

# Anti-metastasis effects of *Spirogyra neglecta* on castration-resistant prostate cancer via the blockage of AKT signaling pathway

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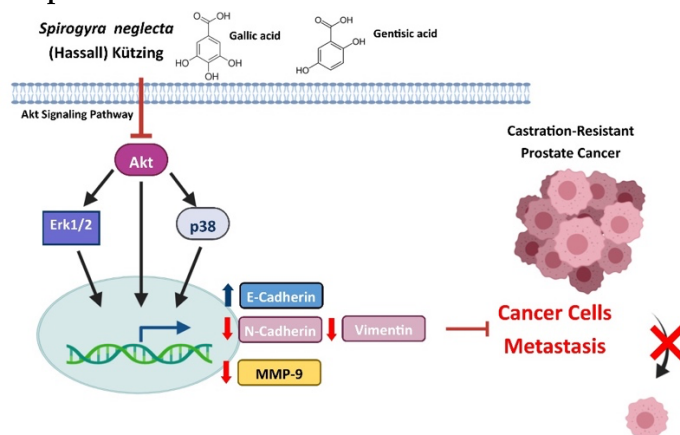
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**Abstract:** Metastatic prostate cancer is the second cause of cancer-related deaths. An attempt to search for natural products against cancer development has gained interest among medical field researchers. *Spirogyra neglecta*, an alga that commonly consumed for health promotion purposes; however, the anti-metastasis activity of this plant against human prostate cancer has not yet been elucidated. This study aimed to investigate the anti-metastasis effects of *S. neglecta* against castration-resistant prostate cancer cells (PC3 cells) using transwell invasion and migration assay. The results revealed that *S. neglecta* ethanolic extract (SnEE) significantly inhibited PC3 cells invasion and migration. The profiling-based plant metabolomics screening has indicated a positive association between the anti-metastasis properties and the phenolic active compounds in SnEE (gallic acid and gentisic acid). Thus, the solvent-partition technique was performed to concentrate the phenolic compounds in SnEE and then to establish the *S. neglecta* ethyl acetate fraction (SnEA). Mechanistically, SnEA inhibited PC3 cells metastasis through the inhibition of MMP-9 secretion, epithelial-mesenchymal transition, and the Akt signaling pathway ( $p < 0.01$ ). Taken together, *S. neglecta* extracts displayed remarkable anti-metastasis properties against castration-resistant prostate cancer. These findings appeared to support the use of *S. neglecta* extract as a natural supplement in the effective treatment of prostate cancer.

## Graphical abstract:



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**Keywords:** *Spirogyra neglecta*; Castration-resistant prostate cancer; Herbal extracts; Plant metabolomics; Anti-metastasis; Akt signaling

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