

## Phytodiversity of Herbaceous Flora in the Pratapgarh district: A Change in the Composition due to Adoption of Exotic Species

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### ABSTRACT

Edaphic and climatic conditions are the factors that influence the species composition of the particular area. A checklist contains all available plant species of particular area. The area of study Pratapgarh district is located in Uttar Pradesh state. The paper attempts to represent the herbaceous flora of the district. There were 60 species of herbaceous plants, representing 22 different families, identified in the area studied. They were represented by 2 monocots and 20 dicot families. The dominance was shown by the family Asteraceae, represented by the greatest number of herb species. The study also points out the native and exotic status of the plants, changing the composition of the district's flora. 57% of the reported herbaceous plants were found exotic and 43% native, in origin. The study updates 48 new herbaceous plant species in the existing flora of Pratapgarh.

Figures : 03

References : 42

Table : 01

KEY WORDS : Checklist, Exotic, Herbs, Least concern, Native, Vegetation

### Introduction

Humanity has been using plants for sustenance and therapeutic purposes since the dawn of civilization. Therefore, it is crucial to take into account the various aspects of plants, including their effects on health, economic value, sustainability, conservation efforts, and the assessment and recording of their botanical characteristics<sup>40</sup>. A particular area has a particular type of vegetation, governed by the climate and soil of that area. Plants may be herbs, shrubs, or trees, depending on the habit of that species. Plants that are categorized as herbaceous tend to be shorter and less robust than their woody counterparts., with short life span. Plant diversity, prevalence, and richness are all affected by the temporal shifts in conditions in nature.<sup>38</sup>

A checklist is an account of all species present in that specific area. In India, different type of checklists has been published by different workers. Researchers had worked on the checklist on the grasses of India and checklist on invasive flora of India.<sup>13,16</sup> The state flora too has been represented in different styles. The checklist on Weed flora in Odisha<sup>28</sup>, Woody flora of

Jammu and Kashmir<sup>22</sup>, checklist on Dicots in the West Bengal<sup>23</sup>, Alien flora of Sikkim Himalaya<sup>27</sup> and Herbaceous flora of the Perumudiyoor<sup>29</sup> etc. are important of them.

Herbaceous species have a crucial role in regulating carbon fluxes and energy flow. They affect the rate of cycling of vital minerals including potassium (K), magnesium (Mg), and nitrogen (N) as well.<sup>8</sup> They complete their life span mostly within a year. The fate of the climax community is decided by the climate of that particular area and, in most cases, the dominance too. Reduction of soil erosion, enhancement of infiltration into soil, and contribution of organic matter for moisture retention are some of the important properties of herbaceous plant species.<sup>11</sup>

Uttar Pradesh occupies an area of nearly 2,43,486 square kilometers, of which 6.98 percent is covered by forests. Several attempts have been made by scholars to compile floristic composition of different areas. The flora of district of Sonbhadra<sup>18</sup>, Katarniaghat wildlife sanctuary<sup>35</sup>, Himalayan Tarai<sup>17</sup>, Varanasi District<sup>34</sup>, and Chandauli district are represented by different workers.

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TABLE-1. Representing the herbaceous flora of Pratapgarh District and their origin status

S. No	Family	Plant name	Origin status	Collection no.
1	Acanthaceae	<i>*Dicliptera paniculata</i>	Native	SKPG 51
		<i>*Ruellia simplex</i>	Exotic	SKPG 56
2	Amaranthaceae	<i>Achyroathus aspera</i>	Native	SKPG 29
		<i>*Aerva lanata</i>	Native	SKPG 68
		<i>*Alternanthera sessilis</i>	Exotic	SKPG 10
		<i>*Amaranthus viridis</i>	Native	SKPG 30
		<i>Digera muricata</i>	Exotic	SKPG 53
		<i>*Gomphrena celosioides</i>	Exotic	SKPG 23
3	Apocynaceae	<i>*Ichnocarpus frutescens</i>	Native	SKPG 40
		<i>*Oxystelma esculentum</i>	Native	SKPG 24
4	Asteraceae	<i>*Acmella oleracea</i>	Exotic	SKPG 33
		<i>*Acmella uliginosa</i>	Exotic	SKPG 64
		<i>*Ageratum conyzoides</i>	Exotic	SKPG 15
		<i>*Cyanthillium cinereum</i>	Native	SKPG 44
		<i>*Eclipta prostrata</i>	Native	SKPG 31
		<i>*Gamochaeta pensylvanica</i>	Exotic	SKPG 69
		<i>*Sonchus oleraceus</i>	Exotic	SKPG 66
		<i>*Xanthium strumarium</i>	Exotic	SKPG 49
		<i>*Tridax procumbens</i>	Exotic	SKPG 71
5	Boraginaceae	<i>*Hackelia virginiana</i>	Exotic	SKPG 13
6	Caesalpiniaceae	<i>Cassia occidentalis</i>	Native	SKPG 6
7	Convolvulaceae	<i>*Ipomea amnicola</i>	Exotic	SKPG 55
		<i>*Ipomea aquatica</i>	Exotic	SKPG 46
		<i>*Ipomea carnea</i>	Exotic	SKPG 9
		<i>*Ipomea quamoclit</i>	Exotic	SKPG 47
		<i>*Ipomoea violacea</i>	Exotic	SKPG 7

8	Cucurbitaceae	<i>Coccinia grandis</i>	Native	SKPG 14
9	Euphorbiaceae	<i>*Chrozophorarottleri</i>	Native	SKPG 12
		<i>*Croton bonplandianus</i>	Exotic	SKPG 11
		<i>*Euphorbia hirta</i>	Exotic	SKPG 19
10	Lamiaceae	<i>Anisomeles indica</i>	native	SKPG 35
		<i>*Clerodendrum viscosum</i>	Native	SKPG 57
		<i>*Hyptissuaveolens</i>	Native	SKPG 52
		<i>Leucas aspera</i>	Native	SKPG 59
		<i>*Ocimum tenuiflorum</i>	Native	SKPG 22
		<i>Ocimum basilicumcitriodorum</i>	Native	SKPG 54
11	Liliaceae	<i>*Asphodelus tenuifolius</i>	Native	SKPG 58
12	Malvaceae	<i>Abutilon indicum</i>	Native	SKPG 37
		<i>*Malvastrumcoromandelianum</i>	Exotic	SKPG 2
		<i>Sida cordifolia</i>	Exotic	SKPG 34
13	Papaveraceae	<i>Argemone mexicana</i>	Exotic	SKPG 70
		<i>*Fumaria officinalis</i>	Exotic	SKPG 63
14	Poaceae	<i>*Digitariasanguinalis</i>	Native	SKPG 72
		<i>*Cynodondactylon</i>	Exotic	SKPG 73
15	Polygonaceae	<i>*Persicarialapathifolia</i>	Native	SKPG 41
		<i>*Polygonum plebeium</i>	Native	SKPG 60
16	Portulacaceae	<i>*Portulaca oleracea</i>	Exotic	SKPG 26
17	Primulaceae	<i>Anagallis arvensis</i>	Exotic	SKPG 65
18	Scrophulariaceae	<i>*Lindernia crustacea</i>	Exotic	SKPG 27
		<i>*Mazus reptans</i>	Exotic	SKPG 62
		<i>*Mecardonia procumbens</i>	Exotic	SKPG 32
		<i>*Scoparia dulcis</i>	Native	SKPG 39
19	Solanaceae	<i>*Datura innoxia</i>	Exotic	SKPG 26
		<i>*Nicotiana plumbaginifolia</i>	Exotic	SKPG 3
		<i>*Physalis peruviana</i>	Native	SKPG 28
		<i>*Solanum virginianum</i>	Native	SKPG 1

20	Tiliaceae	<i>Corchorus olitorius</i>	Native	SKPG 20
21	Urteceae	<i>*Pilea microphylla</i>	Exotic	SKPG 16
		<i>*Pouzolziapentandra</i>	Native	SKPG 42
22	Verbenaceae	<i>*Lantana camara</i>	Exotic	SKPG 4

\*New addition to flora of Pratapgarh.

District Pratapgarh, Uttar Pradesh, acquires the area of 3730 square kilo meters. As the vegetational diversity depends on the altitude, temperature, rainfall, salinity, topology *etc.*<sup>36</sup> So, district has its own type of floral composition.

A comprehensive floristic inventory of an area provides a fundamental foundation for research in several disciplines such as photochemistry, ethnobotany, environmental sciences, ecological preservation, taxonomy, and management.<sup>41</sup> The floral vegetation of Pratapgarh was examined previously in 2007.<sup>12</sup> Since, environmental factors and a period of time influence a

region's flora and fauna,<sup>9</sup> a thorough assessment of biodiversity is essential for every area to effectively and sustainably use its plant resource.<sup>39</sup> Therefore, this is a whole new approach to representing the current herbaceous flora of the district.

The composition of the flora of an area is made up of both native and exotic species. The competition between exotic and native species for space and nutrition alters the species composition over time. An investigation was carried out in order to record the variety of herbaceous community in Pratapgarh district by comparing the origin status of the plants. This study also



Fig. 1: Map of District Pratapgarh<sup>2</sup>

## Material and Methods

### Study area

The Pratapgarh district (Fig. 1) is located between coordinates of 25°34'2" and 26°11'2" North and 81°19'2" and 82°27'2" East, with a span of approximately 110 km from west to east. The district has long been recognized as the world's leading 'Aonla' fruit grower. The 'Aonla' fruit is incredibly high in vitamin C, aids in the treatment of gastrointestinal ailments, is thought to promote youth and vitality.

Rae Bareilly District demarcates the district's northwestern and western boundaries, while Allahabad District isolates it across the southwest. Jaunpur District borders it eastward, Fatehpur District to the west. The district is separated from Fatehpur and Allahabad by the river Ganga for about 50 kilo meter in the southwest, and by the river Gomati for about 6 km in the extreme north-east. As per district statistics, it has a total area of around 3,678 sq. km. The district's surroundings frequently alter as a result of the Ganga's influence.<sup>1</sup> Sai and the Ganga are the major rivers flowing in the district. Chamraura, Bakulahi, Paraiya, etc. are small rivers that flow in district of Pratapgarh. There are two national highways and many major roads connecting different parts within and out to districts. The district has 3 major railway lines passing through it and connecting many parts in India.

### Field Survey

The field survey trip for plants specimen collection

was conducted from April 2022 to October 2023, each month. To collect the plant specimen, three areas were taken mainly into consideration: the flora near the roadside, the flora near water bodies like rivers, ponds etc. and the flora near railway tracks (in accordance with the book Flora of Allahabad).<sup>25</sup> The plants were collected for authenticity at flowering and fruiting stage according to "A Manual of Herbarium Collection" (by Botanical Survey of India)<sup>31</sup> and preserved accordingly. The herbaceous specimens of plants were gathered, assigned numbers, and kept as voucher evidence, with proper care.

**Identification of Plant specimens:** The process of plant identification was performed by comparing the plant specimens with existing monographs and literature of neighboring districts and states, like the Flora of Uttar Pradesh<sup>14,37</sup> and Flora of Allahabad<sup>25</sup>. A valuable source for identification was 'virtual herbarium'<sup>10</sup>, prepared and provided in public domain by the Botanical Survey of India. The plants were ranked in the families according to the classification.<sup>5</sup>

## Result and Discussion

The herbaceous flora of the district was recorded alphabetically according to family name (Table 1). There were a total 60 herbaceous species belonging to 22 families present in wild. The representation of monocots was only by the Liliaceae and Poaceae families and the remaining 20 families belongs to dicots. The district's flora is dominated by dicot species. The dominance was shown by the family Asteraceae, represented by the greatest number of herb species, which is further

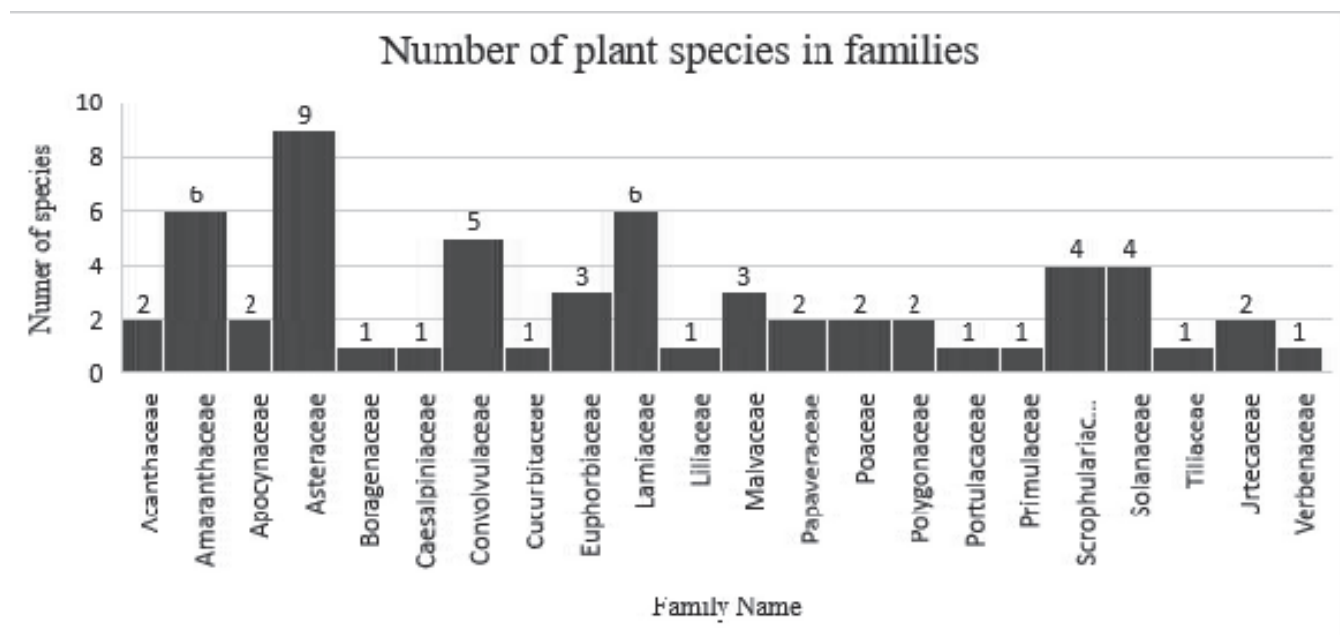
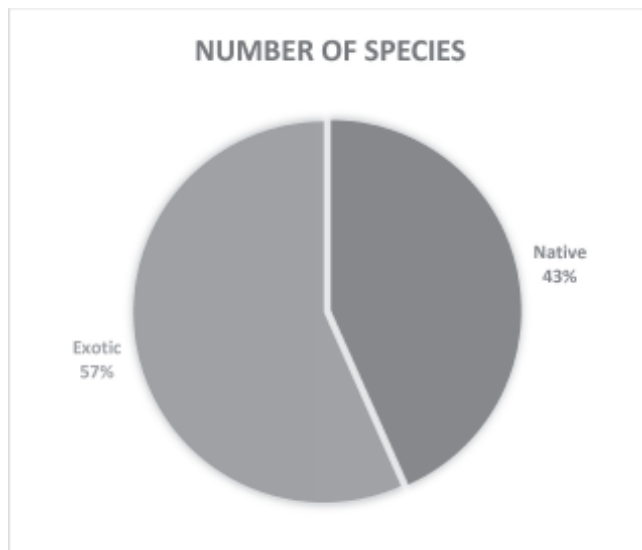


Fig. 2: Number of species per family





**Fig. 3: Plant species percentage according to origin of Status**

followed by the Amaranthaceae and Lamiaceae families. Amaranthaceae and Lamiaceae are both represented by the same number of species (Fig. 2). The families Asteraceae, Amaranthaceae and Lamiaceae showed dominance in Pratapgarh district, as they are represented by maximum number of herbaceous species. Asteraceae was among the top three families in Varanasi district<sup>34</sup> also. The lowest number of species were represented by the Boraginaceae, Caesalpiaceae, Cucurbitaceae, Primulaceae, and Verbenaceae families. Convolvulaceae was a family represented by a single genus but five species (Fig. 2).

The 48 plants marked with the ‘\*’ sign represent are new additions to the flora (Table-1). There were only 12 plants, which were present in previous literature<sup>12</sup>. The reason for the great variation in the herbaceous flora documented earlier is the adoption shown by the exotic species. The Lamiaceae family, which was the dominant flora of the existing literature<sup>12</sup> available on the flora of Pratapgarh, is now outnumbered by the family Asteraceae (Fig. 1). Out of the nine plants in the family Asteraceae, six are exotic (Table-1). Exotic plant species adapted to the area and altered the composition of the district’s flora. This view is also supported by the fact that, out of 48 newly added species, 30 are exotic in origin.

The percentage of native species (43%) is less than the percentage of exotic species (57%) in the Pratapgarh district (Fig. 3).<sup>34</sup> The exotic flora became part of the district over time. An investigator<sup>26</sup> had concluded the possibility of exchange between humans from different continents is a reason for the dominance of exotic flora. Another worker<sup>3</sup> reported dominance of exotic flora in the Thar desert and Gangetic plains. Development projects and human inhabitations are more prevalent in the plainer region, changing the natural habitat and making it more susceptible to invasion by exotic species.<sup>33</sup>

Among the 60 plant species reported, 11 are listed in the IUCN red data list (threatened species). They are placed in the category ‘Least Concern’. The plants are *Acmella uliginosa*,<sup>4</sup> *Alternanthera sessilis*,<sup>20</sup> *Oxystelma esculentum*,<sup>21</sup> *Eclipta prostrata*,<sup>30</sup> *Cassia occidentalis*,<sup>32</sup> *Fumaria officinalis*,<sup>15</sup> *Persicaria lapathifolia*,<sup>19</sup> *Polygonum plebeium*,<sup>42</sup> *Portulaca oleracea*,<sup>6</sup> *Lindernia crustacea*,<sup>7</sup> and *Physalis peruviana*.<sup>24</sup>

## Conclusion

The district of Pratapgarh represents 60 species of herbaceous plants. They belong to 22 different families. There was almost complete dominance of the dicot families, as they represent 20 families out of 22. The climatic and edaphic conditions of Pratapgarh favour the Asteraceae family most, as the purse of the family is filled by the maximum number of species. There is an addition of 48 herbaceous plants species, belonging to 18 reported families to the Flora of Pratapgarh. The exotic flora in the district makes up 57% of the total species composition, showing dominance over native species (43%). Changes in the natural habitat favoured the growth of exotic species in the area. This resulted in a change in the composition of the vegetation. Out of the 48 latest augmentations to the Flora of Pratapgarh, 30 plants are exotic in their origin. They changed the dominance of the family as well, as the family Asteraceae outnumbered the family Lamiaceae in terms of herbaceous species count (in comparison of previous literature).<sup>12</sup> There were 11 species of plant categories in the IUCN list of threatened plants of Least Concern.

## Conflict of Interest

The author(s) declare no conflict of interest.

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