EXPERIMENT

AIM

To study plant population density by quadrat method.

REQUIREMENTS

Thread, nails, hammer, meter scale, paper, pencil.

THEORY

Population Density

It represents the numerical strength of a particular plant species in the community per unit area at a specific time. The unit area may be small or large, depending on the size and nature of the plant community being studied.

Population density of an organism in an ecosystem varies from place to place and depends a various factor such as food and water availability, predation, weather conditions, birth rate, death rate and migration rates. It can be calculated using the following formula:

$$\text{Density(D)} = \frac{\text{Total no. of individuals of the species in all the sampling units (S)}}{\text{Total number of sampling units studied (Q)}}$$

The value thus obtained is then expressed as number of individuals per unit area. When the measured unit area is divided by the number of individuals, the average area occupied by each individual is obtained. For obtaining more accurate results, it becomes necessary to take different sample areas for studying population density in a large geographical area.

Quadrat Method

It would be an extremely laborious and time consuming task to count all the individual plants within a given population and may also incur disturbance and damage to the habitat and population under study. Thus, we use quadrat as representation of the total population.

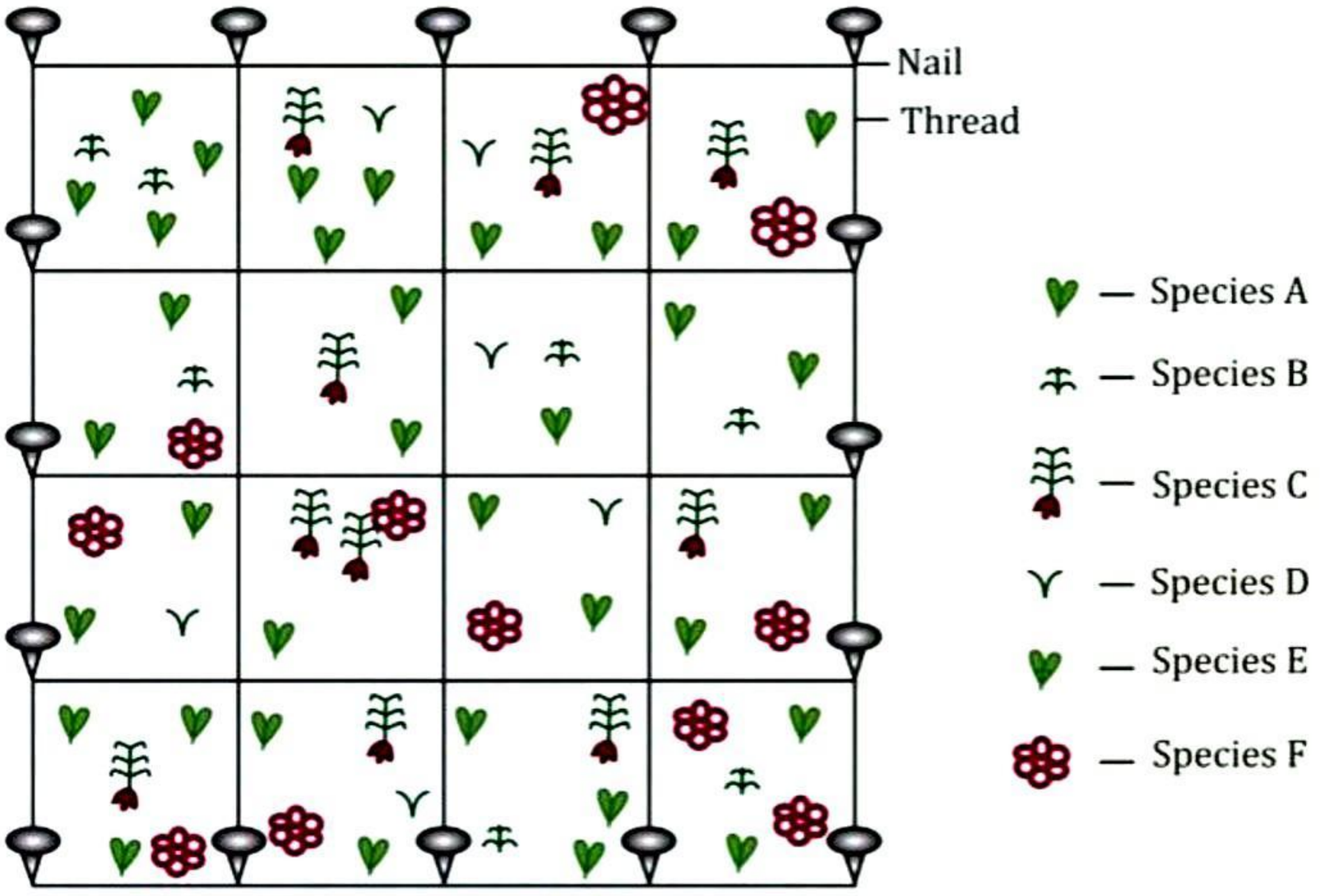
Quadrats are the sampling units of a known area. These sampling units must be distinct and must not overlap each other. The quadrats having a rectangular frame and dimensions of 1m x 1m are most commonly used for herbaceous plants. Quadrat method is considered as the most preferable method to calculate population density and percentage frequency of different plant species.

Significance of Plant Population Density

Plant population density values hold significant importance as they show relative importance of each species with respect to the other species and the surroundings. With the increase in denstiy, the competition stress also increases which further gets reflected in poor growth and lower reproductive capacity of the species. Data on population density is useful for measurement of the effects of reseeding, burning, spraying and successional changes.

PROCEDURE

1. Select a quadrat randomly in a uniform area.
2. With the help of metre scale, make a quadrat of 1m × 1m in the field. Fix 4 nails at the corners of the quadrat and tie/fix thread or string over the nails.
3. Count the number of plants of each species present in the quadrat. If the plant is of small size and large in number, then each quadrat can be further divided into smaller units.
4. Make another quadrat in the same area and record number of plants in that quadrat also.
5. Repeat with the third quadrat.



A quadrat with sub-units

Wrie down the total number of species seen in ten quadrats. This wil give an idea about the composition of the vegetation. There will be difference in the species composition in the quadrats made in shady areas, exposed areas with bright sunlight, dry or wet areas, etc.

S.No.	Name of plant species.	No. of individuals in the area 1m × 1 m quadrats			Total number of individuals in 3 quadrats	Average
		I	II	III		
A B C D						

RESULT

Population density of a plant species. is the average no. of individual plants of the species. occurring in an area.

$$\text{Density(D)} = \frac{\text{Total no. of individuals of the species in all the sampling units (S)}}{\text{Total number of sampling units studied (Q)}}$$

PRECAUTIONS

1. Count the individuals of one plant species at a time.
2. Field chosen should have uniform distribution of species.
3. Plant lying under the string should be considered in quadrat, if more than half of it lies towards inside.

VIVA VOCE

Q1. What is community?

Ans. An associate of a number of different inter-related populations belonging to different species in a common environment which can survive in nature.

Q2. What is vegetation?

Ans. Vegetation is total numbers of plant species showing different life forms, structure, spatial extent or showing any other special characteristics, specific to a particular area.

Q3. Define population?

Ans. It refers to the number of individuals of one species that live in a group in a well defined geographical area, share and compete for same resources and can potentially interbreed.

Q4. What is a quadrat?

Ans. Any sampling plot of standard size (say 1m × 1m) is called quadrat. It is used in ecological studies.

Q5. What do you mean by population density?

Ans. It is the number of individuals of same species per unit area at a given time.

Q6. What factors influence the population density?

Ans. The natality and immigration contribute an increase in population density, while mortality and emigration contribute to the decrease in population density.

Q7. What is the significance of quadrat method?

Ans. **(i)** The quadrat (one metre square) can be randomly drawn with the nail and thread, so we can have a sample quadrat to measure population density anywhere (even at different topography).
(ii) Handling of experiment is easy with this method

Q8. What conclusion can be drawn if density of a plant species is low?

Ans. If the density of a particular species is found low, that indicates the environmental factors are not suitable for that particular species to thrive well.

Q9. Define natality and mortality.

Ans. Natality is the birth rate of a species, whereas, mortality is the death rate.