. One species records namely *Physalis minima* Batoro var. nov. Gumuk Pasir.

Description

The position of the sand dune (gumuk pasir) is in front of the Indonesian Ocean. *Physalis* has large rootstock, and the size has diameters approximately 0.5-1 cm. The white roots sometimes branch into white-pink. The trunks are perforated, rectangular, has green-pink colors, straight, has branched, and sometimes drooping. The surface of the branches is green interspersed with pink, smooth to soft, has white pubescent hair. Short internodes around 5-11 cm long, buds of leaves and flowers appear on the internodes. Petiole 0.5 x 1 mm, round, 3-4 cm long, leaves oval-lanceolate, 3-4.5 x 2.5-3.5 mm with a tapered tip; serrated 4-6 pairs, fine hairs on the edges around the leaf veins. The base of the leaves is blunt or slightly tapered with different spacing of up to 0.2-0.3 mm; the upper surface of the leaf is green, the bottom surface is whitish green, if it is dark yellow. Pedicel (flower stem) 2-2.5 x 1 mm diameter, crooked-brown at the bottom. Calyx has fine hair, elongated, sticky green, 2.5-4.1 x 1.2-1.6 cm, the main 5 petals are brown, brown veins; slit 5, sharing a triangular shape at the end, acute 0.5 cm, ribbed light purple with fine white hair. The bell corolla are 5 pairs, the color is white-light-yellow 6-7.4 x 5-6.2 mm, the edges are notched 5; inside the neck with a yellow-white stain. On each inner blemish there are clusters of short and dense white hair; the end of the corolla is divided into 5 short, pointed acute. Filament glabrous 5, 1.5-2 mm x 0.5 mm, brown-green; anthers ovate 2 mm x 1 mm, greenish brown. Style 1, round, smooth, brownish-green; stigma 1-1.5 mm, button shape, brown. Buni fruit, round, slightly elongated 1-1.1-1.2 cm, shiny and smooth; sweet salty taste; when young is green, it's ripe shiny yellow-pink. The seeds are white, many are located on the edge, to the middle.

SPECIMENS EXAMINED: Specimens. JB, no. 21; 23 Glagah villages (YIA), Temon sub-district, Kulon Progo regency. Altitude 25 m ASL; S.08°0'06.45"; E.112°7'56.48"; S.07°54'36.69"; E.110°03'41.01". Collection JB, No. 22, Karangwuni Village, Temon District, Kulon Progo Regency, Yogyakarta.

NOTES: Specimen *Physalis minima* in a sand dune (gumuk pasir) scattered in small groups (sporadic), the base of the stem is large (rootstock) 0.5-1 cm, slightly brownish white, has short book, leaves are green, a bit thick and the fruit has a sweet-salty taste. Enlarged stem roots (rootstock) are intended to cope with hot and windy sand soil conditions (Figures 2, A, B and C), as well as rather thick leaves, high salt content and environmental temperature of 33-37°C. The plant survived and managed to survive on other plants (*Canavalia maritima* (Aubl.) Urb.). Due to the soil and environment being very that hot, sea water vapor contains salt and its need shade as well as adequate nutrition (Batoro, 2017 & Batoro, 2018). The characterization is the result of the adaptation of the species to the sand dune environment, thus indicating the existence of new species or new varieties.

USES: Edible ripe fruit, sweet salty taste; by the local community it is used as fruit, medication for high blood pressure, heart disease, malaria and diabetes mellitus (Perry, 1980; Batoro, 2017; Mastuti *et al.*, 2018). It is used as a high blood pressure medicinal herb by cleaning and boiling the whole plant, while the water is drunk with a bitter taste.

DISTRIBUTION: Endemic to the sand dune (Gumuk Pasir) Karangwuni and Glagah village, Temon district, Kulon Progo regency, Yogyakarta Province (Figure 1).

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HABITAT: Gumuk pasir (sand dune) contains iron sand, local name (*wedi malelo*), among Pandanus plants (*Pandanus tectorius*), krandan (*Canavalia maritima*), balaran (*Ipomoea pes-caprae*) and rumput angin (*Spinifex littoreus*), bordering the open south sea (Figure 2 and 3).

LOCAL NAMES: Ciplukan, cimplukan (Java); yor-yoran (Madurese), cecendet (Sundaense).

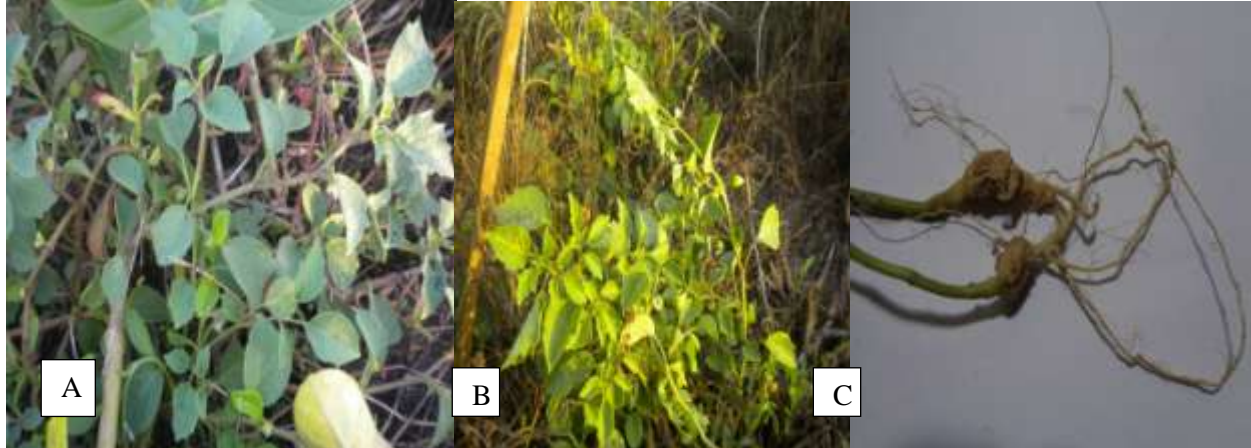


Figure 2. Specimen A, B Habitat of *Physalis minima* C. Rootstock, location in *sand dune* (gumuk pasir), Glagah village, Kulon Progo Regency, Yogyakarta.

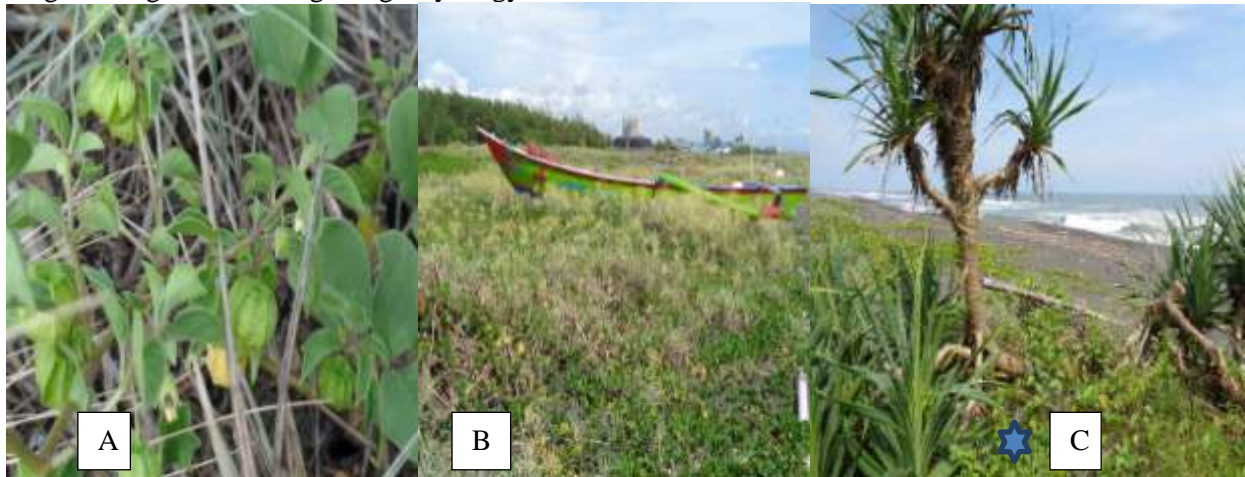


Figure 3. Specimen 3. A, B. Habitat of *Physalis minima* in sand dune, Karangwuni village and C. Glagah village, Kulon Progo Regency.

According Batoro (2019) *Physalis minima* and *Physalis angulata* plants grow in the lowlands to the highlands and are scattered in dry moor and rice fields. Distribution among maize, pohong, cassava, beans. *Physalis minima* has a small height of 30 cm to 50 cm, the flowers are yellow-white, with slightly dark petals. The specimens in the sand dune are still problematic whether they are closer to *Physalis minima* or *Physalis angulata* because they have adapted to the environment. In Australia this plant is spread from the sea to an altitude of 800 m ASL and is considered a weed in agricultural land.

Conclusions

The results of research in the sand dune of Glagah Village and Karangwuni Kulon Progo Regency, Yogyakarta province, consists of one species of *Physalis minima* L. Batoro var nov. It grows well in sand dune with a height of 5-25 m. *Physalis* has large rootstock, and the size has diameters approximately 0.5-

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1 cm, small, thick leaves, fruit sweet salty taste. It is very suitable for living in habitats and conditions on sand dunes as well as for the protection of coastal infrastructure.

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