viii. Abstract

Cancer in simple terms is an uncontrolled growth inside the human body. The environment is one of the major reasons that influences cancer rates and risks. **Cancers like colon cancer, liver cancer, lung cancer, throat cancer and skin cancer are majorly associated with environmental influences.** Recent reports suggest that intake of some natural products has greatly reduced the risk for such cancers. Today plants or herb extracts have emerged as a novel approach for controlling various diseases, including cancers. In the Union territory of Puducherry, various medicinal plants are used which have not been much explored till date. Especially, the effect of such plants as cancer drug candidates have been less reported. Hence, **we propose to investigate the effect of some selected medicinal plants growing in and around Puducherry on cell growth and proliferation of various cancer models.** In this study, lyophilized aqueous extracts of plants will be used to treat cancer cell lines and its effect on cell proliferation will be evaluated using MTT. Cell cycle analysis using propidium iodide will be carried out to evaluate the phase of cell cycle arrest. Apoptotic effects will be confirmed using Acridine orange-Ethidium bromide staining. **The results from this study could provide us the potent anticancer drug candidates from the traditionally used and commonly available medicinal plants in Puducherry for the treatment of cancer.**

ix Introduction

According to estimates published in 'The Lancet', around 5,55,000 people died of cancer in India, in 2010 (1). Various factors within the body are responsible for cancer, but environmental factors also play a major role for the development of some cancer types. Factors outside the body such as diet, smoking, alcohol use, hormone levels, or exposures to certain carcinogens over time may collectively destabilize normal balances on growth. Researchers have estimated that among cases of cancer two-third are linked to one or the other environmental factors. People are exposed daily to several environmental hazards which goes unnoticed until cancer develops. **One best remedy for surviving such cancer risks is to identify plants with potent anticancer property and utilize them in our day to day life.** Several plants which once thought to be of less value have proven to be highly efficient today. In this perspective, evaluating the natural principles of some medicinal plants in our surroundings would result in a valuable outcome.

According to the World Health Organization (WHO) 80% of the population of developing countries relies on traditional medicine for their primary care needs. Several ethnobotanical and ethnopharmacological surveys conducted by researchers allowed to identify plants of interest for various pathologies. Most scientific investigations on these plants demonstrated an anti-inflammatory or antioxidant effect. A growing number of plants have also been reported to possess anticancer activities. Identification of such plants is very crucial due to the emergence of resistance to cancer chemotherapy.

The Union territory of Pondicherry encompasses an area of 480 sq km with Pondicherry town and its villages covering 290 sq km. It includes major industries viz. hardware, metal, textile, leather and so on. Total pollution load increases day by day though several measures are taken to eradicate its increase. Also lifestyle change and fast foods may add up for the increased oxidative stress which is the influential factor for cancer development.

In Puducherry, research on natural anti-cancer molecules is still in its infancy . However several plants were investigated for their antioxidant property and were shown to possess some potential medicinal values. **Evaluation of such medicinal plants in and around Puducherry for their anticancer effects could pave way for potential drug discovery and also for health improvement of the native.** With this aim we have planned to screen some of the plants that are commonly available, utilized daily, available cheaper for their anticancer potency. The following are the lists of some of the commonly available medicinal plants selected for the current study,

Amaranthus spinosus, commonly known as the spiny amaranth, prickly amaranth or thorny amaranth. In Tamil it is called **'mulai keerai'**. In Sanskrit it is called *Tanduliyaka*. The plant helps to reduce fevers and softens the skin, causing warmth and moisture. It is used internally for the treatment of internal bleeding, diarrhea and excessive menstruation. Externally, it is used to treat ulcerated mouths, vaginal discharges, nosebleeds and wounds. The leaves are also used for gastroenteritis, gall bladder inflammation, abscesses, colic menorrhagia, and arthritis and for the treatment of snakebites. *A.* spinosus was shown to possess a very good free radical scavenging system viz. superoxide dismutase, catalase, ascorbate peroxidase, glutathione reductase and phenolic peroxidase (2).

Tridax procumbens is best known as a widespread weed and pest plant. It's common names include coat buttons and tridax daisy in English, '**vettukaaya poondu**' in Tamil. *Tridax procumbens* is known for several potential therapeutic activities like antiviral, antioxidant, wound healing, insecticidal and anti-inflammatory activity. Some reports from tribal areas in India state that the leaf juice can be used to cure fresh wounds, to stop bleeding, as a hair tonic. *Tridax procumbens*, grows primarily during rainy season (3).

Alpinia galanga, (Tamil: '**chittarattai**') a plant in the ginger family, is a herb used in cooking and medicines. It has carminative, antituberculosis and stimulant properties. *A. galanga* rhizome contains the flavonol galangin. The root contains a volatile oil, resin, galangol, kaempferid, galangin and alpinin, starch, etc. The rhizome is used against rheumatism, throat infections and to control fever (4).

Acorus calamus, commonly known as Sweet Flag or Calamus (Tamil: '**Vasambu**'). It is widely employed in modern herbal medicine due to its sedative, laxative, diuretic, and carminative properties. It is used in Ayurveda to counter the side effects of all hallucinogens. It is widely employed in modern herbal medicine as an aromatic stimulant and mild tonic. In Ayurveda it is highly valued as a rejuvenator for the brain and nervous system and as a remedy for digestive disorders. Both roots and leaves of *A. calamus* have shown antioxidant, antimicrobial and insecticidal activities (5).

Gloriosa superba also known as Glory lily (Tamil, '**Kalappai kilangu**') belongs to the family Liliaceae and is known by various vernacular names. Glory lily is among some of the modern medicine's most important plants actually facing local extinction. This plant has been a source of medicine right from the ancient time. In Ayurveda and Yunani system of medicine it is considered to be one of the reputed medicines. According to Ayurveda, tuber is useful in ulcers, gonorrhea, leprosy, piles, inflammations and abdominal pains (6).

Acalypha indica commonly known as '**Kuppaimeni**' in Tamil. This plant is held in high esteem in traditional Tamil Siddha medicine as it is believed to rejuvenate the body. It has been reported to be useful in treating pneumonia, asthma, rheumatism and several other ailments (7). The dried leaves of Acalypha indica was made into a poultice to treat bedsores and wounds and a variety of skin disorders (8).

Leucas aspera is a species within the *Leucas* genus and the Lamiaceae family. *Leucas aspera* commonly known as '**Thumbai**' in Tamil is used traditionally as an antipyretic and insecticide. Medicinally, it has been proven to possess various pharmacological activities like antifungal, antioxidant, antimicrobial, antinociceptive and also cytotoxic activity but its beneficial effects have not been much explored (9).

SL.No.	Plant name	Local name	Plant part used	Classification
1	*Amaranthus spinosus*	mulai keerai	Leaf juice	Family: Amaranthaceae Genus: Amaranthus
2	*Tridax procumbens*	vettukaaya poondu	Leaf juice	Family: Asteraceae Genus: Tridax
3	*Alpinigia galanga*	chittarattai	Rhizome, leaves	Family: Zingiberaceae Genus: Alpinia
4	*Acorus calamus*	Vasambu	Rhizome, roots	Family: Acoraceae Genus: Acorus
5	*Gloriosa superba*	kazhappai kizhangu	Roots and seeds	Family: Colchicaceae Genus: Gloriosa
6	*Acalypha indica*	Kuppaimeni	Leaves	Family: Euphorbiaceae Genus: Acalypha
7	*Leucas aspera*	Thumbai	Seeds, leaves, roots	Family: Lamiaceae Genus: Leucas

All these plants are reported to have potential antioxidant properties. Many of their antioxidant properties appear to be related not only to their ability to scavenge deleterious free radicals but also by modulating the cell signaling pathways (10). Thus the modulation of cell signaling pathways by antioxidants could help to prevent cancer by [i] preserving normal cell cycle regulation; [ii] inhibiting proliferation and inducing apoptosis; [iii] inhibiting tumor invasion and angiogenesis; [iv] suppressing inflammation; [v] stimulating phase II detoxification enzyme activity and other effects.

x. Social Relevance & Usefulness of the Project: Due to enormous chemical diversity found in the natural world, identifying active principles to cure cancer is of much importance. Today many companies have taken interest in finding new drugs by seeking new sources of plant material used by indigenous people for the treatment of cancer. Our findings could help to identify such valuable plants. The report will also help the natives to make use of these plants and decrease the risk of cancer. This could pave way for identification of potent active principles and drug leads for the treatment of cancer.