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This study attempts to evaluate in a comprehensive manner employing a variety of biochemical and in silico modules, the cytoprotective role of M. oleifera flowers in PC3 cell lines, the highly metastatic in vitro androgen-independent models of prostate cancer.

The findings of the present study are summarized as follows:

The methanol extract of M. oleifera flowers from Palayamkottai in Tirunelveli district with loamy red soil, moderate monsoon, less pollution and geographical location towards equator, exhibited the highest antioxidant potential among the samples studied. Its phenolic and flavonoid contents also seemed to be maximum when compared with the other samples. Results suggested that the geographical properties had profound effect on the phytochemical composition which further influenced the antioxidant potential of M. oleifera flowers.

On comparison with a common anticancer compound, Curcumin and its natural source Turmeric, while both these produced a reduction in the cell viability of normal cells from concentration 10µg/ml onwards, the methanolic extract of M. oleifera flowers did not show any significant change even up to 100µg/ml. On the other hand, while Curcumin and Turmeric showed PC3 cell growth inhibition at higher concentrations, the flower extract exhibited a gradual dose-dependent decrease in the percentage of cancer cell growth from 0.01µg/ml onwards. Thus, rather than the cytotoxicity exhibited by Curcumin and Turmeric on existing PC3 cells, the cytostatic nature of the methanolic extract of M. oleifera flowers could be more capable to manage the rapidly metastasizing PC3 cells reiterating its amenability for differentiation therapy.

Separation and identification of bioconstituents in the flower extract by GC-MS indicated their correlation to the observed biological activities and their
applications in folklore medicine. The analysis revealed the presence of twenty six compounds with Ethyl Oleate, Quinic acid and cis-9-Hexadecenal being the major ones.

The present study provided an extensive *in silico* analysis of drug targets involved in PC3 cells and their interaction with *M. oleifera* flower ligands. Homology based models were obtained for human GCNT1 and its mutant form. Significant variations were observed not only in their conformations but also in their biochemistry and stability which were confirmed by molecular dynamics simulations. Through a *de novo* protein modeling applying *ab initio* method, it was possible to achieve the required native conformation of cPAP and differentiate it from its isoform.

The pharmacokinetics study clearly illustrated that the physicochemical, Lipinski-type and drug properties of Quinic acid along with its ADME characteristics and toxicity parameters were favourable as a drug candidate. The comparative analysis with the other compounds, besides emphasizing the greater drug potential and lesser toxicity of Quinic acid over Curcumin illustrated the application of this predominant phytocomponent of *M. oleifera* flowers in combating the manifestation of prostate cancer which was further supported by the findings of the pharmacodynamics study.

The pharmacodynamics study demonstrated that compared to the other compounds studied, *M. oleifera* flower ligands particularly Quinic acid were more target specific to PC3 cells and exhibited more effective active site interactions with mGCNT1, nGCNT1 and ERK rather than with cPAP and HER-2. The *M. oleifera* flower ligands, Quinic acid, alpha-Tocopherol-beta-D-mannoside and Ethyl Oleate were found to inhibit ERK directly even in the absence of cPAP and HER-2. Moreover, these ligands were highly potent in inhibiting the mutant GCNT1 associated with enhanced risk of androgen-independent prostate cancer. Such efficacious drug target-ligand interactions along with a greater suitability of 66.5% of the methanolic extract of *M. oleifera*
flowers to PC3 cell lines in exhibiting anticancer activity, not only supported the *in vitro* results obtained earlier in the study, but also confirmed its cytoprotective role in these cells.