SUMMARY
1. The effects of two known DNA acting agents, arecoline and 5-azacytidine, on growth and development of cellular slime mould *Dictyostelium discoideum* has been investigated.

2. *Dictyostelium* treated with both arc and azaC showed distorted cell morphology, such as retraction of pseudopodia and rounding up of cells and smaller size.

3. The lag, log and stationary phase cells of *Dictyostelium* cells were found equally sensitive to arc. AzaC showed similar effects.

4. Both arc and azaC caused dose dependent cytotoxicity when given continuously. 4 mM arc and 1 mM azaC stopped the cell division completely. Cells became cytotatic which is reversible.

5. 4 mM arc inhibited 70% spore germination while azaC did not affect spore germination. Though cells in both the cases failed to grow further.

6. Colony forming ability of *Dictyostelium* cells by both azaC and arc were inhibited.

7. Arc reduced the overall macromolecular synthesis (both DNA and protein synthesis). The higher dose of azaC (1 mM) inhibited the macromolecular synthesis but the lower dose 0.1 mM stimulated both DNA and protein synthesis.

8. Both phagocytosis and pinocytosis were inhibited by arc and azaC.

9. Arc and azaC both inhibited the cytoskelatal protein (actin) content of growing *Dictyostelium* cells.
10. Arc delayed the differentiation but azaC induced precocious development and "giant" slug formation which are 2-3 times larger than the control ones.

11. 4 mM arc inhibited the morphogenesis completely whereas azaC triggered the differentiation upto slug stage after that it stopped.

12. Cell motility and cAMP chaemotaxis was reduced in arc treated cells. Though in case of azaC treatment chaemotaxis was induced but cells moved inside the droplets to form aggregates rather than moving out of the droplets like control cells.

13. ePDE level was initially higher in arc treated cells but was inhibited later. AzaC stimulated ePDE level to a great extent. The ePDE peak was 2 hrs earlier than control cells which can be correlated with the observed early chaemotaxis and aggregate formation in azaC treated cells.

14. The neutral red staining revealed a random pattern of staining in azaC treated cells suggesting altered prestalk / prespore cell type arrangement in the "giant" slugs.

15. Dilution in cell numbers did not affect the size of the "giant" slug in azaC treated cells.

16. Mixing of control and treated cells gave rise to more normal slugs and more number of normal fruiting bodies.

17. Addition of cytidine together with azaC did not reverse the effects caused by azaC, though cytidine alone did not bring out any noticeable changes in growth and development.
18. Histological sections of "giant" slugs showed a lot of intercellular gaps among cells with thick surrounding coat.

19. Our studies show that the cellular slime mould, *Dictyostelium discoideum* can be used as a model system to test growth and embryotoxicity of various chemicals.