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The anti-carcinogenic activity of *Hydrastis Canadensis* on oral cancer cell lines

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ABSTRACT

Natural herbs are a topic commonly used for the research of drugs that could be used to treat cancer as it has become a leading cause of death in several developing countries. There is a constant demand for new therapies to treat and prevent this life-threatening disease. Scientific and research interest is drawing its attention towards naturally-derived compounds as they are considered to have less toxic side effects compared to current treatments such as chemotherapy. Goldenseal, commonly known as yellow puccoon has wide therapeutic activity. The bioactive components present are helpful in treating several problems in the human systems. They are capable of eliminating toxic substances due to the anti-cancer, anti-inflammatory and other properties. The study aims to do a study on the anti-carcinogenic activity of *Hydrastis Canadensis* on oral cancer cell lines. Through these researches it would be made available to all the people for an affordable cost. The sensitivity of KB (Oral squamous cell carcinoma) cells was determined individually by the MTT colourimetric assay. Higher concentrations of the herb induce increased cell inhibition, and it can give close and similar actions with tamoxifen. Studies indicate that goldenseal is biologically a very active plant which makes it very attention-worthy.



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INTRODUCTION

Natural herbs are essential due to their many useful properties. Among other qualities, they possess various biological properties. The term 'biological' comprises all activities that these mixtures of volatile compounds exert on humans, animals and other plants. (Handbook of essential oils science, technology and applications second edition) Cancer is a growing health problem around the world

and is the second leading cause of death after heart disease. According to a recent report by the International Agency for Research on Cancer (IARC), in 2008 there were 12.7 million new cancer cases throughout the world. There are now more than 10 million cases of cancer per year worldwide, including a group of more than 100 diseases such as cancer of the liver, lung, stomach, colon, breast, etc. (Yashika Bhalla, Vinay Kumar Gupta and Vikas Jaitak)

Goldenseal (*Hydrastis Canadensis*), also called orange root or yellow puccoon is a perennial herb in the buttercup family Ranunculaceae, native to southeastern Canada and the eastern United States. Its thick, yellow knotted rootstock may distinguish it. The stem is purplish and hairy above ground and yellow below ground where it connects to the yellow rhizome. In herbal medicine, goldenseal is used as a multi-purpose remedy; however, there is little scientific evidence it works.

Goldenseal has the following purported uses: control muscle spasms, treat cancer, stimulate the heart and increase blood pressure, treat gastrointestinal disorders, treat conjunctivitis, manage painful and heavy menstruation, treat infections topically, reduce swelling and oedema. Goldenseal may be purchased in salve, tablet, tincture form, or as a bulk powder. Goldenseal is often used to boost the medicinal effects of other herbs with which it is blended or formulated. (Barbara Adorjan and Gerhard Buchbauer)

Cancer belongs to a huge class of diseases, which cause more than 10% of all human deaths, and the third section deals with the anticancer activity of essential oils. The anti-inflammatory properties of essential oils are described in the fourth section. Chronic inflammatory leads to a number of diseases and needs to be treated by using anti-inflammatory drugs pathways (Victor Kuete, Hippolyte K. Web Kenneth O. *et al.*). Natural products are well recognized as sources for drugs in several human ailments including cancers. Examples of natural pharmaceuticals from plants include vincristine, irinotecan, etoposide and paclitaxel. Despite the discovery of many drugs of natural origin, the search for new anticancer agents is still necessary, to increase the range available and to find less toxic and more effective drugs. It has been recommended that samples with pharmacological usage should be taken into account when selecting plants to treat cancer, as several ailments reflect disease states bearing relevance to cancer or cancer-like symptoms. To progress, cancers require a source of nutrition and oxygen. (S.M. Sagar, MD, D. Yance, 2006) New drug discovery is facing serious challenges due to the reduction in a number of new drug approvals coupled with exorbitant rising cost. (Chandrakant Katiyar, Arun Gupta, 2012) Due to these reasons, it is preferred to use medicinal herbs than other products. They are cheap and helpful in giving better and stronger results.

Natural products play a major role in cancer prevention and treatment. A considerable number of anti-tumour agents currently used in the clinic are of natural origin. For instance, over half of all anti-cancer prescription drugs approved internationally between the 1940s and 2006 were natural products or their derivatives. Natural compounds isolated from medicinal plants, as rich sources of novel anticancer drugs, have been of increasing interest since then. Traditional medicinal herbs have been used for pharmaceutical and dietary therapy for several millennia in East Asia, e.g. in China, Japan, India and Thailand, and are currently widely used in cancer therapy. Earlier investigation showed that an average of 35% of overall human cancer-related mortality was attributable to diet (Saftar Asmi and Lakshmi T. 2013). The study aims

to provide affordable medicines with similar effects to the commercially available drugs with less side effects.

MATERIALS AND METHOD

Goldenseal extract that was available commercially was used for the study. The sensitivity of KB (Oral squamous cell carcinoma) cells was determined individually by the MTT colourimetric assay. Cells were seeded in a flat-bottomed 96-well plate and incubated for 24 h at 37°C and in 5% CO₂. Cell lines were exposed to the goldenseal extract at different concentrations. The solvent DMSO treated cells served as control. Cells were then treated with MTT reagent (20 µl/well) for 4 h at 37°C, and then DMSO (200 µl) was added to each well to dissolve the formazan crystals. The optical density (OD) was recorded at 492 nm in a microplate reader. Percentage of residual cell viability was determined as $(1 - (\text{OD of treated cells} / \text{OD of control cells})) \times 100$.

DISCUSSION

Goldenseal can be used for several diseases as they have cardiovascular effects, antibacterial, anti-candidal, anti-inflammatory and anti-parasitic effects (Davis JM. 1999). Goldenseal contains several bioactive compounds. It possesses isoquinoline alkaloids such as hydrastine, berberastine, berberine, hydrastinine, canadine, tetrahydroberberastine, and canalidine. It also possesses 8-oxo tetrahydro thalifendine. These play a role in anti-carcinogenic effects. Besides their anti-carcinogenic property, Goldenseal is also a natural antibacterial agent (Cech R. 2002). Goldenseal was first used by Native Americans to treat wounds, ulcers, digestive disorders, and skin and eye ailments (Miller RA. 1998). Over the years, goldenseal has been used to treat a variety of digestive and hemorrhagic disorders. It is thought to possess slight antiseptic properties (Foster S, Duke JA 2000). It is commonly used for the prevention of infections, especially in the digestive tract. It can also be used to reduce the risk of cancer (Harding AR. 1936). It is used for the treatment of breast cancer, prostate cancer, and oesophageal cancer. It can also be used in the management of cardiovascular diseases. (Tierra Michael 1998). The use of Goldenseal has been found to be beneficial for the treatment and prevention of cancer.

RESULTS

The herb goldenseal shows similarities with tamoxifen which is a commercial drug used for breast cancer (Figure 1).

Concentration of the extract µg/ml	% of cell inhibition	
	Golden seal	Tamoxifen
25	10.34	39.25
50	21.78	60.98
100	42.09	77.05
200	63.87	84.70
400	84.85	96.35

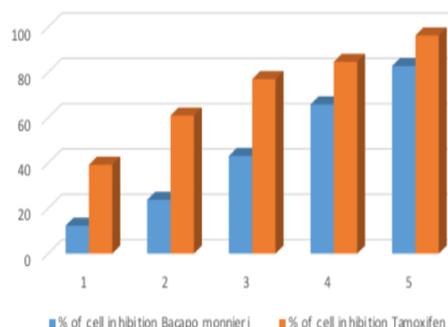


Figure 1 & 2: Percentage of cell inhibition on the KB cell line

Higher concentrations of the herb induce increased cell inhibition, and it can give close and similar actions with tamoxifen which on further research can be made advanced. (Figure 2)

It is effective against several forms of cancer including the breast, prostate, colon, oesophageal, and pancreatic cancers. It helps to reduce the abnormal multiplication of cancer cells thus preventing the disease from worsening. (Grieve M. 1971). It can be used in combination with conventional cancer treatment to achieve better results. It can help in the faster recovery of patients and improve the success rate of the conventional treatments. (Hoffman David. 1990). Goldenseal produces an anti-carcinogenic effect. It reduces the effect of toxins on the healthy tissues of the body. It also acts as an antioxidant and protects the normal cells against the damage caused by free radicals. The anti-inflammatory action of Goldenseal offers protection to the cells and tissues against cancerous changes.

It also improves the effects of chemotherapy and radiation therapy and helps a person to recover faster from the disease. It has been found to reduce the risk of cancer relapse in the future. (Akhter MH, Sabir M, Bhide NK 1979). Exposure to goldenseal occurs orally as a tea or capsule, or it can be applied dermally as a skin lotion to the eye as an eyewash, or as a vaginal douche (Swabb EA, Tai YH, Jordan L. 1981). It is also applied to the ear as eardrops. Berberine and hydrastine are also applied to the eyes as an eyewash. Hydrastine exposure occurs from use of decongestant nose sprays and feminine hygiene products containing hydrastine. From the research, it was found out that goldenseal has many medicinal purposes due to their various properties. Hence goldenseal can be widely used for treatments upon further research.

CONCLUSION

Various studies indicate that goldenseal is biologically a very active plant which makes it very attention-able one. The need is to do more research to

identify active constituents which are more responsible for its biological activity. It has very potent anti-microbial, anti-mycotic and hypoglycaemic activity due to the presence of alkaloids. The pharmacological actions of these alkaloids. Medicinal use of the goldenseal is confined to traditional or folk medicines which give a clue that higher research should be done for new drug molecules of definite activity.

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