CHAPTER - VI

ECOLOGICAL OBSERVATIONS

There has been an increasing interest in bryophyte ecology over the past 100 and so years, initially of a photo-sociological nature but additionally, in recent years of an experimental nature as well. Early studies of bryophyte communities have led to detailed investigations into the relationships between the plants and their environment. Exact knowledge of these relationships can only be shown by studying the various environmental factors acting upon them. The local environmental factors are evidently different from those of the rest of the wider habitats. These small areas are often referred to as microhabitats, micro-climates or microenvironments (Ewuste, 1980). Among bryophyta, as among other plants species differ very much in the range of conditions under which they live. There are few wide ranging species found in a great variety of habitats. On the whole, however it is true to say that most liverworts have a sharply defined and rather narrow ecological range. This gives them great value as indicators of certain habitat conditions. Many more exact measurements of factors in nature are needed for the real study of the liverworts. Taking into considerations all these views an attempt has been made to study the microenvironments of the liverworts of Panhala into following pages.

Accordingly Table -1, shows habit preferences of liverworts studied and Table -2, shows variations in different ecological parameters The various parameters studied are light intensity, humidity, pH, EC, organic matter and moisture contents from different habitats of the different localities. From these tables it is observed that *Riccia fluitans* grows in aquatic as well as in terrestrial habitat. Humidity per cent in both the habitats is found to be the same i.e. 41%. As far as the pH and EC of both the habitats are concerned, comparatively higher values are found in terrestrial habitat than aquatic one. Even organic matter contents are found to be exceedingly higher in terrestrial one. Both *Riccia crystallina* and *R. frostii* are found in a terrestrial habitats. The former grows under less light intensity and high humidity as compared to the later one. pH of the substrates are found to be alkaline while moisture content and organic matter percentage ranges from 20.1-22.9.

Targionia hypophylla is found on epilithic as well as on non-epilithic areas. It shows EC and pH both are found to be moderate while percentage of humidity is found to be more (44%) than that of another locality (40%) in which this species get exposed. As far as organic matter is concerned, it is 20.9% in first locality while 24.3% in another. Moisture percentage in both are found to be higher which are 24.6% and 27% respectively. It is observed that *Cyathodium tuberosum* is found in

Table 1: Habitats of liverworts in Panhala

Name of the liverwort	Terrestrial				Mud banks		Road-side	Aquatic	
	Epilithic		Non-epilithic						
	Exposed	Sheltered	Exposed	Sheltered	Exposed	Sheltered		Exposed	Sheltered
1. *Riccia fluitans* L.	-	-	+	-	+	-	-	+	-
2. *R. crystallina* L.	-	-	+	+	-	-	-	-	-
3. R. *frostii* Aust.	-	-	+	+	-	-	+	-	-
4. *Targionia hypophylla* L.	+	+	+	+	-	-	+	-	-
5. *Cyathodium tuberosum* Kash.	+	+	+	+	-	+	+	-	-
6. *Plagiochasma articulatum* Kash.	+	+	-	-	-	-	-	-	-
7. *P. appendiculatum* L. et L.	+	+	-	-	-	-	-	-	-
8. *P. intermedium* L. et G.	+	+	-	-	-	-	-	-	-
9. *Asterella angusta* Beauv.	-	+	+	+	-	-	+	-	-
10. *Fossombronia himalayensis* Kash.	+	-	+	+	-	-	+	-	-

Table 2 : Some ecological observations of liverworts

Name of the liverwort	Locality	Light intensity mW/Cm^2	Humidity %	pH	E.C. mMhos/ Cm x 10^{-2}	Organic matter %	Moisture content %
1. *Riccia fluitans* L.	Well in the Nursery						
	i) Aquatic	15	41	7.7	6.80	-	-
	ii) Terrestrial	15	41	7.8	20.40	37.7	20.00
2. *R. crystallina* L.	Gopaltirth bag	14	42	7.9	17.20	20.1	22.90
3. *R. frostii* Aust.	Foot-path	19	33	7.7	26.60	22.3	20.20
4. *Targionia hypophylla* L.	i) Ambarkhana	18	44	7.2	11.90	20.9	24.60
	ii) Teen Darwaja	22	40	7.5	10.80	24.3	27.00
5. *Cyathodium tuberosum* Kash.	i) Cave	2	42	7.2	0.30	21.0	28.50
	ii) Gopaltirth bag	8	43	7.8	16.20	19.8	24.70
6. *P. articulatum* Kash.	Temple wall	20	43	8.1	14.00	38.0	46.96
7. *P. appendiculatum* L. et L.	Andharbav	51	39	7.8	18.00	16.0	19.52
8. *P. intermedium* L. et G.	Ambarkhana	18	44	7.1	11.96	14.6	20.30
9. *Asterella angusta* Beauv.	Nursery wall	4	39	7.6	7.80	18.0	22.30
10. *Fossombronia himalayensis* Kash.	Nursery wall (corner)	12	38	7.8	8.01	19.5	22.80

moist and shady habitats i.e. in the caves as well as near water channel. Obviously in the caves light intensity is very less i.e. 2 mW/cm^2, while in unsheltered areas it is found to be $8mW/Cm^2$. Humidity in an average is found to be 42% in both habitats. pH is found to be alkaline while there is found to be no much difference in percentage of organic matter and moisture content. If the habitats of all the *Plagiochasma* spp. are concerned, these are found on epilithic as well as non-epilithic habitats. As far as *P. articulatum* is concerned which is predominantly found on the temple, shows 20 mW/Cm^2 light intensity, where humidity is found to be 43%. The values of organic matter and moisture content are found to be highest than other two species i.e. 38% and 46.96% respectively. In case of *P. appendiculatum* dominant at Andharbav shows 51 mW/ Cm^2 light intensity which is highest. Humidity, organic matter and moisture per cent values are 39%, 16%, and 19.5 respectively. *P. intermedium* shows 44% humidity which is maximum while moisture per cent (20.3%) and organic matter (14.6%) are found to be moderate. Light intensity is 18 mW/Cm^2 which is lowest amongst 3 species of *Plagiochasma*. pH ranges from 7.1 to 8%. *Asterella angusta* growing as an epilithic bryophyte shows low light intensity ($4mW/ Cm^2$). Other values of parameters like humidity (39%), organic matter (18%) and moisture per cent (22.3%) are found to be moderate. *Fossombronia himalayensis*

found in same locality but in exposed areas of nursery wall corner where light intensity is 12 mW/ cm^2, which is three times more than *A. angusta.* Other aspects like humidity (38%), pH (7.8%), E.C. (8%), organic matter (19.5%) and moisture percentage (22.8%) which are altogether same as that of *A. angusta.*

Above results are discussed in the following Chapter No. VII-B.