A battery of 109 marine bacteria were isolated from sea water samples collected from various locations in Bay of Bengal.

The isolates were subjected to preliminary assay for the production of bioactive compounds. Among the 109, 9 isolates showed significant inhibition of germination of *Bacillus subtilis* spores and they were shortlisted for further analysis.

Four isolates that exhibited more than 50% inhibition of germination of *B. subtilis* spores were subjected to anti proliferative activity in cancer cells.

MB 40 isolate that exhibited maximum inhibition of proliferation of HT-29 cells was established as *Bacillus pumilus* MB 40 (GenBank Accession no: HQ705771).

The presence of Polyketide synthase and Non ribosomal peptide synthase gene further confirmed the presence of bioactive molecule producing gene clusters.

The crude extract of *B. pumilus* MB 40 significantly inhibited the proliferation of HT-29 cells with an IC$_{50}$ of 25.4 μg/ml.

The induction of apoptosis as evidenced by morphological changes in cancer cells stained with AO/EB was observed.

The active principle was purified from the crude extract by column chromatography and the structure was established to be Bis (2-ethylhexyl) phthalate (BEHP) by FTIR, NMR and GC-MS.

The purified BEHP was capable of suppressing proliferation of HT-29, K562
and HEp-2 cells with IC$_{50}$ value of 20.4, 21 and 25.3 μM respectively.

- Based on flow cytometric analysis it has become evident that the compound was also effective in arresting the cell cycle at a sub G0/G1 phase.

- Progressive accumulation of fragmented DNA occurred in BEHP treated HT-29, K562 and HEp-2 cells besides induction of apoptosis by caspases and mitochondrial enzymes.

- The gene expression studies and western blot analysis revealed activation of all three caspases viz., caspase-8, caspase-9 and caspase-3 and inhibition of Bcl-2 concomitant with an increase in Bax expression.

- The insilico studies revealed the active binding site of BEHP to Bcl-2 and induction of conformational change was confirmed with immunoprecipitation assay

- Apart from induction of apoptosis the compound exhibited high anti migratory activity as evidenced by cell invasion and migration assays.

- Immunoblot and gelatin zymography confirmed the inhibition of MMP-2 and MMP-9 in BEHP treated cancer cells.

- Employing in silico docking studies the binding sites of BEHP to MMP-2 and MMP-9 were predicted.

- The results of our study demonstrate that BEHP may be a promising inhibitory scaffold for the control of metastatic cancer cell proliferation and migration.