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Effect of mica dust on phytosociological studies of grassland of Jharkhand

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Abstract- Mica dust on phytosociological studies of the species composition on control and polluted grassland indicated that maximum number of the species were present in rainy season the present investigation of foristic composition of the vegetation on control and polluted grassland of Koderma Jharkhand disclosed that the number of species on polluted grassland was more as compared to control one which is due to rainy and winter annuals, on polluted grassland. *Bothriocloa pertusa* was selected to know the effect of Mica dust pollution on phytosiological studies i.e. species composition life forms biological spectrum and importance value index of grassland ecosystem. The control grassland was selected away from the Mica factory where the dust load was zero. The life forms class indicated atherohemicryprophytic flora on both types of grassland in comparison to control grassland respectively as compared to Raunkiers normal spectrum. The importance value index of *Bothriocloa pertusa* was recorded maximum in comparison to other grassland species present on control and polluted grasslands in rainy, winter and summer seasons.

Keywords : *Bothriocloa pertusa,* grassland, Raunkiers normal spectrum

INTRODUCTION

The general principles of community organization based on the factors of environment & the potentialities of the species play an important role in influencing courses of development of the communities phytosociological analysis of a plant community is the first & foremost basis of the study of any piece of vegetation. The knowledge of the component species is necessary for the study of the community and hence plant species which are present on both on control and polluted grassland in each season of the year 2008-09. In India several investigators have warded out on species composition. Raunkiaer (1934)[1] defined the plant climate as a condition for a certain type of vegetation life forms biological spectrum an important value index grassland ecosystem.[2-4] But a total information regarding different parameters of phytosociology of grasslands in relation to Mica dust pollution. This chapter deals with species composition, life forms biological spectrum and importance value index of control and Mica dust polluted grasslands of Koderma, Jharkhand.

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MATERIAL AND METHODS

Sampling of Particulate Matter:

The Present study was sampling i.e. mica dust fall jars were used for settled dust and high volume air sampler for suspended particles. Depositions on foliar surface can be used for measuring the collective dust fall in an area.

(i) Settled dust sampling by dust fall jars the advantages of minimum equipment cost and simplicity in handling. Usually, the particles larger than 10 in diameter which settle on horizontal surfaces by forces of gravity, are collected in an open container kept out doors at an elevated and open to sky place for a 30 days period. The total dust fall is expressed as g/m^2 month by using the following formula (Rao, 1971):

(a) $$\text{Particulate matter (g/m}^2\text{month)} = \frac{\text{g particulate} \times 30}{\text{Ac} \times \text{n}}$$

Where, AC= Cross sectional area of the mouth of the jar (3.14x r^2)n= number of days for which the jar was exposed if the dust fall value is to be computed in tons m/K^2 month, then the formula given below is used.

(b) $$\text{Dust fall (Tons m/K}^2\text{month)} = \frac{\text{g particulate} \times 3500}{\text{Diameter of Jar (cm)}}$$

(ii) Suspended particles matter (SPM) sampling by high volume air sampler involves the principle of filtering a know volume of air through a glass-fibre paper of know weight at an average speed ofg 1.3 to 1.5 m^3 air/minute by using a wolf blower. The amount of suspended dust is expressed as g/m^3 of air by using the following formula:

$$\text{SPM } (\mu\text{g/m}^3) = \frac{(W_2 - W_1) \times 10x^6}{\text{Volume of air sampled (m}^3\text{)}}$$

Where,

W_1=Initial weight (g) of the filter paper.

W_2= Final weight (g) of the filter paper.

The high volume air sampler measures mass concentration from 1 g/m^3 to 1 gm/m, within the size range of 0.1 to 100 (Jalees and Dave, 1979).

The grassland vegetation was analyzed by 50 cm x 50 cm sized quadrats in control and polluted grasslands. The phytosociological observations were made during three different months i.e. September (Rainy season), January (Winter season) and May intervals of five metre belong the line transect. The species present in each quadrate was noted and also their number was counted individual/tiller of each species. For the basal area measurement the diameter of the individual/tiller was considered of each species at the point of emergence. From these data frequency, relative frequency, density, relative, density, basal cover, relative dominance and importance value index were determined using following formula:

$$\text{Frequency} = \frac{\text{Number of quadrants in which the species occurred}}{\text{Total number of quadrants studied}} x\ 100$$

$$\text{Relative Frequency} = \frac{\text{Number of occurrence of the species}}{\text{Number of occurrence of all species}} x\ 100$$

$$\text{Density} = \frac{\text{Total Number of individuals of the species in all the quadrats}}{\text{Total Number of quadrats studied}} x\ 100$$

$$\text{Relative Density} = \frac{\text{Number of individuals of the species}}{\text{Number of individuals of the species}} x\ 100$$

Basal area = 3.14r^2

Where r = Radius of the stem at the point of emergence,

Basal cover = Density × Basal area

$$\text{Relative Dominance} = \frac{\text{Total basal cover of the species}}{\text{Total basal cover of the species}} x\ 100$$

RESULTS

The occurrence of the control and polluted grasslands are shown in the Table 1.1. The total number of species which were present on both types of grasslands in different seasons is tabulated in the Table 1.2.

The perennial species were common in each season on both types of grasslands. The annual plant species completed their life cycle within one season but in some case they extend upto the next season. The maximum numbers of grassland species were recorded in polluted grassland in comparison to control grasslands in rainy, winter and summer seasons. *Alysicarpus vaginalis*, *Aristida cyanantha*, *Bothriochloa pertuse*, *Cynodon dactylon, Cyperus aristatus, Dactyloctenium aegyptium, Desmodium triflorum, Dichanthium annulatum, Echinochloa cotonum, Evolvulus alsinoides Setaria glauca* and *Sporobolus diander* were common on control and polluted grasslands. The species like *Gomphrena globosa* and *Veliveria zizanioidea* were present only on the control grassland.

Achyranthus aspera, Aneilema nudiflorum, Blumea oxyodonta, Boerhaavia diffusa, Cenchrus setigesus, Croton spersittorus, Digitaria adscendus, Euphorbia hirta, Indigofera linifolia, Pasplidium flavidum, Sida rhombifolia, Tephrosia purpurea and *Tridax procumbens* were present only on the polluted grassland.

Table 1.1. List of species occurring on the control(C) and polluted(P) grasslands in different seasons (2008–2009).

Name of species	Rainy		Winter		Summer		Life-form
	C	P	C	P	C	P	
Achyranthus aspera	-	+	-	+	-	+	Th
Alysicarpus vaginalis	+	+	+	+	+	+	He
Aneilema nudiflorum	-	+	-	-	-	-	Th
Aristida cyanantha	+	+	+	+	+	+	Ch
Blumes oxyodonta	-	+	-	-	-	-	He
Boerhaavia diffusa	-	+	-	+	-	+	He
Bothriochloa pertusa	+	+	+	+	+	+	Cr
Cenchrus setigesus	-	+	-	+	-	-	Ch
Croton sparsiflorus	-	+	-	+	-	+	Th
Cynodon dactylon	+	+	+	+	+	+	Ch
Cyperus aristatus	+	+	+	+	+	+	Cr
Desmodium triflorum	+	+	+	+	+	+	He
Dichanthium annulatum	+	+	+	+	+	+	He
Digitaria adscendus	-	+	-	-	-	-	Th
Echinochloa colonum	+	+	-	-	-	-	Th
Euphorbia hirta	-	+	-	+	-	+	Th
Evolvulus alsinoides	+	+	+	+	+	+	He
Indigofera linifolia	-	+	-	+	-	+	He
Paspalidium flavidum	-	+	-	-	-	-	Th
Sida rhombifolia	-	+	-	+	-	+	Th
Sporobolus diander	+	+	-	-	-	-	He
Tephrosia purpurea	-	+	-	+	-	+	Th
Tridax procumbens	-	+	-	+	-	+	Ch
Vetiveria zizanioides	+	-	+	-	+	-	Ch

Th = Therophyte Ch = Chamaephyte
He = Hemicryptophyte Cr = Cryptophyte
\+ = Present - = Absent
C = Control grassland P = Polluted grassland

Table 1.2. Number of species on control and polluted grasslands in different seasons (2008–2009).

Season	Control	Polluted
Rainy	11	23
Winter	09	17
Summer	09	16

Life-Forms

The life-forms of the control and polluted grasslands are tabulated in the Table 1.3

Table 1.3. Number of species under different life-forms classes on control and polluted grasslands (2008-2009).

Life-forms class	Control	Polluted	Total flora
Chamaephyte	2	4	6
Hemicryptophyte	5	8	13
Cryptophyte	2	2	4
Therophyte	2	9	11
Total Number of species	11	23	34

The Chamaehyte, Hemicryptophyte and Therophyte were more on polluted grassland in comparison to control grasslands. The biological spectrum of the grassland species of control and polluted grasslands are compared with Raunkiaer's normal spectrum (Table 1.4).

Table 1.4. Biological spectrum for control and polluted grasslands and Raunkiaer's normal spectrum 2008-2009 (Per cent of total species).

Grassland	Chamaephyte	Hemicryptophyte	Cryptophyte	Therophyte
Control	18.18	45.46	18.18	18.18
Polluted	17.39	34.78	8.70	39.13
Total flora of grasslands	17.65	38.24	11.76	32.35
Raunkiaer's normal spectrum	9.00	26.00	6.00	13.00

*Only those classes are given which were present on the study grasslands.

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