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Determination of Minimum Quadrat Size for Herbaceous Species in Andhra University, Andhra Pradesh, India

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Abstract **Original Research Article**

In this study we analysed herbaceous species diversity in Andhra University campus by using minimum quadrat size method. For this analysis we used 10 × 10 sq. cm as the minimum size of the quadrat and we gradually increased the quadrate size and the count was repeated each time. We repeated the same procedure for 20 × 20 sq. cm, 30 × 30 sq. cm, 40 × 40 sq. cm and so on till 1 × 1 sq. metre area is covered and we noted the number of additional species every time. The vegetation analysis was carried out by total 10, 1 m × 1m sample plots placed randomly from study area. From the collected data we obtained species-area curve and the curve shows that 80 × 80 sq. cm size is the minimum size of quadrat for herbaceous species diversity analysis in Andhra University, Andhra Pradesh, India.

Keywords: Andhra University, Community, Herbaceous Species, Minimum Quadrat Size, Species Area Curve.

INTRODUCTION

Biodiversity is the variety of living organisms considered at all levels of organization, from gene through species, to higher organization levels including habitats and ecosystems (Bhat *et al*., 2014). Biodiversity encompasses the whole of the floristic, faunal and microbial diversity present on the earth (Dar and Farooq, 1997). Unfortunately, this precious biological wealth has been eroded to an alarming level by ruthless anthropogenic activities (Kushwah and Kumar, 2001). Quantitative analysis of vegetation helps in understanding the structure, composition and tropic organization of any community. Species composition and diversity vary from habitat to habitat within the communities exposing identical physiognomic characteristics (Nautiyal *et al*., 1999; Bhat *et al*., 2014). The method of quadrat sampling is among the oldest techniques in ecology and was first introduced by Pound and Clements in (1898). The term quadrat is strictly defined as a four sided figure. This term usually refers to any sampling unit, whether circular, hexagonal, or even irregular in outline (Dombois and Ellenberg 1974; Ishrat Saleem *et al*., 2019). The quadrat method of studying vegetation has become an integral part of many of the more important ecological investigations (Pound and Clements (1900). The various species that thrive there make up the vegetation in a particular habitat.The term "sampling technique" refers to the procedure used to collect a precise sample. The random sampling method is one of the best methods for conducting ecological research; it is widely used in studies of plant diversity, species association analysis, biomass estimation (Mukunda *et al*., 2021). Among sampling techniques quadrat method is one of the best ways for vegetation analysis in a particular habitat. A quadrat is a tool used to record the abundance or density of a particular species in a study area. Quadrats are often square, circular or rectangular areas, of appropriate sizes that are placed at random in the study area. The presence or absence of species, numbers of organisms, or the percentage cover of each species is generally calculated within the quadrat (Mukunda *et al*., 2021).

In general, plant species diversity in the under storey is sensitive to ecosystem conditions (Pregitzer and Barnes, 1982; Strong *et al*., 1991; Mitchell *et al*., 1998) as well as to disturbance such as canopy removal (Duffy and Meier, 1992) and grazing (Hadar *et al*., 1999). The herbaceous species composition typically changes in space and time due to a multitude of factors, such as grazing, fire, rainfall, altitude, and soil properties (i.e. salt content (Shameem *et al*., 2010). A quadrat can be as little as 0.10 m x 0.10 m or as large as 100 m x 100 m. The size of the organisms to be sampled will determine this. Generally < 1m Quadrat enough size for the herbaceous species and 10 m x 10 m for shrub species, whereas > 10 for trees. Species area-curve approach can be used to establish the minimum size for each quadrat. The present study was undertaken to Determination of minimum quadrat size of herbaceous species in Andhra University.

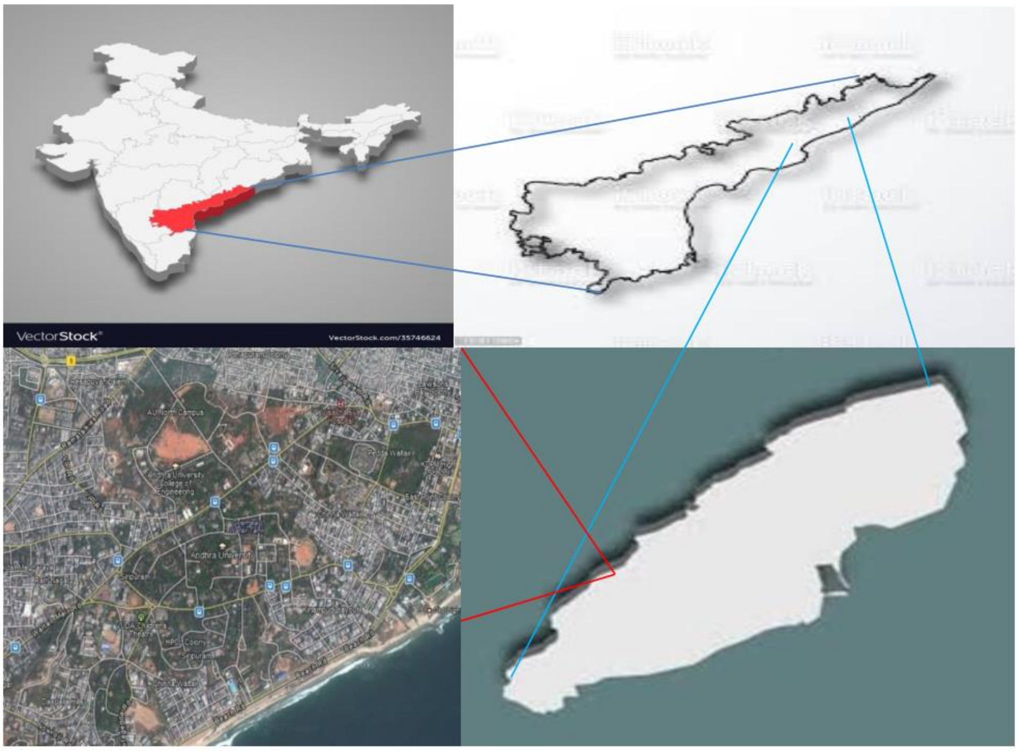
MATERIALS AND METHODS

Study Area

We selected Andhra University campus as our study area, which is situated in Visakhapatnam district very near to Eastern Ghats of Andhra Pradesh India. It is situated 100 km away from Eastern Ghats dense forest. Andhra University is a Government run University located between 17º 35' to 17º 40' N, 83º 20' to 83º 25' E, with an elevation of 60 m in Visakhapatnam City with an area of 200 hectares (Fig 1) which established in 1926 (J. Prakasa Rao 2018). Campus has tropical humid climate with an average annual temperature between 18ºC and 45ºC and an average rain fall of 1000–1200 mm. Data gathering the author observed the richness of herb species and their distribution at the Andhra University Campus between 2021 and 2022. With the aid of floras and literature (Gamble & Fischer 1915–1935, Venkateswaralu *et al*., 1972, Pullaiah, 1997, Pullaiah & Chennaiah 1997, Reddy & Reddy 2008, etc.), all taxa were recognised up to the species level. Local (Telugu) names and common names were also included, as far as was reasonably practicable, along with data on the botanical name, family, distributional status, and occurrence. The scientific names of each plant species were grouped in alphabetical order.

We employed the species area curve method to establish the minimum size of the quadrat. Starting with a little quadrat, count the number of distinct species that are present there. Each time the count is repeated, the quadrat's size is gradually raised. This approach is based on the idea that, as a quadrat's size steadily increases, the number of plant species within it rises until a certain point, beyond which there is no further increase. The minimal quadrat size for analysing the vegetation of that particular area is determined by drawing a graph of quadrat size vs. species number and noting the point when the curve flattens out. For the analysis of plant vegetation, this method is particularly practical.

India Andhra Pradesh



Andhra university Visakhapatnam

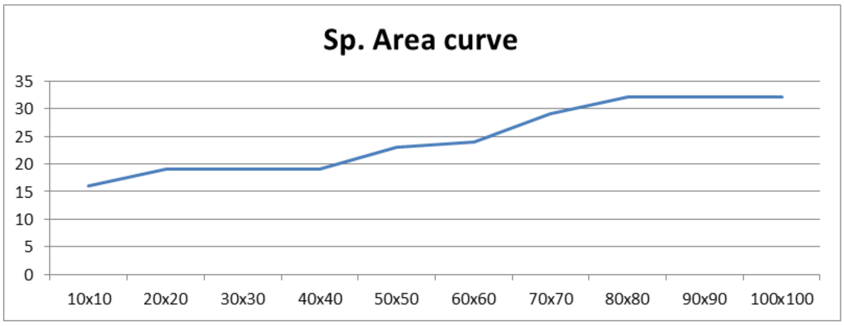
RESULTS AND DISCUSSION

In this study we fallows (Mukunda *et al*., 2021) methods According to them, we used 10 × 10 sq. cm as the minimum size of the quadrat and gradually increases and the count was repeated each time. Procedure for determination of minimum size quadrat in our study site as follows some basic method i, e., 1. Lay quadrat and note the number of species in 10×10 sq. cm. 2. Increase this area to 20×20 sq. cm and note the additional species growing in this area. 3. Repeat the same procedure for 30 × 30 sq. cm, 40 × 40 sq. cm and so on till 1 × 1 sq. meter areas covered and note the number of additional species every time. 4. A graph is prepared where number of species on Y-axis and the area of quadrat on the X-axis using this data recorded in the above table.

Table 1: Total herbaceous species in study area

S. no	Scintific Name	Quadrat size in square cm									
		10x10	20x20	30x30	40x40	50x50	60x60	70x70	80x80	90x90	100x100
1	*Oldenlandia*	+	+	+	+	+	+	+	+	+	+
2	*Synedrella*	+	+	+	+	+	+	+	+	+	+
3	*Andrographis*	+	+	+	+	+	+	+	+	+	+
4	*Alternanthera*	+	+	+	+	+	+	+	+	+	+
5	*Mimosa*	+	+	+	+	+	+	+	+	+	+
6	*Dipteracanthus*	+	+	+	+	+	+	+	+	+	+
7	*Phyllanthus*	+	+	+	+	+	+	+	+	+	+
8	*Phyllanthus*	+	+	+	+	+	+	+	+	+	+
9	*Senna*	+	+	+	+	+	+	+	+	+	+
10	*Sida*	+	+	+	+	+	+	+	+	+	+
11	*Sida*	+	+	+	+	+	+	+	+	+	+
12	*Euphorbia*	+	+	+	+	+	+	+	+	+	+
13	*Talinum*	+	+	+	+	+	+	+	+	+	+
14	*Tephrosia*	+	+	+	+	+	+	+	+	+	+
15	*Tridax*	+	+	+	+	+	+	+	+	+	+
16	*Vernonia*	+	+	+	+	+	+	+	+	+	+
17	*Acalypha*		+	+	+	+	+	+	+	+	+
18	*Achyranthes*		+	+	+	+	+	+	+	+	+
19	*Aerva*		+	+	+	+	+	+	+	+	+
20	*Leucas*					+	+	+	+	+	+
21	*Hybanthus*					+	+	+	+	+	+
22	*Asystasia*					+	+	+	+	+	+
23	*Barleria*					+	+	+	+	+	+
24	*Boerhavia*						+	+	+	+	+
25	*Blepharis*							+	+	+	+
26	*Catharanthus*							+	+	+	+
27	*Commelina*							+	+	+	+
28	*Desmodium*							+	+	+	+
29	*Dipteracanthus*							+	+	+	+
30	*Corchorus*								+	+	+
31	*Emilia*								+	+	+
32	*Euphorbia*								+	+	+

+ = Species present



The point of the graph, at which the curve start flattening or shows only a steady or gradual increase, indicates the minimum size or minimum area of the quadrat suitable for study in that particular location. From the above species-area curve we see that the graph level off after 80× 80 sq. cm, so a maximum of 32 species of plants are found in the area of 80×80 sq. cm. As the area increases, the graph shows no further increase in the number of plant species i.e. shows a constant species richness. So, from above results, shows that 80 × 80 sq. cm sizeis the minimum size of quadrat for herbaceous vegetation in Andhra university of Andhra Pradesh, India.

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