The main purpose of the present work was to evaluate if low laser level therapy (LLLT) can improve the effects of Biosilicate ®/PLGA (BS/PLGA) composites on cell viability and bone consolidation using a tibial defects of rats. The composites were characterized by scanning electron microscope (SEM) and reflection fourier transform infrared spectrometer (FTIR). For the in vitro study, fibroblast and osteoblast cells were seeded in the extract of the composites irradiated or not with LLLT (Ga-Al-As, 808 nm, 10 J.cm²) to assess cell viability after 24, 48 and 72 hours. For the in vivo study, 80 Wistar rats with tibial bone defects were distributed into 4 groups (BS; BS + LLLT; BS/PLGA and BS/PLGA + LLLT) and euthanized after 2 and 6 weeks. Laser irradiation Ga-Al-As (808 nm, 30 J.cm²) in the rats was performed 3 times a week. The SEM and FTIR results revealed that PLGA were successfully inserted into BS and the microparticles degraded over time. The in vitro findings demonstrated higher fibroblast viability in both BS/PLGA groups after 24 hours and higher osteoblast viability in BS/PLGA + LLLT in all periods. As a conclusion, animals treated with BS/PLGA + LLLT demonstrated an improved material degradation and an increased amount of granulation tissue and newly formed bone.