Exploring the General Pattern of Species Distribution and Abundances of Changa Manga Forest Correlating Environment Variables

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Abstract: Ordination axis is frequently correlated with one environmental variable showing the correlation of the species with one of the environmental factor, thus it helps in the identification of the abundance and occurrence of the species. Different multiple approaches can depict such relations including biplot which introduces the species environment correlation. Four zones of the CMF have been analyzed using biplot techniques. pH, P, K, EC and organic matter are the soil variables which are used in analyses against the species abundance. Desmostachya bipinnata, Cynodon dactylon, Malvastrum cormandelianum, Sonchus oleraceus, Veronica arvensis, Sisymbrium irio, Panicum antidotale, Lippia nodiflora, Prosopis cineraria, Galinsago ciliata, Conyza canadensis were the species that shows affirmative response towards the environmental variable. The allocation of the species in a particular region with reference to the environmental variables signifies that although species are strong co related but they fail in forming the grouping.

Key words: Species distribution • Changa Manga forest • Environmental variables

INTRODUCTION

Soil acts as medium for nutrition for plant growth and development and it plays a major role in the distribution and presence of the plant species at particular region. The goals of the ecology consisted to differentiate the abundance pattern and distribution of contemporaneous species and to recognize the procedures accountable for maintaining and establishing those patterns. The species–environment relationship analysis has always been a fundamental ecology issue [1, 2]. Various studies have queried biotic [3-7] and abiotic [8-13] and the methods through which species composition, richness and abundance is affected.

The most significant way of multivariate data exploration is based on ordination results. The first ordination axis is frequently correlated with one environmental variable, thus helps in the identification of the abundance and occurrence of the individual species related to the different environmental factors [14]. Showing the correlation of the species with one of the environmental factor, thus it helps in the identification of the abundance and occurrence of the species which may be related to the environmental factors[15].

The objective of the study is to explore the abundance and distribution pattern of the study area.

MATERIALS AND METHODS

The whole forest has been divided into four zones for the distinctive study. Random sampling technique was assayed for the collection of floristic data by following Braun-Blanquet approach. Total 200 quadrats of 1m x 1m were laid down in all the zones of the forest. The cover estimation was recorded by the “DOMIN” scale [16]. Composite soil samples were collected, tested and recorded. Soil moisture, EC, Organic Matter and pH were analyzed in order to show the relationship among species and these gradients. Allen method was applied for the evaluation of soil moisture [17]. Nikolshi Method was used for the testing of organic matter[2]. CCA ordination methods were applied for the analysis and quantification. Data analysis requires both classification and ordination techniques on the data set.

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RESULTS

ZONE-I: In zone-I pH, P, EC and organic matter are sharing the same arrow, this means that their values are similar. The increased length of an arrow shows that it may be influencing the individual species. *Desmostachya bipinnata* seemed to be affected by the pH, P, EC and organic matter. The arrow of moisture variable was also of feasible length, this also be effecting the absence and presence of the species. *Sonchus oleoraceous* seems to be affected by the moisture variable. *Prosopis cineraria* and *Sisymbrium irio* may likely to be affected by the potassium content. The remaining of the species were in the centre or away from the position of the arrows. The environmental variable will not be influencing these species.

ZONE-II: In zone-II Environmental variables including pH, Organic matter and EC were sharing the same arrow because they had the similar values. While Moisture, Potassium and Phosphorous shared the another arrow, the length of this arrow was slightly high, this may likely be having increased effect on the species as compare to other environmental variables. Species found in this zone were very less in number. *Cynodon dactylon, Desmostachya bipinnata* were found near the arrow of Moisture, Potassium and Phosphorous. This means that these two species will get affected by these variables. pH, Organic matter and EC may likely to had diminutive effect on *Parthenium hysterophorous*. The other species didn’t show any connectedness with the environmental variables.

ZONE-III: The arrow of Phosphorous and potassium had petite increase in length than other environmental variable’s arrow in zone-III. This showing more amplified effect on the species as compare to other. Most of the species occupies the centre position of the graph. This intends that the environmental variables will not have feasible effect on the abundance of the species. *Veronica arvensis* was likely to be effected by the moisture content. *Chenopodium album, Cannabis sativa, Ranunculas muricatus, Conyza cannadensis, Sonchus arvensis* lies in the centre of the moisture, Phosphorous and potassium arrows. So these species abundance and scatterence will be affected by the both variables. *Malvastrum coromendialinum* and *Anaglis arvensis* showed somewhat correlation with the Phosphorous and potassium. *Sisymbrium irio, Panicum antidotale, Lippia nodiflora* showed response towards the pH, Organic matter and EC arrow.
These environmental variables will effectuate the associated species on their abundance and scattering behavior as they may enhance or inhibit their growth.

**ZONE-IV**: Two arrow heads had been drawn by the canoco showing the environmental variables in zone-IV. One of the arrows represents pH, while the remaining 5 variables i.e moisture, Phosphorous, potassium, EC and organic matter were represented by one arrow. Mostly all species were concentrated in the centre of the biplot. and few of the species were present opposite to the arrow heads this showed the null effect of the variables on those species. *Funaria officinalis, Malvstrum cormendialinum* and *Acharanthes aspera* showed a trivial correlation with pH. It is much closer towards the centre. But these species were little bit tilted towards the pH. So it may had somewhat reaction on the change of pH. *Galinsogo ciliata* was much closer towards towards the arrow showing five different environmental variables. This species depicts that its being effected by wide range of variables. *Coryza canadensis Coronopus didymus* and *Chenopodium album* although near the centre but there still this specie was not found abundant in the CMF. Researchers say that it is a challenging weed but its yield slightly get affected by these variables.

**DISCUSSION**

Four zones of the CMF have been analyzed using biplot techniques. pH, P, K, E.C and organic matter are the soil variables which are used in analyses against the species abundance. For the CCA analysis potassium and phosphorous has been used for analyzing the species abundance.

*Desmostachya bipinnata, Cynodon dactylon, Malvstrum cormendelianum, Sonchus oleraceus, Veronica arvensis, Sisymbrium irio, Panicum antidotale, Lippia nodiflora, Prosopis cineraria, Galinsago ciliata, Coryza canadensis* were the species that shows affirmative response towards the environmental variable.

It was found with *Cynodon dactylon* in the soils having the high moisture content [18]. This shows that it favors the EC and its growth enhances. *Sonchus oleraceus* weeds grow best in neutral or alkaline pH soils and vary in size depending on how much moisture they receive and the level of nutrients in the soil [19].

Long term study has been done by the researchers on *P.cineraria* and its status on the soil nutrients. Due to the presence of *Prosopis cineraria* it has been found that there was increase in the organic matter, N, P and K [20]. This phenomenon has been found in the zone-I and zone-II of the CMF after doing analysis of the soil sample from different zones of CMF.300 mg kg-1 of potassium has been found in the soil sample of the zone-I, 360 mg kg-1 was determined in the soil sample of zone-II. Whereas 66.3 mg kg-1 and 66.5 mg kg-1 of Potassium were found in zone-I and zone-II respectively.

*Veronica arvensis* shows response towards the moisture and phosphorous variable, as it grows in moist area and cool season. Phosphorous content in the leaves of *Malvstrum cormendelianum* was significantly very high as compare to other species. This may led to the idea that its growth enhance with the amount of phosphorous in the soil. *Panicum antidotale* has been best adapted to those areas where summer rain fall is adequate, along with proper irrigation [21]. It thrives at the high pH. Highest percentages have been seen at 8.0-11.5 pH [22].

*Lippia nodiflora* work better at neutral and alkaline soil with moist soil. *Galinsogo ciliata* prefers moist and damp soil for its growth with bounty of light. Although its association with the numerous environmental variables still this specie was not found abundant in the CMF. Researchers say that it is a challenging weed but its yield reduces if there is competition between the species for water and nutrients. A study by Rai and Tripathi (1984) specified that it successfully grow and prosper at high altitudes. Its performance and growth get affected at the lower altitude [23].

With the help of using Biplot we have been able to visualize the magnitude of the variables contribution and their representation of the observation. Each variable contribution can be depicted. And it relates the original data to variables. So this helps in identifying the actual responses of the variables which effects the species distribution.

**REFERENCES**