

Original articles

Morphological and cytological studies of *Euphorbia hyssopifolia* L. and *Euphorbia heterophylla* L. from Ile-Ife, Nigeria

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Abstract

The morphotypes and chromosome numbers of *Euphorbia hyssopifolia* and *Euphorbia heterophylla* from Ile-Ife, Nigeria are reported for the first time. Mitotic studies carried out on both species revealed a diploid chromosome number of $2n = 12$ and $2n = 28$ respectively. The results indicate that the two *Euphorbia* species studied belong to the members of the genus *Euphorbia* with the secondary system of basic chromosome number of $X = 6$ and $X = 7$ (respectively) resulting from aneuploidy and polyploidy.

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Keywords: *Euphorbia* chromosomes; *Hyssopifolia*; *Heterophylla*; Weedy species; Cyathium

1. Introduction

The genus *Euphorbia* consists of at least 2100 species and it is the most diverse group of flowering plant on earth [13]. Species of *Euphorbia* are widely represented in non-tropical areas such as the Mediterranean Basin, the Middle East, South Africa, and Southern USA [3]. According to [7]; 30 species of *Euphorbia* occur in West Africa and about 21 of them are well represented in Nigeria.

Euphorbia species are mostly herbs, some shrubs, but rarely trees [4]. They are mostly monoecious, although some are dioecious with male and female flowers occurring on different plants [13].

Euphorbia hyssopifolia is native to tropical America but are also commonly found in the tropics and sub-tropical regions of Africa and America [8,10]. While *Euphorbia heterophylla* (wild poinsettia) is native to Central and South America, but now widely distributed throughout the tropics and subtropics [18]. It occurs throughout most of tropical Africa and the

Indian Ocean Islands, as well as in the Mediterranean region and South Africa [11].

According to [12]; members of the family Euphorbiaceae generally exhibit great diversity in their chromosome numbers and sizes with members of the genus *Euphorbia* being particularly extremely so. Many members of the *Euphorbia* genus were inferred to belong to a primary system of chromosome number with basic chromosome number of $n = 8$ and a secondary chromosome number of $n = 6, 7, 9$ and 10 resulting from aneuploidy and polyploidy [5,12].

Studies by previous researchers [2,15,16] have shown that natural groups (subgenera) and geographical cytotypes [5] occur within the genus *Euphorbia*. Many of these are yet to be sufficiently studied. There are no known records of the chromosome number of *E. heterophylla* and *E. hyssopifolia* species in any part of Africa and in Nigeria. These two species usually occur sympatrically on open fields and road sides in Ile-Ife, Nigeria. This study was carried out to characterize these two species, in order to establish their morphotype and also to determine their chromosome numbers.

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Table 1
Characterization of morphological attributes of *Euphorbia* species studied.

Character	<i>Euphorbia hyssopifolia</i>	<i>Euphorbia heterophylla</i>
Habit	Annual, herbaceous, procumbent, plant height 25.89 ± 2.75 cm, cylindrical solid stem with red pigments, tap root system.	Annual, herbaceous, erect, plant height 57.37 ± 6.33 cm, cylindrical hollow stem with no pigmentation, tap root system.
Leaves	Serrated margin, obovate shape, length 1.08 ± 0.17 cm, breath 0.30 ± 0.05 cm, apex acute, base truncate, petiolate, stipulate	Undulate leaf margin, ovate shape, length 6.61 ± 0.67 cm, breath 3.71 ± 0.37 cm, apex obtuse, base cuneate, petiolate, stipulate.
Inflorescence	Cyanthium, monoecious, hermaphroditic, pedicel green, perianth green, pistil hypogynous, ovary single, placentation axile, stigma branched into four, stamen numerous and epipetalous.	Cyanthium, monoecious hermaphroditic, pedicel green, perianth light green, pistil hypogynous, ovary single, placentation axile, stigma branched into four, stamen numerous and epipetalous
Fruits	Schizocarpous, three-lobed, un-ripened colour green, ripen colour yellowish green	Schizocarpous, three-lobed, unripen colour light green, ripen colour brown.
Seeds	Elliptical shape, carunculate, un-ripened colour white, ripen colour dark brown	Conical shaped, base broad, carunculate, unripen colour white, ripen colour brown
Habitat	Along roadsides, yards and open fields.	On cultivated fields and open fields

2. Materials and methods

2.1. Plant source

Whole plant collections of *E. hyssopifolia* and *E. heterophylla* were made from various locations ($7^{\circ}31'9''N$, $4^{\circ}31'34''E$; $7^{\circ}31'7''N$, $4^{\circ}31'28''E$; $7^{\circ}31'8''N$, $4^{\circ}31'35''E$) within Obafemi Awolowo University, Ile-Ife, Nigeria and identified at the Herbarium of the Botany Department, of the same University. Some of the seeds harvested from these plants were sown in 3.5 L plastic bowls filled with top soil and placed in the Reforestation Project site of the University where they were nurtured to maturity.

2.2. Morphological studies

Both the vegetative and the reproductive attributes of *E. hyssopifolia* and *E. heterophylla* collected from the wild and those cultivated were used in the morphological studies. Characters investigated include: habitat, habit, pigmentation, pubescence, inflorescence, leaf shape, leaf margin, leaf arrangement, stipule, leaf base, leaf apex, petiole, detailed structure of the cyathium, fruit colours (ripen and unripen), seeds colours (ripen and unripen). The assessment of some of the vegetative characters was based on physical examination with the naked eyes while those of the reproductive attributes were assessed with the aid of the dissecting microscope.

2.3. Chromosome studies

Whole plants selections of the two species of *Euphorbia* studied were placed in bottles filled with water after their roots were carefully excised with a razor blade to allow fresh roots to grow. Four days after, the fresh roots were excised from the plant between 9.00am and 9.30am. These were collected in vials containing 0.004M Colchicine where they were pre-treated. After 2 h, they were transferred into vials containing 1:3 acetic-ethanol where they were fixed for 24 h. The fixed roots were hydrolysed in 18% Hydrochloric acid for 18 min. They were squashed and stained with modified Orcein [17] for 3 h. Photomicrographs of selected mitotic cells were documented with an AmScope MT microscope camera version 3.0.0.1 attached to a light microscope.

3. Results and discussion

3.1. Morphological study

3.1.1. Description of *E. hyssopifolia* studies

Annual, herbaceous, procumbent weed, usually found along road sides, fields and yards, plant height 25.89 ± 2.75 cm, cylindrical solid stem with red pigmentation on stem, tap root system; serrated leaf margin, obovate shape, length 1.08 ± 0.17 cm, breath 0.30 ± 0.05 cm, apex acute, base truncate, petiolate, stipulate; inflorescence cyanthium,



Fig. 1. Plant studied. A. *Euphorbia hyssopifolia* (arrowed); B: *Euphorbia heterophylla*.

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