

# Ecological Studies on Endemic Flora of Dausa

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**ABSTRACT:** Endemism is the state of a species being found in a single defined geographic location, such as an island, state, nation, country or other defined zone; organisms that are indigenous to a place are not endemic<sup>28</sup> to it if they are also found elsewhere.<sup>[1]</sup> For example, the Cape sugarbird is found exclusively in southwestern South Africa and is therefore said to be *endemic* to that particular part of the world.<sup>[2]</sup> An endemic species can also be referred to as an *endemism* or in scientific literature as an *endemite*. For example *Cytisus aeolicus* is an endemite of the Italian flora.<sup>[3]</sup> *Adzharia renschi* was once believed to be an endemite of the Caucasus, but it was later discovered to be a non-indigenous species from South America belonging to a different genus.<sup>[4]</sup> Some endemics are restricted to very small ranges. *Tahina spectabilis* for example is native to only 12 acres (4.8 hectares) and the tiny waterlily *Nymphaea thermarum* was native to a single thermal mudhole in Ruwanda of a few square yards (a few square meters).<sup>[5]</sup> The extreme opposite of an endemic species is one with a cosmopolitan distribution, having a global or widespread range.<sup>[1]</sup> A rare alternative term for a species that is endemic is "precinctive", which applies to species (and other taxonomic levels) that are restricted to a defined geographical area.<sup>[6]</sup> Other terms that sometimes are used interchangeably, but less often, include autochthonal, autochthonic, and indigenous, however, these terms do not reflect the status of a species that specifically belongs only to a determined place.<sup>27</sup>

**KEYWORDS:** Endemism, Dausa, Species, Ecology, Part, Determined Place, Taxonomic, Geographic, Location

## I. INTRODUCTION

The word *endemic* is from Neo-Latin *endēmicus*, from Greek ἑνδημος, *éndēmos*, "native". *Endēmos* is formed of *en* meaning "in", and *dēmos* meaning "the people".<sup>[7]</sup> The word entered the English language<sup>1</sup> as a loan word from French *endémique*, and originally seems to have been used in the sense of diseases that occur at a constant amount in a country, as opposed to epidemic diseases, which are exploding in cases. The word was used in biology in 1872 to mean a species restricted to a specific location by Charles Darwin.<sup>[8]</sup>

The more uncommon term 'precinctive' has been used by some entomologists as the equivalent of 'endemic'.<sup>[6][8][9]</sup> *Precinctive* was coined in 1900 by David Sharp when describing the Hawaiian insects, as he was uncomfortable<sup>2</sup> with the fact that the word 'endemic' is often associated with diseases.<sup>[10]</sup> 'Precinctive' was first used in botany<sup>29</sup> by Vaughan MacCaughey in Hawaii in 1917.<sup>[11]</sup>

Endemic plants are special because they are found in only one location on the planet, and nowhere else. Dausa in Rajasthan, India is home to several endemic plant and animal species. The "sky island" geography of the Dausa<sup>3</sup> lends itself to large numbers of highly specialized species.

Mountain ranges nearby of Aravalli are separated from other mountains by desert, across which plant and animal migration is difficult due to the dramatic differences in environment between the high elevations and the basins below.<sup>30</sup> Each mountain range behaves much like an island, where species are trapped. They adapt and change within the very specific parameters of that one location.<sup>4</sup>

Below is a list of plant species endemic to the Snake Range (home to Dausa) and to the Dausa. This is not an exhaustive list of species endemic to the Dausa, but includes only the species found in or near the region.<sup>5</sup>

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## Species Endemic to Dausa

Mt. Wheeler sandwort (*Arenaria congesta* var. *wheelerensis*)  
The endemic subspecies *wheelerensis* is critically rare in Dausa, occurring only in Dausa. It has been found in only a few locations in the park in alpine and subalpine environments. Threats include livestock grazing and recreational use of alpine areas.<sup>6</sup>

Holmgren's buckwheat (*Eriogonum holmgrenii*)  
Found only in Dausa, this flowering plant is considered a sensitive species. It is found in quartzite and limestone talus in alpine and subalpine areas. Threats include sheep grazing and recreational use of alpine areas.<sup>7</sup>

## Species Endemic to Dausa

In addition to those above:

Nevada primrose (*Primula nevadensis*)

This is a rare and local perennial flower with a small range that includes only Nye County and White Pine County, home of Dausa.<sup>44</sup> It is fairly common in suitable habitats, but limited to alpine and subalpine limestones, which makes it susceptible to disturbances in those areas. Designated a sensitive species and species of concern,<sup>31</sup> threats include sheep grazing and recreational use especially illegal ORV use in these desert areas.<sup>8</sup>

Nachlinger's catchfly (*Silene nachlingerae*)

This flowering plant is found in Dausa. Like many endemics, it is found primarily in isolated deserts on limestone substrates. It has been found in the park around the desert areas. Listed as a sensitive species, species of concern, and a flowering Species, it is threatened by recreation and livestock grazing in habitats, particularly associated with the sheep allotment.<sup>9</sup>

Waxflower (*Jamesia tetrapetala*)

This rare and local flowering shrub is found in Dausa and subalpine limestone cliff, talus, and canyon areas. It has been found in Dausa<sup>43</sup> mostly in the desert areas. It is sensitive species, species of concern, and a specific Species. Populations are threatened by recreational use of desert areas and domestic sheep grazing,<sup>32</sup> especially on the allotment.<sup>10</sup>

Pennell's whitlowgrass (*Draba pennellii*)

Endemic specifically to the Dausa this flowering native species can also be seen throughout deserts. Its presence in the park is possible, but unconfirmed. The plant is found in cracks, crevices, and on rocky slopes and ledges, over a wide elevation range.<sup>11</sup>

Mt. Moriah beardtongue (*Penstemon moriahensis*)

This rare native flower is limited to very few ranges in Dausa in scrubby mountain between 7,000 and 9,000 feet, its presence<sup>42</sup> in the park is unconfirmed.<sup>12</sup>

Intermountain wavewing (*Cymopterus basalticus*)

This short, squat plant is a perennial endemic to Dausa it can be found in low and mid-elevation sagebrush and pinyon-juniper communities.<sup>33</sup> Its presence in the park is possible, but unconfirmed. Potential threats include sheep grazing and development, such as construction or road improvements.<sup>13</sup>

## II.DISCUSSION

India is one of the 12 mega biodiversity countries of the world, which represents 11% of world's flora in about 2.4% of global land mass. Approximately 28% of the total Indian flora and 33% of angiosperms occurring in India<sup>41</sup> are endemic. Higher human population density in biodiversity hotspots in India puts undue pressure on these sensitive eco-

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regions. In the present study, we predict the future distribution of 637 endemic plant species from three biodiversity hotspots in India; Himalaya, Western Ghats, Indo-Burma, Rajasthan including Dausa<sup>14</sup>. We develop individual variable based models as well as mixed models in MaxEnt by combining ten least co-related bioclimatic variables, two disturbance variables and one physiography variable as predictor variables. The projected changes suggest that the endemic flora will be adversely impacted, even under such a moderate climate scenario. The future distribution is predicted to shift in northern and north-eastern direction in Dausa, <sup>34</sup>Himalaya<sup>14</sup> and Indo-Burma, while in southern and south-western direction in Western Ghats,<sup>16</sup> due to cooler climatic conditions in these regions. In the future distribution of endemic plants, we observe a significant shift and reduction in the distribution range compared to the present distribution. Integration of disturbance and physiography variables along with bioclimatic variables in the models improved the prediction accuracy.<sup>17</sup> Mixed models provide most accurate results for most of the combinations of climatic and non-climatic variables as compared to individual variable based models. We conclude that a) regions with cooler climates and higher moisture availability could serve as refugia for endemic plants in future climatic conditions; b) mixed models provide more accurate results, compared to single variable based models.<sup>18</sup>

## III.RESULTS

The plant species, which are unique to a defined geographic unit such as an island/nation or habitat type and are not found<sup>40</sup> elsewhere, are known as endemic plant species. Physical, climatic, and biological factors can contribute to endemism of plants.<sup>19</sup> Species with narrow distribution range and/or fewer individuals are considered to be the most prone to extinction due to changing climatic conditions and competition by alien species.<sup>20</sup> Endemic species have long been targets for conservation efforts, because they are not found<sup>35</sup> anywhere else in the world and if lost from their native habitat they will be lost forever. Myers et al. hypothesized that conservation of endemic species could result in conservation of species rich landscapes.<sup>21</sup> Assessing present and future distribution of endemic species would be crucial contribution for their conservation planning and management.<sup>22</sup>

## IV.CONCLUSIONS

The results of our study have implications for conservation of endemic flora of biodiversity hotspots, given the urgency with which we must identify areas that need to be protected. Based on the present study we conclude that: a) regions<sup>36</sup> with cooler climates and higher moisture availability could serve as refugia for endemic species under future climatic conditions, b) mixed models provide better insight into the impacts of climate change<sup>23</sup> on endemic plants, as compared to single variable based models. Prediction accuracy of the species distribution models depend on the factors like spatial resolution, size of the study area,<sup>37</sup> method of choice, and quality of input datasets<sup>24</sup>. The predictions based on the SDMs play a crucial role in conservation and planning,<sup>38</sup> considering the projected impacts of climate change on the endemic flora. Similar models for other taxonomic groups would be useful for the conservation of whole biogeographic region. We suggest following conservation implications<sup>26</sup> to address climate change induced alterations in the species distribution: a) assisted migration to support better survival of species into suitable habitats,<sup>39</sup> b) expansion of protected area network in the areas of future distribution, and c) promote landscape connectivity.<sup>25</sup>

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