The adjusted literature review:

Many articles have studied the coagulation process, especially the coagulant doses. A study that took place in Colombia , the coagulant dose was predicted ,by modeling a jar test data, the created network was able to calculate the dosage based on the value of initial turbidity of the to be treated with a MSE 0 mg/L, achieving 93% removal percentages for most cases**.** **(**León et al , 2016)

In the same field, a comparative study between two promising algorithms namely, the generalized regression neural network (GRNN) and the radial-basis function neural network (RBFNN), was carried out by (Heddam et al., 2011). The GRNN was found to be more accurate showing R and RMSE values of 0.938 and 2.52, compared to the value of 0.907 and 3.04 obtained using the RBFNN model. Neurofuzzy models have been applied for modelling coagulant dosage in drinking water treatment plant based on raw water quality variables. For instance, Heddam et al. (2012) proposed the application of two adaptive neuro-fuzzy inference systems (ANFIS) namely, ANFIS with gird partition called ANFIS_GP, and ANFIS with subtractive clustering named ANFIS_SC. From the obtained results, ANFIS_SC has demonstrated very satisfactory estimation performances with R, RMSE and MAE of 0.92, 2.74 and 1.95, compared to the values of 0.53, 15.40, and 7.73 obtained using the ANFIS_GP. In a recent study, Heddam AND Dechemi (2015) applied a Neuro-Fuzzy model based on an evolving clustering approach called DENFIS for predicting coagulant dosage at Boudouaou, Algeria. Two DENFIS models were applied and compared namely, DENFIS_OF and DENFIS_On, *i.e.*, Offline-based and Online-based systems. The results indicate that the use of the online-based systems enhanced the DENFIS model capability in predicting coagulant dosage, showing and R, RMSE and MAE values of 0.804, 7.858, and 5.531, respectively, more accurate than the values obtained using the DENFIS_OF model. As demonstrated in recent study (Heddam 2021), the overall coagulant dosage estimation in water treatment plant is remarkably improved by an extremely randomized tree model (ERT), exhibiting higher R and **Nash**-**Sutcliffe** efficiency (NSE) values of 0.899 and 0.790 compared to the values obtained using the random forest model (R=0.851, NSE=0.708), and significantly more accurate than the multiple linear regression model (R=0.066, NSE=0.120). Modeling has been performed for Bansong drinking treatment plant, hybrid of k-means clustering and adaptive neuro-fuzzy inference system. Raw water quality data were classified into four clusters according to its properties by a k-means clustering technique. Then the ANFIS model was built. The research indicated that k-means-ANFIS models can be used as a robust tool during rainy seasons which is the most challenging period of operation. RMSE value: 0.0572 , R= 0.9. (Kim, C, & Parnichkun, M. 2017)

In another study, (J. Tomperi et al) Residual aluminum in drinking water was predicted using Multiple Linear Regression (MLR) and Artificial Neural Network (ANN) models.

Variables that affected the amount of residual aluminum according to the study were: raw water temperature, raw water KMnO4 and PAC/KMnO4 (Poly-Aluminum Chloride/Potassium permanganate)-ratio. According to the study that raw water temperature, KMnO4 and PAC/KMnO4-ratio had the highest correlation with residual aluminium. The study gave a good result for the two methods, the MLR model outperformed the MLP . but the Alum was not used in the plant that the study passed its data on. So it cannot be considered in such cases.

Another study done by (Daghbandan, A et al, 2019) Polyelectrolyte, pH, turbidity, polyaluminium chloride, temperature, and electrical conductivity were used as input parameters in a study used GMDH to predict Aluminum and turbidity in drinking water plant, the study gave great results, we added the turbidity of raw water into the inputs.

(Tsai and yen, 2017) employed GMDH for prediction turbidity using daily data. The results from cross-validation showed that GMDH is appropriate to predicting turbidity. The study indicated that even with complex environmental factors, the GMDH remains applicable.

Haghiri et al. (2018) used ANN for determining the optimum coagulant dosage for water purification process by developing two models, i.e., the first one to predict the water quality parameter, and the second to predict the optimal coagulant dosage. The results for predicting alum dose were R= 0.95 and MSE = 0.12, and for turbidity predicting R = 0.9, MSE= 0.024 .