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Research Article

PELARGONDIN - A POTENTIAL CURE TO CANCER

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ABSTRACT

Cancer is one of the main causes of death in the present day and causes the second largest death next to cardiovascular. There are many naturally available medicines to cure cancers. One such plant constituent is the Anthocyanins. These are the flavonoid groups of plant pigments which give red , blue and purple colours. There are 10 known substituents of Anthocyanins. The present investigation aims at screening the best substituent for hDHFR, a potential cancer drug.

Keywords: Anthocyanins, hDHFR, Natural Cancer drugs, Anthocyanin Substituents .

INTRODUCTION

Cancer is the second largest cause of death after the cardiovascular diseases [1] and is one of the main cause of death in the present day world. In 2007 it was estimated that 1.4 million new cases of cancers were diagnosed [1]. Cancer is defined as the uncontrolled division of abnormal cells or a malignate growth or tumor resulting from such a cancer division of cells.

Nature has always served the mankind by providing many notable and inspiring number of medicines. One such cancer preventing drugs is the Anthocyanins. Anthocyanins are the phytochemicals which belong to the flavonoid groups, which are present largely in teas, apples, grapes, cabbage, vegetables etc [2] and imparts characteristic red, blue and purple colour. These plant pigments have been reported to have great health benefits [3,4,5,6] . These H_2O soluble vacuolar pigments are reported to have vast medical applications which include their role in vision, cardiovascular diseases, protection against heart attacks, acts as anti-oxidants and also help in preventing the age related declines. The Anthocyanins have a major role to play against anti-inflammation, reduces the carcinogenesis and also exhibits the antiviral properties. Phytochemical constituents of *Rhaphidophora aurea* climbed over *Lawsonia inermis* revealed the presence of alkaloids, flavonoids, saponins, phenols, glycosides, anthraquinone and anthocyanins . The leaves of *Lawsonia inermis* are used in the form of a decoction or ointment in the treatment of burns, skin inflammations, wound and ulcers [7].

Each individual anthocyanins biological activities depends on their chemical structures like position, number and types of the substituents [8,9] .

The present investigation aims at docking the known Anthocyanin substituents, the word derived from the Greek to describe the blue pigments of the cornflower, *Centaureav cyanus* [10] with human Di hydrofolate reductace (hDHFR) , and to screen the most potent anthocyanin substituents which helps in selecting the best compound amoungst the known 10 substituents.

hDHFR- a target cancer drug , has a molecular weight of 21.3 KDa [11] . The gene coding the hDHFR is found in q11-q22 region of the chromosomes 5 [11] .

MATERIALS AND METHOD

PROTEIN PREPARATION

The protein of interest for the present study is imported from Protein Data Bank (PDB), the high resolution X-ray crystal structure with the PBD ID :1KMS. The crystallographic water molecules and the hetero atoms were removed from the protein. The chemistry of the missing hydrogens of the protein was corrected. To correct the Crystallographic disorders and the unfilled valence atoms, the alternate conformation and the valence monitor options were used. The energy minimizing steps were performed using the steepest descent method and conjugate gradient method till the convergence gradient was satisfied. The active site pockets were identified and a sphere was created around the active site.

LIGAND PREPARATION

The ligand for the present study is known anthocyanin. 10 structures were drawn using chemsketch (ACDLABS 12.0). The bonds were added after the removal of the duplicates. The energy minimization is done using the CHARM m force field. The 3D structures were then generated.

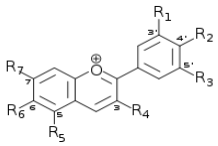

Figure1: General structure of Anthocyanin.

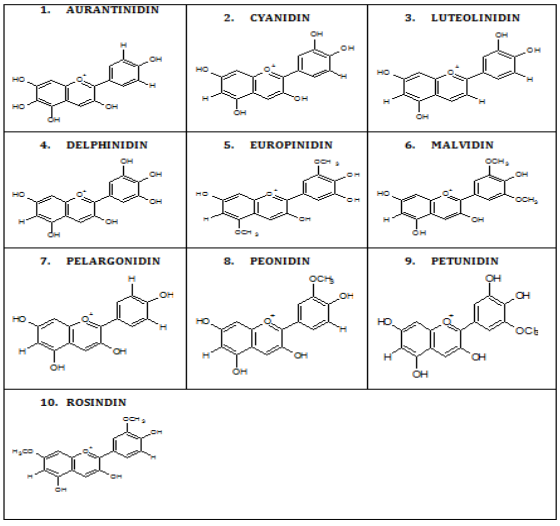

Figure2: Structures of Anthocyanin substituents

PROTEIN LIGAND DOCKING

Molecular docking studies were performed using GOLD version 2.5. Gold enables to make a confident binding and is one of the best molecular docking programs used for the prediction of the interaction of the receptor and ligand. GOLD has proved itself in virtural screening, lead optimization and identifying the correct binding mode of active molecules.

RESULTS AND DISCUSSION

The protein- ligand interaction of the h-DFHR and Anthocyanins was studied and the docking was done using the GOLD software. The results showed the Pelargonidin is the best compound with the highest fitness score of 44.68. The hydrogen bond interaction of Pelargondin with h-DHFR (1KMS) active site residues such as Glu 30, trp 113, tyr 121, Leu 7.

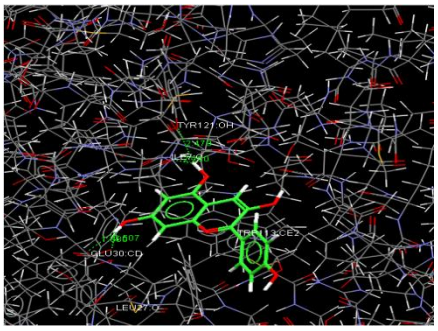

Figure 3: Protein – Ligand Docking.

Table 1: Dock Results

S.no	Fitness	S(hb_ext)	S(vdw_ext)	S(hb_int)	S(int)	Ligand Name
1.	42.97	6.06	35.45	0.00	-11.48	Aurantinidin
2	44.37	5.05	37.77	0.00	-12.62	Cyaniding
3	43.20	4.98	38.18	0.00	-14.28	Delphinidin
4	38.77	2.73	32.57	0.00	-8.74	Europinidin
5	45.32	4.94	36.53	0.00	-9.85	Luteolinidin
6	41.51	6.68	32.61	0.00	-10.01	Malvidin
7	44.68	5.31	36.38	0.00	-10.66	Pelargonidin
8	44.11	4.76	35.13	0.00	-8.94	Peonidin
9	43.74	5.34	36.10	0.00	-11.24	Petunidin
10	36.89	7.20	27.48	0.00	-8.10	Rosinidin

CONCLUSION

Anthocyanins are the plant pigments with a host of health benefits. The anthocyanins are known to cure different types of cancers. The present investigation aims at the hDHFR which is the potent cancer target. The results clearly indicate that amongst the 10 anthocyanin substituents the Pelargondin could act as a best drug for the cancer cure.

CONFLICT OF INTEREST: No

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