The present study focussed on the green synthesis of silver and gold nanobioconjugates from the leaf extracts of *Clitoria ternatea* bearing blue and white flowers and their bioactivities. In the first phase, the leaves, seeds and roots of the two varieties of *Clitoria ternatea* were examined for their antioxidant and antibacterial activities after extraction with solvents of varying polarity. The methanolic leaf extracts of both the varieties tested were selected for further analysis, as they rendered better radical scavenging and antibacterial activities. As nanoparticles are known to show better bioactivity, an attempt was made to increase the efficacy of the extracts by preparing nanobioconjugates using silver and gold by green synthesis approaches, using sunlight, water bath heating and microwave heating. As exposure to bright sunlight for 20 minutes gave the maximum yield, only this method was used further. The synthesized nanobioconjugates were characterized using TEM, SEM, EDX, XRD, FTIR and Zeta potential. The TEM and SEM images revealed that the size of the synthesized nanobioconjugates were well within the range of nanoparticles (<100nm) and having a spherical shape. EDX, XRD, FTIR, zeta potential and PDI showed the successful and stable conjugation of silver and gold with the extract components, which were well dispersed and stable in nature. The antibacterial activity was assessed for the four nanobioconjugates synthesized (AgB, AgW, AuB and AuW) and their unconjugated leaf extracts (BL, WL) against clinical isolates namely *E. coli* and *S. aureus*. *In vitro* anti-inflammatory activity was also evaluated using HRBC membrane stabilization, protein denaturation, heat induced hemolysis and proteinase inhibition activities. The results showed that the gold nanobioconjugates exhibited better bioactivity than their silver counterpart and the unconjugated leaf extracts. Biocompatibility of the nanobioconjugates was determined in human blood cells using hemolysis, blood clotting time and morphological changes of RBC and blood lymphocytes. Drug release kinetics revealed that, all the four nanobioconjugates synthesized released their drug cargo steadily. All the experimental results proved that the synthesized nanobioconjugates were safe. The *in vivo* anti-inflammatory activity was tested using Swiss albino mice against both acute and chronic inflammations. The administration of the synthesized silver and gold

nanobioconjugates protected the mice against the inflammation induced by both carrageenan and adjuvant than their unconjugated leaf extracts as seen in the *in vitro* studies. This clearly proved that the leaves of *Clitoria ternatea* bearing blue and white flowers are potential source of anti-inflammatory components, which rendered better bioactivity when administered as silver and gold nanobioconjugates. The study, thus, proved that the synthesis of nanobioconjugates improved the bioactivity of the plant extracts. Gold nanobioconjugates were found to be more effective than silver nanobioconjugates and the white variety was better than the blue variety.