CHAPTER V :

SUMMARY & CONCLUSION

Physiology of ferns is an interesting field of study in which numerous investigators are engaged actively. In the present investigation also the biochemistry and physiology of some ferns is studied. The ferns selected for the study are Nephrolepis exaltata Schott. a garden fern and Gymnopteris contaminans Bedd. growing naturally in the evergreen forest.

As the ecological conditions of these two ferns are different, their physiology is also expected to be different. But till then in the present investigation the physiology of these two ferns is studied.

The photosynthetic pigments, carbohydrates, polyphenols, proline, mineral metabolism and nitrogen metabolism etc. of these two ferns are studied.

For the present investigation the techniques and methods extensively used were spectrophotometry and atomic absorption spectrophotometry.

Some of the significant findings of the present investigation can be listed as follows.

CHLOROPHYLLS :

In Nephrolepis exaltata Schott. chlorophyll contents are more in vegetative stage than the

reproductive stage. In vegetative stage rachis and leaflet shows more chlorophyll content than reproductive stage. Chlorophyll 'a' is more than the Chlorophyll 'b' in both the stages.

In Gymnopteris contaminans Bedd. chlorophyll contents are more in the vegetative stage than the reproductive stage. Gymnopteris contaminans Bedd. shows more chlorophylls than Nephrolepis exaltata Schott. in both the stages.

These results make it clear that the photosynthetic pigments are affected in the reproductive stage in both the ferns.

TITRATABLE ACID NUMBER (TAN) :

In Nephrolepis exaltata Schott. titratable acid number is more in the vegetative stage and it decreases in the reproductive stage, while in Gymnopteris contaminans Bedd. TAN is more in roots, and rhizome of vegetative stage than the roots and rhizome of reproductive stage.

In reproductive stage of Gymnopteris contaminans Bedd. sterile rachis and sterile leaflet shows more Titratable acid number than the vegetative one.

This indicates that Titratable acid number is more in the Nephrolepis exaltata Schott. during vegetative stage.

CARBOHYDRATES :

Carbohydrate analysis revealed that in Nephrolepis exaltata Schott. carbohydrates are less in the vegetative stage and increase in the reproductive stage. Rachis in both the stages shows maximum carbohydrates than other parts.

In Gymnopteris contaminans Bedd. root and leaflet of the vegetative stage show more carbohydrate content and it decreases in the reproductive stage. In rhizome and rachis carbohydrate content is increased. The carbohydrate content is increased in rhizome of the reproductive stage than the vegetative one. But it is decreased in the sterile leaflet and the fertile leaflet.

POLYPHENOLS :

In Nephrolepis exaltata Schott. root shows similar polyphenolic contents in vegetative stage as well as reproductive stage. In the stolon and rhizome of vegetative stage polyphenols are more and in reproductive stage rachis and leaflet show more phenolic contents. These results indicate that in the reproductive stage they are translocated to the rachis and leaflet.

In Gymnopteris contaminans Bedd. polyphenolic contents are increased in the reproductive stage except the rhizome .

Nephrolepis exaltata Schott. contains more polyphenols than that of Gymnopteris contaminans Bedd..

PROLINE :

In Nephrolepis exaltata Schott. proline contents are more in the vegetative stage except leaflet, while in Gymnopteris contaminans Bedd. proline contents are more in the reproductive stage. This is possibly due to the different ecological conditions in which the two ferns are growing.

TOTAL NITROGEN :

In Nephrolepis exaltata Schott. nitrogen and protein contents are more in the vegetative stage and less in the reproductive stage except the leaflet.

In Gymnopteris contaminans Bedd. nitrogen contents are more in the vegetative stage and less in the reproductive stage.

From these observations it is clear that the nitrogen contents are more in the vegetative stage than the reproductive stage.

Gymnopteris contaminans Bedd. shows more nitrogen content than that ofNephrolepis exaltata Schott.

The activity of enzymes viz. nitrate reductase and nitrite reductase was studied in both the ferns separately but significant findings were not observed.

INORGANIC CONSTITUENTS :

The object of this investigation was to find out the major mineral constituents in the different parts of Nephrolepis exaltata Schott. and Gymnopteris contaminans Bedd..

Na^+ :

In Nephrolepis exaltata Schott. Na^+ contents are more in leaflet of the vegetative stage than the rest of the parts while in reproductive stage sodium contents are more in the rachis than the other parts.

In Gymnopteris contaminans Bedd. sodium contents are more in the rhizome than the other parts during both the stages.

K^+ :

In Nephrolepis exaltata Schott. K^+ contents are more in the leaflet of vegetative stage than the

other parts while in reproductive stage rachis shows more K^+ content and in the rhizome the least.

In Gymnopteris contaminans Bedd. rachis of vegetative stage shows more K^+ content and the roots contain the least potassium while in reproductive stage it decreases in the rachis but the sterile leaflet shows more K^+ content.

Ca^{+2} :

In Nephrolepis exaltata Schott. Ca^{+2} contents are more in the roots of vegetative stage and least in the rachis, while in reproductive stage they are more in the rachis and less in the roots and rhizome.

In Gymnopteris contaminans Bedd. rhizome of the vegetative stage shows more calcium than the other parts, while in reproductive stage sterile leaflet shows more Ca^{+2} content than the rest of the parts. In vegetative stage Ca^{+2} contents are more than the reproductive stage except the leaflet.

Mg^{+2} :

In Nephrolepis exaltata Schott. the leaflet of the vegetative stage as well as of the reproductive stage shows more magnesium content. However, the leaflet of reproductive stage contains more magnesium than that of the vegetative stage.

In Gymnopteris contaminans Bedd. Mg^{+} contents are more in the sterile leaflet during the reproductive stage than the leaflet of vegetative stage.

These observations indicate that in N. exaltata Schott. Mg^{+2} contents in general are more in the reproductive stage, while in G. contaminans Bedd. Mg^{+2} contents are more in the vegetative stage except leaflet.

Fe^{+3} :

In Nephrolepis exaltata Schott. Fe^{+3} contents are more in the roots of vegetative stage and they are less in the rachis, while in the reproductive stage stolon shows more iron content and the rhizome shows the least. These observations indicate that iron contents are more in the vegetative stage than the reproductive stage.

In Gymnopteris contaminans Bedd. Fe^{+3} contents are more in the vegetative stage and they are less in the reproductive stage. These observations indicate that iron content is increased in the vegetative stage and decreased during the reproductive stage.

In both the ferns studied Fe^{+3} contents are more in the vegetative stage than the reproductive stage.

Mn^{+2} :

In Nephrolepis exaltata Schott. Mn^{+2} contents are more in the roots of vegetative stage and rachis shows the least than all other parts. In reproductive stage Mn^{+2} contents are also more in the roots and very less in the rachis. In both the stages of Nephrolepis exaltata Schott. root shows more Mn^{+2} content and the rachis the least.

In the vegetative stage of Gymnopteris contaminans Bedd. root shows more Mn^{+2} content than the rhizome, rachis and leaflet, while in reproductive stage Mn^{+2} contents are more in the sterile leaflet and least in the fertile rachis. These observations indicate that Mn^{+2} contents are more in the vegetative stage than the reproductive stage of Gymnopteris contaminans Bedd.

Cu^{+2} :

In the vegetative stage of Nephrolepis exaltata Schott. copper accumulation is more in the roots and less in the stolon. In reproductive stage Cu^{+2} accumulation is also more in the roots and less in the leaflet. In both the stages of Nephrolepis exaltata Schott. Cu^{+2} accumulation is more in the roots than rest of the parts.

In the vegetative stage of Gymnopteris contaminans Bedd. there was more accumulation of Cu^{+2} in the roots and less in the rhizome as well as rachis.

In the reproductive stage Cu^{+2} accumulation is more in the sterile leaflet and fertile leaflet and less in the fertile rachis.

Zn^{+2} :

In vegetative stage of Nephrolepis exaltata Schott. Zinc contents are more in the roots and less in the rachis, while in reproductive stage Zn^{+2} accumulation is more in the rachis and less in the stolon.

In Gymnopteris contaminans Bedd. Zn^{+2} accumulation is more in the roots of vegetative stage than the rest of the parts, while in reproductive stage fertile leaflet shows more zinc and the rhizome shows the least than the other parts.

Cl^{-} :

In Nephrolepis exaltata Schott. Chloride contents are less in the vegetative stage than the reproductive stage except rhizome.

This indicates that Chloride accumulation is more in reproductive stage than the vegetative one.

In Gymnopteris contaminans Bedd. Chloride contents are less in all parts of vegetative stage than the parts of the reproductive stage. This indicates that there is more accumulation of Cl^{-} ions in the reproductive stage than the vegetative one.