ABSTRACT

Among the traditional systems of medicine, Siddha medicine finds a significant place in the health care system of South India, Sri Lanka and Malaysia. Siddha system of medicine assures cure in certain disease conditions that are found to be complicated to treat by contemporary medical systems. Fibroid uterus, which is a pressing concern for many Indian women, can be well managed with Siddha regime according to various traditional literatures whereas contemporary solution provides mostly surgical intervention. Fibroids are benign growth present in about 30% of women over the age of 30. Literary review reveals that a classical Siddha formulation - Rasaganthi Mezhugu mentioned in Siddha literature Pulippani Vaithiyam- 500, is indicated for the management of Vippuruthi. The treatment aims at relieving the symptoms and disappearance or reducing the size of fibroid. To prove the efficacy of Rasaganthi Mezhugu, this review has been done and it includes published articles on clinical trials and pharmacological studies on Rasaganthi Mezhugu and some of the herbal ingredients in Rasaganthi Mezhugu. A review on the herbal ingredients used in Rasaganthi Mezhugu reveals their anti-tumour, anticancer, antioxidant and immuno-modulatory properties. This review on ingredients of Rasaganthi Mezhugu reveals the authenticity of traditional formulations and proves the synergistic effect of its ingredients.

KEY WORDS: Herbal ingredients, Fibroid uterus, Rasaganthi Mezhugu, Siddha Medicine
INTRODUCTION
Among the Traditional systems of medicine, Siddha Medicine finds a significant place in the health care system of South India, Sri Lanka and Malaysia. Siddha system of medicine assures cure in certain disease conditions that are found to be complicated to treat by contemporary medical systems. Fibroid uterus, which is a pressing concern for many Indian women, can be well managed with Siddha regime according to various traditional literatures whereas contemporary solution provides mostly surgical intervention. The clinical features of fibroid uterus are well correlated to those of Karppa Vippuruthi as described by the great Siddhar Yugi, in his text Vaidya Chinthamani. In Siddha clinical practice, this entity is commonly known as Karuppai Sathai Kattigal.

Fibroid is defined as a benign tumour derived from smooth muscle tissue or a lump of muscle tissue that grows in the wall of the uterus in some women. Fibroids are benign growth present in about 30% of women over the age of 30. There may be a single fibroid or multiple fibroids of varying size. The symptoms like abdominal distention, lower abdominal pain, weight loss, proliferation of uterine tissue with blood clots which gives a mass like structure and produce symptoms similar to rolling of foetus during pregnancy, constipation, headache and ulceration of the uterus occur in Karppa Vippuruthi which resemble those of fibroid uterus.

Vippuruthi may be described as tumour characterized by the formation of connective tissue connecting the epithelial cells. To be more specific, Vippuruthi pertaining to uterus is known as Karppa Vippuruthi. In allopathy medicine hormonal therapy is the only choice and apart from that surgery is the ultimate remedy for the removal of fibroid. Myomectomy removes only the fibroids and leaves the healthy areas of the uterus intact that too if the fibroid is small and single. As a last resort, hysterectomy is done when the fibroid is big in size and multiple. But Rasaganthi Mezhugu, a traditional compound formulation consisting of 48 ingredients of herbal, metal, mineral and animal origin is indicated in treating such fibroids. In order to avoid the surgical risks and to improve the patients’ Quality of Life (QoL) and to reduce the cost of the treatment, the classical preparation Rasaganthi Mezhugu, has been selected and it is in practice for many centuries. To prove the efficacy of Rasaganthi Mezhugu this review has been done and it includes published articles on clinical trials and pharmacological studies on Rasaganthi Mezhugu and some of the herbal ingredients in Rasaganthi Mezhugu.

BACKGROUND
Fibroid is derived from smooth muscle cells which rest either from vessel wall or uterine musculature, common during child bearing years (30 - 45 years). Fibroids are also called myomas, leiomyomas and fibromas. The cause of the fibroid is not exactly known. Fibroid is rarely found before puberty and they generally cease to grow after menopause. Women who are overweight or obese for their height or if their menarche began before the age of ten
are at greater risk and women who have given birth are at lower risk. Once a fibroid starts growing it seems to be linked to the hormone estrogen. The hormone progesterone may also promote fibroid growth\(^2\). On the basis of the fact that uterine leiomyomas develop only after menarche and markedly shrink under hypoestrogenic conditions such as late menopause, it is presumed that their growth depends on estrogens\(^2\). The physiological effects of estrogen are mediated by estrogen receptors (ERs). Among them, ER-\(\alpha\) is more highly expressed in uterine leiomyomas than in normal myometrium suggesting a possible link between uterine leiomyomas and ER-\(\alpha\) expression level\(^9\). Uterine fibroid growths are classified by the location in which they are found in the uterus. Myometrial fibroids are found along the wall of the uterus\(^5\). Sub mucosal fibroids develop under the interior surface of the uterus. Sub serosal fibroids grow on the outside wall of the uterus. Pedunculated fibroids are generally seen growing outside of the uterus\(^2\). The majority of the women with fibroids do not have symptoms. The symptoms depend on how large a fibroid is, its location and whether it is bleeding or pressing on an internal organ. The symptoms are low back pain, dysmenorrhea, excessive menstrual bleeding and pelvic pain, feeling full in the lower abdomen, frequent urination, pain during sex, infertility etc. Uterine fibroid can be more significantly detected through Trans-vaginal ultrasound technology\(^10\). Apart from myomectomy and hysterectomy, recently a non surgical option of uterine artery embolization (UAE) is available. In this procedure, the blood supply to the uterus and fibroids are cut off making the fibroid to shrink\(^11\). Magnetic resonance guided focused ultrasound surgery is the newest treatment for fibroid in women wishing to pursue pregnancy in future\(^12\).

Though above said many modern solutions available for the management of fibroids, it’s really a question of affordability and accessibility for a common Indian woman. It’s really need of the hour to explore the possibility of traditional claims in this arena. Rasaganthi Mezhugu, a herbo mineral formulation is one such common cost effective Siddha medicare for Karppa Vippuruthi.

Since the above mentioned treatments are expensive compared to the use of traditional medicines like Rasaganthi Mezhugu, it is highly essential to explore and validate more traditional formulations.

**RATIONALE BEHIND SELECTING RASAGANTHI MEZHUGU**

Rasaganthi Mezhugu is a traditional drug indicated for various ailments. In clinical practice, many practitioners have successfully observed the shrinkage of fibroid after the administration of Rasaganthi Mezhugu. Rasaganthi Mezhugu (RGM) is included in “The Siddha Formulary of India”, Part-I (English), 1992, which is enlisted under Drugs and Cosmetics Act, 1940\(^13\).

Many works had been done with Rasagandhi Mezhugu, for various ailments, biochemically, pharmacologically and clinically. The bio-safety of the Rasagandhi Mezhugu, were established in various research works in different centers. Based on the possible therapeutic efficacies, Siddha text references, experiences from many traditional Siddha practitioners\(^7\) made a three-drug Siddha regimen (RAN - Rasaganthi mezhugu,
Amukkara chooramam and Nellikkai lehyam) which has been approved by the Government of India for treatment of HIV in conjunction with allopathic treatments during the major quest for the management of pandemic. Rasaganthi Mezhugu is the chief constituent of that RAN therapy (Rasaganthi mezhugu, Amukkara mathirai, Nellikkai ilakam) and was proved effective in many HIV patients in the Government Hospital for Thoracic Medicine (GHTM), Tambaram Sanatorium, Chennai, Tamilnadu. A recently published paper entitled “Toxicity Studies of Siddha Medicine– Rasaganthi Mezhugu” reveals that administration of RGM for one year in HIV patients, and the authors found RGM didn’t alter the hematological and serum parameters and also in the Hepatic and Renal function parameters.

In Animal studies of Rasagandhi Mezhugu, the authors inferred that Rasagandhi Mezhugu has not produced any significant organ or hematologic toxicity. In the acute and chronic toxicity studies, the Rasagandhi Mezhugu did not produce any mortality or adverse reaction in rats. All parameters obtained from the blood and serum was in normal range indicating that Rasagandhi Mezhugu did not show any noticeable toxic changes. Another publication reveals the possible potential of Rasaganthi Mezhugu as alternative medicine for prostatic cancer and also a sensitizing agent in the context of radiation therapy for prostate cancer as a complementary medicine.

Rasaganthi Mezhugu is a compound formulation of 48 ingredients of herbal, metal, mineral and animal origin. All the ingredients are subjected to specific standard operating procedure (SOP) of detoxification. Likewise the toxicities of metals, minerals are nullified by the active principles of the herbs. Curcumin pre - treatment has shown a protective effect against intoxication of mercury. An observable regression on the severity such as haemorrhage, hepatocyte degeneration and tubular degeneration of kidney was observed in mercury - treated mice supplement with different doses of lycopene. These appreciable observations, signifies Siddha preparations, having metals and minerals with several herbs in its process and as ingredients might have reduced the toxicity or even nullify.

This study brings up scientific evidence for the efficacy of RGM against the HPV-mediated cervical cancer cells and, if the toxic heavy metals are the limitation in its use, RGM would be a suitable candidate as evidence-based complementary and alternative medicine for HPV-positive cervical cancers.

Rasaganthi Mezhugu presents a strong case for synergism as well as additivism of the multiplicity of compounds from the 38 herbs, most of which have been scientifically proven as associated with one or more aspects of interference with cancer. A review on the herbal ingredients used in Rasaganthi Mezhugu reveals their anti tumour, anticancer, antioxidant, detoxification and immunomodulatory properties. Specifically, the following medicinal plants possess one or more of these property / properties.

**REVIEW OF SINGLE DRUGS OF RASAGANTHI MEZHUGU**

To understand the efficacy, the herbal ingredients of Rasaganthi Mezhugu are reviewed for their pharmacological activities and therapeutic uses related
effects. Review of Siddha literatures and published articles on the herbal drugs used in Rasaganthi Mezhugu was done using the database of Science Direct website, Pubmed and tabulated in Table No.1.

Ginger may act as an anti-cancer and anti-inflammatory agent by inactivating NF kappa B through the suppression of the pro-inflammatory TNF-alpha. Trachyspermum ammi showed good anthelmintic activity against Indian earth worm. The study states that the active constituent was found to be Curcumin which showed cytotoxicity to lymphocytes and Dalton’s lymphoma cells at a concentration of 4 µg/ml. Initial experiments indicated that turmeric extract and curcumin reduced the development of animal tumours.

Administration of alcoholic extract of Piper longum (10 mg / dose/animal) as well as piperine (1.14 mg/dose/animal) could inhibit the solid tumour development in mice induced with DLA cells and increase the life span of mice bearing Ehrlich ascites carcinoma tumour to 37.3 and 58.8% respectively, in Balb/c mice.

The study reveals that the aqueous extract of Celastrus paniculatus seed has cognitive enhancing properties and antioxidant effect might be involved. Fennel seed methanol extract (FSME) exhibited an anti tumour effect by modulating lipid peroxidation and augmenting the antioxidant defense system in EAC bearing mice with or without exposure to radiation. The study revealed vital information about the poly-pharmacological anti-tumor mode-of action of essential oils in cardamom.

Supplementation with Cuminum cyminum to diabetic rats significantly reduced the fatty changes and inflammatory cell infiltrates. The present review is an attempt to highlight the bioenhancing ability of piperine when it is given along with various drugs and nutrients.

Myristica seed extracts feeding also prevented the accumulation of cholesterol, phospholipids and triglycerides in liver, heart and aorta and dissolved atheromatous plaques of aorta by 70.9-76.5%. Faecal excretion of cholesterol and phospholipids were significantly increased in seed extracts fed rabbits. Topical application of 100 mg/kg body weight of the active fraction (AF) of Psoralea corylifolia seeds inhibited the growth and delayed the onset of papilloma formation in mice, initiated with 7, 12-dimethyl benz(a) anthracene and promoted using croton oil.

Methanol extract of galls of Quercus infectoria was found to possess antibacterial property against Enterococcus faecalis. The study aimed to evaluate the anxiolytic activity of embelin that was isolated from Embelia ribes. On the basis of result, embelin showed its anxiolytic effect in
In the isolated rabbit jejunum preparation the crude extract of Acorus calamus (Ac.Cr), which tested positive for the presence of alkaloid, saponins and tannins, caused inhibition of spontaneous and high K+ (80 mm)-induced contractions, with respective EC50 values of 0.42 ± 0.06 and 0.13 ± 0.04 mg/mL (mean ± SEM; n = 6–8), thus showing spasmylytic activity, mediated possibly through calcium channel blockade (CCB). Cytotoxic, antioxidant and antibacterial activities of these compounds have been evaluated by MTT, DPPH, agar disc diffusion and agar dilution assays respectively. These new compounds showed high cytotoxic effect against K562, jurkat and T47D cell lines.

The results suggest that the ethyl acetate and Methanol extracts of Smilax chinensis L. possesses analgesic and anti inflammatory activities. SA-3C isolated from the kernel of Semicarpus anacardium is cytotoxic with tumor cell lines with IC50 values lower than doxorubicin and even multidrug resistant tumor cell lines were equally sensitive to SA-3C. SA-3C isolated from the kernel of Semicarpus anacardium and it can be developed as an important anti cancer therapy.

The results showed that all tested extracts and pure compounds of Terminalia chebula exhibited antioxidant activity at different magnitudes of potency. It is evident that Nigella sativa provides an important source of antioxidants. The study suggest that the ethanol extract of Nigella sativa seeds can generate antioxidants possess antitumour activity and ameliorate and prolong the lifespan of mice bearing EAT. It was found that V. anthelmintica seeds possess antihelminthic activity against nematodes.

The alcohol extract (50,100 and 200 mg / kg, P.O) of Clerodendron serratum produced a significant antinociceptive, anti inflammatory and anti pyretic activities in animal models. Docetaxel, a semisynthetic analog of paclitaxel, made from the needles of the European Yew, Taxus baccata, is a potentially important chemotherapeutic agent for the treatment of cancer. Results show Docetaxel is a very active drug against breast cancer. Histopathological studies of the liver of different groups also support the protective effects exhibited by the methanol extract of grape pomace (Vitis vinifera) by restoring the normal hepatic architecture.

To screen the anti tumour effects of the four alkaloids: brucine, Strychnine, brucine N-oxide and isostrychnine from the seed of Strychnos nux-vomica. This paper indicates that the major alkaloids present in the seeds of Strychnos nux-vomica are effective against HepG2 cells proliferation, among which brucine proceed HepG2 cells death via apoptosis, probably through the participation of caspase -3 and cyclo - oxygenase-2. The diuretic effect was comparable with that of the standard drug Furosemide. The increase of cations in the urine on treatment with Strychnos potatorum seed extract (SPSE) was dose-dependent. This effect supports the use of the Strychnos potatorum seeds as a diuretic in folk remedies.

Assimilation of the quantitative foci data together with the findings of the modulation of tumor promoting markers give ample evidence to the anti-tumor promoting potential of A. longifolia seeds against chemically induced hepatocarcinogenesis in Wistar rats. An ethanol extract of Asteracantha longifolia
effectively restored the hematological parameters, serum iron and serum protein and normalized the microcytic, anisocytosis and hypochromic RBC’s. Sesamol is the main anti-oxidative constituent contained mainly in the processed sesame seed oil which has not been explored scientifically for its wound healing activity. The present results demonstrate D. biflorus seeds as a potential source of natural anti oxidant. The coconut extract gave a dose dependent reduction in the haemolysis induced by distilled water. This suggests that the extract at low doses has potential anti inflammatory and anti ulcerogenic effects.

The Methanol extract of the leaves of Acalypha fruticosa was evaluated for its anti tumour activity against Ehrlich’s Ascites carcinoma (Eac) bearing swiss albino mice. The result indicates that the MEAF exhibited significant anti oxidant and anti tumour activity. The aim of the present study was to evaluate the anti oxidant, free radical scavenging and liver protective effects of friedelin isolated from Azima tetracantha Lam. Withania somnifera has been used to stabilize mood in patients with behavioral disturbances and this investigations support the use of Withania somnifera as a mood stabilizer in clinical conditions of anxiety and depression. Withania somnifera is a known immunomodulator in indigenous medicine and the current experimental work deals with the immunomodulatory studies in the extract of Withania somnifera root powder against benzo (a) pyrene induced lung cancer in male Swiss albino mice. The anti-stressor properties of Withania somnifera have been investigated and the results indicate that the drug treated animals show better stress tolerance. The ethanolic extract of tuber of C. epigaeus was given at different doses, such as 200 and 400 mg/kg body weight for each group and the studies were compared with a standard drug indomethacin (10 mg/kg body weight). Ethanol extract inhibited significant anti inflammatory activity. Plumbagin exerted anticancer activity on NSCLC cells by modulating the pro-survival and pro-apoptotic signaling that causes induction of apoptosis.

DISCUSSION

The various above inferences strongly warrant about the possible efficacy of Rasaganthi Mezhugu in fibroid uterus. The specialty and peculiarity of Siddha regime is synergy. Multiple modulators working towards multiple targets are the bottom line of Siddha therapeutics. The various presumptions achieved in various studies both as single ingredients and as Rasaganthi Mezhugu, certainly show a ray of hope for the regime for fibroid. The anti inflammatory, anti tumor, anti oxidant, anxiolytic and analgesic actions of various ingredients’ and biosafety results of Rasaganthi Mezhugu in chronic studies adding up the probability towards the rationality. Fibroid uterus needs such regime only. The study not only indicate the definite probability of Rasaganthi Mezhugu but also open up many pathways for developing new regime of molecules for many other ailments, having similar or nearby path physiologies.

CONCLUSION

Rasaganthi Mezhugu though a widely used Siddha formulation, remains to be dubious among researchers regarding its safety in...
human population. The basis of selective ingredients in a traditional formulation is still debatable. Though Mercury and other inorganic drugs are used in Rasaganthi Mezhugu, its extensive usage in practice and earlier peer reviewed researches proves its safety. Moreover the drugs of plant origin used in Rasaganthi Mezhugu are found to be scientifically proven for their efficacy in treating tumors, both benign and malignant. Still, the safety and efficacy studies of Rasaganthi Mezhugu, in large number of patients are much needed to substantiate the traditional claim. Siddha system of medicine, one of the oldest traditional systems, contains numerous collections of herbal / herbo-mineral formulations. These formulations are found to be time tested but require proof for its rationality in this contemporary world. This review is an attempt with scientific and analytical eyes on ingredients of Rasaganthi Mezhugu, reveals the strong possibility of its action against fibroid uterus with the synergistic effect of its ingredients. A detailed dispassionate clinical study and standardization of Rasaganthi Mezhugu, are certainly needed to go beyond.

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Table 1: Comparison of traditional and evidence based pharmacological activities of medicinal raw drugs used in RGM

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Name of the Ingredient</th>
<th>Part used</th>
<th>Chemical constituents</th>
<th>Pharmacological action and therapeutic uses: Siddha</th>
<th>Pharmacological action (Evidence based)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cukku – Zingiber officinale Rosc.</td>
<td>Rhizome</td>
<td>Curcumin, Gingerol, Zingerone, 6 gingesulphonic acid etc</td>
<td>Stimulant(^{19}) Carminative(^{19})</td>
<td>Anti cancer(^{20}) Anti-inflammatory(^{20})</td>
</tr>
<tr>
<td>2.</td>
<td>Ōmam - Trachyspermum ammi L. Sprague</td>
<td>Fruit</td>
<td>Camphene, Carvacrol,</td>
<td>Carminative(^{19})</td>
<td>Anthelmintic(^{21})</td>
</tr>
<tr>
<td>3.</td>
<td>Mañcal – Curcuma longa L.</td>
<td>Rhizome</td>
<td>Curcumin, Desmethoxy-curcumin, Dihydrocumcurcin B turmerone, ukonan A,B,C&amp;D phytosterols</td>
<td>Carminative(^{19}) Stimulant(^{19})</td>
<td>Antitumor(^{22})</td>
</tr>
<tr>
<td>4.</td>
<td>Tippili – Piper longum L.</td>
<td>Fruit</td>
<td>Piper longumine, Longuminine, n-hepatadecane, Zingiberene, Piperine, Sesamin, Pipernonaline, Sylvatin</td>
<td>Stimulant(^{19}) Carminative(^{19}) Diuretic(^{19})</td>
<td>Antitumor(^{23})</td>
</tr>
<tr>
<td>5.</td>
<td>Arattai - Alpinia officinarum Hance</td>
<td>Rhizome</td>
<td>Galangin</td>
<td>Febrifuge(^{19})</td>
<td>Anti inflammatory(^{24})</td>
</tr>
<tr>
<td>6.</td>
<td>Kōstam - Saussurea costus (Falc.) Lipsch.</td>
<td>Root</td>
<td>Alantolactone, Costunolide, Kushin, Saussureal choleamine, Inulin</td>
<td>Stimulant(^{19})</td>
<td>Anxiolytic(^{25})</td>
</tr>
<tr>
<td>7.</td>
<td>Vāluluvai – Celastrus paniculatus Willd.</td>
<td>Seed</td>
<td>Celapagine, Celastrol, Paniculatin, 5-stigmasten-3-β-ol</td>
<td>Stimulant(^{19}) Alterative(^{19})</td>
<td>Antioxidant(^{26})</td>
</tr>
<tr>
<td>No.</td>
<td>Plant Name</td>
<td>Part</td>
<td>Active Constituents</td>
<td>Medicinal Properties</td>
<td></td>
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<tr>
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</tr>
<tr>
<td>8</td>
<td>Cōmpu - Foeniculum vulgare Mill.</td>
<td>Fruit</td>
<td>Vit.C, Anisaldehyde, Foeniculin, stigmasterol</td>
<td>Carminative&lt;sup&gt;19&lt;/sup&gt;</td>
<td>Antitumor&lt;sup&gt;27&lt;/sup&gt;</td>
</tr>
<tr>
<td>9</td>
<td>Ėlam - Elettaria cardamomum (L.) Maton</td>
<td>Seed</td>
<td>Pinene, Geraniol, Terpine, Humulene</td>
<td>Stimulant&lt;sup&gt;19&lt;/sup&gt; Carminative&lt;sup&gt;19&lt;/sup&gt;</td>
<td>Antitumor&lt;sup&gt;28&lt;/sup&gt;</td>
</tr>
<tr>
<td>10</td>
<td>Cirakam - Cuminum cyminum L.</td>
<td>Fruit</td>
<td>Cuminaldehyde, cumin, β-Pinene, Glycosides of luteolin and apigenin</td>
<td>Carminative&lt;sup&gt;19&lt;/sup&gt; Stimulant&lt;sup&gt;19&lt;/sup&gt; Astringent&lt;sup&gt;19&lt;/sup&gt;</td>
<td>Anti inflammatory&lt;sup&gt;29&lt;/sup&gt;</td>
</tr>
<tr>
<td>11</td>
<td>Miḷaku - Piper nigrum L.</td>
<td>Fruit</td>
<td>Pipercide, Guineensine, Pellitornine, Piperonal, Piperin</td>
<td>Carminative&lt;sup&gt;19&lt;/sup&gt; Stimulant&lt;sup&gt;19&lt;/sup&gt; Resolvan&lt;sup&gt;19&lt;/sup&gt; Antivata&lt;sup&gt;30&lt;/sup&gt;</td>
<td>Bioavailability enhancer&lt;sup&gt;30&lt;/sup&gt;</td>
</tr>
<tr>
<td>12</td>
<td>Cātikkāi – Myristica fragrans Houtt.</td>
<td>Kernel</td>
<td>Eugenol, Geraniol, Myristicin, Trymyristin etc</td>
<td>Stimulant&lt;sup&gt;19&lt;/sup&gt; Carminative&lt;sup&gt;19&lt;/sup&gt; Tonic&lt;sup&gt;19&lt;/sup&gt; Aromatic&lt;sup&gt;19&lt;/sup&gt;</td>
<td>Hypo cholestrolemia&lt;sup&gt;31&lt;/sup&gt;</td>
</tr>
<tr>
<td>13</td>
<td>Kārbōkarici – Psoralea corylifolia L.</td>
<td>Fruit</td>
<td>Psoralen , Imperatorin, Angelicin, Bavachinine</td>
<td>Laxative&lt;sup&gt;19&lt;/sup&gt; Stimulant&lt;sup&gt;19&lt;/sup&gt;</td>
<td>Antitumor&lt;sup&gt;32&lt;/sup&gt;</td>
</tr>
<tr>
<td>14</td>
<td>Mācikkāi – Quercus infectoria Oliv.</td>
<td>Gall</td>
<td>Ellagic acid, Pentadigalloyl-glucose</td>
<td>Astringent&lt;sup&gt;19&lt;/sup&gt; Styptic&lt;sup&gt;19&lt;/sup&gt; Tonic&lt;sup&gt;19&lt;/sup&gt;</td>
<td>Anti bacterial&lt;sup&gt;33&lt;/sup&gt;</td>
</tr>
<tr>
<td>15</td>
<td>Vāiviṭāṅkam – Embelia ribes L.</td>
<td>Fruit</td>
<td>Embelin, Quercitol, Embelic acid, Vilangin</td>
<td>Stimulant&lt;sup&gt;19&lt;/sup&gt; Carminative&lt;sup&gt;19&lt;/sup&gt;</td>
<td>Anxiolytic&lt;sup&gt;34&lt;/sup&gt;</td>
</tr>
<tr>
<td>16</td>
<td>Vacampu – Acorus calamus L.</td>
<td>Rhizome</td>
<td>Asarone, Calamenol, Eugenol, Acordin, Asarylladehyde</td>
<td>Stimulant&lt;sup&gt;19&lt;/sup&gt; Carminative&lt;sup&gt;19&lt;/sup&gt; Disinfective&lt;sup&gt;19&lt;/sup&gt; Germicide&lt;sup&gt;19&lt;/sup&gt;</td>
<td>Antispasmodic&lt;sup&gt;35&lt;/sup&gt;</td>
</tr>
<tr>
<td>17</td>
<td>Ilavaṅkam – Syzygium aromaticum Merr.</td>
<td>Flower bud</td>
<td>Caryophyllene oxide, Eugenol, Acetophenone, β-caryophyllene, Eugenine</td>
<td>Anti spasmodic&lt;sup&gt;19&lt;/sup&gt; Carminative&lt;sup&gt;19&lt;/sup&gt;</td>
<td>Cytotoxic&lt;sup&gt;36&lt;/sup&gt;</td>
</tr>
<tr>
<td>18.</td>
<td><em>Paraṅkicakkai</em> - Smilax china L.</td>
<td>Root</td>
<td>Sarsaponin, Parallin, ( \beta )-sitosterol, Daucosterol</td>
<td>Alterative(^{19}), Depurative(^{19})</td>
<td>Analgesic(^{37}), Anti inflammatory(^{37})</td>
</tr>
<tr>
<td>19.</td>
<td><em>Cērānkoṭṭai</em> - Semicarpus anacardium L.f</td>
<td>Fruit</td>
<td>Bilawanol, Anacordoside, Anacardic acid, Carpuflavanone</td>
<td>Alterative(^{19})</td>
<td>Cytotoxic(^{38}), Anti cancer(^{38})</td>
</tr>
<tr>
<td>20.</td>
<td><em>Kaṭukkāi</em> – Terminalia chebula Retz</td>
<td>Fruit</td>
<td>Anthroquinone, Chebulic acid, Chebulagic acid, Terachebin etc</td>
<td>Balances Trithodam(^{19})</td>
<td>Antioxidant(^{99})</td>
</tr>
<tr>
<td>21.</td>
<td><em>Karunčīrakam</em> - Nigella sativa L.</td>
<td>Seed</td>
<td>Psoralen, Imperatorin, Angelicin, Bavachinine</td>
<td>Emmenogogue, Diuretic(^{19})</td>
<td>Anti oxidant(^{40}), Anti tumor(^{41})</td>
</tr>
<tr>
<td>22.</td>
<td><em>Kāṭṭu cīrakam</em> - Vernonia anthelmintica Wild</td>
<td>Fruit</td>
<td>Avenasterol, Vernosterol</td>
<td>Diuretic(^{19}), Alterative(^{19})</td>
<td>Anthelmintic(^{42})</td>
</tr>
<tr>
<td>23.</td>
<td><em>Cīrutekkku</em> – Clerodendrum serratum (L.) Moon</td>
<td>Root</td>
<td>Serratagenic acid, Phylosterol, Scutellarein</td>
<td>Stimulant(^{19}), Sedative(^{19})</td>
<td>Antinociceptive(^{43}), Anti inflammatory(^{43}), Antipyretic(^{45})</td>
</tr>
<tr>
<td>24.</td>
<td><em>Tāḷicapatiri</em> – Taxus baccata L.</td>
<td>Leaves</td>
<td>Taxine, Taxinine, Ephedrine, Taxicatin</td>
<td>Carminative(^{19}), Tonic(^{19})</td>
<td>Anticancer(^{44})</td>
</tr>
<tr>
<td>25.</td>
<td><em>Tirāṭcai</em> – Vitis vinifera L.</td>
<td>Dried Fruit</td>
<td>Dulphinidin, Cyanidin, Ergosterol</td>
<td>Laxative(^{19}), Coolant(^{19}), Demulcent(^{19})</td>
<td>Hepatoprotective(^{45})</td>
</tr>
<tr>
<td>26.</td>
<td><em>Eṭṭi</em> – Strychnos nux vomica L.</td>
<td>Seed</td>
<td>Loganine,4 and 15 OH, Strychinine, Brucine</td>
<td>Antiseptic(^{19}), Carminative(^{19}), Purgative(^{19}), Stimulant(^{19}), Tonic(^{19}), Diuretic(^{19})</td>
<td>Anti tumor(^{46})</td>
</tr>
<tr>
<td>27.</td>
<td><em>Tēṟṟaṉ</em> – Strychnos potatorum L.f.</td>
<td>Seed</td>
<td>Diaboline, Brucine, Strychnine, Loganine, ( \beta )-sitosterol</td>
<td>Alterative(^{19}), Demulcent(^{19})</td>
<td>Diuretic(^{47})</td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Part</td>
<td>Active Ingredients</td>
<td>Properties</td>
<td>Additional Properties</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------</td>
<td>------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>---------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>29.</td>
<td>Eḷ – Sesamum indicum L.</td>
<td>Seed</td>
<td>Natural lipids, Sesomolin, Sesamolate</td>
<td>Stimulant, Diuretic</td>
<td>Antioxidant</td>
</tr>
<tr>
<td>31.</td>
<td>Tēṅkāi – Cocos nucifera L.</td>
<td>Endosperm</td>
<td>Lauric acid, Myristic acid, Phytoesterol, Squalene</td>
<td>Coolant, Nutrient</td>
<td>Anti inflammatory, Antiulcerogenic</td>
</tr>
<tr>
<td>34.</td>
<td>Amukkarā vēr – Withania somnifera (L.) Dunal</td>
<td>Tuberous Root</td>
<td>Bryonin</td>
<td>Alterative, Tonic</td>
<td>Anti inflammatory</td>
</tr>
<tr>
<td>35.</td>
<td>Ākāsakaruṭaṉ Kiḻaṅku – Corallocarpus epigaeus</td>
<td>Tuberous root</td>
<td>Plumbagin, Plumbagic acid, Plumbazineylanone</td>
<td>Antiperiodic, Diaphoretic</td>
<td>Anti cancer</td>
</tr>
<tr>
<td>36.</td>
<td>Citramōlam vērpaṭṭai – Plumbago indica L.</td>
<td>Root bark</td>
<td>Plumbagin, Plumbagic acid, Plumbazineylanone</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>