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Journal of Threatened Taxa

The international journal of conservation and taxonomy

www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

NOTE

INTRUSION OF DEVIL WEED *CHROMOLAENA ODORATA*, AN EXOTIC INVASIVE, INTO KINNERASANI AND ETURNAGARAM WILDLIFE SANCTUARIES, TELANGANA, INDIA

Sateesh Suthari, Ramesh Kandagatla, Sarede Geetha, Ajmeera Ragan & Vatsavaya S. Raju

26 February 2016 | Vol. 8 | No. 2 | Pp. 8538–8540

10.11609/jott.2134.8.2.8538-8540



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ISSN 0974-7907 (Online)
ISSN 0974-7893 (Print)

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Although indigenous to the central and southern tropical Americas, *Chromolaena odorata* (L.) R.M. King & H. Rob. (Asteraceae) is now a pantropical weed indiscriminately invading the humid tropics and subtropics of their forests, sanctuaries, elephant habitats, plantations, towns and villages (Prasad & Williams 2009).

The taxon is popularly known as jack-in-the-bush, devil weed, siam weed among other names, and was first described as *Eupatorium odoratum* in 1759 by Linnaeus, and then transferred to *Chromolaena* in 1970 by King & Robinson. It was listed among the top 100 of the world's most invasive alien species (Lowe et al. 2000). The Millennium Ecosystem Assessment (2005) lists invasive alien species (IAS) as one of the five primary drivers of change in ecosystem composition, structure and function.

Voigt (1845) recorded the presence of *Eupatorium odoratum* in India as an introduction to Calcutta Botanical Gardens, as ornamental. But, it had become wild in parts of India, as mentioned by Clarke (1876). However, Hooker (1881) included this taxon under "Excluded and Suppressed Species", as a floral element rarely under cultivation. Although widespread in Assam and Bengal by 1918 (Rao 1920), it was not reported from Madras Presidency (Gamble 1921). By the year 1995, it was reported as naturalized in India (Uniyal 1995). It gradually dispersed in its pathway of spread from west to southeastern parts of Asia, i.e., from the native country via Singapore, northeast India, Bengal, Odisha and

INTRUSION OF DEVIL WEED *CHROMOLAENA ODORATA*, AN EXOTIC INVASIVE, INTO KINNERASANI AND ETURNAGARAM WILDLIFE SANCTUARIES, TELANGANA, INDIA

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towards the southern Indian peninsula (Biswas 1934). Muniappan et al. (2005) mapped its distribution till 2005 as 'entire northeastern India, down up to northern Andhra Pradesh, entire west coast including Western Ghats and Sri Lanka'. Conversely, it is of great threat to the three biodiversity hotspots, Himalaya, Western Ghats and Sri Lanka, and Indo-Burma (CEPF 2016).

Chromolaena odorata was reported from the northern Eastern Ghats of Visakhapatnam District of Andhra Pradesh (Subbarao & Kumari 2002; Pullaiah et al. 2007). In the erstwhile Andhra Pradesh, it is now very prevalent and pernicious in Visakhapatnam District, and fast spreading from there to the districts of East and West Godavari, Khammam, Warangal, Karimnagar, Nalgonda, Rangareddy and Hyderabad (Vatsavaya S.

DOI: <http://dx.doi.org/10.11609/jott.2134.8.2.8538-8540>

Editor: B. Ravi Prasad Rao, Sri Krishnadevaraya University, Anantapur, India.

Date of publication: 26 February 2016 (online & print)

Manuscript details: Ms # 2134 | Received 03 July 2015 | Final received 03 February 2016 | Finally accepted 08 February 2016

Citation: Suthari, S., R. Kandagatla, S. Geetha, A. Ragan & V.S. Raju (2016). Intrusion of devil weed *Chromolaena odorata*, an exotic invasive, into Kinnerasani and Eturnagaram wildlife sanctuaries, Telangana, India. *Journal of Threatened Taxa* 8(2): 8538–8540; <http://dx.doi.org/10.11609/jott.2134.8.2.8538-8540>

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Funding: Science and Engineering Research Board (SERB, New Delhi) for the Start-Up Research Grant (Young Scientist Award to S. Suthari; SB/YS/LS-70/2014 dated 11 March 2015), and University Grants Commission's major and minor research grants to Vatsavaya S. Raju, Ramesh Kandagatla and Sarede Geetha.

Conflict of Interest: The authors declare no competing interests.

Acknowledgments: SS is grateful to the Science and Engineering Research Board (SERB, New Delhi) for the Start-Up Research Grant (Young Scientist) [SB/YS/LS-70/2014 dated 11 March 2015] and VSR, RK and SG are obliged to the University Grants Commission, for financial assistance through major and minor research projects. The authors are obliged to Dr. V. Krishna Reddy, Head, Department of Botany, Kakatiya University, for encouragement and facilities.



Raju, pers. obs.). The study of alien invasions into the natural ecosystems of Telangana revealed the entry and establishment of the devil weed in two important wildlife sanctuaries of Telangana, namely Kinnerasani and Eturnagaram.

Study area: Kinnerasani Wildlife Sanctuary (17°35'–18°00'N & 80°25'–80°30'E) was established in 1977 on the southern bank of river Godavari and occupies an area of 635.4km² in Khammam District whereas Eturnagaram Wildlife Sanctuary (17°15'–18°40'N & 79°30'–80°04'E) was set up in 1952, with 812km² reserved forest in Warangal District. These two sanctuaries are more or less contiguous, with typical southern tropical deciduous forest, comprising different tree-associates, dominated by species of *Terminalia*, *Diospyros*, *Anogeissus*, *Lagerstroemia*, *Cleistanthus*, *Xylia*, *Tectona*, *Hardwickia* and *Madhuca*.

Methods: The periodic field surveys were conducted in the natural ecosystems of Telangana from 2012 to 2015 as part of the study of impact of IAS (Invasive Alien Species) by laying 150 quadrats (31.62m x 31.62m) and 20 belt transects (100x5 m). The sample plots (30) were laid in different locations in the two sanctuaries in the forest areas, using the villages as the centre of disturbance gradient. GPS (Global Positioning System) was used to record the latitudes, longitudes and altitudes of the plots laid for the devil weed presence.

Results and Discussion: There seems to be two established biotypes, Asia and West Africa [AWA] and Southern Africa [SA], in the adventive *Chromolaena odorata* (Zachariades et al. 2004). The biotype invasive in the study area is determined as of Asia-West Africa biotype based on its lax habit, young leaves appearing purple and turning to dark green, prominently ribbed, hispid nature, pale blue-lilac flowers and phyllaries ovate (outer) to linear (inner), acute to shortly acuminate with three green furrows.

(i) Distribution: *Chromolaena odorata* is found growing gregariously in the northeastern region of Telangana State, particularly in Kinnerasani and Eturnagaram wildlife sanctuaries. It is found especially along the roadsides, hedges and in the areas of Yanam Bail, Kinnerasani, Reddigudem, Sarekallu, Mamillavai, Ulvanoor, Chandralu gudem, Thummala gudem, Mallaram, Allapalli, Ramanujagudem, Gattumalla, Chathakonda, Regalla, Kothaguda and Paloncha villages of Kinnerasani wildlife sanctuary, and Oddugudem, Bandala, Kodisala, Lingala, Mondala thogu, Lavvala, Kamaram, Bhutaram, Allamvari Ghanpur, Ramannagudem and Ramnagar (bank of Godavari River) in Eturnagaram Wildlife Sanctuary.



Image 1. *Chromolaena odorata* in flower and fruit (AWA biotype) along the forest fringe in Kinnerasani Wildlife Sanctuary.

(ii) Spread: In the 30 sample plots laid, devil weed was found in nine in the buffer zones and three in the core areas. Out of the 150 quadrats (1x1 m), devil weed was found in 48 (32%) as saplings or regenerating stocks (10; 20.83%) and seedlings (38; 79.17%). The devil weed incidence was 30% in the core area and 70% in the buffer zone of these sanctuaries. This scrambling shrub has gradually dispersed from forest fringes into the core areas of these sanctuaries, including Mallur forest (MPCA - Medicinal Plant Conservation Area), a sacred grove in Warangal District. The seeds are found stuck to animal skins and moved with grazing cattle, sheep goat, and perhaps wild animals. Elsewhere, it is reported to spread by wind, vehicles, animal fur, and clothing (Blackmore 1998; Zachariades et al. 2009), and which is also true to the study area. In northern Telangana, the devil weed is present in Karimnagar District, though sparsely populated primarily along the rail tracks of Pothkapalli, Odela, Kolanur, Kothapalli, Peddapalli, Ramagundam and Peddampet villages. It is predicted, unless its spread is checked, that the devil weed is likely to reach the three sanctuaries, namely Sivaram, Kawal and Pranahita in Adilabad District within a few years.

(iii) Broad Ecological Impacts: The devil weed, with its high reproductive capacity (a plant in South Africa is known to produce over one million seeds in a single season - Liggitt 1983), rapid dispersing ability and the capacity to form thickets due to its straggling habit which prevents free movement of livestock and wildlife. It is found not to allow the growth of native shrubs by its own biomass (canopy cover, i.e., umbrella effect). It is also known to suppress the surrounding vegetation through its high allelopathic properties (Ambika &

Jayachandra 1980), affecting the rise of seedlings, saplings, medicinal and economic plants while enhancing forest fires during the summer by dieback shoots. With a high growth potential, devil weed competes with other plant associates for light, nutrients, water and minerals. It is toxic to domestic animals and wildlife (Biller et al. 1994). In the study area, by its area of occupation, devil weed had reduced the grazing ground for herbivores in the forested land while increasing the cost of production in silviculture and other plantations around, which is under investigation. During the dry season, the devil weed, along with another neotropical invasive *Hyptis suaveolens* (Lamiaceae), promotes the annual fire which is common and man-made in the study area for more grass and *tendu* leaf. The fragmentation and fire problems in Telangana are documented by Reddy et al. (2015).

Discussion: The spread of devil weed is alarming in areas of podu cultivation, on the bunds of agricultural lands, wastelands, along roadsides, forest tracks and gaps, protected areas and plantations in Kinnerasani and Eturnagaram wildlife sanctuaries. The manual removal of this weed (mechanical method) before flowering is the effective means to mitigate the spread of the species in comparison to the biological (*Pareuchaetes pseudoinsulata*, *P. insulata*, *Actinote thalia-pyrtha*) and chemical (Glyphosate, Triclopyrester) methods attempted. The species is not troublesome in its native range but weedy in India for want of natural enemies to keep it under control. It is a mandate to prevent the loss of native biodiversity due to biological invasions. Conversely, there is an urgent need to devise action plans by managers of the respective wildlife sanctuaries to control and eradicate the devil weed. The local people are to be educated of its potential dangers to their farming on one hand and Non-timber Forest Product (NTFP) extraction from the local forests on the other. The Government of India has to develop a national level policy towards the control of invasive alien weeds in general and implement it at the earliest before we lose our indigenous biodiversity once for all.

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ISSN 0974-7907 (Online); ISSN 0974-7893 (Print)

February 2016 | Vol. 8 | No. 2 | Pages: 8421–8540

Date of Publication: 26 February 2016 (Online & Print)

DOI: 10.11609/jott.2016.8.2.8421–8540

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