The conversion of an apical meristem from vegetative to reproductive state is a dramatic site for switching a developmental pathway (Evans, 1975). It expresses a new genetic information (Zeevaart, 1962; Salisbury, 1963; Bonner, 1965; Searle, 1965). The suggestion that floral stimulus causes the transcription of new genetic material by combining with histones and removing them from DNA-histone complex is not gaining experimental evidences. Present investigation envisages a subtle interaction of the genetic material with its counterparts, histone and nonhistone chromosomal proteins (NHCP) during transitional stages of vegetative to reproductive state. Cytophotometric estimations of the relative changes of NHCP during transitional stages showed a positive correlation with RNA and protein syntheses. These findings support that nonhistone chromosomal proteins (acidic nuclear proteins) even act as derepressors of DNA dependent RNA synthesis (Frenster, 1965; Johnson et al. 1974; Stein et al. 1974; Wang and Hyberg, 1974; Elgin and Stumpf, 1975). These findings presume that floral stimulus derepress the genes responsible for reproductive growth and it acts at the transcription level. As a result, novel messengers are
released into the cytoplasm. Pryke and Bernier (1978) observed the synthesis of 5SRNA and rRNA, but could not find evidences for mRNA synthesis.

Floral evocation is followed by an increase in the synthetic activity for all metabolites and redistribution of sites of activity. During evocation, the cytohistological zonation is lost in the shoot apex of Paspalidium. The higher relative amounts of the main nuclear constituents, DNA, histone and NHCP in the peripheral zone account for the greater mitotic activity of this zone and thus there is a tendency for more cells to be in synthetic phase. The presence of more proteins and nucleic acids is also noted in Chenopodium (Gifford and Tepper, 1962), Pharbitis nil (Healy and Jensen, 1965) Paulownia (Pickson, 1968), Brachychiton (West and Guncke, 1968a), Setaria and Panicum (Rudramuniappa and Panchaksharappa, 1975, 1977). The accumulation of metabolites on the peripheral region augurs the initiation of floral primordia from the main axis. The vegetative shoot apex in Paspalidium showed differential values for content as well as extinction in different zones. This is an indication of the metabolic disparities and zone specific distribution of different metabolites. Much more evidence comes from the work of Mauseth (1978 a,b) who concluded after experimenting with a number of species of
cacti that the development of zonation in the apical meristem is controlled by metabolic mechanisms and is independent of other criteria viz. apical size, shape, age or plastochron changes of morphogenesis.

The interpretation of meristem d'attente or waiting meristem suits the vegetative apex of *Paspalidium* because of striking changes in distribution of metabolites, nuclear and cellular volume changes. This zone is not generally recognizable in monocotyledons like *Lolium* (Evans, 1975) but in *Paspalidium* at the summit of apical meristem just below the tunica there is a region where the cell density is relatively poor as compared to its neighbouring cells (Fig. 27A).

This zone showed lower extinction values (Fig. 7A,B), but there is no much difference in total dye content for RNA, total proteins and SH proteins (Fig. 8A,B,C). Lyndon (1976) interprets that because of low cell density the stain intensity is low and thus cell density is correlated with stain intensity. However our results reveal that these cells show low extinction values. Therefore the central mother cell zone is quiescent in metabolic activity and awaiting for floral stimulus which transforms the apex from vegetative to reproductive state. Furthermore, central mother cell zone showed more fluctuations in the distribution
of metabolites when compared to other regions and hence it is the target tissue to perceive the floral stimulus. Activation of this zone at evocation is associated with a pronounced swelling of nuclei probably analogous to loop formation during polypeny, when genes are derepressed for RNA synthesis. Because of increase in nuclear volume, histone and feulgen extinction values are at an ebb (Fig. 9,A,B). But there is an increase of total proteins, RNA, SH protein and NHCP extinction during evocation. Such an increase is a reliable indicator of transitional stage (Healy, 1964; Bernier, 1966, 1970, 1977; Gifford, 1971). Lance (1957) stated that "meristeme d'attente" is not easily recognized in vegetative apices of Xanthium because the central zone stains more intensely than does the axial zone. She related this observation to its sensitivity to photo-induction. A gradual loss of zonal patterns and changes in cytological detail explain why some authors are unable to find the same zonation especially the lighter staining in "meristeme d'attente" and why so many conflicting reports exist in the literature. This point was stressed by Nougarede et al. (1965). Our observations with Respalidium support the concept of French school (Buvat, 1952, 1955; Nougarede et al. 1965) regarding the quiescence of central mother cell zone. Though some authors (Fosket and Mikesche, 1966; Varnell and Vasil, 1978b) disfavoured it. The lower DNA
levels in the apical zone when compared to the peripheral region is due to long duration of cell cycles. If the duration of synthesis of DNA lengthens significantly in the apical region then the duration of cell cycle also increases (Jacqmard, 1970; Lyndon, 1973). It means that the rate of DNA synthesis decreases in that region which signifies important changes in the metabolic status of cells in performance (Nougarede and Rembur, 1977). The transitional apex of *Paspalidium* has less starch than the vegetative apex. The disappearance of starch from the apex during evocation is another indicator of the transitional stage (Healy, 1964). In *Sinapis alba* flower induction is associated with increased total sugar levels (Bodson, 1977) and acid invertase activity is associated with the increased sugar levels (Pryke and Bernier, 1977). It is not known whether the primary role of the increased amount of sugars is to provide additional respiratory substrates in the buds or other morphogenetic effects.

II. ANther

The callose prevails on the walls of microocytes during microsporogenesis in *Limophyton* as in other plants. PAS test showed a strong positive reaction for callose supporting the earlier reports by Nanda and Gupta (1974) on *Allium cepa*, Panchaksharappa and Rudramuniappa (1974) on *Zea mays*, and
Albertini and Souvre (1978) on *Rhoeo discolor*. However, Beslop-Harrison (1961*) reported a negative PAS reaction for callose. According to him (1961, 1966) callose wall acts as a molecular filter permitting the passage into the spores the basal nutrients but excluding larger molecules. In this way high degree of isolation of each meiotic cell is brought about. PAS reaction during different developmental stages of anther suggests the involvement of carbohydrate metabolism during bioenergetic mechanisms such as cell wall formation. Sugars are concerned with the production of ATP. The storage of starch in the anther wall layers outside the tapetum points towards its stored energy being used during different phases of growth and differentiation of anthers as well as formation of endothelial thickenings (Bhatia and Chopra, 1978). The PAS negativity in the tapetal tissue in the anther sac of *Lipnophyton* (Fig. 29B) is a firm evidence for the secretory role of tapetum. PAS negativity can be attributed to the presence of free sugars. Thus the tapetum acts as a via media for the transference of free sugars from the cells outside the tapetum to the inner sporogenous tissue (Christensen and Horner, 1970).

In the present study wall layers are uniformly stained in the early stages of anther differentiation. But, with lapse of time tapetal layers showed PAS negativity. At all stages tapetal tissue showed no starch grains. This is corroborated
by the findings of Panehaksharappa and Rudramuniappa (1974), Bhandari et al. (1976) and Bhatia and Chopra (1978). In *Datura alba* (Bhatia and Chopra, 1978) there were correlative changes between the changes in α amylase and starch phosphorylase and the distribution of starch during anther development. Starch hydrolysed by α amylase, serves as a substrate for the cell wall biogenesis leading to the endothecial thickening of the anther (Christensen and Horner, 1970).

In *Limnocharis*, SH group containing proteins showed wide variations during cell divisions, meiotic as well as mitotic. These variations during microsporogenesis (Fig. 11, C, D) point to the functional significance of SH protein in the dividing cells. The role of SH groups in the metabolism of dividing cells has been discussed by Jocelyn (1972) and Slepchenkov (1977). Our observations agree with the reports of Stern (1958) and Linskens and Schrauwen (1963). In lily the meiotic and mitotic cycles are each preceded by a rise in soluble SH groups. In *Trillium* there was only one rise which preceded meiosis. During division, there was a marked drop in soluble SH and a rise in soluble SS. The principal conclusion from these observations is that meiosis and mitosis probably have relatively high requirements for soluble SH compounds, whether an actual rise in SH concentration
precedes active division depends on physiological circumstances. A sufficient store of thiols is laid down during one meiotic and mitotic cycle (Stern, 1958). This conclusion is consistent with the peak values for both extinction as well as content of DDD stained SH groups just before or during meiotic and mitotic divisions in Limnophyton (Fig. 11,C,D). As early as 1950, Braach also concluded that growing or proliferating tissues are rich in SH proteins.

RNA synthesis is relatively passive during microsporogenesis than gametogenesis (Fig. 11, E,F). During meiotic period, RNA content reduces to the lowest value at the tetrad stage (Fig. 11, E). Autoradiographic reports by Taylor (1959) on Lilium, Albertini (1965) on Rhosa discolor, Das (1965) on Zea mays, and Sauter on Paeonia (1968b, 1969) also record a very prominent RNA synthesis at premeiotic stage and drop during meiotic prophase. The remarkable continuous drop up to the tetrad stage (Fig. 11, E) is very consistent with the cytochemical studies of Geneves (1966), Moss and Heslop-Harrison (1967) and Sauter and Marquardt (1967, a,b).

Correlative changes of DNA and histone content during microsporogenesis (Fig. 13) suggest a simultaneous duplication of nucleohistone complex. This correlation is highly significant up to pollen mitosis. Afterwards there is a change in the nucleohistone complex between the generative and
vegetative nuclei. There are many reports on the changing patterns of DNA and histone in generative and vegetative nuclei (Bodkiewicz, 1960; Sauter, 1969, 1973; Pipkin and Larson, 1973). In Limnophyton, vegetative nucleus showed an increasing trend of DNA and decreasing trend of histone (PG pH 8.0) from binucleate to trinucleate condition (Fig. 13). But, ammoniacal silver nitrate (AS) stained histones showed an increasing content. Again NHCP (PG pH 5.0) content also follows the DNA changes. But extinction values for DNA, histone (PG and AS) and NHCP in the generative nucleus showed higher values than that of vegetative one. Thus, vegetative and generative nuclei are different from each other in their staining characteristics as reported by Sauter (1969, 1973) in Paeonia and Pipkin and Larson (1973) on Hippeastrum. However, Sauter's (1969) findings on Paeonia do not fit with the pollen of Limnophyton. In Paeonia, generative nuclei showed lysine rich fraction (fast green stainable form) while vegetative nuclei showed no lysine. Both staining reactions (FG and AS) for histone localization in binucleate pollen of Limnophyton do not support Sauter's (1969) findings on Paeonia pollen. Our cytophotometric estimations showed relatively higher histone content (Fig. 13) in vegetative nucleus than in the generative one. Extinction values of generative nucleus also stood at higher levels.
than that of generative one (Fig. 12). Furthermore, a reaction which is known to detect qualitative changes in histone composition (Black and Ansley, 1964, 1966; Nougarede, 1977; Appa Rao et al. 1978; Marcinaik and Olszewksa, 1978) also did not support Sauter's (1969) report on *Paeonia* pollen. In binucleate pollen of *Limnophyton* vegetative nuclei showed black granules (indicating arginine) with yellow background (lysine) and generative nuclei stained black with one yellow tinge (arginine rich). Thus, arginine rich histones are highly responsible for chromatin condensation and hence the chromatin is inactive in transcribing mRNA (Leschem, 1973). Thus generative cell nucleus is switched off from DNA-dependent RNA synthesis.

Vegetative nucleus showed higher NHCP content than generative one and with the period of maturation there is a corresponding increase in NHCP content. The relative changes in RNA content showed negative correlation with DNA/NHCP ratio \((r = -0.7)\) and a positive correlation with DNA/histone ratio \((r = + 0.69)\). Thus the changes in NHCP content are of importance during nuclear differentiation. Cytophotometric estimations in roots by Rueh and Fosselet (1970) and autoradiographic studies of Albertini and Souvre (1974) in the anther of *Phoeo discolor* also deduce the wide variations in nonhistone proteins during nuclear
differentiation. The findings indicate that BECP could serve as derepressors of gene activity (Johns and Hoare, 1970; Wang, 1970).

The changes in size, number and texture of nucleoli during microsporogenesis in Limnophyton command attention. A decreased number of nucleoli from sporogenous to MMC stage (from three nucleoli to one) (Fig. 30A, B) prior to meiotic division can be attributed to the phenomenon of nucleolar fusion (Busch and Smetana, 1970; Heslop-Harrison, 1973; White and Kaltsikes, 1978). A similar period of nucleolar fusion was observed upon entry to the meiotic division (Elanski and Kaltsikes, 1977a,c). The granular and fibrillar nucleoli at sporogenous stage (Fig. 30B, A) indicate active ribosome population. Fibrillar texture of nucleoli is common in animal cells. For instance, Karasaki (1965) has shown that first formed nucleoli during embryogenesis in Xenopus are exclusively fibrillar in texture. Nucleoli of oospores also first consist of fibrils, peripheral granules only appearing later on (Camefort, 1964). It is possible that these fibrils transform into particles (Yasuzumi and Sugihara, 1965). But genes transcribing RNA within these particles are activated subsequent to the elaboration of the nucleolar fibrillar material. The fibrils may be unutilized polysomes. This granular nucleoli
indicate active ribosome production. Such active nucleoli are found in the meristematic and rapidly elongating zone of root tips (Hyde, 1967; Lafontaine, 1968; Lafontaine and Lord, 1969; Chaly and Setterfield, 1975), in actively dividing cells of young coleoptiles (Rose, 1974), in germinating corn radicles (Deltour and Bronchart, 1971), in artichoke and carrot slices activated by aging (Powe and Setterfield, 1968; Jordon and Chapman, 1971, 1973; Rose et al. 1972), and in cultured tobacco callus (Johnson, 1969). It has been suggested by Chapman and Jordan (1971) and King and Chapman (1972) that nucleolar size reflect nucleolar activity. Although the size-activity correlation may hold good in many cases, it can be misleading in others (Chaly and Setterfield, 1975). Our statistical analysis between nucleolar volume changes and RNA synthesis showed no significant correlation and thus supporting the earlier reports by Lin (1955) and Das (1965). The nucleolus represents a transitory accumulation of RNA and proteins and is dependent on the relative rates of both input and output of material. The changes in cellular, nuclear and nucleolar volume changes during microsporogenesis in Limnophyton are highly heterogeneous (Fig. 15, Table, 5). However, present data showed a significant correlation between nuclear versus
cellular, nucleolar versus nuclear volume changes. These results are highly consistent with the recent report by White and Kaltsikes (1978). The sensitivity of nuclear volume to DNA content was highly significant ($r = + 0.9$) but the expression of the correlation is less convincing in uninucleate cells (Fig. 14, A, B). This is due to the changes in the nuclear constituents after pollen mitosis. Simply taking DNA content to correlate with nuclear volume is incomplete (Rees and Jones, 1972) because other ingredients like NHCP are also responsible. White and Kaltsikes (1978) also concluded that in hexaploid triticale during meiosis of anther development the increase of DNA content has no impact on nuclear volume.

There are many cytochemical evidences for the transfer of metabolites from the degenerating tapetum into the developing microspores (Linskens, 1958; Vasil, 1959; Prasad, 1977). But some authors (Takats, 1952; Kosan, 1959; Heslop-Harrison and Mackenzie, 1967) disfavour the nursing function of tapetum. In *Lycopersicon*, the nuclear DNA content in tapetal nuclei is greater than 2C DNA content. This is due to endoreduplication of nuclear DNA content. Both extinction and relative nuclear DNA content of tapetal nuclei are higher than the sporocytes (Figs. 12 and 13). With the advancement of microsporogenesis, there is a simultaneous decrease both in extinction and content of nuclear DNA.
content. Similar pattern of behaviour is exhibited by histone and NHGP content. Endoreduplication activity is highest in the tissues, like endosperm (Erbrich, 1965) and suspensor (Nagl, 1962, 1976) which are associated with secretory role. The extensive literature dealing with the tapetum also reveal the secretory role of tapetum. There is no direct evidence for the transport of tapetal tissue components into sporocytes but, through labelled experiments it is possible to understand the role of tapetum during microsporogenesis.

III OVULE

Chemical transformation to and fro and the build-up of complex molecules and differentiated structural substances are of significance at the molecular levels of specialization of cells in the embryosac (Aaghavan, 1976). The division products of functional megaspore are situated at different places possessing different chemical milieu. The first sign of chemical differentiation occurs by the shift of two nuclei to opposite poles-polarity in widely different environments. In Limnophyton, PAS reaction pointed out these obvious differences in the two poles of embryo sac by the differential distribution of starch grains. Micropylar end reserves more starch than chalazal one. A similar starch distribution was
also observed by Panchaksharappa and Rudramuniappa (1973) in *Paspalum scrobiculatum* and Rodkiewicz and Bednara (1974) in *Epilobium*. Sugar level alters the osmotic value which is an important parameter in cell differentiation as viewed by Ryczkowski (1974). In the mature embryosac PAS reaction is strongly associated with filiform apparatus (Fig. 28, D). The starch granules are distributed scanty in the cytoplasm of egg and polar cell of the embryosac. Synergid showed little or no response to PAS test. Thus, the distribution of polysaccharides reveals the components responsible in the nutrition of the embryosac. The placement of filiform apparatus in the synergid also hints of its role in nutrient absorption and translocation (Vajarat and Vajarat, 1966; Vajarat, 1969; Jensen, 1965,b; Rodkiewicz and Migulska, 1967; Schulz and Jensen, 1968b; Vijayaraghavan et al. 1972; Cass, 1972; D'Alascio-Deschamps, 1973). The major role of synergids is probably to direct pollen tube growth (Jensen, 1965b). In the present study the diffused staining for PAS test and the lack of starch in the synergids also supporting the nutritional role for the synergids in support of the egg and young embryo. Although the function of filiform apparatus has been studied in a number of plant species (vander Pluijm, 1964; Mogensen, 1972) its development has been described only in a few species. In *Torenia* (vander Pluijm, 1964) and in
Paspalum longifolium (Hu and Chao, 1979) it was found that filiform apparatus is formed by the thickening of the micropylar portion of the wall. In Limnohyton, PAS reaction showed strong kinship of the filiform apparatus with the micropylar wall of the embryosac and it subsequently radiates into the synergid. This suggests that the origin of filiform apparatus is from the embryosac wall and is not the extension of synergid wall as viewed by Maheshwari (1950). Polysaccharides are the chief components because filiform apparatus is not visible in other staining reactions.

In Limnohyton, the extinction values for RNA, total proteins and SH protein showed wide variations during megasporogenesis but they are stage specific (Fig. 17). During sporogenesis the extinction values for RNA and proteins are relatively higher than during gemetogenesis. But, SH protein extinction values showed a reverse trend. The predominance of these compounds in the elements of embryosac might have a functional role in the act of fertilization.

Antipodal nucleus showed highest extinction values for DNA, histone and NHCP (Fig. 19) among all components of the embryosac. The chromatin material is highly condensed in antipodal cell because of least nuclear volume (Fig. 14, C). It is stated by Khvedynich et al. (1978) that the
physicochemical state of the chromatin in the embryosac nuclei correlates with different functions. The highest levels of extinction values for nuclear constituents in antipodals point to the polyploidy of the nuclei as recorded in some plants (Johri, 1962b; Masand and Kapil, 1966). Thus, polyploid condition of antipodal nucleus suggests its role in the nutrition of the embryo sac (Brink and Cooper, 1944; Bennett et al., 1975).

The aberrant DNA metabolism in the egg cell is also noted in Limnophyton. This has been demonstrated in many plants viz. Pisum and Nicotiana (Vassileva-Dryanovska, 1964; Dannikova, 1971), Gossypium, Helianthus, Dolichos (Hu and Chu, 1964) and Lilium species (Georgieva, 1966). In Limnophyton egg nucleus showed a distinct staining for DNA and it is confined to the nucleus only (Fig. 35, A). During maturation of the egg the feulgen DNA showed qualitative changes. With the increase of nuclear volume there is a decrease in the feulgen extinction values (Fig. 21). The staining reaction is granular and the feulgen positive granules are dispersed towards the peripheral side of nuclear membrane. Klyuchareva (1960) also observed similar qualitative changes in the feulgen reaction in the egg nuclei of cereal grains. These changes in the feulgen stain
are a prelude to the participation of the egg nucleus in the act of fertilization. Since the egg is highly swollen at the time of fertilization, it is possible that DNA present in the cell have been diluted and is thus beyond the resolution of the feulgen reaction. The disappearance of feulgen reaction is due to chemical transformation of chromosomal DNA (Raghavan, 1976), stretching of DNA molecule (Kapil and Mathargar, 1975) or increase in nuclear volume (Bennett and Smith, 1976). Woodcock and Bell (1968a) have demonstrated by fluorescent microscopy and ultraviolet microspectrography the presence of DNA in the egg of *Myosurus minimus*, although feulgen reaction is negative. Therefore, a nucleus failing to show reaction as reported by Pritchard (1964a) does not necessarily lack the nucleotides of DNA molecule. In any case, transformation of DNA is thoroughly interlocked with overall processes which regulate enzyme synthesis, precursor levels and physiological state of its primers. The resolution of these aspects of DNA metabolism of the egg based on analytical evidence, is a step necessary in the elucidation of the changes described above.

IV EMBRYO

The first division of the zygote in *Lepophyton* is unequal with profound changes in the staining characters. Of
the two daughter cells formed, one gives a big unicellular suspensor which plays a nutritive role during embryogeny. The other cell actively engages in divisions to form embryo proper. There existed differences in biochemical characteristics too. The bigger suspensor cell showed more synthetic activity than the embryonal cells as visualized through staining reactions (Figs. 32, A and 33, C). Similar staining was observed in cotton (Jensen, 1964), *Stellaris media* (Pritchard, 1964b), *Vanda* (Alvarez and Sagava, 1965b) and *Coix* (Shah and Bhatt, 1974). The asymmetric cell division is similar to other instances like the first mitosis of the microspore, guard cell and subsidiary cell formation in the stomata. In such cases the sharing of the cytoplasm strongly influences the nucleus to embark on separate pathways of development (D'Amato, 1964a; Holliday and Pugh, 1975). The functional differentiation of the embryo occurs at two celled stage only. Further stages of development are followed by an increase in protein and DNA contents up to globular stage. Embryo elongation is associated with a decline in synthetic activity of the cells. Our study revealed no changes in RNA content per cell throughout all stages of development (Fig. 22,F). The capacity of nucleus to synthesize new RNA is not able to keep pace with the rapid cell multiplication that occurs during embryogenesis (Raghavan, 1976). This is further
supported by the observations of Chang (1963a) on barley embryos. He observed the incorporation of $^{32}$P into RNA during embryogeny and found an increase with the increase of physiological differentiation, but the relative amounts of incorporation of the isotope into RNA per cell, per unit time decreased during progressive embryonic differentiation. Similar reports appear in the literature by Yoo and Jensen (1966) and Fisher and Jensen (1972) in cotton embryogeny. In Limno phyton the big suspensor cell showed massive accumulation of RNA and protein content. During 32 celled stage suspensor cell showed 60 times higher RNA content than embryonal cells (Fig. 22, F). These findings are corroborated with the earlier reports by Walbot et al. (1972) and Sussex et al. (1973). The suspensor cell has an advantage over the dividing cells of the embryo in being able to divert energy resources to the processes connected with large scale transcription rather than those connected with cytokinesis. Some form of differential template activity has been suggested to account for the results (Clutter et al. 1974) but direct evidence is lacking. During organ differentiation, in the mature embryo differential growth regions are formed as evidenced by cytophotometric study. But nuclear constituents did not display much disparities in their staining
characteristics. Different regions of the mature embryo did not differ in the Feulgen extinction values. All regions record an extinction value of 0.0836 uniformly (Fig. 25). This is quite contradictory to the report of Stein and Questler (1963) who reported different C values of DNA in different regions of the mature embryo of maize. In Limophyton the DNA synthesis in mature (horse shoe shaped embryo) is arrested at G₁ stage of the cell cycle. The estimated nuclear DNA content at this stage (6h) is nearly half of the G₂ DNA value (120) estimated in premeiotic mother cell.

Feulgen cytophotometry during proembryo stages in Limophyton showed highest values both for extinction and for the calculated nuclear content. But these values are not far from the expected 2C-4C DNA values. The present data (Fig. 24) did not indicate high ploidy levels as shown by Mericle and Mericle (1970, 1973) in barley proembryos. But strongly support the DNA estimates in proembryos of Hordeum (Bennett and Smith, 1976) and Tradescantia (Woodard, 1958). The decrease in DNA content with the embryo development has a decrease in nuclear volume as reported by Shimazawa (1956) in case of Ginkgo and Pinus. Dehydration during embryo maturation is also a responsible factor to arrest DNA metabolism, Brunori (1967).
The cytophotometric estimates of the relative changes in DNA, histone and NHCP showed no correlative changes among themselves during embryogeny, but suspensor cell throughout all stages maintained manifold higher values for these metabolites than embryonal cells. DNA content increases progressively by repeated cycles of endoreduplication similar to the giant suspensor cells of Phaseolus (Nagl, 1969b, 1976, 1977). The process of endopolyploidization is a reflection secretory function of the cells to actively growing tissue like dividing embryonal cells. Idiophyton suspensor nucleus showed highest DNA content (2853 au.) at globular stage. This value is 12 times higher than the DNA content in the embryonal nuclei. At globular stage the degenerating suspensor cell is accompanied by rapid decline in protein and nucleic acids. In Tropaeolum majus the progressive autolysis of suspensor cells occurred by the release of hydrolytic enzymes from tonoplast (Nalik et al. 1977; Singh et al. 1980). Nagl (1976) also reported that the activity of hydrolysing enzymes is correlated with the autolysis of the suspensor cells of Phaseolus embryo. These findings suggest that the death of suspensor cell is due to hydrolysing enzymes but not due to mechanical pressure imposed by the developing embryo (Maheshwari, 1950).
Endosperm in *Limnophyton* is underdeveloped and this tissue did not exhibit polyploidy. The DNA values are not far from 3C karyotype. After globular stage of embryo there is a uniform reduction in all the metabolites in endosperm cells coinciding with the lysis of the suspensor cell. The degradation of macromolecules in the endosperm occurs when the embryo is ready to embark upon its most rapid growth (Figs. 22, 23 and 24). How the embryo begins to draw upon the food material of the endosperm is not evident. Further it was hinted by Raghavan (1976) that whether there is any significant interaction between endosperm and early division phase of embryo. In the present study, there is no indication of the correlative metabolic changes between the embryo and endosperm for a particular metabolite. The endosperm built-up which itself requires substantial quantities of cellular constituents and precursors to synthesize macromolecules takes place coincident with the divisions of the zygote (Schulz and Jensen, 1969, 1974; Newcomb, 1973b). In the suspensor cell there is no need of utilizing the synthesized proteins and other compounds in the build-up of cell walls since there is no cytokinesis. The storage of starch in the endosperm and its depletion during embryo elongation elucidates the utilization of the stored carbohydrates by the developing
embryo. But the main nutrition of the embryo in *Limnothyton*
comes from suspensor cell only because of its high
metabolic activity, high degree of polyploidy and the
characteristic PAS positive net work possibly mucopolysa-
ccharides engaged in transferring food materials from the
walls of the embryosac.