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Phytochemical screening and pharmacological update on Kabasura Kudineer Chooranam and Nilavembu Kudineer Chooranam

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Abstract

Kabasura Kudineer Chooranam is a poly herbal formulation recommended by Government of India for combating respiratory viral infection in human whereas Nilavembu kudineer choornam was specified for dengue and chikungunya viral infections. In the present study, preliminary phytochemical screening was carried out for both the decoctions. Kabasura kudineer choornam was found to contain alkaloids, carbohydrates, glycosides, cardiac glycosides, flavonoids, phenols, saponins, tannins, hydrolysable tannins and terpenoids whereas Nilavembu kudineer choornam possessed alkaloids, carbohydrates, glycosides, flavonoids, phenols, tannin and terpenoids. The ingredients in the polyherbal formulations were reviewed for their active principles and pharmacological action. Based on the comprehensive analysis it can be concluded that both the formulations can balance the tridoshas and help in restoring the body condition to normalcy in respiratory viral infections.

Keywords: Kabasura Kudineer Chooranam, Nilavembu Kudineer Chooranam, Phytochemicals, Respiratory Viral infection

Introduction

The Siddha system of medicine is one of the ancient traditional medicines with its origin in Tamil Nadu, South India. It treats not only the body but also mind and soul as it focuses on both physical and spiritual wellbeing. According to Siddha medicine disease is due to imbalance of tridoshas viz. Vatha, Pitha, Kapha, the three biological components of the individual human being and is corrected by using herbs, metals and minerals^[1]. Based on the mode of application the medicines were classified into internal and external. They were further classified into 32 categories based on their form, method of application, shelf life etc. Among the 32 internal medicines two of them are recommended by the Government of India for combating viral infections namely Kabasura kudineer choornam for covid-19 and swine flu and, Nilavembu kudineer choornam for dengue, chikungunya and covid-19.

Kabasura kudineer choornam is a polyherbal siddha formulation containing 15 ingredients recommended for effective management of common respiratory ailments such as cold, cough, breathing difficulty and flu as the principal organ of kapha is lungs. Kaba denotes kapha dosha which means fever due to excess accumulation of kapha (mucus, phlegm) asura means herbs that alleviate the symptoms, kudineer denotes decoction and choornam indicates powder. The preparation was reported to possess anti-inflammatory, antipyretic, antibacterial property^[2] as well to bind SARS-CoV-2 spike protein by *in silico* studies^[3].

Nilavembu kudineer choornam comprises of nine ingredients in equal proportion of which nilavembu, *Andrographis paniculata* is one of them. It is also recommended for alleviating the symptoms of covid-19 as well extensively used for the management of dengue and chikungunya, owing to its immunomodulating property. The preparation was reported to stimulate both cell mediated and humoral immune response in desi chicken^[4]. The antiviral property of one of the ingredients *Andrographis paniculata* against Newcastle disease virus affecting chicken was established by *in silico* and *in vitro* studies in cell culture^[5].

This paper attempts to analyse and interpret the phytochemicals present in both the formulation and to review the pharmacological property of the ingredients as a preliminary attempt for scientific justification for use in viral infections.

Materials and Methods

The polyherbal formulations, Kabasura kudineer choornam and Nilavembu kudineer choornam marketed by commercial manufacturer were procured from local pharmacy.

Kabasura kudineer choornam contains equal proportion of 15 ingredients where as Nilavembu kudineer choornam

comprises of equal quantity of 9 ingredients. The composition of polyherbal formulations are presented in Table 1 and Table 2.

Table 1: Composition of Kabasura Kudineer Choornam

S. No.	Botanical name	Local name (Tamil)	Part
1	<i>Zingiber officinale</i> L.	Sukku	Rhizome
2	<i>Piper longum</i> L.	Thippili	Fruit
3	<i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry	Ilavankam	Flower bud
4	<i>Tragia involucrate</i> L.	Sirukanchori ver	Root
5	<i>Anacyclus pyrethrum</i> (L.) Link	Akkirakaram ver	Root
6	<i>Hypophila auriculate</i> Schumach	Neermulli ver	Root
7	<i>Terminalia chebula</i> Retz.	Kadukkai	Fruit rind
8	<i>Justicia adhatoda</i> L.	Adathodai	Leaf
9	<i>Coleus aromaticus</i> Benth	Karpuravalli	Leaf
10	<i>Costus speciosus</i> (J.Koenig) Sm.	Koshtam	Root
11	<i>Tinospora cordifolia</i> (Thunb.) Miers	Seendhil	Stem
12	<i>Clerodendron serratum</i> (L.) Moon	Siruthekku	Root
13	<i>Andrographis paniculata</i> Burm.f.Nees	Nilavembu	Whole plant
14	<i>Sida acuta</i> Burm.f.	Vattathiruppi ver	Root
15	<i>Cyperus rotundus</i> L.	Korai kilangu	Root tuber

Table 2: Composition of Nilavembu Kudineer Choornam

S. No.	Botanical name	Local name (Tamil)	Part
1	<i>Andrographis paniculate</i> Burm.f.Nees	Nilavembu	Whole plant
2	<i>Chrysopogon zizanioides</i> (L.) Roberty	Vettiver	Root
3	<i>Santalum album</i> L.	Sandanam	Bark
4	<i>Zingiber officinale</i> Roscoe	Sukku	Rhizome
5	<i>Piper nigrum</i> L.	Milagu	Fruit
6	<i>Cyperus rotundus</i> L.	Koraikilangu	Root tuber
7	<i>Mollugo cerviana</i> (L.) Ser.	Parpadagam	Whole plant
8	<i>Plectranthus vettiveroides</i> (Jacob) Singh and Sharma	Vilamichai ver	Root
9	<i>Trichosanthes cucumerina</i> L.	Paipudal	Whole plant

As per the instruction of the manufacturer, 5gm of each powder was weighed separately and boiled in 240 ml potable drinking water until the content got reduced to 60ml (one-fourth). The decoction was filtered using a muslin cloth and the clear filtrate was subjected to preliminary qualitative phytochemical screening as per standard protocol [6].

Results and Discussion

The results of the phytochemical screening of both the polyherbal formulations are presented in presented in Table 3.

Table 3: Preliminary phytochemical screening of Kabasura Kudineer Choornam and Nilavembu Kudineer Choornam

S. No.	Phytochemicals	KSKC	NKC
1	Alkaloid	+	+
2	Carbohydrate	+	+
3	Glycosides	+	+
4	Cardiac glycosides	+	-
5	Flavonoid	+	+
6	Amino acid & protein	±	-
7	Phenols	+	+
8	Saponins	+	-
9	Tannins	+	+
10	Hydrolysable tannin	+	-
11	Phlobatannins	±	-
12	Terpenoids	+	+
13	Volatile oils	±	-
14	Vitamin C	±	-

+ Positive; - Negative; ± Traces

The phytochemical analysis of KSKC decoction revealed the presence of alkaloids, carbohydrates, glycosides, cardiac glycosides, flavonoids, phenols, saponins, tannins,

hydrolysable tannins and terpenoids. The reaction for determination of phlobatannins, volatile oil, vitamin C, proteins and amino acids were not remarkable but noticed as precipitate, hence recorded as traces. Similar results were reported by other authors except with the absence of saponin in one study [7] and the presence of proteins and amino acids in another [2] wherein the screening was conducted in the KSKC aqueous filtrate.

The phytochemical screening of NKC decoction showed the presence of alkaloids, carbohydrates, glycosides, flavonoids, phenols, tannin and terpenoids whereas cardiac glycosides, saponin, hydrolysable tannin, phlobatannin, volatile oil, vitamin C, protein and amino acids could not be detected and the results are similar to earlier findings [4].

On comparison KSKC has more phytochemicals than NKC which might be due to the presence of a greater number of and difference in the variety of medicinal plants.

These secondary metabolites are principally responsible for the claimed pharmacological activity of the polyherbal formulations. Alkaloids are heterocyclic compounds synthesised from amino acids which have a bitter taste and are highly potent. Due to the wide varieties of alkaloids like pseudoalkaloid, protoalkaloid, quinoline, steroid, indole, imidazole, purine, pyrrolizidine alkaloid etc. the therapeutic differences may be extensive even within a class of alkaloid. They were reported to exhibit wide range of activity like inhibition of oxidation, inhibition of phospholipase A₂, strengthening of myocardial contractility, inhibition of angiogenesis, induction of apoptosis in cancer cell and so on [8]. Plants containing carbohydrates, glycosides and coumarins are known to exert a beneficial action on immune system by increasing body strength and hence are valuable as dietary supplements [9]. Glycosides contain a sugar molecule known

as glycone made up of either mono or disaccharide or uronic acid to which the pharmacologically active molecule known as aglycone is attached by a glycosidic linkage. The pharmacological activity of the glycoside varies depending on the type of aglycone present *viz.* cardiac glycosides (cardioprotective), anthraquinone glycosides (cathartic), cyanogenic glycosides (goitrogenic, toxic) etc, thus they have a vast therapeutic potential.

Flavonoids are synthesised from cinnamic acid and constitute around half of the phenolic compounds found in plants. These flavonoids are present as aglycone, glycosides and methylated derivatives. They are referred as universal antioxidant and sometimes as vitamin P as they decrease the capillary permeability and fragility [8]. Flavonoids and phenols are nontoxic and have been reported as interesting candidate for pharmaceutical and medical application because of their effective antioxidant, anticancer, antibacterial, cardioprotective, anti-inflammatory, immunostimulant, anti-allergic and antineoplastic activity [10].

Tannins are less soluble in cold water and are better extracted by heating, thus in the present study both the decoctions tested positive. Of the tannins, only triester and large hydrolysable tannins have astringent properties and are known to hasten the healing of wounds and inflamed mucous membranes. Various tannins have been shown to partially inhibit angiotensin converting enzyme and aldose reductase, as well HIV integrase, protease and reverse transcriptase [8]. They also possess anticarcinogenic and antimutagenic potential due to their antioxidative property, which is important in protecting cellular oxidative damage, including lipid peroxidation. The growth of many fungi, yeasts, bacteria, and viruses was shown to be inhibited by tannins.

Their antimicrobial properties seemed to be associated with the hydrolysis of ester linkage between gallic acid and polyols [11].

Saponins are amphiphilic in nature due to the presence of lipid-soluble aglycone and water-soluble sugar chain. They have traditionally been used as natural detergents. Saponins have been proposed for treatment of various diseases like diabetes, obesity, osteoporosis, and cancer. They also possess antimicrobial property and found to enhance the immune response to antigens for which they are explored to be used as immune adjuvants in new generation vaccines [12].

Terpenoids have been found to be useful in the prevention and therapy of several diseases, including cancer. Terpenoids are also known to possess antimicrobial, antifungal, antiparasitic, antiviral, anti-allergenic, antispasmodic, antihyperglycemic, anti-inflammatory and immunomodulatory properties [9, 13].

Thus, all the phytochemicals contribute significantly to the antioxidant, immunostimulant, antimicrobial and other desirable pharmacological activity which play a key role in restoring and rejuvenating the diseased individuals.

Further identification and quantification of the specific phytochemical constituent is required to pin down the pharmacological activity.

Pharmacological activity of the ingredients

The proven and traditionally claimed pharmacological activity of the plant ingredients present in Kabasura Kudineer Choornam and Nilavembu Kudineer Choornam is presented in table 4. The formulations contain three ingredients in common *viz.* *Zingiber officinale* L., *Andrographis paniculata* Burm. f. Nees and *Cyperus rotundus* L.

Table 4: Pharmacological activity of ingredients of Kabasura Kudineer Choornam and Nilavembu Kudineer Choornam

S. No.	Botanical name	Active Ingredient	Pharmacological properties
1	<i>Zingiber officinale</i> L.	Gingerols, shogaols, paradols, quercetin, zingerone, gingerenone-A, 6-dehydrogingerdione β -bisabolene, α -curcumene, zingiberene, α -farnesene, β -sesquiphellandrene [15]	Antiemetic (comparable with that of metoclopramide), anti-inflammatory (inhibits both lipoxygenase and cyclooxygenase pathways), inhibits platelet-activating factor, hepatoprotective, antipyretic, antioxidant, immunomodulatory, thermogenic, antiviral, nematocidal, insect repellent, molluscicidal activity. Universal medicine as it balances all three Doshas: Vata, Pitta, and Kapha [14, 15].
2	<i>Piper longum</i> L.	Piperine, pipartine, sesamin, pipasterol, pipelonguminin, steroids, glycosides [14]	Traditionally used for diseases of the respiratory tract (expectorant) and as an analgesic and counterirritant for musculoskeletal pain and inflammation. Considered to be a blood "cleanser." Improves circulation, digestion, and immune function. Increases secretory immunoglobulin A (IgA), cholagogue for gallbladder disease [14].
3	<i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry	Eugenyl acetate, eugenol, β -caryophyllene [16]	Stimulant, expectorant, carminative, analgesic, and aphrodisiac. Indicated for colds, coughs, asthma, indigestion, toothache, vomiting, hiccough, laryngitis, pharyngitis, hypotension, and impotence [14, 16].
4	<i>Tragia involucrata</i> L.	vinyl hexylether, shellsol, 2,4-dimethyl hexane, 2-methylnanone, and 2,6-dimethyl heptane, stigmaterol, quercetin, rutin [17, 18]	Traditionally used to treat high fever, inflammation, wounds, eczema, scabies and skin infections. Found to be effective in treating pain and bronchitis, possess antimicrobial activity [17, 18].
5	<i>Anacyclus pyrethrum</i> (L.) Link	Pyrethrine and N-alkylamides enhance the medicinal value [19]	Pacifies kapha and vata dosha Nasal congestion and problems of upper respiratory tract Molluscicidal and anti-inflammatory activity, analgesic, anti-rheumatic, aphrodisiac, carminative, antiviral, anti-catarh, improve digestion, emmenagogue, febrifuge, vermifuge and nervine tonic [19].
6	<i>Hygrophila auriculata</i> Schumach	Apigenin-7-O-glucuronide, apigenin-7-O-glucoside, β -sitosterol, lupeol, betulin, 25-oxo-hentriacontanyl acetate, methyl8- <i>n</i> -exyltetracosanoate [20]	Used in traditional medicine for the treatment of anasarca, diseases of the urinogenital tract, dropsy from chronic Bright's disease, hyperdipsia, vesical calculi, flatulence, diarrhea, dysentery, leukorrhea, gonorrhoea, asthma, blood diseases, gastric diseases, inflammation, cancer, rheumatism, painful micturition, menorrhagia [20].
7	<i>Terminalia chebula</i> Retz.	Rich in Myrobalan tannins and a plant sterol, beta-sitosterol Chebuinic acid, chebulagic acid,	Antiviral, antiyeast, antihistaminic, anti-inflammatory, laxative, and antibacterial activities (<i>E. coli</i> , <i>Salmonella typhosa</i> , <i>Salmonella paratyphosa</i> A, B, and C,

		chebulic acid, corilagin, ethyl gallate, terflavin B, ellagic acid, arjungenin ^[21]	<i>Cholera, Shigella, Klebsiella and Pseudomonas</i> Balances the Dosha, Vata ^[14] .
8	<i>Justicia adhatoda</i> L.	Vasicine, vasicinone, adhavasione, vasicinolone, adhavasine, adhatodine, anisotine, vasicoline, vasicolinone ^[22]	Antiasthmatic, antispasmodic, expectorant antitussive, abortifacient, antimicrobial, cardiovascular protection, anticholinesterase, anti-inflammatory activity ^[14] .
9	<i>Coleus aromaticus</i> Benth	Carvacrol, Thymol (flavour); chlorogenic acid, caffeic acid, coumaric acid, rosmarinic acid are polyphenolic components ^[23]	Strong antioxidant activity Helpful in cold and cough, the concentrated decoction consumed while warm is effective in respiratory infections and reduces 'Kapha' in the body, has allelopathic potential, antimicrobial activity, insecticidal property; radio-protective activity and appetizing potential ^[23] .
10	<i>Costus speciosus</i> (J.Koenig) Sm.	Eremanthin, diosgenin, costunolide, dioscin, gracillin, β -sitosterol, lupeol palmitate, β -amyrin, α -amyrinesterate, dihydrophytic plastoquinone ^[25, 26]	Anti-bacterial, anti-fungal, anti-choline esterase, antioxidant, anti-hyperglycemic, anti-inflammatory, analgesic, antipyretic, antidiuretic, larvicidal, anti-stress and estrogenic activities ^[24] . Widely used in Ayurveda for pneumonia, constipation, skin diseases, fever, asthma, bronchitis, inflammation, anaemia, rheumatism, dropsy, cough, urinary diseases, jaundice, antidiabetic, hypolipidemic, adaptogenic, anticancer, hepatoprotective activity ^[25, 26] .
11	<i>Tinospora cordifolia</i> (Thunb.) Miers	Tinosporide, tinosporine, magnoflorine, berberine, cordifolioside A, B, C, D and E, giloinsterol, β -sitosterol, tinosporidine, arabinogalactan ^[27]	Immunostimulant, anti-inflammatory, antispasmodic, antipyretic, galactagogue. In treatment of patients with pneumonia, asthma, cough, swelling of the lungs, colic, constipation, tetanus, anthrax, pox, and compound fracture ^[14, 27] .
12	<i>Clerodendrum serratum</i> (L.) Moon	Icosahydropicenic acid, Ursolic acid, D-mannitol, hispidulin, cleroflavone, apigenin, scutellarein, serratagenic acid, acteoside, verbascoside, oleanolic acid, clerodermic acid, γ -sitosterol, β -sitosterol, cholestanol, clerosterol, campesterol, 24-ethyl cholesterol ^[28]	Traditionally used for all respiratory disease due to morbidity of kapha, asthma, fever, inflammation and liver disorders, anti-allergic effect due to stabilization of mast cell, hepatoprotective, anti-oxidant, anti-inflammatory, anticancer and antinociceptive ^[28, 29]
13	<i>Andrographis paniculata</i> Burm.f.Nees	Andrographolide, neoandrographolide, 14-deoxyandrographolide, 14-deoxy-12-hydroxyandrographolide, isoandrographolide, andrograpanin β -sitosterol, stigmaterol ^[30]	Liver tonic, positive cardiac inotrope, alterative, anthelmintic, febrifuge, anti-inflammatory, anticancer, anti-atherosclerotic, immunostimulant ^[31] Reduces the severity of symptoms associated with respiratory infections in humans—including colds, sinusitis, and influenza Antiviral against hepatitis B, HIV, respiratory syncytial virus ^[32]
14	<i>Sida acuta</i> Burm.f.	Cryptolepine, ecdysterone, beta-sitosterol, stigmaterol, ampesterol, evofolin-A, B, scopoletin vomifoliol, loliolid and 4-ketopinonesin ^[33, 34]	Treating infections, fever, malaria, asthma, cold, headache, diarrhea, skin diseases, dysentery, gonorrhoea, rheumatism, eye cataracts, snakebite, nervous and urinary diseases, blood, bile and liver disorders ^[33,34]
15	<i>Cyperus rotundus</i> L.	Patchoulene, isopatchoulene, sugenoyl acetate, sugetriol triacetate, sugeibol, kaempferol, luteolin, quercetin ^[35]	Essential oil derived from root is used in perfumes. Diuretic, diaphoretic, and astringent properties and for gastrointestinal complaints ^[14]
16	<i>Piper nigrum</i>	Piperine, sarmentosine, piperamide, piperamine, trichosta, sarmentine, chavicine ^[36]	Stomach and digestive complaints, cold, bronchitis, sinus congestion. Topical use as an anodyne for pain due to cold and neuralgia, for hemorrhoids and dermatologic disorders ^[14] .
17	<i>Santalum album</i>	α - Santalol, sandalore, β -santalol, (-)- α -santalene, cedrene, isobornyl cyclohexanol ^[14]	Traditional uses include ophthalmic conditions, conditions of the genitourinary tract such as cystitis, urethritis, and vaginitis, and acute dermatitis, herpes virus infections, bronchitis, palpitations, and heatstroke ^[14]
18	<i>Chrysopogon zizanioides</i> (L.) Roberty	Khusimol, α -vetivone, β -vetivone, zizanal, epizizanal, nootkatone ^[37, 38]	Decoction is used in high fever, inflammation, sexual disorder, paste in diarrhoea and dysentery, leaf juice as anthelmintic. Also has antioxidant, antibacterial, antifungal, analgesic, anticataleptic activity ^[37,3 8]
19	<i>Mollugo cerviana</i> (L.) Ser.	C-glycosyl flavonoids – Orientin and Vitexin ^[39]	Anti-inflammatory, antioxidant, antimicrobial, antidiabetic, hepatoprotective, photo-protective, uterine stimulant, antiseptic, antipyretic, immunostimulant activity ^[39]
20	<i>Plectranthus vetiveroides</i> (Jacob) Singh and Sharma	Androstan-17-one-3-ethyl-3-hydroxy-(5 α)- (25%)-spathulenol (9%), α - bisabolol, Z-valerenyl acetate, megastigma-4,6(E), 8(Z)-triene ^[40]	Aromatic, bitter, cooling, febrifuge, diaphoretic, stimulant, diuretic. Useful in vitiated conditions of pitta, burning sensation, leprosy, skin diseases, leucoderma, vomiting, diarrhoea, ulcers, stomachic, emmenagogue ^[40]
21	<i>Trichosanthes cucumerina</i> L.	Cucurbitacin B, E, isocucurbitacin, 23,24- dihydroisocucurbitacin B, E, lycopene, ascorbic acid ^[41]	Headache, alopecia, fever, abdominal tumors, bilious, boils, acute colic, diarrhoea, haematuria, skin allergy, bronchitis. Used as abortifacient, vermifuge, stomachic, refrigerant, purgative, antimalarial, antidiabetic, laxative, emetic, cathartic and anthelmintic ^[41]

A comprehensive overview of the ingredients reveals that majority of the ingredients in KSKC and NKC have activity against respiratory problems, possess antipyretic, anti-inflammatory, antimicrobial and immunostimulant activity apart from a wide array of other pharmacological activities. Thus, their use in respiratory viral infection seems to be scientifically reasonable.

Conclusion

Kabasura kudineer choornam and Nilavembu kudineer choornam both are polyherbal formulations comprising of a bewildering range of phytochemicals whose synergistic action is expected to balance the tridoshas and bring back the body condition to normalcy. Due to the complexity of phytomolecules it is beyond the scope of the author to delineate the mechanism of action. Further, chronic toxicity studies must be conducted to specify the duration of administration of both the preparations. In the current scenario the use of KSKC and NKC for respiratory viral infection as an add on formulation and for alleviation of symptoms of covid19 viral infection is found rational.

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