A simple one-pot synthesis of new ferrocene-containing 1,3-thiazinan-2-imines from 3-arylamino-1-ferrocenylpropan-1-ols and phenyl isothiocyanate has been developed. The key intermediate β-hydroxy thioureas were generated *in situ* using ultrasound irradiation and subsequent cyclization was achieved by the addition of acetic acid. The scope of the reaction towards various 3-arylamino-1-ferrocenylpropan-1-ols has been explored and the corresponding 3-aryl-6-ferrocenyl-*N*-phenyl-1,3-thiazinan-2-imines were obtained in moderate to high yields (52–90%).