Table 3: Bcl-2-TP53 binding energy, interaction and highest function loss analysis of Bcl-2 by chief chemical compounds; stigmast-4-en-3-one and octadecanoicacid

Receptor	Ligand	Score	Intermolecular H-Bond
Bcl-2 (4IEH)	TP53 (1TSR)	−753.41	A: ARG86:HH11 - A: ASN288:O A: ARG86:HH11 - A: LEU289:O A: ARG86:HH12 -A: LEU289:O A: ARG88:HH11 - A: ARG248:O A: ARG88:HH12 - A: ARG248:O A: ARG142:HH11 - A: GLU287:O A: ARG142:HH12 - A: GLU287:O A: GLN165:HE21 - A: HIS79:O A: GLN165:HE21 - A: THR84:OG1 A: GLN165:HE22 - A: LEU78:O A: GLN165:HE22 - A: HIS79:O A: GLN167:HE21 - A: HIS79:O A: GLN167:HE22 - A: HIS79:O A: ARG248:HH21 - A: GLN77:OE1 A: ARG273:HH21 - A: THR91:O A: ARG273:HH21 - A: GLU94:OE1 A: ARG280:HH11 - A: TYR139:OH
Bcl-2+stigmast-4-en-3-one	TP53	−702.16	A: ARG66:HE - A: GLU287:O A: ARG66:HH21 - A: GLU287:O A: ARG66:HH22 - A: GLU287:O A: GLN167:HE21 - A: GLU50:OE2 A: GLN167:HE22 - A: GLU50:OE2 A: ARG248:HH11 - A: ASP155:OD2 A: ARG248:HH21 - A: ASP155:OD2 A: ARG273:HH21 - A: GLU159:O A: ARG280:HH21 - A: LEU160:O
Bcl-2+octadecanoicacid	TP53	−714.03	A: ARG12:HH21 - A: SER269:OG A: LYS17:HZ3 - A: THR102:O A: GLN100:H-A: ASP31:O A: LYS101:HZ2 - A: MET16:O A: LYS101:HZ3 - A: MET16:O A: SER166:H-A - ASN131:OD1 A: SER166:HG - A: PRO127:O
Bcl-2+gamma-tocopherol	TP53	−740.01	A: ARG86:HH11 - A: ASN288:O A: ARG86:HH11 - A: LEU289:O A: ARG86:HH12 - A: LEU289:O A: ARG88:HH11 - A: ARG248:O A: ARG88:HH12 - A: ARG248:O A: ARG142:HH11 - A: GLU287:O A: ARG142:HH12 - A: GLU287:O A: GLN165:HE21 - A: HIS79:O A: GLN165:HE21 - A: THR84:OG1 A: GLN165:HE22 - A: LEU78:O A: GLN167:HE21 - A: HIS79:O A: GLN167:HE22 - A: HIS79:O A: ARG248:HH21 - A: GLN77:OE1 A: ARG273:HH21 - A: GLU94:OE1 A: ARG280:HE - A: GLU94:OE2 A: ARG280:HH11 - A: TYR139:OH

with TP53) to −702.16 and −714.03 respectively. As per earlier studies, it has been reported that Bcl-2 inhibits apoptosis by safeguarding the mitochondrial integrity, thereby preventing cytochrome c release and activation of caspase 9. Bcl-2 also constitutively suppresses p53 functions such as tumor suppression in many tumor types, growth arrest, and p53 dependent apoptosis,[33] so as per the verification of *in silico* studies stigmast-4-en-3-one and Octadecanoic acid both reduce the normal binding affinity of Bcl-2 and TP53, so that Bcl-2 is unable to suppress TP53. Our results also indicate that the chief constituents of our extract preferentially sequester Bcl-2 with a higher affinity as compared to p53, as a result p53 seems to be freely available in the cytoplasm for induction of growth arrest and apoptosis.

CONCLUSION

It can be concluded by the results that the CQ stem ethanolic extract contains several bioactive compounds that showed remarkable anti-cancer property towards KB oral epidermoid carcinoma cells. The CQ extract downregulates the Bcl-2 and up-regulates the p53 protein expression. Apart from this *in silico* studies suggest the two chief compounds, that is, stigmast-4-en-3-one and octadecanoic acid may act as key mediators of anti-cancer activity of CQ extract. Also, induction of cancer cell apoptosis by CQ extract suggests that this material could be developed as a promising p53-dependent cancer therapeutic agent in the future.

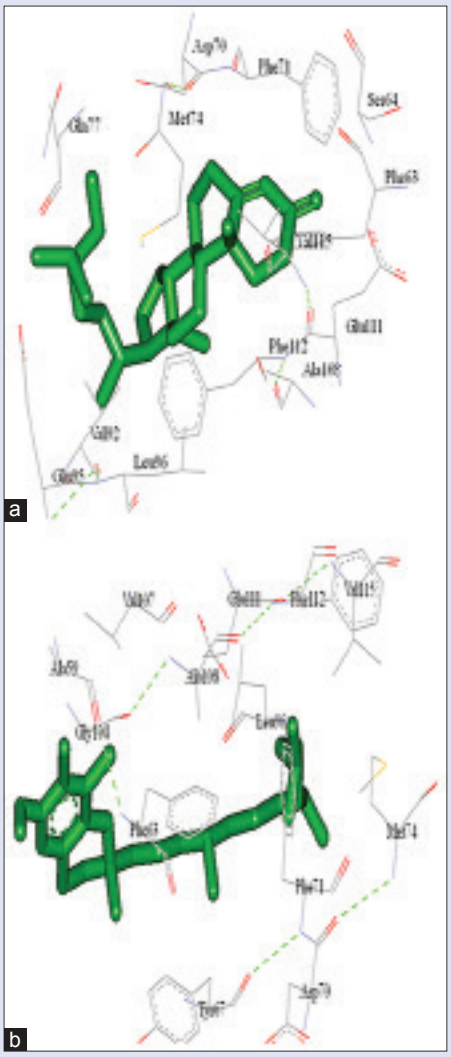

Figure 10: Molecular interaction of Bcl-2 with (a) Stigmast-4-en-3-one and (b) Gamma–tocopherol

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Conflicts of interest

There are no conflicts of interest.

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