**In-silico studies of Kalanchoe pinnata leaf phytochemicals for breast cancer inhibition based on PASS, ADMET, DFT, Molecular Docking and Molecular Dynamic simulation**

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**Supplementary Table 1 (ST1): Amino acid Residues, Bond Distances, and Bond categories**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Protein** | **Ligand** | **Residues, Distance, Bond types and Bond categories** | | | |
| 4QMX | Hit1 | Interaction  Residue | Distance | Bond Category | Bond type |
| ASP162 | 2.29 | Hydrogen Bond | Conventional Hydrogen Bond |
| MET99 | 2.59 | Hydrogen Bond | Conventional Hydrogen Bond |
| LYS53 | 3.55 | Hydrogen Bond | Carbon Hydrogen Bond |
| ILE30 | 4.70 | Hydrophobic Bond | Alkyl |
| LEU151 | 4.04 | Hydrophobic Bond | Alkyl |
| LEU151 | 5.03 | Hydrophobic Bond | Alkyl |
| VAL38 | 4.32 | Hydrophobic Bond | Alkyl |
| VAL38 | 4.81 | Hydrophobic Bond | Alkyl |
| VAL38 | 4.54 | Hydrophobic Bond | Alkyl |
| VAL38 | 4.30 | Hydrophobic Bond | Alkyl |
| ALA51 | 4.83 | Hydrophobic Bond | Alkyl |
| ALA51 | 4.59 | Hydrophobic Bond | Alkyl |
| MET99 | 5.01 | Hydrophobic Bond | Alkyl |
| LYS53 | 4.29 | Hydrophobic Bond | Alkyl |
| ILE30 | 4.72 | Hydrophobic Bond | Pi-Alkyl |
| 4QMX | Hit2 | ASP162 | 2.30 | Hydrogen Bond | Conventional Hydrogen Bond |
| MET99 | 2.34 | Hydrogen Bond | Conventional Hydrogen Bond |
| ILE30 | 4.70 | Hydrophobic Bond | Alkyl |
| LEU151 | 4.04 | Hydrophobic Bond | Alkyl |
| LEU151 | 5.03 | Hydrophobic Bond | Alkyl |
| VAL38 | 4.32 | Hydrophobic Bond | Alkyl |
| VAL38 | 4.81 | Hydrophobic Bond | Alkyl |
| VAL38 | 4.55 | Hydrophobic Bond | Alkyl |
| VAL38 | 4.29 | Hydrophobic Bond | Alkyl |
| ALA51 | 4.83 | Hydrophobic Bond | Alkyl |
| ALA51 | 4.59 | Hydrophobic Bond | Alkyl |
| MET99 | 5.01 | Hydrophobic Bond | Alkyl |
| LYS53 | 4.30 | Hydrophobic Bond | Alkyl |
| ILE30 | 4.72 | Hydrophobic Bond | Pi-Alkyl |
| 4QMX | Hit3 | ASP162 | 2.68 | Hydrogen Bond | Conventional Hydrogen Bond |
| LEU151 | 5.06 | Hydrophobic Bond | Alkyl |
| LEU151 | 4.80 | Hydrophobic Bond | Alkyl |
| VAL38 | 4.80 | Hydrophobic Bond | Alkyl |
| ALA51 | 4.82 | Hydrophobic Bond | Alkyl |
| ILE30 | 4.96 | Hydrophobic Bond | Alkyl |
| ILE30 | 3.55 | Hydrophobic Bond | Alkyl |
| TYR101 | 5.35 | Hydrophobic Bond | Pi-Alkyl |
| TYR291 | 4.68 | Hydrophobic Bond | Pi-Alkyl |
| 4QMX | Hit4 | LYS53 | 2.40 | Hydrogen Bond | Conventional Hydrogen Bond |
| LYS53 | 2.69 | Hydrogen Bond | Conventional Hydrogen Bond |
| ALA148 | 2.48 | Hydrogen Bond | Conventional Hydrogen Bond |
| ASP162 | 3.67 | Hydrogen Bond | Carbon Hydrogen Bond |
| LYS53 | 4.22 | Hydrophobic Bond | Pi-Alkyl |
| MET99 | 4.84 | Hydrophobic Bond | Pi-Alkyl |
| VAL99 | 4.67 | Hydrophobic Bond | Pi-Alkyl |
| VAL99 | 4.37 | Hydrophobic Bond | Pi-Alkyl |
| VAL99 | 5.19 | Hydrophobic Bond | Pi-Alkyl |
| LEU151 | 5.48 | Hydrophobic Bond | Pi-Alkyl |
| ALA51 | 5.02 | Hydrophobic Bond | Pi-Alkyl |
| 4QMX | Hit5 | LEU102 | 2.13 | Hydrogen Bond | Conventional Hydrogen Bond |
| ASP162 | 2.87 | Hydrophobic Bond | Pi-Donor Hydrogen Bond |
| ALA161 | 4.40 | Hydrophobic Bond | Pi-Alkyl |
| MET99 | 4.57 | Hydrophobic Bond | Pi-Alkyl |
| LEU151 | 4.88 | Hydrophobic Bond | Pi-Alkyl |
| ILE30 | 5.28 | Hydrophobic Bond | Pi-Alkyl |
| VAL38 | 4.91 | Hydrophobic Bond | Pi-Alkyl |
| ALA51 | 4.08 | Hydrophobic Bond | Pi-Alkyl |
| ALA51 | 4.60 | Hydrophobic Bond | Pi-Alkyl |
| 4QMX | Hit6 | MET99 | 2.95 | Hydrogen Bond | Conventional Hydrogen Bond |
| ASP162 | 2.68 | Hydrogen Bond | Conventional Hydrogen Bond |
| LYS53 | 2.18 | Hydrogen Bond | Conventional Hydrogen Bond |
| GLY33 | 3.34 | Hydrogen Bond | Carbon Hydrogen Bond |
| GLY105 | 3.37 | Hydrogen Bond | Carbon Hydrogen Bond |
| VAL38 | 4.03 | Hydrophobic Bond | Alkyl |
| LYS53 | 4.12 | Hydrophobic Bond | Alkyl |
| ILE30 | 4.61 | Hydrophobic Bond | Pi-Alkyl |
| ILE30 | 5.27 | Hydrophobic Bond | Pi-Alkyl |
| ALA51 | 3.95 | Hydrophobic Bond | Pi-Alkyl |
| LEU151 | 4.94 | Hydrophobic Bond | Pi-Alkyl |
| 4QMX | Hit7 | LEU102 | 1.78 | Hydrogen Bond | Conventional Hydrogen Bond |
| LEU102 | 2.38 | Hydrogen Bond | Conventional Hydrogen Bond |
| LYS53 | 1.86 | Hydrogen Bond | Conventional Hydrogen Bond |
| GLU70 | 2.46 | Hydrogen Bond | Conventional Hydrogen Bond |
| ILE30 | 3.76 | Hydrophobic Bond | Pi-Sigma |
| LEU151 | 5.10 | Hydrophobic Bond | Pi-Alkyl |
| ALA51 | 5.10 | Hydrophobic Bond | Pi-Alkyl |
| ALA51 | 4.19 | Hydrophobic Bond | Pi-Alkyl |
| VAL38 | 5.32 | Hydrophobic Bond | Pi-Alkyl |
| VAL38 | 4.99 | Hydrophobic Bond | Pi-Alkyl |
| LYS53 | 5.29 | Hydrophobic Bond | Pi-Alkyl |
| 4QMX | Hit8 | LEU102 | 1.93 | Hydrogen Bond | Conventional Hydrogen Bond |
| GLU100 | 2.35 | Hydrogen Bond | Conventional Hydrogen Bond |
| ASP162 | 2.05 | Hydrogen Bond | Conventional Hydrogen Bond |
| GLU70 | 2.30 | Hydrogen Bond | Conventional Hydrogen Bond |
| ILE30 | 3.99 | Hydrophobic Bond | Pi-Sigma |
| VAL38 | 5.05 | Hydrophobic Bond | Pi-Alkyl |
| VAL38 | 5.10 | Hydrophobic Bond | Pi-Alkyl |
| ALA51 | 5.44 | Hydrophobic Bond | Pi-Alkyl |
| ALA51 | 4.15 | Hydrophobic Bond | Pi-Alkyl |
| LEU151 | 5.05 | Hydrophobic Bond | Pi-Alkyl |
| MET99 | 4.73 | Hydrophobic Bond | Pi-Alkyl |
| ALA161 | 4.87 | Hydrophobic Bond | Pi-Alkyl |
| 4QMX | Hit9 | ALA51 | 2.33 | Hydrogen Bond | Conventional Hydrogen Bond |
| LYS53 | 2.75 | Hydrogen Bond | Conventional Hydrogen Bond |
| ASP162 | 2.03 | Hydrogen Bond | Conventional Hydrogen Bond |
| GLU100 | 3.57 | Hydrogen Bond | Carbon Hydrogen Bond |
| LEU151 | 4.99 | Hydrophobic Bond | Alkyl |
| LYS53 | 4.94 | Hydrophobic Bond | Alkyl |
| VAL38 | 5.46 | Hydrophobic Bond | Pi-Alkyl |
| ALA51 | 5.35 | Hydrophobic Bond | Pi-Alkyl |
| LYS53 | 5.18 | Hydrophobic Bond | Pi-Alkyl |
| MET99 | 4.12 | Hydrophobic Bond | Pi-Sulfur |
| 4QMX | Hit10 | THR83 | 1.87 | Hydrogen Bond | Conventional Hydrogen Bond |
| LEU102 | 2.33 | Hydrogen Bond | Conventional Hydrogen Bond |
| ILE30 | 5.00 | Hydrophobic Bond | Alkyl |
| VAL38 | 4.29 | Hydrophobic Bond | Alkyl |
| ALA51 | 3.70 | Hydrophobic Bond | Pi-Alkyl |
| LEU151 | 4.94 | Hydrophobic Bond | Pi-Alkyl |
| 4QMX | Hit11 | ILE30 | 2.52 | Hydrogen Bond | Conventional Hydrogen Bond |
| LEU102 | 2.25 | Hydrogen Bond | Conventional Hydrogen Bond |
| LEU102 | 2.16 | Hydrogen Bond | Conventional Hydrogen Bond |
| LEU102 | 2.13 | Hydrogen Bond | Conventional Hydrogen Bond |
| GLU70 | 2.11 | Hydrogen Bond | Conventional Hydrogen Bond |
| ASP162 | 2.87 | Hydrophobic Bond | Pi-Donor Hydrogen Bond |
| ILE30 | 5.28 | Hydrophobic Bond | Pi-Alkyl |
| VAL38 | 4.91 | Hydrophobic Bond | Pi-Alkyl |
| ALA51 | 4.60 | Hydrophobic Bond | Pi-Alkyl |
| ALA51 | 4.08 | Hydrophobic Bond | Pi-Alkyl |
| LEU151 | 4.88 | Hydrophobic Bond | Pi-Alkyl |
| MET99 | 4.57 | Hydrophobic Bond | Pi-Alkyl |
| ALA161 | 4.40 | Hydrophobic Bond | Pi-Alkyl |
| 4QMX | Hitt12 | LYS53 | 2.78 | Hydrogen Bond | Conventional Hydrogen Bond |
| ASP162 | 2.08 | Hydrogen Bond | Conventional Hydrogen Bond |
| LYS53 | 5.21 | Hydrophobic Bond | Pi-Alkyl |
| VAL38 | 5.45 | Hydrophobic Bond | Pi-Alkyl |
| ALA51 | 5.36 | Hydrophobic Bond | Pi-Alkyl |
| MET99 | 4.17 | Hydrophobic Bond | Pi-Sulfur |
| 4QMX | D1 | GLU70 | 2.11 | Hydrogen Bond | Conventional Hydrogen Bond |
| ASP162 | 2.20 | Hydrogen Bond | Conventional Hydrogen Bond |
| ASP162 | 3.02 | Hydrogen Bond | Conventional Hydrogen Bond |

**Supplementary Table 2 (ST2): 2Dimensional structure of complexes**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 4QMX\_Hit1 | 4QMX\_Hit2 | 4QMX\_Hit3 | 4QMX\_Hit4 |
|  |  |  |  |
| 4QMX\_Hit5 | 4QMX\_Hit6 | 4QMX\_Hit7 | 4QMX\_Hit8 |
|  |  |  |  |
| 4QMX\_Hit9 | 4QMX\_Hit10 | 4QMX\_Hit11 | 4QMX\_Hit12 |
|  |  |  |  |
| 4QMX\_D1 |  |  |  |

**Supplementary Table 3 (ST3): Optimized Structure of tested ligands**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| **Hit1** | **Hit2** | **Hit3** | **Hit4** |
|  |  |  |  |
| **Hit5** | **Hit6** | **Hit7** | **Hit8** |
|  |  |  |  |
| **Hit9** | **Hit10** | **Hit11** | **Hit12** |
|  |  |  |  |
| **D1** |  |  |  |

**Supplementary Table 4 (ST4): Frontier Molecular Orbital of ligands Hit1 to Hit12 and D1. Deep green positive and radish brawn negative.**

|  |  |  |
| --- | --- | --- |
| Ligand No | HOMO | LUMO |
| **Hit1** |  |  |
| **Hit2** |  |  |
| **Hit3** |  |  |
| **Hit4** |  |  |
| **Hit5** |  |  |
| **Hit6** |  |  |
| **Hit7** |  |  |
| **Hit8** |  |  |
| **Hit9** |  |  |
| **Hit10** |  |  |
| **Hit11** |  |  |
| **Hit12** |  |  |
| **D1** |  |  |

**Supplementary Table 6 (ST6): Molecular Electrostatic Potential map of ligands Hit1, Hit7, Hit8, and D1. The attacking zone's potential diminishes in the following order: blue>green>yellow>orange>red.**

|  |  |
| --- | --- |
|  |  |
| **Hit1** | **Hit2** |
|  |  |
| **Hit3** | **Hit4** |
|  |  |
| **Hit5** | **Hit6** |
|  |  |
| **Hit7** | **Hit8** |
|  |  |
| **Hit9** | **Hit10** |
|  |  |
| **Hit11** | **Hit12** |
|  |  |
| **D1** |  |