Organic scintillators play a significant role in detecting ionizing radiation and have been widely utilized in Particle and Nuclear Physics research, as well as in their related applications, due to their cost-effectiveness. This study addresses the fundamental research and development aimed at meeting the demands of next-generation experiments in High Energy Physics, which necessitate enhancements in light yield, radiation hardness, and response speed. Traditionally, plastic scintillators incorporate organic polymeric base solvents doped with wavelength shifters (WLS) to optimize light yield. Recent investigations, however, have highlighted Polyethylene Terephthalate (PET) and Polyethylene Naphthalate (PEN) as promising alternatives, emitting blueish light when exposed to ionizing radiation. Our research focuses on the manufacturing and characterization of PET, PEN, and PET:PEN blend scintillator samples through injection molding of granular raw materials. Additionally, we explore the impact of dopants on these substrates. Comparative analysis reveals that PEN samples exhibit significantly higher light responses compared to PET samples, with specific dopants doubling PET's light yield. Furthermore, a positive correlation exists between the light response and PEN proportion in PET:PEN blended samples. This study presents preliminary evidence suggesting that suitable dopants enhance the scintillation effect of PET:PEN base mixtures, thus contributing to the advancement of organic scintillator technology in radiation detection applications.