Anticancer Activity and *In-Silico* ADMET Analysis of Malvastrum Coromandelianum

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ABSTRACT - Breast cancer is the world's leading cause of cancer death and the most common cancer among women. There is significant variation in survival rates worldwide for breast cancer, where 80% are estimated to be below 40% for low-income countries in the high income countries for 5 years. Natural products have been considered to be important sources of potential chemotherapeutic agents and many anticancer drugs have originated from different natural sources. Primary aim of the present study was to investigate the possible anticancer mechanism of Malvastrum coromandelianum extract using *in-vitro* model. Anticancer activity of ethyl acetate extract of Malvastrum coromandelianum was evaluated by tryphan blue exclusion method and ADME analysis was done with the help of SwissADME software. From the observed results the anticancer activity of Malvastrum coromandelianum is could be due to its Phytochemical constituents.

Keywords: Breast cancer, Malvastrum coromandelianum, Anticancer activity, SwissADME.

INTRODUCTION

Cancer is considered to be one of the deadlier disease and about 13% of all death worldwide is due to different types like Leukemia, Lymphoma and Sarcoma [1]. There are over 60 different organs in the body that can develop cancer from nearly any cell type in the body [2]. In traditional medicine practice including medicinal plant are used for treatment of and preventing various tumours [3]. Due to lack of detection methods and associated poor prognosis of patients diagnosed it increased on global scale [4]. Different synthetic are used to cure cancer but because of toxicity, researcher is investigating plant derived chemotherapeutic agents. Malvastrum coromandelianum belonging from family Malvaceae commonly known as broom weed and clock plant [5-6]. In previous study showed that M. Coromandelianum ethyl acetate extract exhibited anti-inflammatory and antibacterial activity [7]. It is used in traditional medicine as an antidysenteric, analgesic and in the treatment of ulcers and jaundice [8]. There are different in-vitro models are available to assess the anticancer activity one of the assay tryphan blue exclusion is used to know number of viable cells present in cell suspension. In this method tryphan blue dye is mixed with cell suspension and examined to check whether cells take up or exclude dye and those cells are viable have clear cytoplasm on other side nonviable cell have cytoplasm in blue colour [9]. It is one of the useful tool including microbiological resistance, tumour susceptibility and cell death after submission to different experimental conditions [10]. ADME analysis was carried by using SwissADME software. It used to evaluate different pharmacokinetics parameter and drug likeness etc, and with help of this search engine it gives results of BBB permeability, bioavailability, Solubility of Phytochemical constituents. This study aimed to investigate anticancer properties of the ethyl acetate extract, and in-silico ADME analysis [11-12].

MATERIALS AND METHODS

Plant material

Malvastrum Coromandelianum was obtained from Kasegaon, Sangli, Maharashtra, India. The plant was identified and authenticated by Department of Botony, Yashwantrao Chavan College of Science, Karad.

Preparation of plant extract

Shade drying was done for almost a month as to avoid chemical degradation due to sunlight. Grinding of the dried material was done, with the aid of a grinder and converted into coarse powder. Extraction of Malvastrum coromandelianum was done by microwave extraction further filtered and excess solvent present was evaporated and dried extract were collected and subjected for activity studies.

Chemicals

The chemicals used in the present study was Phosphate buffered Saline (PBS) and tryphan blue dye from, Research lab, Mumbai. All the chemicals used were of analytical grade.

Cell lines and culture conditions

MCF-7 cell line obtained from National Centre for Cell Sciences (NCCS), Pune. The cells were cultured at 37˚C in a humidified atmosphere of 5% CO_2 incubator.

Anticancer activity

Method: Tryphan blue exclusion method

Place 50µl of cell suspension in cryo-vial. Add equal parts of 0.4% tryphan blue dye to the cell suspension to obtain a 1 to 2 dilution (example: 50 µl of cells to µl of tryphan blue) and mix by pipetting up and down. Incubate the mixture for less than three minutes at room temperature. If cells are counted after approximately five minutes, viability will be inaccurate due to the cell death. With the cover slip already in place, fill one side of a hemocytometer counter with the cell suspension by placing the tip of the pipette at the notch. Typically, each side will take 10 to 20 µl. Place the hemocytometer on the stage of a motic microscope and focus onto the cells. Each side of the hemocytometer contains multiple squares. Count all cells in each squares in each corner of the hemocytometer. Each large square contains 16 small squares. In each large square count cells that are on the border lines on two sides only. Keep track of the number of the blue cells seperately as well as part of the complete number of cells [13-15].

ADMET Analysis

The list of phytochemicals constituents of Malvastrum Coromandelianum from different literature sources was subjected to ADMET analysis using SwissADME web tool. The structures of the molecules were sketched by using chemsketch and their pharmacokinetics and drug likeness were calculated and compiled into a final table for representation [16].

Table 1: Phytochemical constituents of Malvastrum Coromandelianum

Sr. no	Phytochemical constituents
1	Palmitoleic acid
2	Stearic acid
3	Palmitic acid
4	Linoleic acid
5	Malvalic acid
6	Stigmasterol
7	Lutein

RESULTS AND DISCUSSION

Anticancer activity of ethyl acetate extract was tested using trypan blue exclusion method. 5-fluorouracil used as standard anticancer drug. By performing anticancer activity it has been noted that percent viability of Malvastrum Coromandelianum by comparing with standard drug shows significant activity. The results obtained by performing anticancer activity are listed in Table 2.

Table 2: Anticancer activity of M. coromadelianum extract against MCF-7 cell line

Sr.no	Test Subs.	% viability		
		10 mcg	50 mcg	100 mcg
1	M. Coromadelianum	85.76	80.54	78.82
2	Standard (5-Fluorouracil)	87.52	84.12	81.24

The pharmacokinetic properties and drug-likeness prediction of Phytochemical constituents were performed by SwissADME online version and the data are shown in Table 3. According to the pharmacokinetic properties, all phytochemicals showed Moderately soluble and soluble gastro intestinal absorption and no BBB permeability however drug likeness were predicted by bioavailability score.

Table 3: Pharmacokinetics and drug-likeness prediction for Phytochemical constituents of M. Coromadelianum by SwissADME

Phytochemical constituents	Pharmacokinetics			Drug-likeness
	GI absorption	BBB permeability	Log Kp (skin permeation) cm/s	Bioavailability Score
Palmitoleic acid	Soluble	No	-2.35	0.17
Stearic acid	Moderately soluble	No	-2.12	0.55
Palmitic acid	Soluble	No	-3.54	0.56
Linoleic acid	Moderately soluble	No	-2.72	0.11
Malvalic acid	Soluble	No	-2.67	0.22
Stigmasterol	Soluble	No	-2.20	0.55
Lutein	Moderately soluble	No	-2.45	0.11

CONCLUSION

In current study *in-vitro* results confirmed anticancer activity of Malvastrum Coromandelianum. *In-vitro* anticancer activity was performed by tryphan blue exclusion method on MCF-7 cell line. It can be postulated from the observed results that M. Coromandelianum extracts contains different phytochemicals constituents like palmitoleic acid, stearic acid, palmitic acid, linoleic acid and malvalic acid etc, have anticancer activity. ADMET analysis was performed for the listed phytochemicals by using SwissADME. All molecules demonstrated a significant drug likeness based on Lipinski's rule-of-five (RO5). All molecules were predicted to be BBB non-permeant (blood–brain barrier), it means no expected neurological side effects. All the molecules demonstrated significant bioavailability, suggesting that the molecules could be absorbed and delivered throughout the body in case of use as drug. Thus, all molecules were screened for their ADMET prediction and the molecules were confirmed to be suitable drug-like molecules.

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