Application of nanomolar doses of triacontanol (TRIA) to cotton (Gossypium hirsutum L.) leaves resulted in an increase in dry weight and alteration in lipid composition. A significant increase in monogalactosyldiacylglycerol (MGDG) and digalactosyldiacylglycerol (DGDG) was attained 24h after TRIA treatment. Similar observations were also made when the plants were treated with nanomolar doses of 9-β-L(+)-adenosine (Ado), the proposed second messenger of TRIA. However, TRIA did not bring about any change in the levels of phospholipids. Benzyladenine (BA) treatment increased only phosphatidylcholine (PC) levels without having any effect on either glycolipids or other phospholipids. Indole-3-acetic acid (IAA) was not effective in changing the lipid composition in cotton. Combined treatment with TRIA and BA resulted in an increase of MGDG, DGDG and PC indicating that the individual effects of these two growth regulators were not altered. However, the combined treatment of TRIA and IAA did not bring about any change in the levels of any of the glycolipids indicating that the effect of TRIA was nullified by IAA. MGDG is known to be involved in the packaging of photosystem I proteins and TRIA - induced increase in dry weight which is due to the enhanced photosynthetic rate, is related to increased MGDG level is not yet conclusive.

The effect of TRIA and ABA on the physical properties of membranes was studied using cucumber (Cucumis sativus L.) fruit protoplasts and egg lecithin liposomes. These two membrane systems were probed with two structurally different fluorophores, diphenylhexatriene (DPH) and pyrene. Fluorescence properties (anisotropy and lifetime) of membrane bound fluorophores were studied after incorporating the growth regulators, TRIA and ABA into the membranes. The fluorescence lifetime of pyrene incorporated into the protoplast membranes was measured using neodymium-doped yttrium aluminium garnet (Nd:YAG) laser of 35 pico second pulses. With the values of fluorescence anisotropy and lifetime at various
temperatures (10-40°C) the microviscosities of the protoplast membranes were determined.

When the protoplast membranes were exposed to the plant growth regulators, TRIA and ABA, there was sharp decrease in the fluorescence lifetime of pyrene at all the temperatures tested. Similarly, there was also a decrease in the microviscosity of the membranes and decrease in the rotational correlation time (RCT) of membrane bound fluorophore induced by these growth regulators. On the contrary, ABA was able to significantly decrease the fluorescence anisotropy of pyrene but not that of DPH, whereas TRIA + ABA were able to bring about a significant reduction in fluorescence anisotropy of both the fluorophores. This property of ABA may be due to the confinement of this molecule to a specific spatial facet in the membranes and also, intercalation of the two probe molecules at different depths and domains of the membranes. Similar effect of ABA was also observed in egg lecithin liposomes. Fatty acid analysis of the protoplasts after growth regulator treatment revealed that the change in membrane viscosity induced by these growth regulators was not due to change in fatty acid composition alone as it is now known that lipid-protein interaction would also contribute to the physical status of the membrane. Studies on the fluorescence anisotropy of pyrene and DPH incorporated into egg lecithin liposomes revealed that TRIA and ABA could decrease the fluidity of the egg lecithin liposomes.

Cucumber fruit protoplasts have been proven to be very ideal for studies on membrane dynamics with membrane associated with cytoplasm. Thus the current results may pave the way for a new line of research i.e. consideration of both biochemical and biophysical properties of membrane components in understanding the molecular mechanism of hormone action in plants.

**Key words:**

Abscisic acid, benzyladenine, Cucumis sativus, Gossypium hirsutum, indole-3-acetic acid, liposomes, membrane lipids, membrane phase transition, protoplast, triacontanol.