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# PHYTOCHEMICAL SCREENING AND ANTIOXIDANT POTENTIAL OF PAAVU DECOCTION OF KANYAKUMARI DISTRICT, INDIA

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## ABSTRACT

The main objective of the present investigation is to evaluate the phytochemical constituents and antioxidant potential of Siddha Cancer medicine prescribed by the Traditional Siddha Practitioner of Kanyakumari District, India. Paavu Decoction is an internal form of Breast Cancer medicine prescribed above 18 years was prepared with 21 different plant ingredients. Phytochemical analysis of the Paavu Decoction, aqueous, silver nitrate and ethanol extract revealed the presence of alkaloid, flavanoid, phenol, terpenoid, reducing sugar, tannin, steroid and glycosides except saponin constituents. The unexplored area of hydroxyl radical assay of Paavu Decoction and extracts varied from the minimum scavenging 47.59 ± 0.020 % (25µl) of ethanol extract to the maximum scavenging 81.21 ± 0.025 % (100µl) of L-ascorbic acid, DPPH radical assay varied from the minimum scavenging 44.31 ± 0.025% (25µl) of aqueous extract to the maximum scavenging 83.21 ± 0.011 % (100µl) of Paavu Decoction, nitric oxide radical scavenging varied from the minimum scavenging 37.32 ± 0.030 % (25µl) of aqueous extract to the maximum scavenging 75.26 ± 0.012 % (100µl) of Paavu Decoction, hydrogen per oxide assay varied from the minimum scavenging 42.61 ± 0.010 % (25µl) of aqueous extract to the maximum scavenging 86.31 ± 0.015 % (100µl) of Paavu Decoction and reducing power varied from the minimum scavenging 36.20 ± 0.011 % (25µl) of silver nitrate extract to the maximum scavenging 79.12 ± 0.010 % (100µl) of Paavu Decoction. The antioxidant assay of the Paavu Decoction and extracts indicated promising antioxidant

activities in concentration dependent manner. Siddha Cancer drugs highlight the effect of Paavu Decoction as a great potential source to rid Breast Cancer.

**KEYWORDS:** Paavu Decoction, phytochemical, antioxidant, Kalanchi, Cancer.

## INTRODUCTION

Siddha system is one of the pioneer systems of medicine among traditional medicine practices in India. There are many formulations prescribed by the ancient Siddhars. Unique way of prescribing medicines by this system draws attention worldwide for keen research in drugs for reverse pharmacology manner. In this modern era there are number of new drug inventions are going day by day and substituting the previous generation drugs in order to empower the health systems. But the age old systems are blended with natural principles remains unchanged. The philosophy behind this system is bound with humane and nature of the universe. In Siddha system of medicine, the line of treatment goes with single drug therapy to compound drug formulations which are prescribed in classical literature as curative ailments for many diseases.

Traditional Siddha medicine upholds balancing, uprighting and eliminating the pathogens as the main principles of treating diseases and maintaining health. Siddha Medicine stresses "prevention before diseases rather than treating diseases". The drugs prescribed by the Siddhars could be classified into three groups: *thavaram* (herbal product), *thadhu* (inorganic substances) and *jangamam* (animal products).[1] Breast cancer develops from breast tissue signs of breast cancer may include a lump in the breast, a change in breast shape, dimpling of the skin and fluid coming from the nipple or a red scaly patch of skin.[2] In those with distant spread of the disease, there may be bone pain, swollen lymph nodes and shortness of breath or yellow skin.[3] The therapeutic value of medicinal plants depends upon the presence of one or more constituents possessing certain physiological and pharmacological activity. When two or more herbs are used in formulations, they are known as polyherb. The main herbs are selected according to the disease and other herbs are used to enhance the effects of chief herb.[4]

*Tridosha* is the physiological base around which the Siddha system of medicine revolves. Three basic functions operating through a constant interplay between the environment and the individual are thought to be required to maintain the integrity of a living system. In benign neoplasm one or two of the three bodily systems are out of control and it is not too harmful to

the body as the body could overcome this condition. Malignant tumours are very harmful because all the three major humours loose mutual co-ordination and thus cannot prevent tissue proliferation resulting in deadly morbid condition. (*Vippuruthi*, *Putru*).[5] Low levels of antioxidants or inhibition of the antioxidants enzymes, cause oxidative stress and may damage or kill cells. As oxidative stress might be an important part of many human diseases, the use of antioxidants in pharmacology is intensively studied, particularly as treatments for stroke and neurodegenerative diseases. However, it is unknown whether oxidative stress is the cause or the consequence of disease.[6] Antioxidants are widely used in dietary supplements and have been investigated for the prevention of diseases. Siddha system of medicine is one of the ancient system of medicine in India was gifted by 18 siddhars said the longevity of the human was upto 100 years but nowadays it was reduced due to lifestyle modification to avoid it, we are in demand to stop oxidation stress.[7]

## MATERIALS AND METHODS

### Collection of plant materials

The plant materials were collected from unpolluted rural areas of India and other ingredients were procured from commercial Siddha raw drug store was authenticated and prepared by my Uncle (Siddha Traditional Practitioner). All the ingredients were shade dried, powdered and stored in porcelain pots. The Siddha formulation were prepared as prescribed in the written scripts, books and palm leaf parchments of my Grandpa and Forefathers - Traditional Vadiyars (Table -1).

**Table: 1 Composition of Paavu Decoction**

| S.No | Siddha Name | Scientific Name | Quantity |
|---|---|---|---|
| 1 | Seenthil | *Tinospora cordifolia* | 2 Kalanchi |
| 2 | Chukku | *Zingiber officinale* | 5 Kalanchi |
| 3 | Milagu | *Piper nigrum* | 4 Kalanchi |
| 4 | Thippili | *Piper longum* | 5 Kalanchi |
| 5 | Nellikai | *Emblica officinalis* | 3 Kalanchi |
| 6 | Kadukkai | *Terminalia chebula* | 4 Kalanchi |
| 7 | Thandrikkai | *Terminalia belerica* | 3 Kalanchi |
| 8 | Kottamalli | *Coriandrum sativum* | 4 Kalanchi |
| 9 | Seeragam | *Cuminum cyminum* | 5 Kalanchi |
| 10 | Karamjiragam | *Nigella sativa* | 4 Kalanchi |
| 11 | Sivanarvembu | *Indigofera asphalanthoides* | 4 Kalanchi |
| 12 | Chitarathai | *Alpinia speciosa* | 1 Kalanchi |
| 17 | Kodivelikizhangu | *Plumbago indica* | 2 Kalanchi |
| 18 | Veppampattai | *Azadirachta indica* | 4 Kalanchi |
| 19 | Culliver | *Anagallis arvensis* | 1 Kalanchi |

| | | | |
|---|---|---|---|
| 20 | Karunjuraiver | *Capparis sepiaria* | 4 Kalanchi |
| 21 | Suddhi Seidalingam | *Mercuric chloride* (Natural) | 3 Kalanchi |

**Preparation of Extract**

All the dried herbs were finely powdered and fresh leaves were triturated in household mortar and pestle without adding water. The powdered herbs were weighed (Kalanchi). The sampling decoction was subjected to maceration using different solvents aqueous, silver nitrate and ethanol for 48 hrs. The extracts were filtered and steam boiled for further studies.

**Phytochemical Analysis and antioxidation assay of Paavu Decoction**

The phytochemical analysis of Paavu decoction, aqueous, silver nitrate and chloroform extract of siddha medicine were carried out to analyse the presence of alkaloid, flavanoid, phenol, terpenoid, saponin, reducing sugar, tannin, steroid and glycosides [8 & 9]. Antioxidation assay of hydroxyl, DPPH, nitric oxide, hydrogen per oxide and reducing power activity.[10, 11 & 12]

**RESULT**

**Qualitative Analysis**

The qualitative analysis of Siddha Paavu Decoction (Kashayam) revealed the presence of alkaloid, flavanoid, phenol, terpenoid, reducing sugar, tannin, steroid and glycosides except saponin. On the other hand, aqueous extract revealed the presence of alkaloid, tannin and steroid whereas, the absence of flavanoid, saponin, phenol, terpenoid, reducing sugar and glycosides. Meanwhile, ethanol extract revealed the presence of alkaloid, terpenoid, tannin, steroid and glycosides whereas, the absence of flavanoid, saponin, phenol and reducing sugar. However, silver nitrate extract revealed the presence of alkaloid, phenol, terpenoid, tannin, steroid and glycoside whereas, the absence of flavanoid, saponin and reducing sugar (Table:2).

**Table: 2 Qualitative Analysis of Paavu Decoction and extracts**

| S.No | Phytochemicals | Decoction | Aqueous | Ethanol | Silver nitrate |
|---|---|---|---|---|---|
| 1 | Alkaloid | + | + | + | + |
| 2 | Flavanoid | + | - | - | - |
| 3 | Saponin | - | - | - | - |
| 4 | Phenol | + | - | - | + |
| 5 | Terpenoid | + | - | + | + |
| 6 | Reducing Sugar | + | - | - | - |
| 7 | Tannin | + | + | + | + |
| 8 | Steroid | + | + | + | + |
| 9 | Glycoside | + | - | + | + |

+ Presence - Absence

**Quantitative Analysis**

The quantitative analysis of the Paavu Decoction revealed the phytochemical constituents of alkaloid 3.13 ± 0.001 ml/l; flavanoid 2.611 ± 0.002 ml/l; phenol 1.006 ± 0.001 ml/l; terpenoid 2.111 ± 0.001 ml/l; reducing sugar 1.791 ± 0.000 ml/l; tannin 1.963 ± 0.001 ml/l; steroid 2.537 ± 0.000 ml/l and glycosides 1.968 ± 0.001 ml/l. On the other hand, aqueous extracts of the decoction showed the phytochemical constituents of alkaloid 0.916 ± 0.000 ml/l; tannin 0.415 ± 0.001 ml/l and steroid 1.052 ± 0.000 ml/l; ethanolic extract of alkaloid 2.500 ± 0.000ml/l; terpenoid 1.998 ± 0.000 ml/l; tannin 2.124 ± 0.001 ml/l; steroid 1.975 ± 0.001 ml/l and glycosides 2.500 ± 0.000 ml/l and silver nitrate extract of alkaloid 2.500 ± 0.000 ml/l; phenol 1.823 ± 0.002 ml/l; terpenoid 2.371 ± 0.002 ml/l; tannin 1.261± 0.000 ml/l; steroid 2.962 ±0.000 ml/l and glycosides 2.217 ± 0.001 ml/l.

**Antioxidation**

**Assay**

**Hydroxyl radical scavenging**

Hydroxyl radical scavenging of the Paavu Decoction varied from the minimum of 57.26 ± 0.011 % (25µl) to the maximum of 81.06 ± 0.020 % (100µl). On the other hand, aqueous extract of the decoction varied from the minimum scavenging of 59.20 ± 0.011 % (25µl) to the maximum scavenging of 75.07 ± 0.010 % (100µl). Meanwhile, ethanolic extract of the decoction varied from the minimum scavenging of 47.59 ± 0.020 % (25µl) to the maximum scavenging of 71.07 ± 0.010 % (100µl). The silver nitrate extract of the decoction varied from the minimum scavenging of 59.25 ± 0.011 % (25µl) to the maximum scavenging of 77.26 ± 0.011 % (100µl). The antioxidant potential of standard antioxidant L-ascorbic acid varied from the minimum scavenging of 57.25 ± 0.020 % (25µl) to the maximum scavenging of 81.21 ± 0.025 % (100µl). In general, hydroxyl radical scavenging of the Paavu Decoction and extracts varied from the minimum scavenging 47.59 ± 0.020 % (25µl) of ethanol extract to the maximum scavenging 81.21 ± 0.025 % (100µl) of L-ascorbic acid (Table: 3).

**Table: 3 Hydroxyl Radical Scavenging of Paavu Decoction and Extracts**

| Concentration of medicine and extracts | Paavu Decoction | Aqueous Extract | Ethanol Extract | Silver nitrate (Nanoparticle) | L-Ascorbic acid (Standard) |
|---|---|---|---|---|---|
| 25µl | 57.26 ± 0.011 | 59.20 ±0.011 | 47.59 ±0.020 | 59.25 ± 0.011 | 57.25 ± 0.020 |
| 50µl | 66.50 ± 0.015 | 67.37 ±0.010 | 51.77 ±0.025 | 66.19 ± 0.015 | 67.41 ± 0.010 |
| 75µl | 74.69 ± 0.010 | 71.29 ± 0.010 | 66.27 ± 0.011 | 71.69 ± 0.011 | 73.99 ± 0.011 |
| 100µl | 81.06 ± 0.020 | 75.07 ±0.010 | 71.07 ±0.010 | 77.26 ± 0.011 | 81.21 ± 0.025 |

**DPPH radical scavenging**

DPPH radical scavenging assay of the Paavu Decoction varied from the minimum of 59.71 ± 0.005 % (25µl) to the maximum of 83.21 ± 0.011 % (100µl). On the other hand, aqueous extract of the decoction varied from the minimum scavenging of 44.31 ± 0.025 % (25µl) to the maximum scavenging of 59.62 ± 0.010 % (100µl). Meanwhile, ethanolic extract of the decoction varied from the minimum scavenging of 54.23 ± 0.011 % (25µl) to the maximum scavenging of 77.69 ± 0.011 % (100µl). The silver nitrate extract of the decoction varied from the minimum scavenging of 57.23 ± 0.030 % (25µl) to the maximum scavenging of 79.62 ± 0.011 % (100µl). The antioxidant potential of standard antioxidant L-ascorbic acid varied from the minimum scavenging of 49.63 ± 0.000 % (25µl) to the maximum scavenging of 79.73 ± 0.010 % (100µl). In general, DPPH scavenging of the Paavu Decoction and extracts varied from the minimum scavenging 44.31 ± 0.025% (25µl) of aqueous extract to the maximum scavenging 83.21 ± 0.011 % (100µl) of Paavu Decoction (Table: 4).

**Table: 4 DPPH Radical Scavenging of Paavu Decoction and Extracts**

| Concentration of medicine and extracts | Paavu Decoction | Aqueous Extract | Ethanol Extract | Silver nitrate (Nanoparticle) | L-Ascorbic acid (Standard) |
|---|---|---|---|---|---|
| 25µl | 59.71 ± 0.005 | 44.31 ±0.025 | 54.23 ±0.011 | 57.23 ±0.030 | 49.63 ±0.000 |
| 50µl | 67.22±0.015 | 46.26 ±0.020 | 67.61 ±0.010 | 68.09 ±0.020 | 57.74 ±0.000 |
| 75µl | 79.62 ±0.020 | 51.69 ±0.005 | 72.67 ±0.011 | 73.96 ±0.011 | 69.21 ±0.015 |
| 100µl | 83.21 ±0.011 | 59.62 ±0.010 | 77.69 ±0.011 | 79.62 ±0.011 | 79.73 ±0.010 |

**Nitric Oxide Radical Scavenging**

In general, nitric oxide radical scavenging of the Paavu Decoction and extracts varied from the minimum scavenging 37.32 ± 0.030 % (25µl) of aqueous extract to the maximum scavenging 75.26 ± 0.012 % (100µl) of Paavu Decoction (Table: 5). of the Paavu Decoction varied from the minimum of 46.12 ± 0.005 % (25µl) to the maximum of 75.26 ± 0.012 % (100µl). On the other hand, aqueous extract of the decoction varied from the minimum scavenging of 37.32 ± 0.030 % (25µl) to the maximum scavenging of 62.04 ± 0.037 % (100µl). Meanwhile, ethanolic extract of the decoction varied from the minimum scavenging of 49.20 ± 0.010 % (25µl) to the maximum scavenging of 63.76 ± 0.005 % (100µl). The silver nitrate extract of the decoction varied from the minimum scavenging of 54.26 ± 0.015 % (25µl) to the maximum scavenging of 66.23 ± 0.011 % (100µl). The antioxidant potential of standard antioxidant Gallic acid varied from the minimum scavenging of 49.19 ± 0.000 % (25µl) to the maximum scavenging of 71.94 ± 0.030 % (100µl). In general, nitric oxide radical scavenging of the Paavu Decoction and extracts varied from the minimum scavenging

37.32 ± 0.030 % (25µl) of aqueous extract to the maximum scavenging 75.26 ± 0.012 % (100µl) of Paavu Decoction (Table: 5).

**Table: 5 Nitric Oxide Radical Scavenging of Paavu Decoction and Extracts**

| Concentration of medicine and extracts | Paavu Decoction | Aqueous Extract | Ethanol Extract | Silver nitrate (Nanoparticle) | Gallic acid (Standard) |
|---|---|---|---|---|---|
| 25µl | 46.12 ± 0.005 | 37.32 ±0.030 | 49.20 ±0.010 | 54.26 ±0.015 | 49.19 ±0.000 |
| 50µl | 56.31 ± 0.020 | 44.71 ±0.020 | 55.76 ±0.015 | 57.39 ±0.015 | 54.71 ±0.025 |
| 75µl | 67.23 ±0.020 | 57.61 ±0.020 | 59.62 ±0.000 | 64.62 ±0.011 | 66.33 ±0.000 |
| 100µl | 75.26 ±0.012 | 62.04 ±0.037 | 63.76 ±0.005 | 66.23 ±0.011 | 71.94 ±0.030 |

**Hydrogen per oxide Scavenging**

Hydrogen per oxide radical scavenging assay of the Paavu Decoction varied from the minimum of 69.32 ± 0.010 % (25µl) to the maximum of 86.31 ± 0.015 % (100µl). On the other hand, aqueous extract of the decoction varied from the minimum scavenging of 42.61 ± 0.010 % (25µl) to the maximum scavenging of 69.07 ± 0.020 % (100µl). Meanwhile, ethanolic extract of the decoction varied from the minimum scavenging of 45.62 ± 0.010 % (25µl) to the maximum scavenging of 73.13 ± 0.011 % (100µl). The silver nitrate extract of the decoction varied from the minimum scavenging of 56.31 ± 0.011 % (25µl) to the maximum scavenging of 68.67 ± 0.020 % (100µl). The antioxidant potential of standard antioxidant L-ascorbic acid varied from the minimum scavenging of 58.47 ± 0.015 % (25µl) to the maximum scavenging of 85.21 ± 0.000 % (100µl). In general, hydrogen per oxide scavenging of the Paavu Decoction and extracts varied from the minimum scavenging 42.61 ± 0.010 % (25µl) of aqueous extract to the maximum scavenging 86.31 ± 0.015 % (100µl) of Paavu Decoction (Table: 6).

**Table: 6 Hydrogen peroxide Radical Scavenging of Paavu Decoction and Extracts**

| Concentration of medicine and extracts | Paavu Decoction | Aqueous Extract | Ethanol Extract | Silver nitrate (Nanoparticle) | L-Ascorbic acid (Standard) |
|---|---|---|---|---|---|
| 25µl | 69.32 ± 0.010 | 42.61 ±0.010 | 45.62 ±0.010 | 56.31 ±0.011 | 58.47 ±0.015 |
| 50µl | 76.29 ±0.010 | 55.72 ±0.005 | 57.29 ±0.020 | 59.26 ±0.005 | 67.33 ±0.020 |
| 75µl | 81.62 ±0.011 | 64.07 ±0.015 | 64.67 ±0.011 | 63.35 ±0.015 | 74.66 ±0.020 |
| 100µl | 86.31 ±0.015 | 69.07 ±0.020 | 73.13 ±0.011 | 68.67 ±0.020 | 85.21 ±0.000 |

**Reducing Power Activity**

Reducing Power activity of the Paavu Decoction varied from the minimum scavenging of 54.72 ± 0.011 % (25µl) to the maximum scavenging of 79.12 ± 0.010 % (100µl). On the other hand, aqueous extract of the decoction varied from the minimum scavenging of 39.00 ± 0.000 % (25µl) to the maximum scavenging of 61.72 ± 0.010 % (100µl). Meanwhile,

ethanolic extract of the decoction varied from the minimum scavenging of 42.36 ± 0.000 % (25µl) to the maximum scavenging of 63.10 ± 0.015 % (100µl). The silver nitrate extract of the decoction varied from the minimum scavenging of 36.20 ± 0.011 % (25µl) to the maximum scavenging of 64.97 ± 0.005 % (100µl). Reducing power activity of the standard antioxidant (Vitamin-C) varied from the minimum scavenging of 51.97 ± 0.005 % (25µl) to the maximum scavenging of 75.94 ± 0.010 % (100µl). In general, reducing power activity of the Paavu Decoction and extracts varied from the minimum scavenging 36.20 ± 0.011 % (25µl) of silver nitrate extract to the maximum scavenging 79.12 ± 0.010 % (100µl) of Paavu Decoction (Table: 7).

**Table: 7 Reducing Power Activity of Paavu Decoction and Extracts**

| Concentration of medicine and extracts | Paavu Decoction | Aqueous Extract | Ethanol Extract | Silver nitrate (Nanoparticle) | Vitamin – C (Standard) |
|---|---|---|---|---|---|
| 25µl | 54.72 ± 0.011 | 39.00 ±0.000 | 42.36 ±0.000 | 36.20 ±0.011 | 51.97 ±0.005 |
| 50µl | 63.93 ±0.020 | 47.20 ±0.011 | 46.27 ±0.010 | 47.09 ±0.020 | 63.21 ±0.011 |
| 75µl | 74.10 ±0.005 | 56.39 ±0.011 | 57.93 ±0.010 | 56.31 ±0.005 | 71.73 ±0.011 |
| 100µl | 79.12 ±0.010 | 61.72 ±0.010 | 63.10 ±0.015 | 64.97 ±0.005 | 75.94 ±0.010 |

## CONCLUSION

It is obvious that the plant kingdom offers a better prospect of providing useful medicinal compounds for the treatment of numerous challenging diseases. The polyherbal formulation of Paavu Decoction was evaluated for the phytochemical and antioxidation activity. The presence of secondary metabolites showed that the Paavu Decoction was found to be an effective antioxidant, when it is compared to standard antioxidant compounds (Ascorbic acid, Gallic acid and Vitamin C).

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