Ab Initio study of Quantitiative Structure-Activity Relationship (QSAR) of Methotrexate Drug

hamid rahmani*,

In the present study, QSAR studies were carried out on 31 Methotrexate derivatives. Geometry of the compounds optimized by using Gaussian 09W at B3LYP/6-31g methods. Polarized continuum model (SCRF) was applied and all molecules were optimized in H2o solvent. Multiple linear regression (MLR) and artificial neural networks (ANN) were used as modelling tools and simulated annealing algorithm (SA) and genetic algorithm (GA) as optimization methods were employed to choose the best set of descriptors. The obtained results combinations of modelling-optimization methods were compared and GA-ANN combination showed the best performance based on its correlation coefficient and root mean square errors (RMSE). In the MLR-MLR, MLR-ANN, SA-ANN, MLR-GA and GA-ANN models the root mean sum square errors (RMSE) were calculated as 0.643, 0.262, 0.182, 0.223, 0.127 in gas phase and 0.643, 0.305, 0.183, 0.276, 0.139 in solvent phase and correlation coefficient (R2) were observed 0.888, 0.917, 0.934, 0.920, 0.957 in gas phase and 0.888, 0.82, 0.938, 0.9, 0.949 in solvent phase, respectively. The results obtained by using the GA-ANN method indicate that the activity of derivatives of depend on different parameters including DP02, RDF140u, ESpm10x, BEHv1, RDF085e, H1m , R5v in gas phase and EEig05r, VED2, Mor23e, Mor05u, BEHm4, Mor20m, Mor08u in solvent phase.

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