Table 2. Variability parameters for some of the characters relating to the recovery of seed studies in chilli genotypes

Character	Mean	SE	Maximum	Minimum	Range	CV(%)
No.of seeds/fruit	64.8	2.49	132.5	31.5	101.0	32.8
Fruit length (FL) (cm)	8.19	0.34	14.73	1.39	13.40	35.5
Fruit diameter (FD) (cm)	1.22	0.033	2.43	0.65	1.78	23.0
Fruit size (FL x FD)	9.74	0.391	16.74	1.89	14.85	34.3
No.of fruits/plant	46.10	2.43	126.3	8.7	117.60	44.9
Fruit shape (FL:FD)	7.24	0.433	20.37	1.0	19.37	51.0
Dry fruit yield per plant (g)	26.69	1.12	48.0	11.3	36.7	34.5
Root dry wt/plant (g)	39.08	0.89	53.67	0.9	52.77	19.6
Stem diameter (cm)	1.27	0.02	1.68	0.71	0.97	15.9
Plant spread (cm)	52.09	1.09	68.9	17.5	51.4	17.8
Plant height (cm)	58.39	1.35	82.5	24.9	57.6	19.9
Number of secondary branches/plant	13.61	0.51	43.4	5.1	38.3	32.2
Number of primary branches/plant	5.34	0.12	7.8	2.7	5.1	18.8
Root vol./plant (cc)	10.07	0.39	25.7	4.5	21.2	30.8
1000 seed wt. (g)	4.92	0.1005	7.68	3.44	4.24	17.4
Pedicel length (cm)	2.95	0.0550	4.35	1.69	2.66	16.0
Ascorbic acid content (mg/100g)	130.16	3.76	192.1	58.7	133.4	24.7
Capsanthin content(%)	0.245	0.0065	0.407	0.126	0.281	22.7
Capsaicin content(%)	0.689	0.0465	1.810	0.055	1.755	57.6
Fruit dry weight (g)	0.765	0.025	1.481	0.384	1.097	28.1

ratio and number of seeds/fruit showed less improvement in their relative contribution than others in the variability of SR.

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APPLICATION OF REMOTE SENSING TO STUDY THE ENVIRONMENT AND ECOSYSTEM. A CASE STUDY FOR SECONDARY ANALYSIS OF VEGETATION

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ABSTRACT

Four types of vegetation *viz*., moist sal forest, moist mixed forest, dry mixed forest and seral vegetation were identified at the Kanha National Park using remote sensing data products *viz*., satellite imageries (Landsat -TM-FCC 1:50,000 scale) and aerial photographs (B/W Panchromatic 1:10,000 scale). Secondary analysis of the vegetation interms of index of similarity has revealed that there was highest similarity between *Terminalia tomentosa* and moist mixed forest as *T. tomentosa* was the most abundant and dominant tree species in moist mixed forest. Also there were more similarity between Sal (*Shorea robusta*) and *T. tomentosa* forests. *S. robusta* forest was the most dominant among all the vegetation in the study area. The dry mixed and moist mixed forests were having greater diversity, indicating the richness of the tree species, compared to sal forest and seral vegetation.

KEY WORDS : Remote sensing, aerial photographs, satellite imageries, environment, ecosystem, vegetation analysis

Vegetation analysis is of paramount importance in understanding the forest ecosystem and their environment. The various components of forest ecosystem interact either directly or indirectly, in such a way that all the components together perform some system function. Forest fire, illegal felling or large scale deforestation in tropical forest area will certainly affect the forest ecosystem. Because of these unexpected biotic and abiotic events, the phytosociological settings of natural forest ecosystem get disturbed. Primary analysis of forest vegetation aims at quantitative description of phytosociology and ecology of plant communities. This is not an easy job if we go for conventional methods of vegetation analysis considering the vastness and inaccessibility of tropical forest environment. This becomes an uphill task especially if we want to have vegetation analysis of particular forest ecosystem at very frequent intervals. In the light of these, remote sensing as a tool for vegetation analysis had gained momentum only a decade back by virtue of its synoptic coverage of vast terrain and repeatability (Roy, 1983, 1984). The present study was undertaken to delineate the different types of forest as well as to have primary analysis of forest vegetation using remote sensing technique.

MATERIALS AND METHODS

The study area comprised part of the Kanha National Park (80° 26' to 80° 30' E longitude and 22° 07' to 22° 27' N latitude). Remote sensing data products *viz.*, satellite imageries and aerial photographs pertaining to the study area were obtained from the National Remote Sensing Agency (NRSA), Hyderabad. The boundary of the study area was marked using Survey of India toposheets (1:50,000 scale). The satellite imageries (Landsat - TM - FCC 1:50,000 scale) were used to identify visually the broad physiognomic units of forest vegetation as it was unable to give 3- D view of the objects in the study area. Whereas the aerial photographs (B/W panchromatic 1:10,000 scale) were used to identify specific vegetation or forest types (Champion and Seth, 1968) within each of the broader physiognomic units identified on satellite imageries. Informations such as stand height, crown diameter, crown density, slope of the terrain, topstorey and understorey vegetation etc., of the study area were also obtained through aerial photographs in view of its 3-D effect. Thirty-one sample plots were marked on aerial photographs for various forest types following proportional stratified random sampling technique. These sample plots were located on the ground (study area) for collecting ground truth besides checking for the correctness of the already interpreted / identified details on aerial photographs and satellite imageries. Ground truth was collected from sample plots of 0.1 ha in the field (forest area).

Data on number of tree species, tree height, diameter at breast height (DBH), basal area, topstorey and understorey species etc., were collected from a quadrate of 10 m x 10 m in each sample plot in the field. The whole spectrum of work was done systematically in three phases viz., pre-field, field and post-field work as per modified Kuchler's (1967) comprehensive method. Secondary analysis of vegetation interms of index of similarity (Muller - Dombios and Ellenberg, 1974), index of dominance (Simpson, 1949) and index of diversity (Shannon and Wiener, 1963) was done using the sample plots data.

RESULTS AND DISCUSSION

Four major types of vegetations viz., sal forest, moist mixed forest, dry mixed forest and seral vegetation were identified in the study area from the remote sensing data products *viz.*, satellite imageries and aerial photographs. The results of secondary analysis of vegetation interms of index of similarity, index of dominance and index of diversity are presented in Table 1 and 2.

Index of similarity

The index of similarity (IS) is used to assess the overall similarity of different localities with respect to species diversity. Index of similarity is based on the community co- efficient concept of Jaccard (1912) and is centred on the presence-absence relationship between the number of species common for two areas and total number. Thus, it express the ratio of the common species to all species found in the vegetation (Muller-Dombois and Ellenberg, 1974).

Table 1. Index of similarity between vegetations

Vegetation type	Index of similarity
Sal vs Terminalia forests	42.55
Dry mixed vs Moist mixed forests	50.00
Terminalia vs Moist mixed forests	73.47

In the present study the index of similarity between Terminalia and moist mixed forest, between dry mixed forest and moist mixed forest and between Sal and Terminalia forests, respectively, were 73.47, 50.00 and 42.55, showing highest similarity between Terminalia and moist mixed forests (Table 1).

Index of dominance

The dominance index is an expression of the cumulative dominance exerted by all the species constituting a community. IVI (importance value index) expresses the importance of individual species in a plant community whereas index of dominance reflects the joint dominance of all the species in a community. The result of the present study had shown that the sal group or community was more dominant over the other community viz., moist mixed forest, dry mixed forest and seral vegetation as evident from the highest index of dominance for Sal (0.320) and the lowest index of dominance for dry mixed forest (0.085)

Index of diversity

Index of diversity expresses the magnitude of biological richness in a plant community and consists of two components viz., species richness and evenness. Species richness is nothing but the number of species occuring per unit area. Evenness is a measure of proportional distribution of total number of individuals in a community amongst the various species components. The results of the present study revealed that dry and moist mixed forests were found to have more diversity and hence more species richness in dry and moist mixed

Table 2. Index of dominance and index of diversity among vegetations

Vegetation type	Index of dominance	Index of diversity
Sal forest	0.320	0.816
Moist mixed forest	0.128	1.131
Dry mixed forest	0.085	1.252
Seral vegetation	0.196	0.815

forest compared to Sal forest and Seral vegetation The index of diversity for dry mixed forest, mois mixed forest, sal forest and seral vegetation wer 1.252, 1.131, 0.816 and 0.815, respectively.

Hence, it has been concluded that at Kanh National Park, Sal forests were the most dominan community compared to moist mixed forests, dr mixed forests and seral vegetations. As far a species richness is concerned, both dry mixed an moist mixed forests were having greater diversit than sal forest and seral vegetation.

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