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# Short Communication / Nota Científica
# New records of parasitized plants by *Escobedia grandiflora* (Orobanchaceae) in natural habitats

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**Abstract**

Hemiparasitic plant roots adhere to neighboring plants in order to meet part or all of their nutritional requirements. *Escobedia grandiflora* (L. f.) Kuntze is a hemiparasitic plant found throughout the America. Its orange colored roots are used as a natural colorant in food and medicines, but there is little information about plant requirements. The aim of this study was to identify host plants of *E. grandiflora* in five natural habitats within the department of Antioquia (Colombia). There, *E. grandiflora* plants were selected and an area of 50 × 50 cm around them was demarcated, in order to identify the vegetation in the quadrant with adhering haustoria. The Amount of haustoria of *E. grandiflora* on these plants was established. Twenty-two species belonging to seven botanical families were recorded as being parasitized by *E. grandiflora*, the most predominant family being Poaceae, with twelve species. Greater compatibility or preference was suggested for 18.2% of the identified plant species. It was concluded that *E. grandiflora* has a wide host range, especially within the Poaceae family. This record contributes to an increased knowledge of this species, and constitutes basic information for future studies.

**Key words**: *Escobedia*, parasitism, hosts, haustorium, Orobanchaceae.

**Resumen**

Las plantas parásitas de raíces se adhieren a las plantas vecinas, absorbiendo vía xilema una parte o la totalidad de sus requerimientos nutricionales. *Escobedia grandiflora* es una planta hemiparasita obligada de raíces, que se encuentra en algunas regiones de América. Las raíces naranjadas de esta especie son usadas como colorante natural para los alimentos y en la medicina tradicional, pero existe poca información sobre esta planta parasita. El objetivo de este trabajo fue identificar las plantas hospederas de *E. grandiflora* en cinco hábitats naturales del departamento de Antioquia (Colombia). Para la identificación se ubicaron plantas de *E. grandiflora,* demarcadas en un área de 50×50 cm, revisando y verificando, a partir de la extracción de raíces de las plantas vecinas, la presencia de haustorios de color naranja adheridos, típicos de *E. grandiflora*. Se reporta la presencia de 22 especies divididas en 7 familias botánicas, siendo más predominante la familia Poaceae con 12 especies. Una mayor compatibilidad fue sugerida para el 18.2% de las especies identificadas. Se puede concluir que *E. grandiflora* tiene un amplio rango de hospederos, especialmente dentro de la familia Poaceae. Este registro contribuye al incremento del conocimiento sobre la especie, y se constituye como una información básica para futuros estudios.

**Palabras clave**: *Escobedia*, parasitismo, hospederos, haustorio, Orobanchaceae.

Root hemiparasites adhere to neighboring plants, absorbing some or all of the water, carbohydrates, and minerals they require through the use of haustoria (Yoder 2001). A complex web of interactions is established between the parasitic plant and the host, affecting the structure of the entire community (Gibson & Watkinson 1992b; Press & Phoenix 2005). Successful parasitism depends on the ability of the parasitic plant to recognize and attack the host, the responses and

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defense of the host, and the resource offering of the host for optimal growth of the parasite (Yoder 2001). Parasitic plants recognize a group of molecules liberated by their hosts, which act as stimulants for the germination of their seeds and the formation of haustoria. The amplitude of chemical compounds that a parasite can recognize determines its host specificity (Yoder 2001; Cardoso *et al.* 2011; Joel *et al.* 2011).

The family Orobanchaceae has the largest number worldwide of facultative and obligate parasites with approximately 87 genera and 1700 species, which are morphologically diverse and utilize a wide range of hosts (Westwood *et al.* 2010; Morawetz *et al*. 2010). Many genera of this family are known by their harmful effects on economically important plants, such a crop-parasitic weed *Striga hermonthica* (Delile) Benth. (Bouwmeester *et al.* 2007; Parker 2009; Sholes & Press 2008). Within this family, various genera are phylogenetically related to *Escobedia*, such as *Alectra, Hyobanche, Striga, Melasma*, *Euphrasia*, *Parentucellia, Sopubia* and *Rhinanthus* (Bennett & Mathews 2006; Morawetz *et al.* 2010). The species of these genera have been found to parasitize plants of more than 18 families, among them: *Andropogon monticola* Roem. & Schult., *Andropogon pumilus Roxb., Arachis hypogaea* L., *Borreria pusilla* (Wall.) DC., *Commelina hasskarlii C.B*. Clarke, *Medicago sativa* L, *Oryza sativa* L., *Oryza glaberrima* Steud., *Panicum maximum* Jacq, *Paspalum scrobiculatum L.*, *Pennisetum glaucum* (L.)R. Br., *Saccharum officinarum* L, *Sporobolus coromandelianus* (Retz.) Kunth, *Sorghum vulgare* Pers., *Vigna unguiculata* (L.) Walp., *Vigna radiata* (L.) R. Wilczek, *Tridax procumbens* L., *Zea mays* L, among others hosts (Kumar & Solomon 1941; Thombre 1962; Riches *et al.* 1992).

*Escobedia grandiflora* (L.f.) Kuntze is an obligate hemiparasitic plant (Cardona & Muriel 2015) that has been used by tradional communities, especially in South America, due to its orange-colored roots that serve as a natural colorant for foods and medicine (Pennell 1931). Despite its importance, there is little information on this specie regarding aspects of its behavior as a parasitic plant. Cardona & Muriel (2015) registered, under experimental conditions, the formation of haustoria of *E. grandiflora* in four plants of the Poaceae family: *Zea mays*, *Andropogon bicornis L.*. *Calamagrostis viridiflavescens* (Poir.) Steud. and *Sporobolus jacquemontii* Kunth. However, little was known so far about the host plants in its natural habitat, which allow it to reach its reproductive stage and thus maintain natural populations. The objective of this study was to determine the host plants of *E. grandiflora* in five previously identified natural habitats in the department of Antioquia.

The natural habitats in which *Escobedia grandiflora* was found were located in the countries of Copacabana (6°18.781'N, 75°30.392'W), Gómez Plata (7°9.566'N, 75°22.524'W), San Jerónimo (6°22.40'N, 75°43.1'W), Yarumal (7°9.458'N, 75°22.570'W) and Yolombó (6°34.871'N, 75°8.679'W) Antioquia-Colombia. For the determination of hosts, *E. grandiflora* was first located and an area of 50 × 50 cm was demarcated around it in order to study the vegetation in the quadrant. A detailed revision of neighboring plants of *E. grandiflora* was done to verify whether they were parasitized or not (Gibson & Watkinson 1992b). The revision entailed carefully uncovering the roots of neighboring plants by eliminating the soil around them until adhered orange colored haustoria were observed, following the methodology developed by Montes-Hernández *et al*. (2015). The number of haustoria in 10 cm of the root of the parasitized plant were counted of 30 hosts plants. If the number of haustoria were greater to or equal to 8, they were ranked as high, with numbers oscillating between seven and three ranked as medium, and less than three ranked as low. Later, botanical samples of parasitized species were collected for identification. When the plants were not fertile, specimens were collected and grown in greenhouse bags at the Laboratory of Botany and Vegetal Physiology of the Politécnico Colombiano Jaime Isaza Cadavid until they became fertile. Samples of the plants were identified at the JUAM, UDEA, and COL herbaria.

Twenty-two hosts belonging to seven botanical families, of which 52.3% of the parasitized species belonged to the family Poaceae, including three specimens of *Axonopus*. 14% of the species belonged to the family Asteraceae; 9% to the family Cyperaceae with two species of *Scleria;* and 9% to the family Melastomataceae, with two species of the genus *Clidemia*. The families Thelypteridaceae, Blechnaceae, and Bromeliaceae were each represented, with 1% of the parasitized species. In Table 1, there is a complete list of parasitized species and abundance of haustoria of *E. grandiflora* found in their roots (Fig. 1a-d).


**Figure 1** – The haustoria of *E. grandiflora* on roots – a. *Axonopus compressus*; b. *Thelypteris conspersa*; c. *Clidemia strigillosa*; d. *Calamagrostis viridiflavescens.*

The predominance of hosts in the family Poaceae was also registered for plant parasites of the *Striga* and *Sopubia* genera (Kumar & Solomon 1941; Thombre 1962). Here, in 31.8% of the parasitized species, low numbers of haustoria were observed, which may indicate a low compatibility with, or preference of *E. grandiflora* for these species. A medium number of haustoria were found in 50% of the species, while 18.2% had a high number of haustoria. These last belonged in their totality to Poaceae, suggesting that *E. grandiflora* has a preference for, or more marked compatibility with, plants of this family. Which may suggest that it has a better compatibility with family Poaceae (Fig. 1d).

Many of the species registered as hosts in this study were observed in the same natural habitats within the department de Antioquia, for which it is possible for *E. grandiflora* to form simultaneous parasitic relationships, as is registered in other species of the family Orobanchaceae (Gibson & Watkinson 1989a). This is the first study comprising the identification of hosts of the hemiparasite *E. grandiflora*, knowledge of which is increasing and constitutes base information for future studies related

**Table 1** – Host plants of *E. grandiflora* in five municipalities of Antioquia, Colombia.

| | ***Specie*** | **Family** | **Number of haustoria** |
|---|---|---|---|
| 1 | *Andropogon bicornis* | Poaceae | Middle |
| 2 | *Axonopus compressus* | Poaceae | High |
| 3 | *Axonopus scoparius* (morfotipo 1) | Poaceae | Middle |
| 4 | *Axonopus scoparius* (morfotipo 2). | Poaceae | Low |
| 5 | *Calamagrostis viridiflavescens* | Poaceae | Middle |
| 6 | *Cenchrus* c.f *purpureus* | Poaceae | High |
| 7 | *Hyparrhenia rufa* | Poaceae | Middle |
| 8 | *Melinis minutiflora* | Poaceae | Middle |
| 9 | *Paspalum* sp. | Poaceae | High |
| 10 | *Sporobolus jacquemontii* | Poaceae | Middle |
| 11 | *Trichanthecium* cf. *polycomum* | Poaceae | High |
| 12 | *Urochloa decumbens* | Poaceae | Low |
| 13 | *Calea sessiliflora* | Asteraceae | Middle |
| 14 | *Lepidaploa canescens* | Asteraceae | Low |
| 15 | *Taraxacum officinale* | Asteraceae | Low |
| 16 | *Scleria* sp. | Cyperaceae | Middle |
| 17 | *Scleria distans* | Cyperaceae | Low |
| 18 | *Clidemia sericea* | Melastomataceae | Middle |
| 19 | *Clidemia strigillosa* | Melastomataceae | Middle |
| 20 | *Thelypteris conspersa* | Thelypteridaceae | Middle |
| 21 | *Blechnum cordatum* | Blechnaceae | Low |
| 22 | *Pitcairnia* sp. | Bromeliaceae | Low |

to its requirements for reaching reproduction, its conservation, and the feasibility of its sustainable use.

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