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Original Article

Formulation and Evaluation of Nilavembu Kudineer Capsules

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ABSTRACT

The herbal medicines of Nilavembu Kudineer is very effective in viral fevers. The study was effort to prepare a Nilavembu Kudineer herbal capsule from Nilavembu Kudineer churnam. The task of this work was to detainment of active biomolecules and ensure their biological activity. The Nilavembu Kudineer capsule was prepared from Nilavembu churnam ethanol and water solvents extracts, and then the extract was powdered by drying process. The resultant dried extract powder was screened by various chemical and microbiological tests for to ensure the potency. The results confirms that both the extract have active biomolecules and possess their activity. Based on the microbiological activity Nilavembu Kudineer water extract was comparatively better than the ethanol extract powder. The dried NVK water extract powder was filled in capsules, it also complies with pharmaceutical standards of pre and post capsule filling parameters such as angle of repose, bulk density, tapped density, carr's index, hausner's ratio, weight variation and disintegration. In future stability, dosage titrations and more number of microbial test have to conduct for strengthen the NVK capsule effectiveness.

Key word: Nilavembu Kudineer churnam, ethanol, biomolecule, angle of repose, bulk density and microbial test.

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INTRODUCTION

The herbal medicine Nilavembu kudineer is well effective in preventing and controlling vector borne diseases like viral fever, dengue, dengue hemorrhagic fever, malaria and bacterial fever. Dengue is a major threat to public health in many countries.[1-3]Today dengue ranks as most important mosquito borne viral disease in the world. Many study has showed herbal drugs are safer than synthetic chemical drugs. The herbal drug having more secondary metabolites which include alkaloids, glycosides, flavonoids, steroids, tannins and saponins. It has been found to have antiviral, antibacterial, anti-inflammatory, antiulcer and antioxidant properties for therapeutic applications. It drives to develop of newer drugs for the reason that of their effectiveness, less side effects and relatively low cost when comparing with synthetic medicines. Government of Tamil Nadu has come out with public health advertisement promoting Nilavembu Kudineer as preventive and controlling the morbidity level of public on contracting viral fever. Further, government has made arrangements for the supply of decoction to all patients reporting for this purpose in Primary Health Centers and Government Hospitals. The composition of Nilavembu Kudineer is mixture of nine herbal ingredients,4-6,8,10 it is mentioned in table number [1]. Nilavembu Kudineer is a polyherbal decoction widely used in Siddha Medicine to combat majority of fevers. But this medicine has some constrains when administer to patients, NVK is available in the form of churnam, patient has to make a hot decoction with water in their home. In process of making decoction, preparation reference (siddha vaithiya theratu) states, the preparation need to volume condense one-fourth of its original volume by boiling, then only the concentrate decoction have to consume.[6,10] In practical it is difficult to follow all the time by patients, if it's not done properly the biomolecule elution may not be the level so the efficacy of the drug may be a question mark. The NVK extract stability is 12 hours and taste is also not agreeable to children and old age peoples. To overcome the problem, this study was plan to make poly herbal enrich NVK powder from NVK churnam/decoction/extract.

The present work focused on to make better patient convenient while on NVK drug regimen. The challenge of this work is, to detainment of active biomolecules and ensure the bio activity. This study confirms the biomolecule presence by phytochemical screening tests and anti-microbial activity. The next process of this project work to formulate the resultant product in a convenient dosages of capsules. By this formulation we can ensure that correct detainment biomolecule, mask

the bitter taste, stability, safety, convenient to carry medicine on travelling, better patient compliance, and thus achieve patient's quality of life.

Table 1: Composition of Nilavembu Kudineer churnam

Sl. No	Plant botanical name	Local name (Tamil)
1	Andrographis paniculata	Nilavembu
2	Vetiveria zizanioides	Vettiver
3	Santalum album	Sandanam
4	Zingiber officinale	Sukku
5	Piper nigrum	Milagu
6	Cyperus rotundus	Koraikilangu
7	Hedyotis corymbosa	parpadagam
8	Plectranthus vettiveroides	Vilamichaiver
9	Trichosanthes cucumerina	Paipudel

MATERIALS AND METHODS

Nilavembu churnam was obtained from Tampcol, Chennai, Ethanol from SBCP laboratory, Muller Hinton from Himedia. All other chemicals used were of analytical grade and were used without further purification.

Preparation of Nilavembu Kudineer extract:

By Maceration process:

In maceration (for fluid extract),coarsely powdered NVK churnam was kept in contact with the solvent (ethanol) in a stoppered round bottom container, in the ratio of 1:4 of drug (Nilavembu kudineer churnam) and solvent for a defined period of 48 hours with frequent agitation until soluble matter was dissolved. The mixture was strained, the marc was pressed and the liquids are clarified by filtration / decantation after standing.[9]

b)By Decoction:

In this process, the crude drug (Nilavembu kudineer churnam) 10 g was boiled in a specified volume of water (240 ml) for a defined time; the starting ratio of crude drug to water is fixed. The volume is then brought down to one-fourth its original volume by boiling during the extraction procedure. Then, the concentrated extract is filtered and the filtrate allowed to dry by open air dry method.[6,9]

Drying:

Discharge the concentrated liquid (Maceration liquid) into the surface uncovered stainless steel plate. Where it will be undisturbed for 24 hours, preferably outdoors if the weather is sunny and warm. When the water / ethanol has evaporated away, the liquid will return to its solid state. Solid mass of NVK extract collected and stored in desiccator.

Preliminary Phytochemical screening:

Phytochemical examinations were carried out for NVK extract powder as per standard methods for following constituents, alkaloids, carbohydrates, glycosides, saponins, phytosterols, phenols, tannins, flavonoids, diterpenes, proteins and amino acids.

Antimicrobial activity

Agar well diffusion method

The antibacterial medium Muller Hinton Agar was used in this study. Specified quantity of Nilavembu extract powder was dissolved in purified water (10 mg/ml). Pathogenic bacteria were grown in nutrient broth for 24 hours and swapped on the Petridis plates containing Muller Hinton Agar. In Muller Hinton Agar plate, about 6 mm diameter well were made by gel puncture. Diluted extracts were applied into the well and the plates were incubated at 37°C for 24 hrs. The antibacterial activity was assayed by inhibition zone formed around the well.[7]

Prefilling evaluation of NVK capsule

The following prefilling evaluation has denotes the compatibility of powder in to formulation, (i.e) Angle of repose, Bulk density, Tapped density, Carr's compressibility index and Hausner's ratio.

Post filling evaluation of NVK capsule

The following evaluation has implies the formulation value, (i.e) Weight Variation Test and Disintegration Time.

RESULTS AND DISCUSSION

The preliminary phytochemical screenings of Nilavembu kudineer extract powder results were summarized in table number 2.

Table 2: Phytochemical screenings of NVK extract powder

Sl,No	Phytochemical test	NVK water extract powder	NVK ethanol extract powder	Fresh NVK decoction
1	Colour	Greenish brown	Yellowish green	Pale greenish brown
2	Alkaloid	+	+	+
3	Anthraquinones	-	-	-
4	Carbohydrates	+	+	+
5	Cardiac glycosides	+	+	+
6	Coumarins	+	+	+
7	Flavonoids	+	+	+
8	Glycosides	-	-	-
9	Phenols	+	+	+
10	Phlobatannins	-	-	-
11	Quinones	+	+	+
12	Saponins	-	-	-
13	Steroids and Phytosterols	+	+	+
14	Tannins	+	+	+
15	Terpenoids	+	+	+

(+ indicates presence, - indicates absence of phytochemical constituents

From the present investigation, it has been observed that phytochemicals like alkaloids, carbohydrates, cardiac glycosides, coumarins, flavonoids, phenols, quinones, phytosterols, tannins and terpenoids were present in all the extracts powders and fresh NVK decoction. Anthraquinones, glycosides, phlobatannins and saponins were not present in the extracts powder and fresh NVK decoction.

This study showed a promising effect on presence of phenolic compounds in almost all the extracts that elevates the levels of antioxidants. Increase in total antioxidant status has been shown to be important in recovery from dengue. Tannins bind to proline rich protein and interfere with protein synthesis, previous studies proves that tannins also exhibit larvicidal activity on activities on larvae of *Aedesaegypti*, effective antioxidant and show strong anticancer activities.

This investigation showed the presence of flavonoids which give anti-oxidant effect anti-allergic, anti-inflammatory, anti-microbial and anti-cancer activities. The presence of alkaloids that ensure the action of analgesic and malaria, Phytosterol esters dissolved in food fat reduce LDL-cholesterol, carbohydrates regulates the blood glucose level and provides energy to the body. Cardiac glycosides are medicines for treating heart failure and certain irregular heartbeats. Glycosides serve as defense mechanisms against many micro-organisms. Coumarins are used in the treatment of chronic infections like Q-fever, mycoplasmosis and chronic brucellosis Quinones for anti-micro bacterial effect. The results obtained in this study suggested that phytochemical compounds were protected, which is valuable reservoir of bioactive compounds of substantial medicinal merit.

Antimicrobial activity:

The antimicrobial activity of NVK water extract powder, ethanol extract powder, fresh NVK decoction and standard ciprofloxacin was examined against gram positive and negative bacteria's using Staphylococcus *aureus and E.coli organisms.* It is shown in figure 1, 2 and table number 3.

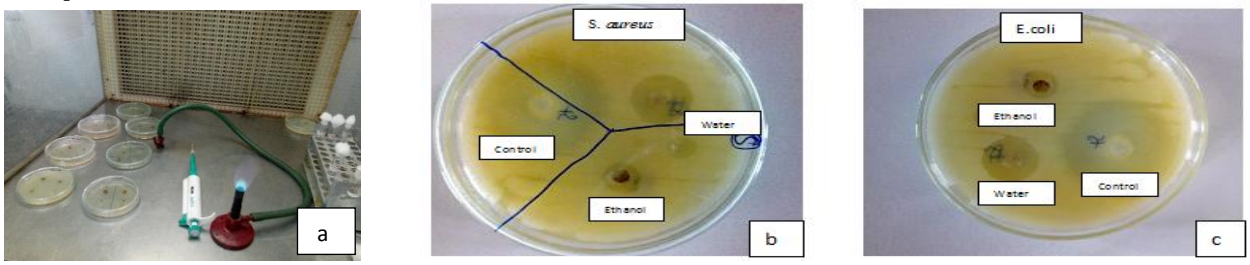

Figure 1: (a) LAF (b) activity in G + bacteria; (c) activity in G – bacteria

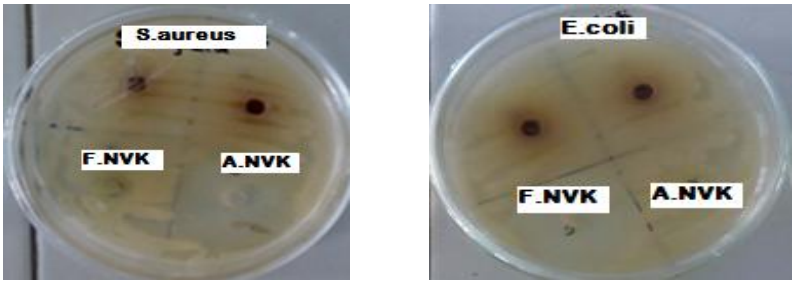

Figure. 2: Activity of NVK Water extract and NVK fresh decoction. (F.NVK – Fresh NVK; A.NVK- water extract powder of NVK); (a) activity in G (+) (b) activity in G (-) bacteria

Table 3: Antibacterial activity

Organism	NVK Water extract powder	NVK Ethanol extract powder	Fresh NVK decoction liquid	Standard Ciprofloxacin
S.aureus	+	+	+	+
E.coli	+	+	+	+

The Antimicrobial effects indicates that NVK water extract, ethanol extract and fresh decoction contains active constituents and retained the medicinal potency. Among the two formulations water extract powder exhibited better antibacterial activity than ethanol extract powder. Moreover water extract powder showed more or less equivalent antimicrobial effect when compared with fresh NVK decoction. The NVK inhibits above organism's growth, so this drug / formulation may confirms the effective protection against G (+) and G (-) organisms.

Angle of repose:

The angle of repose of NVK water extract powder was found to be $38^0.12' \pm 0.84'$ and NVK ethanol extract powder was found to be $39^0.32' \pm 0.69'$ after addition glidant (cornstarch powder 2%), the angle of repose was found to be $33^0.23'$in water extract and $34^0.62'$ in ethanol extract powder. The drug material belongs to fair flow and requires glidant to improve the flow property. After addition of glidant the flow property has modified as good flow powder.

Pre filling evaluations NVK powder capsule:

Table 4: Angle of repose

S. No	Formulation	Angle of repose (Degree) Before glidant	Angle of repose (Degree) after addition of glidant
1	Water extract of NVK powder	$38^0.12' \pm 0.84'$	$33^0.23' \pm 0.12'$
2	Ethanolic extract of NVK powder	$39^0.32' \pm 0.69'$	$34^0.62' \pm 0.38'$

*All values are expressed as mean ± standard deviation, n=3

Other parameters evaluations:

The bulk density was found in the range of 0.526 to 0.584gm/cm^3. The tapped density was between 0.614 to 0.673 gm/cm^3. The compressibility index of the powder is between 11 and 15% which means good flow character, here the formulations exist in the range between13.22 % to 14.82 %. The result showed that the Hausner ratio of all the formulations lies between1.15 to 1.16. The bulk density and tapped density was within acceptable limit. The compressibility index shows that the powder blend has good flow character. Hausner ratio lies between 1.12-1.18, it shows good flow behavior of the powder. The powder blend showed good flow properties in terms of prefilling evaluations. The results are tabulated in table number 5.

Table No 5: Pre filling evaluation of NVK capsules

Formulation	Bulk density (gm/cm3)	Tapped density (gm/cm3)	Compressibility Carr's Index (%)	Hausner's ratio
Water extract of NVK powder	0.526 ± 0.08	0.614 ± 0.12	14.82 ± 0.22	1.16 ± 0.28
Ethanolic extract of NVK powder	0.584 ± 0.16	0.673 ± 0.18	13.22 ± 0.09	1.15 ± 0.14

*All values are expressed as mean ± standard deviation, n=3

Weight Variation Test:

The weight of all the capsules from each formulation was found in the range of 98.45mg to 106.24 mg. It was found all the capsule passed weight variation test, as the percentage weight variation was within the acceptable limits of ± 10%.

Disintegration Time

The disintegration time of NVK capsule was found to be in the range of 4 minute 50sec to 4 minute 10 seconds. The results showed in table no.6. The disintegration will plays major role in drug dissolution and faster onset of action of product. Disintegration time of all formulation was found within acceptable limit of below 30 minutes.

Table 6: Post filling evaluation of NVK capsules

Formulation	Weight of capsules (mg)	Percentage of deviation (%)	Disintegration time (mint)
NVK water extract powder capsule	98.45 ± 1.12	3.92	4 .50 Sec
NVK Ethanol extract powder capsule	106.24±0.9	5.8	4.10 sec

*All values are expressed as mean ± standard deviation, n=3

CONCLUSION

The NVK capsules were successfully formulated by using Nilavembu Kudineer churnam. The extract of NVK churnam has contained all fresh NVK decoction active constituents. Microbiological studies also confirms, the activity of NVK extract against gram positive and gram negative bacteria. The best formulation was selected on the basis of phytoconstituents presents, bacterial activity, cost of chemicals and minimal chemical composition. In all those factors derived that the formulation using water was best and economical also. The water extract of NVK powder would be a promising formulation to achieve the anti-bacterial. The phenolic compounds present in the extract may produce anti-viral effect also. NVK capsule promise the anti-bacterial and dengue infections without any compromise of efficacy and also enhance patient compliance. This results indicates water extract of NVK powder is alternative and effective herbal medicine against most of microbial infections.

FUTURE SCOPE

In future this research effort may continue for dose optimization, more microbial study and stability test, which will give a platform for FDA approval and preclinical research study.

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