



## Structural Analyses on aromatic-aromatic Interactions in Proteins

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**Abstract:** Proteins are the most abundance and functional macromolecules of living organism cells. These versatile macromolecules carry out many key roles in the cells such as structuring, signaling, catalyzing, transporting etc. Proteins thermo-stability is one of the most interesting subjects of protein engineering[1]. Increasing proteins stability against high temperatures can be achieved by introducing hydrogen bonds[2], salt bridges[3], aromatic-aromatic interactions[4], [5] and also improvement in hydrophobic interactions[6]. Several studies have been performed on proteins in order to clarify the role of aromatic-aromatic interactions on stabilization of proteins[4], [5]. In those studies, analyses which have been performed on proteins such as orientation of aromatic amino acids rings, aromatic amino acids frequency in secondary structure of proteins, conservation of aromatic amino acids and the energy of aromatic-aromatic interactions, have determined the fact that aromatic-aromatic interactions have undeniable roles on stability of proteins. In some studies, Trp, Phe, Tyr have been considered as aromatic amino acids and in some other studies in addition to mentioned amino acids, His has also been involved in analysis too. In our study four aromatic amino acids -Y, W, P, H- have been involved in structural analysis. In contrast to previous studies we have considered two pairs as interactor pairs by distance distribution of each pair in whole dataset. By considering four amino acids as aromatic amino acid we will have 10 pairs. The frequency of the pairs from the least to the most frequent was as follows: Phe-Tyr, Phe-Phe, Phe-Trp, Tyr-Trp, Tyr-Tyr, Phe-His, His-His, Tyr-His, Trp-His, Trp-Trp. Also further structural analyses were performed on a dataset which contains 30289 proteins. It has been revealed that aromatic interactions can be discriminated into several clusters.

**Keywords:** protein engineering; aromatic-aromatic interaction; stability

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