The cumulus processes play an important role in predicting the track, intensity and inner core structure of the tropical cyclones. Its adequate representation becomes one of the most challenging tasks in mesoscale numerical simulation and prediction. The present study explores the sensitivity of initial condition and cumulus processes on the numerical simulation of severe cyclone LAILA (maximum surface wind of 55kt and lowest central pressure of 986 hPa as per IMD observation) during pre-monsoon season (May 2010) over Bay of Bengal. Weather Research & Forecasting (WRF) model developed by NCAR with two ‘two-way’ interactive nested domains at resolutions of 60km, 20 km is used. Total 9 experiments are conducted using KF (Kain Fritsch), BMJ(Betts-Miller-Janjic) and GD(Grell-Devenyi) as cumulus schemes and 00UTC of 15th May (approximately 36hrs. before Low Pressure Area (LoPar)), 00UTC of 16th May (approximately 12hrs. before Lopar) & 00UTC of 17th May (low pressure area) as three different initial conditions provided by GFS data of 1° X 1° degree resolution. The model is integrated for 5 days and the model predicted intensity and track positions are compared with the observations. Results indicate that BMJ scheme produces relatively better track than other schemes though the intensity is overestimated by all schemes. Simulated results are found to be improved when the initial conditions are supplied 12hrs prior to the formation of low i.e. on 16th May. The vertical structure of simulated cyclone is not altered significantly by varying initial conditions.