



OCCURENCE OF NEW ANGIOSPERM WEED SPECIES *PHYLLANTHUS AMARUS* SCHUMACH. & THONN. (EUPHORBIACEAE) IN THE STATE OF PUNJAB, INDIA

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Abstract

Phyllanthus amarus Schumach. & Thonn. has been recorded for the first time from Malwa region of the state of Punjab, India. It has been found growing as a weed in crops such as rice, cotton, maize *etc.* Existing population of this species is very dominant in the study area. Besides morphological, anatomical characters have also been studied for characterization of this species. The morphological detail of other *Phyllanthus* species (*P. fraternus*, *P. maderaspatensis*, *P. urinaria* and *P. virgatus*) have also been examined for comparative studies with *Phyllanthus amarus*. Outcome of the study will be useful to the taxonomists, researchers and ethnobotanists as it is an addition to the already existing species of genus *Phyllanthus* in the state.

Key words: Anatomy, morphology, *Phyllanthus*, Punjab, taxonomy, weed.

Introduction

Phyllanthus L. is one of the largest genus of family Euphorbiaceae having 833 species occurring throughout the world including 56 from India (Govaerts *et al.*, 2000; Hooker, 1890). However, according to Jantan *et al.*, (2019), has suggested that *Phyllanthus* as a member of family Phyllanthaceae, contain 1270 species. Bamber, (1916) reported four *Phyllanthus* species such as *P. niruri* L., *P. parvifolius* Buch.-Ham. ex D. Don., *P. urinaria* L. and *P. virgatus* G. Forster from Punjab and its adjoining areas. Later on, Nair, (1978) recorded four species of *Phyllanthus* (*P. fraternus* G. L. Webster, *P. maderaspatensis* L., *P. urinaria* L. and *P. virgatus* G. Forster) from Punjab and Haryana. No doubt that both the studies has yielded four species each but later study has two species different than the former. It may likely be due to geographical restrictions. Sharma, (1990) also recorded 4 species of *Phyllanthus* including *P. fraternus*, *P. maderaspatensis*, *P. urinaria* and *P. virgatus* from Punjab, India. But these are exactly the same species that has been recorded by Nair, (1978).

Phyllanthus amarus Schumach. and Thonn. is commonly called 'Hazardani' because of the presence of large number of fruits and 'Jantri' due to its

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morphological resemblance with *Sesbania sesban* (L.) Merr. It commonly grows in the waste places, gardens and in different *kharif* crops as a weed. It has wide adaptability to sandy or sandy loam soils (Silva and Sales, 2008) and also to drought-stress conditions. It is originated in America and now widely grow in India as well (Chowdhury and Rao, 2002; Ralimanana *et al.*, 2013).

Phyllanthus amarus (Jain *et al.*, 2003) recorded from Assam, Gujarat, Haryana, Karnataka, Uttar Pradesh and West Bengal. The detailed literature survey has suggested that this species occur throughout India but information is lacking as for as its mention in the floristic studies of Punjab is concerned. It may be confused with *P. niruri* and *P. fraternus* because of its close resemblance. But according to Mitra and Jain, (1985) *P. niruri* is endemic to West Indies. Thus confusion lies only between *P. amarus* and *P. fraternus*. Present study is specifically planned to look into this aspect.

Materials and Methods

Study area

Punjab is one of the top agriculture state of the India. It has an area of 50362 Km² and is located in the Northern part of country (Fig. 1; a-b). The state has Majha, Malwa and Doaba zones. Present study has been carried out in

district Faridkot (Malwa region). The soil texture of the study area is sandy loam to slit. The temperature varies from 3°C to 47°C in different seasons. The average annual rainfall ranges between 480mm to 960mm.

Collection of Material

The plant samples were collected from different *kharif* crops and waste places in the year 2019 from district Faridkot, Punjab, India. Field photographs were taken using Android mobile Camera and photographs of plant parts like leaf, flower, fruit and seeds were taken using stereomicroscope in the Department of Botany, Panjab University Chandigarh.

Morphological Study

For morphological study, 15-20 samples were examined. Various characters pertaining to the stem, leaves, flower, fruit *etc* have been taken into consideration. Fruit and seed morphology were studied under the dissection microscope. Certain other characters have been examined using the stereomicroscope.

Herbarium Preparation

After collection, plant specimens were dried in 3-4 layers of newspapers at room temperature. After proper

drying and pressing, the plant specimens were mounted on the sheets for preparation of herbarium.

Taxonomic Identification

The collected plant specimens were identified using the available literature, *i.e.* Hooker, (1890); Bamber, (1916); Webster, (1970); Nair, (1978); Mitra and Jain, (1985); Chowdhury and Rao, (2002); Shu *et al.*, (2008); Kandavel *et al.*, (2011); Ralimanana *et al.*, (2013), Kumar and Vijayadas, (2014). Different online floras and Herbaria have also been consulted for identification. After proper identification, the herbarium specimen was deposited in the Herbarium, Department of Botany, Panjab University Chandigarh (PAN No.-21952).

Results

Morphological Features

Phyllanthus amarus is an erect, annual herb which may attain height up to 65cm or more. Stem is green, simple or sometimes branched and hairy. Cataphylls are 0.9mm long, triangular, acuminate and black at maturity. Branchlets are 2-10cm long with 10-35 leaves. Leaves are alternate, stipulate, oblong elliptic, round base and apex obtuse or round, petiole 0.4mm long, lamina 1-1.2cm

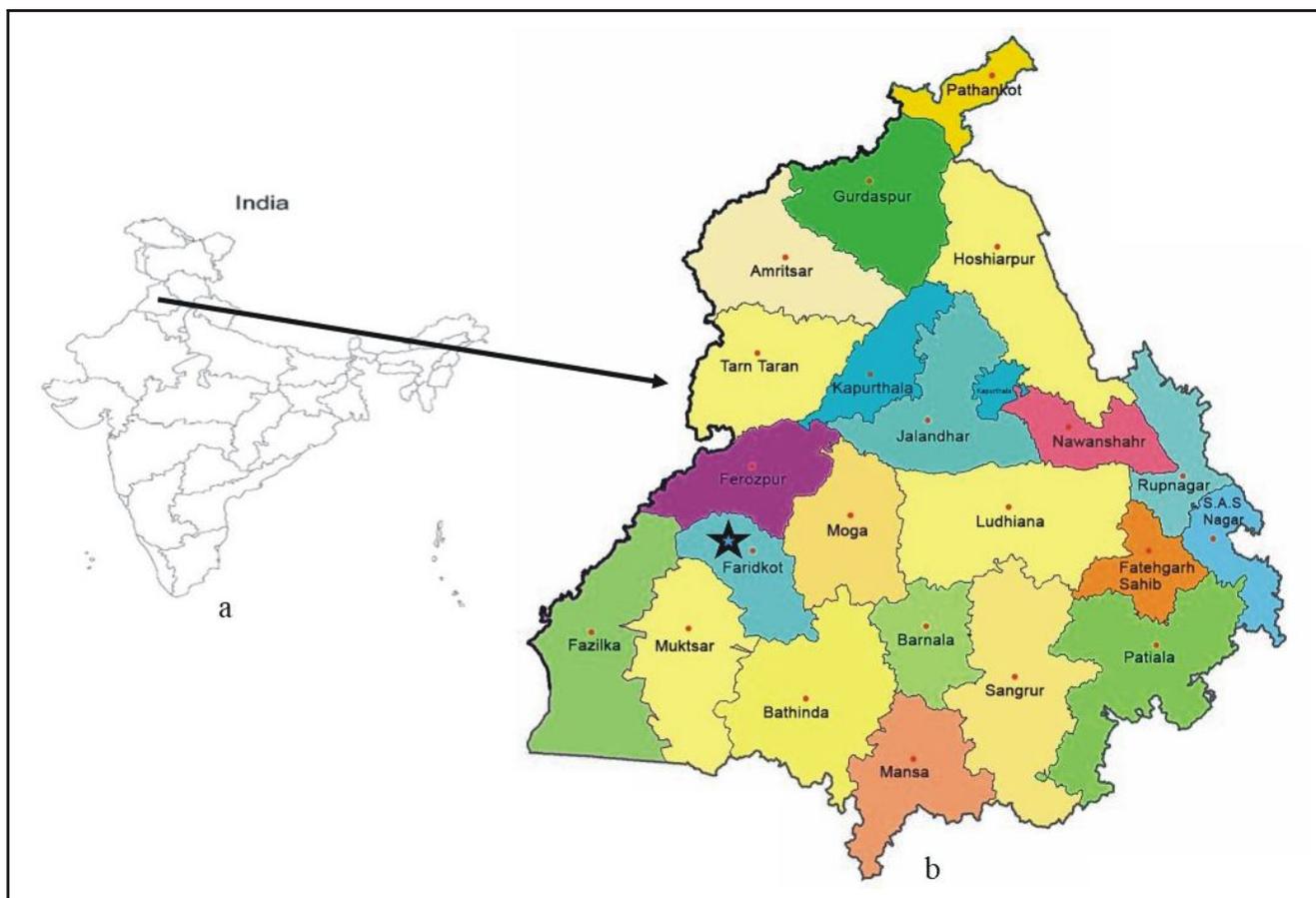


Fig. 1: a-b: Study area (source: www.punjab.gov.in).

× 0.5-0.7cm and stipule 0.9mm long. Male flower is 1.8mm across, pedicel 0.4 mm long, tepals-5 with 5 disc glands, yellowish green in color and 0.7mm long, stamens 3 and connate. Female flower 2.26mm across, pedicle 0.6mm long, tepals-5 greenish white and 0.8mm long, three styles with bifid stigma. Fruit is capsule, smooth, green and 1.8mm diameter. Seeds trigonous brownish-black and 0.8-1.2mm long (Fig. 2 and Fig. 4). Pollen grain measured 27µm × 22µm (Fig 3-k).

- Flowering and Fruiting: From August to December.

The morphological detail of other *Phyllanthus* species (*P. fraternus*, *P. maderaspatensis*, *P. urinaria* and *P. virgatus*) have also been examined (Fig. 4 & 5).

Anatomical Features

Transverse section of the stem is circular and shows

epidermis bearing hairs. Hypodermis is made up of 2-3 layer of cells. Conjoint, collateral, open and endarch vascular bundles are arranged in a ring. Pith is large and parenchymatous (Fig. 3).

Discussion

Phyllanthus amarus has been recorded as a weed species in different *kharif* crops of the study area. The collected plant specimens have been studied for morphological and anatomical characters to establish the identity. Leaves were alternate, stipulate, oblong elliptic with round base and apex obtuse or round; Male and female flowers with 5 tepals, 3 styles with bifid stigma; smooth and green coloured fruit; triangular and blackish-brown seeds were the characters considered for identification. Based on these characters *P. amarus* have

been described in different parts of the world such as China (Shu *et al.*, 2008); Comoro Island (Ralimanana *et al.*, 2013) and Saudi Arabia (Kumar and Vijayadas, 2014).

Kandavel *et al.*, (2011) studied the morphological and anatomical details of *P. amarus*, *P. debilis*, *P. maderaspatensis* and *P. virgatus* from Tamil Nadu, India and suggested that anatomical characters of the stem such as circular epidermis with stem hairs; 2-3 layered hypodermis; conjoint, collateral, open and endarch vascular bundles arranged in a ring; large and parenchymatous pith are distinct features of *P. amarus*.

Chowdhury and Rao, (2002) has enlisted 12 herbaceous species of *Phyllanthus* from India such as *P. ajmerianus*, *P. amarus*, *P. debilis*, *P. fraternus*, *P. kozhikodanus*, *P. maderaspatensis*, *P. rheedei*, *P. rotundifolius*, *P. scabrifolius*, *P. tenellus*, *P. urinaria* and *P. virgatus*. Out of these 12 species, only *P. amarus* and *P. tenellus* were found to be pentatepalous. *Phyllanthus amarus* and *Phyllanthus tenellus* can be differentiated from each other as the former contain three stamens in comparison to the later which has 5 stamens (Webster, 1970; Mitra and Jain, 1985; Shu *et al.*, 2008; Kandavel *et al.*, 2011; Ralimanana *et al.*, 2013; Kumar

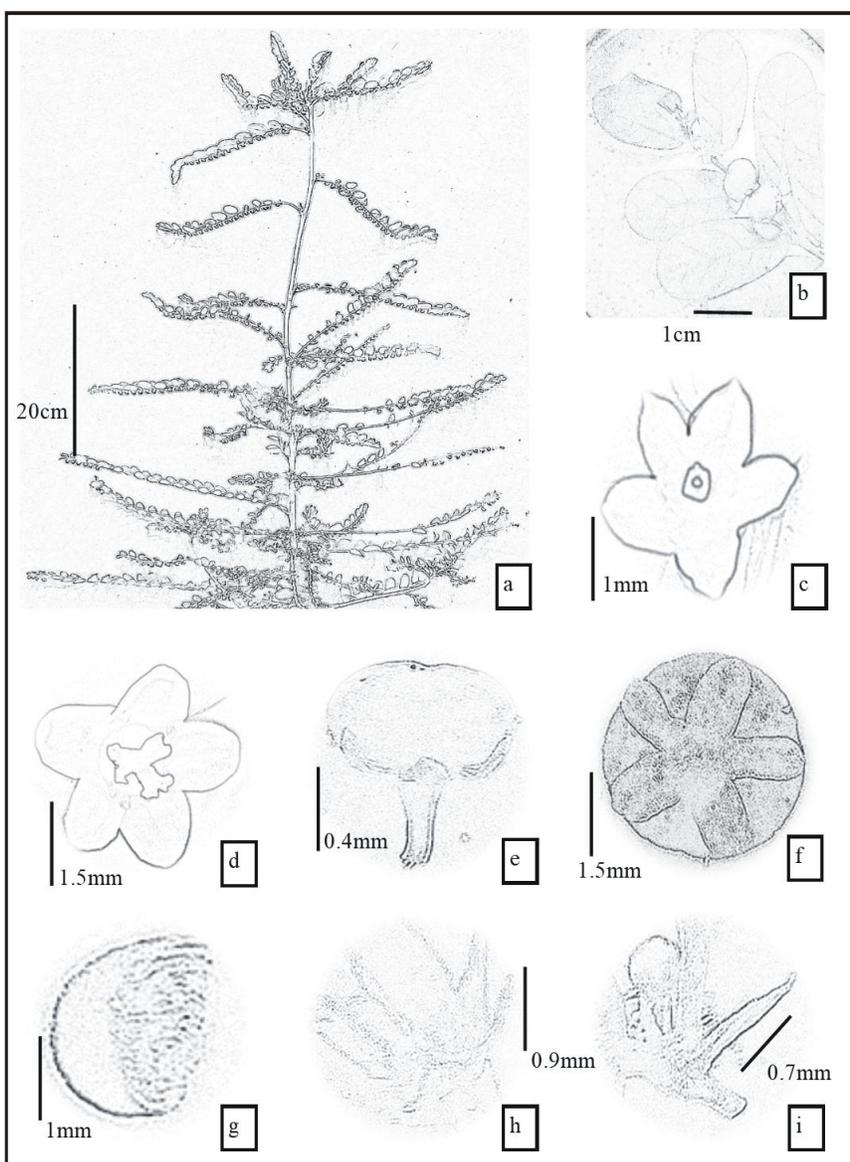


Fig. 2: (a-i) a-Plant; b-Leaf; c-Male Flower; d-Female Flower; e-Fruit with Pedicel; f-Fruit; g-Seed; h-Cataphyll; i-Stipule.

and Vijayadas, 2014). The same description has also been advocated in the eFlora of India for the identification of *P. amarus* (www.efloraofindia.com).

It is believed that *P. amarus* has been described as *P. niruri* or *P. fraternus* in the Punjab state due to its morphological similarities. Mitra and Jain, (1985) suggested that *P. niruri* L. is endemic to West Indies. There is still a confusion between *P. amarus* and *P. fraternus*. Some time they are referred as the PAF (Phyllanthus-amarus-fraternus) complex due to its close morphological appearance. According to available literature *P. amarus* and *P. fraternus* contain the number of tepals five and six respectively and are two different species. (Webster, 1970; Mitra and Jain, 1985; Shu *et al.*, 2008; Kandavel *et al.*, 2011).

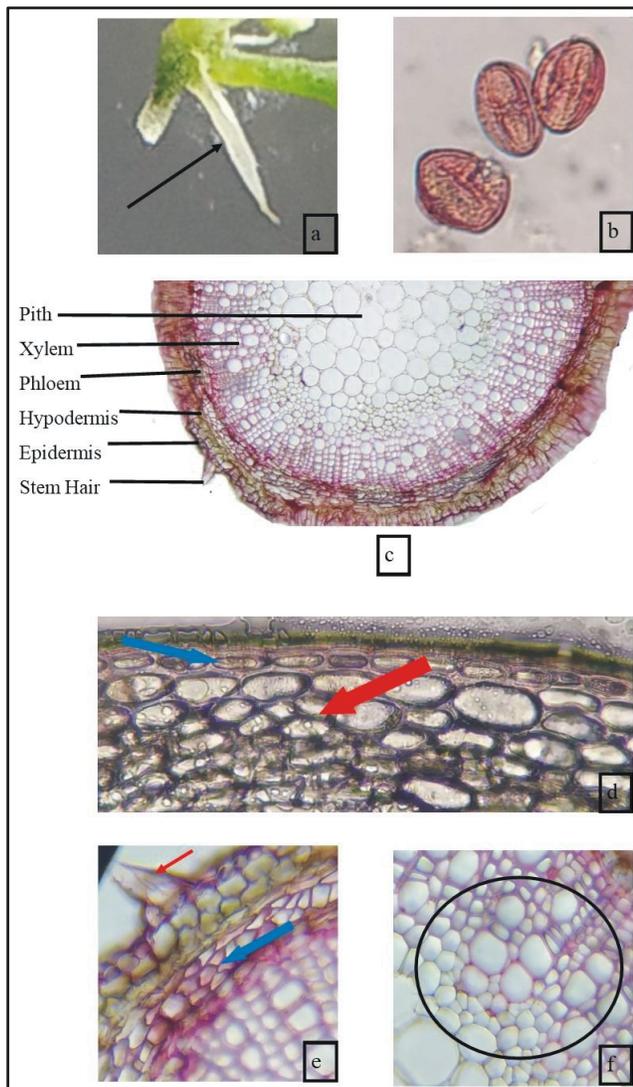


Fig. 3: (a-f) a-Stipule (at 3.5x); b-Pollen grains (at 40x); c-T.S. of Stem (at 10x); d-Bule arrow showing epidermis and Red arrow showing Hypodermis (at 40x); e-Red arrow showing stem hair and blue arrow showing Phloem (at 40x); f-Xylem (at 40x).

Therefore, on the basis of morphological and anatomical features, presently studied species has been described as a *Phyllanthus amarus*. It has not been mentioned in the available literature pertaining to the floristic studies Punjab (Nair, 1978; Sharma and Bir, 1978; Meenakshi and Sharma, 1985; Sharma, 1990; Sidhu, 1991, Rawat *et al.*, 2013). Thus, *P. amarus* is considered to be an addition to the species of genus *Phyllanthus* occurring in the state of Punjab, India.

Identification Key (Morphological)

- 1. Fruit smooth.....3
- 2. Fruit tuberculate.....6
- 3(a) Cataphyll present.....4
- 3(b) Cataphyll absent.....5
- 4(a) Tepals-5.....*P. amarus*
- 4(b) Tepals-6.....*P. fraternus*
- 5(a) Tepals-6, small pedicle.....*P. maderaspatensis*



Fig. 4: Habit of different *Phyllanthus* Species. a-*P. amarus*; b- *P. fraternus*; c-*P. maderaspatensis*; d-*P. urinaria*; e-*P. virgatus*.

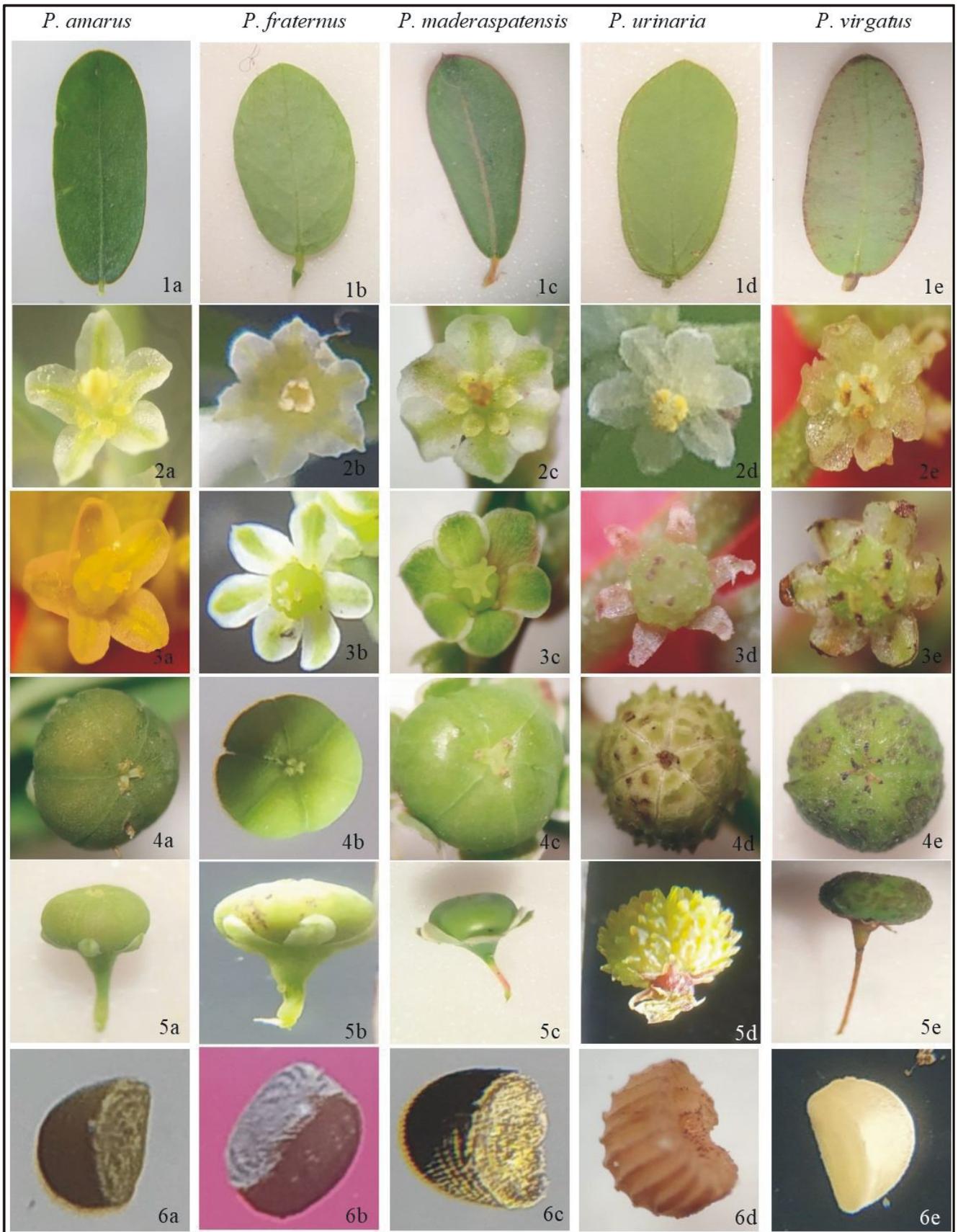


Fig. 5: Morphological variations in *Phyllanthus* species. 1(a-d) Leaf; 2(a-d) Male Flower; 3(a-d) Female Flower; 4(a-d) Fruit; 5(a-d) Fruit with Pedicle; 6(a-d) Seed.

- 5(b) Tepals-6, long pedicle.....*P. virgatus*
 6. Tepals-6.....*P. urinaria*

Conclusion

Phyllanthus amarus is an annual herb, growing as dominant weed in different *kharif* crops such as rice, cotton, maize etc. This species has not been placed on record in the available literature pertaining to *Phyllanthus* species occurring in the state of Punjab. So, it is likely new to the state of Punjab, India. The record species (*P. amarus*) will be considered as an addition to the number of species to the genus *Phyllanthus* especially for Punjab. It will be useful for the taxonomists, researchers and ethnobotanists.

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