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Research Article

ANTI-CANCER ACTIVITY OF *Datura metel* ON MCF-7 CELL LINE

NAZEEMA BANU B,[1] JULIE J,[1] ABIRAMI J,[1] KUMAREASAN R,[1] MUTHUKUMARAN T[1], RAJASREE S[2], JEYA JOTHI K[3], KUMARAN S[1*]

[1]Department of Biotechnology, Periyar Maniammai University, Vallam, 613 403, Thanjavur, Tamil Nadu, India. [2]CoRx Life sciences and Pharmaceutical Pvt Ltd, Tiruchirapalli, 620 020, Tamil Nadu, India, [3]Department of Chemical Engineering, Periyar Maniammai University, Vallam, 613 403, Thanjavur, Tamil Nadu, India. Email: kumarans@pmu.edu

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ABSTRACT

Objective: Current clinical trends involve the usage of plants as therapeutic agents in a wide range of applications. Present investigation is focused on the anticancer activity of the methanolic extract of *Datura metel* against MCF-7 cell line.
Materials & Methods: The study was facilitated by collecting the plant sample and subjected to methanol extraction using Soxhlet apparatus. The anticancer activity of the extracted sample against MCF-7 cell line was examined by MTT assay.
Results: The study confirms that the leaf extract of *Datura metel* has pronounced anticancer potential against MCF-7 cell lines while compared to that of the stem extract.
Conclusion: The plant investigated possesses remarkable anticancer activity and hence isolation of the compound contributing to the activity may lead to develop at a novel and natural phytomedicine for the disease.

Keywords: *Datura Metel, MCF-7 cell line, MTT assay, anti-cancer activity*

INTRODUCTION

A report by World Health Organization states that around 80% of people in the world rely on phytomedicine [11] and 33% of drugs used are from plant sources [2]. According to Hartwell, around 3000 species of plants are currently being used in cancer therapy [3]. One such plant with anticancer potential is *Datura metel* which is from *solanaceae* family [4-6]. The species has common names such as thorn apple and downy datura. In Tamil, it is commonly called as Oomatthai, Karuvoomatthai [7]. The plant species is rich in various kinds of alkaloids, such as hyoscine, fastusine, hyoscyamine, littorine, valtropine and acetoxytropine. It also has many withonilides with anticancer properties [8,9] and calystigines with glycosidase inhibitory property [10].

The prevalence of breast cancer in Indian women is more at the age of forty [11]. The incidence of breast cancer has been increasing worldwide for many decades [12] with Asian countries attaining highest incidence rate [13]. Some breast tumors stay resistant to conventional treatment [14,15] and may have many side effects which affect the quality of the treatment [16]. Skirmishing with such a dreadful disease as a treatment must be considered with high importance. Surgical treatments are in need by the specialized proficient surgeons in the area of surgical oncology [17,18]. Existing radiation oncology infrastructure is not sufficient for the most developing countries [19]. According to the data of world Health organization, chemotherapy is needed for more than 90% of people affected with breast cancer.

Nowadays, researchers focus greatly on folk medicine to develop better drugs for cancer.[1] The traditional users own only ideas on the identification of the plant and dosages through personal practices but are not with an awareness on scientific reasons behind its medicinal uses [1,20]. Owing to the growth in medical perception, plant derived compounds can be designed as drugs for diseases. The present investigation focused on the determination of the anticancer effect of the plant species *Datura metel* on breast cancer MCF-7 cell lines , which was compared to the effects on control Vero cell lines.

METERIALS AND METHODS

Collection of plant samples

Healthy fresh plants of *Datura metel* species were collected from Vallam village at a close proximity to Thanjavur district during the month of January in the year 2012. The plant species were recognized and authenticated by a taxonomist. Different parts of the plants were isolated and air dried at room temperature. The dried samples were ground into powder and the powdered samples were subjected to Soxhlet extraction with methanol as solvent. The extracts were collected and stored in air tight containers for further studies.

Phytochemical analysis

The plant samples were subjected to phytochemical analysis using the standard protocol [21, 22].

MTT Assay

After the extraction of the sample, the viability of the cells were determined through MTT assay[23,24]. MCF-7 cells and VERO cells were collected and washed twice with PBS and 10 µl of MTT reagent (5 mg/mL in PBS) were added in the wells. The plates were kept for incubation for 4 h. The incubated cells were washed twice with PBS and DMSO (100µL/well) reagent which dissolved the insoluble crystalline formazan product. The efficacy of the sample was determined based on the reduced dye at 570 nm by UV spectrophotometer [25]. The effect of the samples on the proliferation of MCF-7 cell lines and VERO cell lines were expressed as the % cell viability, using the following formula:

% cell viability = A570 of treated cells / A570 of control cells × 100%[26].

RESULTS

The leaf extract possessed more anticancer potential and composed of phytocomponents like alkaloids, sterols saponins, phenols, tannins and flavonoids. (table.1)

Table1: The detected compound in the plant sample.

S. No.	Test	Leaves	Stem
1	Alkaloids	+	+

2	Terpenoid and steroid	+	+
3	Flavonoid	+	+
4	Phenolic compounds	+	-
5	Saponins	+	-
6	Tannins	+	-
7	Glycosides	+	-

Effects of leaf and stem extracts on the cell lines used have been portrayed in figures 1-4.

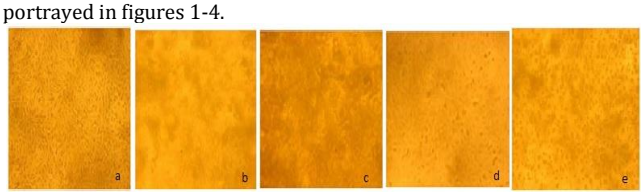

Fig1: Anticancer effect of *Datura metel* leaf extract on Vero cell line

Figure 1(a) Normal VERO cell line,(b) Toxicity at 1000 µg/ml, **(c)**Toxicity at 125 µg/ml (d)Toxicity at 62.5 µg/ml, (e)Toxicity at 31.2 µg/ml.

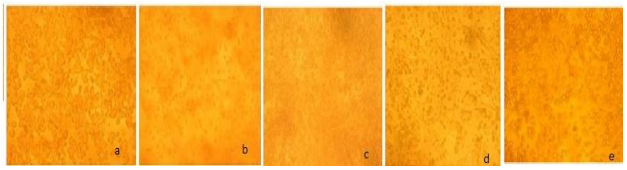

Fig.2: Anticancer effect of *Datura metel* leaf extract on MCF-7 cell line

Fig.2 (a)Normal MCF-7 cell line, (b) Toxicity at 1000 µg/ml, (c)Toxicity at 125 µg/ml, (d)Toxicity at 62.5 µg/ml (e) Toxicity at 31.2 µg/ml

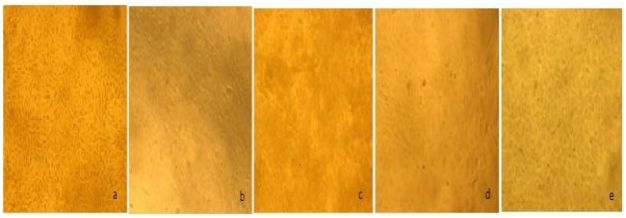

Fig.3: Anticancer effect of *Datura metel* stem extract on Vero cell line

Fig.3(a) Normal VERO Cell line,(b) Toxicity at 1000 µg/ml , (c)Toxicity at 250 µg/ml (d) Toxicity at 62.5 µg/ml , (e)Toxicity at 31.2 µg/ml.

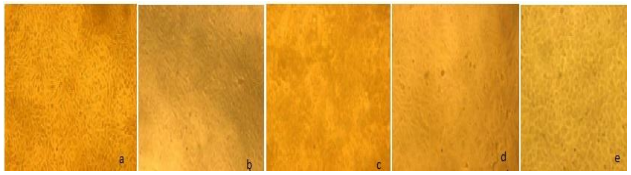

Fig.4: Anticancer effect of *Datura metel* stem extract on MCF-7 cell line

Fig.4(a) Normal MCF-7 cell line 2, (b) Toxicity at 1000 µg/ml ,(c)Toxicity at 250 µg/ml , (d) Toxicity at 62.5 µg/ml ,(e)Toxicity at 31.2 µg/ml.

Concentrations of the samples required to inhibit 50% (IC_{50}) of the viability of the cells were determined and highlighted in tables 2-5.

Table2: Anticancer effect of the stem extract on Vero cell line.

S.No	CONCENTRATION (µg/ml)	ABSORBANCE (O.D) nm	CELL VIABILITY (%)
1	1000	0.07	15.2
2	500	0.12	26.0
3	250	0.18	39.1
4	125	0.22	47.8
5	62.5	0.27	58.6
6	31.2	0.33	71.7
7	15.6	0.39	84.7
8	7.8	0.42	91.3
9	Cell control	0.46	100

Table3: Anticancer effect of leaf extract on Vero cell line.

S.No	CONCENTRATION (µg/ml)	ABSORBANCE (O.D) nm	CELL VIABILITY (%)
1	1000	0.06	13.0
2	500	0.10	21.7
3	250	0.19	41.3
4	125	0.23	50.0
5	62.5	0.29	63.0
6	31.2	0.34	73.0
7	15.6	0.40	86.9
8	7.8	0.43	93.4
9	Cell control	0.46	100

Table 4: Anticancer effect of the stem extract on MCF-7 cell line.

S.No	CONCENTRATION (µg/ml)	ABSORBANCE (O.D) nm	CELL VIABILITY (%)
1	1000	0.02	4.1
2	500	0.10	20.8
3	250	0.16	33.3
4	125	0.22	45.8
5	62.5	0.27	56.2
6	31.2	0.31	64.5
7	15.6	0.36	75.0
8	7.8	0.40	83.3
9	Cell control	0.48	100

Table5: Anticancer effect of the leaf extract against MCF-7 cell line

S.No	CONCENTRATION (µg/ml)	ABSORBANCE (O.D) nm	CELL VIABILITY (%)
1	1000	0.08	8.3
2	500	0.13	16.6
3	250	0.19	27.0
4	125	0.23	39.5
5	62.5	0.23	47.9
6	31.2	0.29	60.4
7	15.6	0.33	68.7
8	7.8	0.38	79.1
9	Cell control	0.48	100

DISCUSSION

The phytochemical analysis of the methanolic extract of the plant reveals that the plant has components such as alkaloids, terpenoid, steroids, flavonoid, phenolic compounds, saponins, tannins and glycosides. It was observed that the ethanol extract of the leaves had high anticancer activity than the stem extract on both Vero and MCF-7 cell lines as they had low IC_{50} values compared to the latter (tables 2 -5). The withonilides which are steroidal lactones present in the plant have a have been reported to have a high anticancer activity against colorecto carcinoma (HCT-116) cell line [31, 32]. Many solanaceae species are rich in calystegines, which have glycosidase inhibiting properties against cancer [6].The results obtained hence confirm that the plant has signifcant anticancer potential as stated in the other reports about the species [26-30]. Many other phytocomponents extracted can also be expected to contribute to the anticancer activity. Cysteine methylation is associated with many diseases including breast cancers [33]. In future, we also plan to study the mechanism of the anticancerous potential of the plant in

particular we will investigate whether the plant extract influences DNA methylation and gene expression in breast cancer.

CONCLUSION

The methanolic leaf extract of the *Datura metal* is considered to have a high anticancer potential compared to stem. The outcome of the present study encourages carrying out further investigation by isolating a particular component with anticancer activity so as to design a specific drug for the disease. In future, we also plan to study the mechanism of the anticancerous potential of the plant, in particular, we will investigate whether the plant extract influences DNA methylation and gene expression in breast cancer.

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