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Anti-neoplastic Impact of Thymoquinone from *Nigella Sativa* on Small Cell Lung Cancer

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Introduction

Small cell lung cancer (SCLC) comprises 15% of all lung cancer cases [1] and has a 5-year survival rate of a mere 7%. The recalcitrant malignancy is defined by poor prognosis, rapid growth, widespread metastasis, frequent relapse and high mortality rates [1, 2]. Recently, increased attention and resources have been invested in studying medicinal herbs for alleviation of the enervating side-effects of chemotherapy. My project investigates the anti-cancer effects of thymoquinone (TQ) [3], a naturally occurring compound found in black cumin *(Nigella sativa)*.

Fig.1. *Nigella Sativa* (black cumin) in a stone dish.

Objective

To investigate the anti-cancer effects of TQ on 5 different SCLC cell lines.

Methods

MTT assay was used to assess relative cell viability in response to varying concentrations of TQ over time, in 5 SCLC cell lines: H69-Adherent, DMS79 (Suspension), H446 (Mixed Adherent and Suspension), H841-Adherent & SW1271 (Adherent).

Results

Average IC_{50} values of all cell lines across 24h, 48h and 72h were noted and tabulated in Table 1, with trends plotted in Fig. 2: H446 was the most sensitive with 6, 4 and 3 μM; the next three cell lines were similar to one another: H69-Adherent with 18, 15 and 17 μM; H841-Adherent with 19, 16 and 17 μM; and SW1271 with 15, 12, and 12 μM; For DMS79, the cell line was minimally responsive to TQ at 24h; IC_{50} value could not be detected. At 48h and 72h, however, DMS79 was more responsive with average IC_{50} values of 19 and 22 μM, respectively.

	IC_{50}/μM		
Cell Line	24hrs	48hrs	72hrs
H69-Adherent	18	15	17
DMS79	N/A	19	22
H446	6	4	3
H841-Adherent	19	16	17
SW1271	15	12	12

Table 1. The overall trend observed is similar across all cell lines over all time points, with each having its distinct IC_{50} values.

Conclusion & Future Directions

The cell viability assay indicates the anti-cancer potential of TQ on SCLC whereby increasing concentrations of TQ dose-dependently decreased the relative cell viability over time across all cell lines. Future directions include the role of TQ on apoptosis, cell cycle and ROS. The annexin V assay protocol with annexin V & 7AAD staining – for studying TQ's apoptotic potential on SCLC cells – is currently being optimized and preliminary data has been obtained. Repeated trial and error involved testing cell conditions, setting parameters for efficient detection by flow cytometry, conduction of experimental repeats, and data analyses on FlowJo.

References:

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[3] S. Padhye, S. Banerjee, A. Ahmad, R. Mohammad, F.H. Sarkar, From here to eternity - the secret of Pharaohs: Therapeutic potential of black cumin seeds and beyond, Cancer Ther 6(b) (2008) 495-510.

Fig.2. TQ reduced the relative cell viability in all cell lines over (a) 24 hours, (b) 48 hours, and (c) 72 hours. Results are representative of at least three independent replicates for each cell line.