IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 19, Issue 7 Ser.18 (July. 2020), PP 15-37
www.iosrjournals.org

Vallarai Nei for the Management of Iron Deficiency Anemia (Veluppu Noi) In Children – A Review

K.Ajitha Bala*[1] A.M.Amala Hazel[2] M.Meenakshi Sundaram[3] R.Meenakumari[4]
[1]*PG Scholar,Department of Kuzhandhai Maruthuvam, National Institute of Siddha, Chennai-47.*
[2]*Guide&Asso. Professor, Department of Kuzhandhai Maruthuvam, National Institute of Siddha, Chennai-47.*
[3]*HOD&Professor, Department of Kuzhandhai Maruthuvam, National Institute of Siddha, Chennai-47.*
[4]*The Director, National Institute of Siddha, Chennai-47.*

Abstract:
Anemia is a common and predominant blood disorder globally, in which the level of hemoglobin or healthy red blood cells are abnormally lower. The most common type anemia is Iron deficiency anemia (IDA). In Siddha system Veluppu Noi is almost correlated with clinical conditions of anemia as described in modern medicine. Veluppu is described as a diseased condition in which the nature color of the body including nail beds and conjunctiva becomes pallor. Siddha system has better medicines for the treatment and management of Veluppu Noi. One among them is Vallarai Nei the ingredients of this preparation contains as its chemical constituents iron, folic acid, vitamin C, vitamin B_{12}, copper, zinc, carbohydrate, protein, tannin, flavonoids. The ingredients of this medicine exhibits anti-oxidant, anti-microbial, immunomodulatory and hepatoproductive. The medicine improved both the haemoglobin level in RBC's and also strength in the immune system.

Key words: *Iron deficiency anemia, Veluppu Noi, Vallarai Nei*

Date of Submission: 17-07-2020 Date of Acceptance: 01-08-2020

I. Introduction:

Anemia is a major public health problem in the world. It is characterized by the reduction in red blood cell count, hemoglobin content and packed cell volume. Generally these conditions occur because of decreased production of RBC and excess loss of blood from the body[1]. All these incidents are caused either by inherited disorders or environmental influences such as nutritional deficiency, infection and exposure to drugs or toxins.

Iron is essential for the various activities of the human body especially in the hemoglobin synthesis. A low level of iron, leading to anemia, can result from various causes. The causes of iron deficiency anemia are poor absorption of iron, bleeding from the gut (intestine), dietary factors (iron poor or restricted diet), medication (aspirin ibuprofen, naproxen and diclofenac), and lack of certain vitamins (folic acid and vitamin B12), bleeding from the kidney, hook worm infestation, decreased red blood cells[2]. Iron deficiency anemia is characterized by a defect of hemoglobin synthesis, resulting in microcytic hypochromic red blood cells. Hemoglobin measurement is being widely used as a proxy for detection of iron deficiency.

As per the report of WHO the prevalence of Anemia in Tamilnadu during 2008 was 54.7%and the world wide prevalence was 25.4%in school aged children.

In Siddha system Veluppu Noi is correlated with clinical conditions of anemia as described in modern medicine. As per Siddha concept Veluppu Noi occurs due to excess intake of salt and sour taste, fever, vomiting, diarrhea, worms, liver diseases and intake of inconsumable items such as soil, ash& camphor. It presents with symptoms of generalized weakness, sigh, loss of appetite, nausea, giddiness, fatigue, palpitation and weight loss. The term Veluppu denotes the pallor of the body. Veluppu is described as a disease condition in which the nature color of the body including nail beds and conjunctiva becomes pallor[3]. Siddha system has better medicines for the treatment and management of Veluppu Noi. One among them is Vallarai Nei.

INGREDIENTS OF VALLARAI NEI:[4]

- Vallarai (*(Centellaasiatica)*)
- Seenthil(*Tinosporacordifolia*)
- Kadukkai(*Terminaliachebula*)
- Thanrikkai(*Terminalia bellirica*)
- Nellikkai(*Phyllanthusemblica*)
- Chukku(*Zingiberofficinale*)
- Milagu(*Piper nigrum*)
- Thippili(*Piper longum*)

- Naruku moolam(*Piper longum*)
- Kirambu(*Syzygiumaromaticum*)
- Thalisapathiri(*Abiesspectabilis*)
- Athimathuram(*Glycyrrhizaglabra*)
- Kostam(*Costusspeciosus*)
- Siruthekku(*Clerodendrumserratum*)
- Kadukurohini(*Picrorhizakurroa*)
- Nannari(*Hemidesmusindicus*)
- Sitramutti(*Sidacordifolia*)
- Seeragam(*Cuminum cyminum*)
- Perichampazham(*Phoenix dactylifera*)
- Munthiripazham(*Vitisvinifera*)
- Karkandu*(Sugar candy*)
- Nei

1. VALLARAI:
- Botanical name: *Centella asiatica*
- Family: Apiaceae
- English name: Indian pennywort

Fig 1: Vallarai*(Centella asiatica)*

Table 1: Chemical Constituents of *Centella asiatica*[5]

Active component types	Compounds
Triterpenoids	Asiatcoside, Centelloside, Madecossoside, Thankuniside, Isothankunic acid, Centellose, Asiatic, Centellic and Madecassic acids
Volatile and Fatty acids	Glycerides of Palmitic, Stearic, Lignoceric, Oleic, Linoleicand Linolenic Acids
Alkaloids	Hydrocotylin
Glycosides	Asiaticoside, Madecossoside and Centelloside Triterpene acids, Asiatic acid, Madegascaric acid and Centellic acid
Flavanoids	3-glucosylquercetin, 3- glucosylkaemferol and 7-glucosylkaemferol
Others	Sugars, inorganic acids and resin. Vitamin B, C and some amino acids etc.

PHARMACOLOGICAL USES:

Immunomodulatory property:

Pectin isolated from C. asiatica showed immunostimulating activities and triterpenoid saponins and methanol extracts showed preliminary immunomodulatory effect

2. SEENTHIL:
- Botanical name: *Tinospora cordifolia*
- Family: Menispermaceae
- English name: Heart leaved moonseed

Fig 2: Seenthil*(Tinospora cordifolia)*

Table 2: Chemical Constituents of *Tinospora cordifolia*[6]

Active component types	Compounds	Source
Alkaloids	Berberine, Choline, Palmatine, Tembetarine, Tinosporin and Isocolumbin	Stem toot
Glycosides	Tinocordiside, Tinocordifolioside, Cordioside and Palmatosides	Stem
Diterpenoid lactones	Furanolactone, Clerodane derivatives and Tinosporides	Whole plant
Steroids	Beta – sitosterol, Hydroxyl ecdysone, Eodysterone and Giloinsterol	Stem
Aliphatic compounds	Octacosanol and Heptacosanol	Whole plant
Others	Giloin and Tinosporic acid	Whole plant

PHARMACOLOGICAL USES:

Immunomodulatory property:

Aqueous *Tinospora* extracts has been also reported to influence the cytokine production, mitogenicity, stimulation and activation of immune effector cells. In mice, *Tinospora cordifolia* extracts has been shown to result in up-regulation of IL-6 cytokine, resulting in acute reactions to injury, inflammation, activation of cytotoxic T cells, and B cell differentiation.

Anti-oxidant activity:

Tinospora cordifolia extracts possess possible inhibitors of aldose reductase and anti-oxidant agent'sthereby reducing chemotoxicity induced by free radicals.

Anti-microbial activity:

The methanol extracts of *Tinospora cordifolia* have been reported to have potential against microbial infections. The anti-bacterial activity of *Tinospora cordifolia* extracts has been assayed against Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae, Proteus vulgaris, Salmonella typhi, Shigella flexneri, Salmonella paratyphi, Salmonella typhimurium, Pseudomonas aeruginosa, Enterobacter aerogene, and Serratia marcesenses (Gram-positive bacteria).In mice models, TCE has been reported to function in bacterial clearance and improved phagocytic and intracellular bactericidal capacities of neutrophils.

3.KADUKKAI:

- Botanical name: *Terminalia chebula*
- Family: Combretaceae
- English name: Ink nut

Fig 3: Kadukkai*(Terminalia chebula)*

Table 3: Chemical Constituents of *Terminalia chebula*[7]

Active component types	Compounds
Tannins	Punicalagin((2, 3-(S)-hexahydroxydiphenoyl-4, 6-(S, S) gallagyl-D-glucose), Terflavin A, Terchebulin, Terchebin (1, 3, 6-trigalloyl glucose,), Terflavins B, Terflavin C, Terflavin D, Punicalin, Casuarinin, Corilagin, Ascorbic acid, Chebulaginic acid and Eugenol
Phenolic Carboxylic compounds	Shikimic acid, Ferulic acid, Vanillic acid, p-Coumaric acid, Caffeic acids and Melilotic acid
Flavonoids	Rutin, Quercetin, Luteolin [2-(3, 4-Dihydroxyphenyl)-5, 7-dihydroxy-4-chromenone], Methoxy quercetin and Pelargonidin
Sterols	β-Sitosterol and Daucosterol
Miscellaneous compounds	Behenic acid [Docosanoic acid], Stearic acid [Octadecanoic acid], Palmitic acid [Hexadecanoic acid], Oleic acid [(9Z)-Octadec-9-enoic acid] and Arachidic acid [Icosanoic acid]
Compound isolate	2-Undecanone, Hexadecane, 9-Eicosene, Oxirane, Tritetracontane, Tetradecane, 1-Tricosene, 1, 19-Eicosadiene, Heptafluorobutyric acid, 1, 2-benzenedicarboxylic acid, Tetracosanoic acid, [Lignoceric acid], Sulfurous acid, Vitamin E, Octacosanoic acid, Acetic acid, Heptacosanoic acid and Ethanedioic acid

PHARMACOLOGICAL USES:

Anti-oxidant:[8]

The methanol extract of Terminalia chebula had the greatest total triterpenoid content and exhibited good antioxidant activity in the HRP-luminol-H2O2 assay. The water extract appeared to have the greatest total phenolic and tannin content and showed good antioxidant activities in both CuSO4-Phen-Vc-H2O2 and luminol-H2O2 assays. The 95% ethanol extract exhibited good antioxidant activity in the pyrogallol-luminol assay.

Cytoprotective activity:[9]

Ethanolic extract of Terminalia chebula fruit exhibited significant cytoprotective effect against UV B-induced oxidative damage. These observations were attributed to the inhibitory effect of the Terminalia chebula extract on the age dependent shortening of the telomere length as shown by the Southern Blots of the Terminal Restriction Fragments (TRFs) of DNA extracted from sub-culture passages. Cytoprotective effect on oxidative stress and inhibitory effect on cellular aging of its fruits have also been well documented.

4.NELLIKKAI:

- Botanical name: *Phyllanthus emblica*
- Family: Euphorbiaceae
- English name: Indian gooseberry

Fig 4: Nellikkai*(Phyllanthus emblica)*

Table 4: Chemical Constituents of *Phyllanthus emblica*[10]

Chemical components	Percentage
Fruits: Moisture	81.2%
Protein	0.5%
Fat	0.1%
Mineral matter	0.7%
Fiber	3.4%
Carbohydrate	14.1%
Calcium	0.05%
Phosphorus	0.02%
Iron	1.2 mg/100g
Vitamin C	600 mg/100g
Nicotinic acid	0.2 mg/100g

PHARMACOLOGICAL USES:

Antioxidant and free radical scavenging activity:

The methanolic seed extract of Emblica officinalis has promising free radical scavenging activity of 1, 1, Diphenyl-2-picryl-hydrazil (DPPH) in a concentration dependant manner[11]. Methanolic extract of fruit pulp also have antioxidant and free radical scavenging activity[12].

Immunomodulatory activity:

Reports suggest that triphala can stimulate the neutrophil functions in the immunized albino rats[13]. There was considerable dose dependent raise in haemagglutination antibody titre, macrophage migration index, hypersensitivity reaction, respiratory burst activity of the peritoneal macrophages, total leukocyte count, percentage lymphocyte distribution, serum globulin and relative lymphoid organ weight in Emblica treated albino mice indicating its ability to stimulate humoral and cell mediated immunity along with macrophage phagocyte[14].

Hepato-protective activity:

The histopathological study of liver cells of rats was examined by administering E. officinalis as a preventative agent to reduce paracetamol induced hepatotoxicity and it has been observed that fruit extract has the ability to rectify toxicity or hepatic damage[15].

5.THANDRIKKAI:

- Botanical name: *Terminalia bellirica*
- Family: Combretaceae
- English name: Beleric myrobalans

Fig 5: Thanrikkai*(Terminalia bellirica)*

Table 5: Chemical Constituents of *Terminalia bellirica*[16]

Chemical constituents	Source
Beta cetosterol, gaelic, ethyl and ellagic acid. Gallo-tannic acid, Tannins, ellagic acid, ethyl gallate, galloyl glucose and chebulaginic acid. Phenyllemblin, β-sitosterol, mannitol, glucose, fructose and rhamnose. Glucoside (bellericanin), Gallo-tannic acid, Ellagic acid, gallic acid, lignans (termilignan and thannilignan),	Plant body
17.70 % myristic acid, 21.6 % palmitic acid, 45.67 % oleic acid and 14.93 % stearic acid.	Seed
Tain termilignan, Thannilignan, 7-hydroxy-3',4'-(methylenedioxy) flavones, Anolignan B 5, Gallic acid, Ellagic acid, ß-sitosterol. Flavonoids, sterols and tannins. Gallic acid, ellagic acid and chebulagic acid Gallo-tannic acid and glycoside bellericanin	Fruit
Arjungenin and its glycosides, belleric acid and bellericosides. Hydrolysable tannins; gallic acid and ellagic acid in the water-soluble extract	Stem bark
Proteins, steroids and terpinoids Saponins, Tannins, Amino acids, Proteins, Alkaloids, Carbohydrates and Flavonoids. Pyridine-3-carboxamide,4-dimethylamino-N,2, 4-difluorophenyl β-sitosterol,1,5-diphenyl-3-pentanone, 9-Octadecenoic acid	Leaf

PHARMACOLOGICAL USES:

Antioxidant activity:

Antioxidant potential of acetone extract/fractions of its fruit was investigated using in vitro assays, including scavenging ability against 2,2'-diphenyl-2-picrylhydrazyl (DPPH), β-carotene bleaching inhibition, reducing power and chelating ability on Fe2+ ions. Maximum antioxidant activities (expressed as EC50 values) observed were 14.56, 27.81 and 67.8 μg/mL in DPPH, β-carotene bleaching and reducing power assays, respectively

Hepatoprotective activity:

Evaluated the protective effect of fruit extract and its active principle, gallic acid (3,4,5trihydroxybenzoic acid) at different doses against carbon tetrachloride intoxication. Toxicant caused a significant increase in the activities of serum transaminases and serum alkaline phosphatase. Hepatic lipid peroxidation level increased significantly whereas significant depletion was observed in reduced glutathione level after carbon tetrachloride administration.

6.CHUKKU:

- Botanical name: *Zingiber officinale*
- Family: Zingiberaceae
- English name: Dried ginger

Fig 6: Chukku*(Zingiber officinale)*

Table 1. Nutritional composition of ginger (per 100g).

Constituent Value Constituent Value
Moisture 15.02 ± 0.04 Ash (g) 3.85 ± 0.61 (4.53)
Protein (g) 5.087 ± 0.09(5.98) Calcium (mg) 88.4 ± 0.97 (104.02)
Fat (g) 3.72 ± 0.03 (4.37) Phosphorous (mg) 174±1.2 (204.75)
Insoluble fibre (%) 23.5 ± 0.06 (27.65) Iron (mg) 8.0 ± 0.2 (9.41)
Soluble fibre (%) 25.5 ± 0.04 (30.0) Zinc (mg) 0.92 ± 0 (1.08)
Carbohydrate (g) 38.35 ± 0.1 Copper (mg) 0.545 ± 0.002 (0.641)
Vitamin C (mg) 9.33 ± 0.08 (10.97) Manganese (mg) 9.13 ± 001 (10.74)
Total carotenoids (mg) 79 ± 0.2 (9296) Chromium (µg) 70 ± 0 (83.37)

All value in this table represent the mean ± SD (n = 4). Figures in the parenthesis represent the dry weight values.

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PHARMACOLOGICAL USES:[18]

Antioxidant:

(6)-gingerol appears to be the antioxidant constituent present in ginger, as it was shown to protect HL-60 cells from oxidative stress[19]. Ginger oil has dominative protective effects on DNA damage induced by H2O2. Ginger oil might act as a scavenger of oxygen radical and might be used as an antioxidant[20].

Anti-microbial activity:

[6]- gingerol and [12]-gingerol, isolated from ginger rhizome, demonstrated antibacterial activity against periodontal bacteria[21].

7. MILAGU:

- Botanical name: *Piper nigrum*
- Family: Piperaceae
- English name: Black pepper

Fig 7: Milagu*(Piper nigrum)*

Table 7: Major chemical compounds responsible for the aroma, pungency and medicinal property of the black pepper[22].

Chemical compound	Type of odor
α–terpineol	Floral
Acetophenone	Irritant, sharp
Hexonal	Green apple
Nerol	Fresh, Floral, Herbal
Nerolidol	Mild spicy, Rooty
1, 8 – cineol	Camphory
Dihydrocarveol	Warm, Woody
Citral	Citrussy
α–pinene	Terperic, Oxidised
Piperolnol	Sweet, Floral

Table 8: Antioxidant active chemicals isolated from black pepper.

Ascorbic-acid	0–10 ppm
Beta-carotene	0.114–0.128 ppm
Lauric-acid	400–447 ppm
Myristic-acid	700–782 ppm
Palmitic-acid	12,200–13,633 ppm
Piperine	17,000–90,000 ppm

PHARMACOLOGICAL USES:

Antipyretic & Analgesic:[23]

Analgesic and antipyretic actions of piperine have been experimented on rabbit and mice and found strong antipyretic effect on typhoid vaccinated rabbits at a dose of 30 mg/kg body weight. Reported that piperine gave a strong activity with an ED50 of 3.7 mg/kg on writhing method and 104.7 mg/kg on tail clip method.

Improves appetite

Antioxidant:

Black pepper minimizes oxidative stress caused by saturated fats in the food. The high levels of cholesterol and triglycerides associated with oxidative stress inhibit the efficacy of important antioxidants (eg. glutathione, superoxide dismutase, catalase, glutathione peroxidase, vitamin C and E). Oxidation is a leading cause for quality deterioration during processing and storage of muscle foods.

Immunomodulatory activity:[24]

Pepper doesn't have cholesterol. It enhances digestion process by helping faster break down of larger fat molecules into easily digestible simple molecules and prevents the accumulation of fat in body. Black pepper exhibits immunomodulatory effect on human body. It is able to boost and supports the number and the efficiency of white cells and assists the body to raise a powerful defense against invading microbes and cancer cells.

Increases digestive power:[25]

It has been found that piperine can increase absorption of selenium, vitamin B, beta-carotene and curcumin. It can improve digestion and stimulate the secretion from the taste buds and taste bud stimulation is a feedback loop for digestion process. It sends impulses to the stomach to increase digestive juices secretion (eg. Hydrochloric acid). These juices break down the protein in the stomach, improving ability for further digestion in the duodenum. Bile acids are important for fat digestion and absorption and pepper constituents stimulate bile acid production by the liver and its secretion into bile

8.THIPILI:

- Botanical name: *Piper longum*
- Family: Piperaceae
- English name: Long pepper

Fig 8: Thippili*(Piper longum)*

Table 9: Chemical composition of *Piper longum*[26]

Active component types	Compounds
Alkaloids and amides	Piperine, Piperlonguminine,Retrofractamide A, Pergumidiene, Brachystamide-B, 1(3,4methylenedioxyphenyl)1E-tetradecene, 3-(3,4-methylenedioxophenyl), Propenal, Piperoic acid, 3,4-di-hydroxy- biabola-1, 10-diene, Eudesm-4(15)-ene-1beta, 6-alpha-diol,
Lignans	Sesamin, Pulviatilol, and Fargesin.
Esters	Tridecyl-dihydro-pcoumaarate,Eicosanyl-(e)-p-coumarate and Z-12octandecenoic – glycerol-monoester.
Volatile oil	Caryophyllene, Pentadecane, Bisaboline, Thujine, Terpinoline, Zingiberine, Pcymene, P-methoxy acetophenone and Dihydrocarveol
Organic acids	Palmitic acid and Tetrahydropiperic acid
Others	Starch, ProteinSaponins, Carbohydrates, and Amygdalin

PHARMACOLOGICAL USES:

Antioxidant:[27]

The petroleum ether extract of the fruit decrease lipid peroxide levels and maintain glutathione content, demonstrates antioxidant activity.

Immunomodulatory activity:[28]

The immunomodulatory potential of Piper longum fruit extract have been evaluated by heme agglutination titre(HA), macrophage migration index (MMI), and phagocytic index (PI) in mice. A familiar ayurvedic preparation containing long pepper, pippali Rasayana, was tested in mice infected with Giardia lamblia and found to produce significant activation of macrophages as shown by an increased MMI and phagocytic activity

Anti-asthmatic activity

Hepatoprotective activity:[29,30]

The plant extract of Piper longum was studied in rodents for its hepatoprotective action against carbontertrachloride induced acute, chronic reversible and irreversible damage using morphological, biochemical and histopathologic parameters. The main piperine was found to protect against tertiary butyl hydroperoxide induced and carbontetrachloride induced hepatotoxicity by reducing lipid peroxidation by invitro and invivo methods.

Anti-microbial activity:

The various solvent extract of Piper longum was tested for its anti-bacterial and anti-fungal activity against a variety of pathogenic bacteria and fungi respectively[31]. The fruit extract of Piper longum shown to possess anti-microbial activity against certain antibiotic resistant specific bacteria, this supports its traditional use as an anti-microbial remedy[32].

Antiplatelet activity:[33]

The inhibitory effects of the four acid amides piperine, pipernonaline, piperoctadecalidine, and piperlongumine, isolated from the fruits of Piper longum Linn. Were evaluated on washed rabbit platelet aggregation. These four tested acid amides dose-dependently inhibited washed platelet aggregation induced by collagen, arachidonic acid, and platelet-activating factor, but not that induced by thrombin.

9.NARUKU MOOLAM:

- Botanical name: *Piper longum*
- Family: Piperaceae
- English name: Long pepper root

Fig 9: Naruku moolam*(Piper longum)*

PHARMACOLOGICAL USES:

Antioxidant activity:

P. longum exhibits promising antioxidant potential against free radical-induced oxidative damage. Petroleum ether extract of the root and piperine from roots of P. longum Linn. Decrease lipid peroxide levels and maintain glutathione content, demonstrating antioxidant activity

10.KIRAMBU:

- Botanical name: *Syzygium aromaticum*
- Family: Myrtaceae
- English name: Clove tree

Fig 10: Kirambu*(Syzygium aromaticum)*

The volatile compounds identi灯ed in the n-hexane extract of Syzygium aromaticum buds by using GC-MS
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Table 10: The volatile compounds identied in the n-hexane extract of *Syzygium aromaticum*[34]

GC-MS
The volatile compounds identi灯ed in the n-hexane extract of Syzygium aromaticum buds by using GC-MS
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The volatile compounds identi灯ed in the n-hexane extract of Syzygium aromaticum buds by

Compound	Conc. (%)
1 p-Cymene	0.9
2 5-Hexene-2-one	0.67
3 Thymol	0.87

4 Eugenol	71.56
Eugenyl acetate	8.99
Caryophyllene oxide	1.67
Guaiol	0.90
Benzene-1-butylheptyl	0.55
Nootkatin	1.05
Isolongifolanone (trans)	0.86
Hexadecanoic acid	0.50
9,17-Octadeca-dienal	0.24
Octadecanoic acid butyl ester	0.33
Phenol-4-(2,3-dihydro-7-methoxy-3-methyl5-(1-propenyl)-2 -benzofurane	0.98
Dodecatrienoic acid-3,7,11- trimethylethyl ester	0.38
Vitamin E acetate	0.43

PHARMACOLOGICAL USES:

Antioxidant activity:

The ethanol extract of the clove buds showed remarkable scavenging activity (93%), as compared with synthetic antioxidants such as BHT (95%). These results demonstrated that the extracts of S. aromaticum buds and the isolated flavonoids have effective activity as hydrogen donors and as primary antioxidants by reacting with lipid radicals.

Hepatoprotective study:

The reversal of increased serum enzymes in paracetamol-induced liver damage by the ethanol extract of clove may be due to the prevention of leakage of the intracellular enzymes by its membrane stabilizing activity, which in agreement with the commonly accepted view that serum levels of transaminases return to normal with healing of hepatic parenchyma and the regeneration of hepatocytes.

Antimicrobial Activity

Essential oils were diluted to get the final concentration ranging from 0 to 1000 µg/mL in NB. Finally, 20 µL inoculums of each bacteria strain were inoculated and the tests were performed at a final volume of 5.0 mL. The plates were incubated at 37 oC for 24 h. The lowest concentration of the test samples which did not show any visual growth of tested organisms after macroscopic evaluation was determined as MIC, which was expressedin µg/mL.

11.THALISAPATHIRI:

- Botanical name: *Abies spectabilis*
- Family: Pinaceae
- Common name: Himalayan fir

Fig 11: Thalisapathiri*(Abies spectabilis)*

Table 11:*A. spectabilis* bark extract (ME) was remarkably high, the IC_{50} for the 2,2-diphenyl-1-picrylhydrazyl (DPPH) test[35]

Extract	DPPH IC_{50} µg/mL
Methanol	4.13 ± 0.02
Chloroform	>100
Rutin	4.80 ± 0.02
Ascorbic acid	3.50 ± 0.01

PHARMACOLOGICAL USES:

Antioxidant:[36]

DPPH and FC tests on the chloroform extract revealed poor activity. These results are not unexpected due to the poor solubility of polyphenol derivatives in lipophylic solvents. Ferrozine can quantitatively form complexes with Fe2+ and, in the presence of other chelating agents, complex formation is inhibited and the red colour of the complex is decreased. For this reason, determination of the reduction of the colour allows estimation of the chelating activity of the sample in question. The scavenging of transition metals is important because of their ability to catalyse oxidative reactions and thus, the capacity of extracts to chelate metals is a significant antioxidant-related property.

Iron (II) Chelating Capacity:[37]

The extracts were diluted 10-fold with ethanol, then the solution obtained (0.9 mL) was added to 2 mM FeCl2 (60 µL), and the reaction mixture was activated by the addition of 5 mM ferrozine (120 µL). After vortexing, the reaction mixture was incubated at room temperature for 10 min and its chelating activity spectrophotometrically measured at 562 nm.

12.ATHIMATHURAM:

- Botanical name: *Glycyrrhiza glabra*
- Family: Fabaceae
- English name: Indian liquorice

Fig 12: Athimathuram*(Glycyrrhiza glabra)*

Table 12: Phytochemical screening for hydro-methanolic extract of *Glycyrrhiza glabra* Linn[38]

Constituents	Test performed	Result
Carbohydrates	Molisch's test	(-)
Proteins	Copper sulphate test	(-)
Flavonoids	Leadacetate test, NAOH solution test	(+)
Alkaloids	Dragendroff's test	(+)
Steroids	Lieberman's test	(+)
Terpenoids	Salkowski's test	(+)
Saponins	Froth test	(+)
Tannins	Ferric chloride test	(+)
Phlobatannins	HCL test	(-)
Anthraquinones	Benzene test	(-)
Glycosides	Keller-Killani test	(+)
Phenolic Compounds	Ferric sulphate test	(-)

PHARMACOLOGICAL USES:

Anti-oxidant effect:[39]

Chalcone derivative, a novel group of neolignan lipid esters, and seven known phenolic compounds (formononetin, glabridin, hemileiocarpin, hispaglabridin B, isoliquiritigenin, 4'-O-methylglabridin, and paratocarpin B) isolated from the roots and stolons of Glycyrrhiza glabra were tested in an authentic peroxynitrite anti-oxidant assay. Of these compounds, hispaglabridin B, isoliquiritigenin, and paratocarpin B were found to be the most potent anti-oxidant agents.

Antimicrobial effects:[40]

The antibacterial effect of alcoholic extract obtained by percolation from roots of *Glycyrrhiza glabra*was tested against Escherichia coli, Pseudomonas fluorescens, Enterococcus faecalis, Bacillus cereus, and Staphylococcus aureus, the extract showed the strong antibacterial activity against all bacterial strains tested. The maximum inhibition diameter was 15 mm against E. coli, E. faecalis, B.cereus, whereas P. fluorescens showed the lowest sensitivity, with an inhibition zone of 9 mm.

Immunological effect:[41]

The effect of *Glycyrrhiza glabra* root extract (0.1, 0.2 and 0.3 mg/l drinking water) was investigated on the performance and some immunological parameters of broiler chickens. *Glycyrrhiza glabra*root extract had no significant (P > .05) effect on immunological parameters including antibody titers against Newcastle disease and Influenza viruses, heterophil and lymphocyte percentages and heterophil to lymphocyte (H/L) ratio as well as liver and lymphoid organ (bursa of Fabricius, thymus and spleen) weights

13.KOSTAM:

- Botanical name: *Costus speciosus*
- Family: Zingiberaceae
- English name: Costus root

Fig 13: Kostam*(Costus speciosus)*

Table 13: Percentage of Phytochemcial of *Costus speciosus*[42]

Bio Active Compounds	*mg/gm of Dry Material
Total Phenol	25.4 ± 0.4
Tannin	20.3 ± 0.62
Saponin	18.3 ± 0.66
Flavonoid	13± 0.79
Terpenoid	11.2 ± 0.5
Alkaloid	6.4 ± 0.45
Steroid	1.03± 0.15

*Values are expressed as Mean ± Standard deviation

Table 14: Phytochemical screening of rhizome extracts of *Costus speciosus*[43]

Constituents	Test	Observation	S1	S2	S3	S4
Carbohydrates	Benedicts Reagent	Red precipitate	+	+	+	+
Alkaloids	Mayer's Reagent	White precipitate	-	+	-	-
Glycosides	Borntranger's Reagent	Pink coloration	+	+	+	+
Saponins	Foaming	Frothing persisted for 10-15 min	+	+	-	-
Flavonoids	Shinoda	Pink-Red colouration	+	-	-	-
Phenols	Ferric chloride	Dark brown coloration	-	+	+	+
Vitamin C	2,6-dichlorophenol-indophenol sodiumsalt	Red coloration	+	-	-	-
Vitamin E	HPLC method	-	-	-	+	-

S1=Water, S2=Methanol, S3=Acetone, S4=Chloroform.

PHARMACOLOGICAL USES:

Anti-scavenging & Antioxidant properties:

The antioxidant activity of chloroform extract of C. speciosus leaves for its free radical scavenging activity.Plant derived antioxidants such as tannins, lignans, stilbenes, coumarins, quinones, xanthones, phenolic acids, flavones, flavonols, catechins, anthocyanins and proanthocyanins could delay or provide protection for living organisms from damage caused by uncontrolled production of reactive oxygen species (ROS) and the concomitant lipid peroxidation, protein damage and DNA strand breaking, because of their redox properties, which allow them to act as hydrogen donors, reducing agents, free radical scavengers.

14.SIRUTHEKU:

- Botanical name: *Clerodendrum serratum*
- Family: Verbenaceae

- English name: Blue flower glory tree

Fig 14: Siruthekku*(Clerodendrum serratum)*

Table 15: Physico-chemical parameters of C. serratum root[44]

Parameters	Result
1. Ash values	
Total	3.24±0.06 % w/w
Acid insoluble	0.53±0.09 % w/w
Water soluble	0.26±0.02 % w/w
2. Extractive values	
Alcohol soluble	7.5±0.21 % w/w
Water soluble	13.28±0.38 % w/w
3. Moisture content	5.16±0.03 % w/w
4. Crude fiber content	30.00±0.28 % w/w
5. Foaming index	9 cm

Table 16: Phytochemical screening of C. Serratum root

Constituents	Test performed	Result
Carbohydrates	Molisch test	+++
Amino acid	Ninhydrin test	-
Glycoside	Baljet test	-
Steroids and terpenoids	Salkowski test	++
Flavonoids	Shinoda test	+++
Saponins	Foaming test	+++
Alkaloids	Hager's test	-
Tannins (phenolic compounds)	Lead acetate test	+++

+++ = highly present; ++ = moderately present; + = slightly present; - = absent

PHARMACOLOGICAL USES:

Antioxidant:[45]

In DPPH radical scavenging assay, *Clerodendrum serratum* root at various concentrations (50, 100, 150, 200, 250 µg/ml) and ascorbic acid (50, 100, 150, 200, 250 µg/ml) showed the significant inhibitory activity with IC50 value 175 and 137 respectively. In reducing power assay, a linear increase in reducing power was observed over the concentration range 20-120 µg/ml sample, equivalent to 20 -120 µg/ml ascorbic acid. The inhibition of 73.32 ± 0.002%, and 64.49 ± 0.242% was observed for ascorbic acid (standard) and ethanolic extract of root (test) respectively at maximum concentrations.

15.KADUKUROHINI:

- Botanical name: *Picrorhiza kurroa*
- Family: Scrophulariaceae
- English name: Picrorhiza

Fig 15: Kadukurohini*(Picrorhiza kurroa)*

Table 17: Qualitative test of hydromethanolic plant extract of *Picrorhiza kurroa*[46]

Constituents	Test performed	Result
Phenolics	Ferric Chloride Test Lead acetate Test	+ +
Flavonoids	Ammonia Test H2SO4 Test Alkaline reagent Test	+ + +
Tannins	Gelatin Test	-
Phytosterols	Salkowski's Test	+
Alkaloids	Dragendroffs reagent test	+
Saponins	Foam test	+
Protein	Xanthoprotic Test	+
Amino acids	Ninhydrin Test	-
Carbohydrate	Molisch's Test Benedict's test	+ +

PHARMACOLOGICAL USES:

Antioxidant Activity:[47]

P. kurroa Extract Exhibits High in Vitro Antioxidant Activity: In both DPPH and ferrymyoglobin radical scavenging assays P. kurroa extract showed concentration-dependent activity. In ferric reducing antioxidant power (FRAP) assay, the maximum ferric reducing ability of 1.1±0.03 µg/ml ascorbic acid equivalent (AEAC) was recorded, whereas in DPPH assay, the maximum radical scavenging activity was 0.8±0.03 µg/ml AEAC.

16.NANNARI:

- Botanical name: *Hemidesmus indicus*
- Family: Asclepiadaceae
- English name: Indian sarasaparilla

Fig 16: Nannari*(Hemidesmus indicus)*

Table 18: Physicochemical contents of *Hemidesmus indicus* root powder[48]

Parameters	Fresh sample	Market sample
Foreign matter	<0.2%	<0.74%
Powder Particle size	2.07µm	1.95
Foaming index	250U	200U
Swelling index	2.3%	1.8%
Acid insoluble ash value	0.9%	1.15%
Water soluble ash value	1.85%	2.23%

Total ash	3.8%	4.23%
Ethanol extractive	13.20%	10.25%
Water extractive	14.40%	15.98%

Table 19: Qualitative phytochemical evaluation of H. indicus ethanolic extract[49]

Phytochemical	Leaf	Stem	Root
Alkaloids	Present	Present	Present
Flavonoids	Present	Present	Present
Tannins	Present	Present	Present
Saponins	Present	Present	Present
Terpenoids	Present	Present	Present
Carbohydrate	Present	Present	Present
Glycosides	Present	Present	Present
Proteins	Present	Present	Present

Table 20: Quantitative phytochemical evaluation of H. indicus ethanolic extract

Phytochemical (per gram of extract)	Leaf (mg/g)	Stem (mg/g)	Root (mg/g)
Polyphenols	45.5	46.7	57.7
Flavonoids	12.2	22.3	27.3
Flavonones	4.80	3.69	7.16
Flavones and flavonols	0.32	0.62	0.69

PHARMACOLOGICAL USES:

Antioxidant and free radical scavenger:[50]

The dried plant material extract at a dose level of 1.5 and 3.0 mg/kg BW was effective as chemopreventive agent, capable of ameliorating cumene-hydroperoxide induced cutaneous oxidative stress and tumor promotion with significant inhibition of cutaneous oxidative stress, epidermal ornithine decarboxylase activity and enhanced DNA synthesis.

17.SITRAMUTTI:

- Botanical name: *Sida cordifolia*
- Family: Malvaceae
- English name: Country mallow

Fig 17: Sitramutti*(Sida cordifolia)*

Table 21: Phytochemical screening of *Sida cordifolia*:[51]

Constituents	Test performed	Result
Reducing sugar	Benedict's test	++
Alkaloids	Mayer's test	++
	Hager's test	++
Flavonoids	General test	- -
Tannins	$FeCl_3$ test	- -
Saponins	Frothing test	++
Gums & Carbohydrates	Molisch Test	- -
Steroids	Sulphuric acid test	++

PHARMACOLOGICAL USES:

Antimicrobial:

Antimicrobial activities of the extract were tested against five pathogenic bacteria and compared with the standard antibiotic kanamycin by measuring the zone of inhibition diameter and expressed in mm.

Antioxidant:

The ethanolic extract of S. cordifolia roots was tested for DPPH radical scavenging activity. The IC50 value for the extract was 50 µg/mL and for ascorbic acid standard was 1.16 µg/mL.Which have been shown to exert antioxidant action by breaking the free radical chain through donating a hydrogen atom and may have great relevance in the prevention and treatment of diseases associated with oxidants or free radicals

18.SEERAGAM:

- Botanical name: *Cuminum cyminum*
- Family: Apiaceae
- English name: Cumin seeds

Fig 18: Seeragam*(Cuminum cyminum)*

Table 22: Preliminary phytochemical screening of hot water extracts of *Cuminum cyminum* seeds:[52]

Constituents	Test performed	Result
Carbohydrates	Molisch Test	+
Proteins	Biuret Test	+
Amino Acids	Ninhydrin Test	+
Alkaloids	Mayer's Test	+
Steroid	Salkowski reaction	+++
Saponins	Foam test	+
Phenols and Tannins	Folin Test Bromine water Acetic acid	++++ + -

PHARMACOLOGICAL USES:

Antioxidant effect:[53]

Antioxidant activity of essential oils was evaluated by DPPH radical scavenging assay, radical inhibition of *Cuminum cyminum* essential oils was 83.59%, the scavenging activities of the essential oil was increased with the increased of the essential oil concentrations.

Effect on platelet function:[54]

Extract of cumin inhibited arachidonate-induced platelet aggregation. It also inhibited thromboxane B2 production from exogenous (14C) arachidonic acid (AA) in washed platelets, in addition, a simultaneous increase in the formation of lipoxygenase-derived products was also observed

Immunological effect:[55]

The health modulating effects and immunomodulatory properties of *Cuminum cyminum* were evaluated using flowcytometry and ELISA in normal and immune-suppressed animals. *Cuminum cyminum* stimulated the T cells and Th1 cytokines expression in normal animals.

19.PERICHAMPAZHAM:

- Botanical name: *Phoenix dactylifera*
- Family: Arecaceae
- English name: Date palm

Fig 19: Perichampazham*(Phoenix dactylifera)*

Table 23: Qualitative phytochemical characteristics of *Phoenix dactylifera*[56]

Constituents	Extracts			
	Aqueous	Ethanol	Diethyl ether	Hexane
Alkaloid	+	+	+	+
Flavonoid	+	+	+	+
Tannin	+	+	+	+
Saponin	+	+	+	+
Terpernoid	+	+	+	+
Steroids	+	-	+	+
Combined Anthraquinone	+	+	-	-
Phenol	+	+	+	-
Cardiac Glycoside	-	-	-	-

PHARMACOLOGICAL USES:

Antioxidant:[57]

The antioxidant of date seeds assessed using three assays varied between 10.966–22.86 mmol Trolox equivalent/100 g DW, 4.807–8.021 mmol Trolox equivalent/100 g DW and 0.166–0.112 g/l for FRAP, ABTS and IC50 of DPPH respectively.

20.MUNTHIRIPAZHAM:

- Botanical name: *Vitis vinifera*
- Family: Vitaceae
- English name: Dry grapes

Fig 20: Munthiripazham*(Vitis vinifera)*

Table 24: Physicochemical analysis of grape pomace *vitis vinifera*[58]

Parameters (% dry basis)	Results (mean ± SD)
Moisture (g/100g)	3.33 ± 0.004
Ash (g/100g)	4.65 ± 0.05
Total lipids (g/100g)	8.16 ± 0.01
Protein(g/100g)	8.49 ± 0.02
Carbohydrate (g/100g)	29.20

Pectin (g/100g)	3.92 ± 0.02
Fructose (g/100g)	8.91 ± 0.08
Glucose(g/100g)	7.95 ± 0.07
Total dietary fiber (g/100g)	46.17 ± 0.80
Total calories (Kcal/100g)	224

Table 25: Bioactive compounds in *Vitis vinifera*

Bioactive compounds	Results (mean ± SD)
Vitamin C(mg ascorbic acid/100g)	26.25 ± 0.01
Total anthocyanins (mg/100g)	131 ± 0.4
Soluble dietary fiber (g/100mg)	9.76 ± 0.03
Insoluble dietary fiber (g/100mg)	36.40 ± 0.84

Table 26: Composition of minerals (mg/100g) in grape pomace (Vitisvinifera L) flour

Minerals	Results (mean SD)
Calcium	0.44 ± 0.715
Magnesium	0.13 ± 0.255
Sodium	0.044 ± 0.056
Potassium	1.40 ± 0.313
Iron	18.08 ± 0.03
Manganese	0.817 ± 0.550
Phosphorus	0.183 ± 0.255
Sulfur	0.089 ± 0.336
Zinc	0.98 ± 0.702

PHARMACOLOGICAL USES:

Antioxidant property:[59]

Oxidative stress is a hallmark of various health problems.Resveratrol (3, 5, 40-trans-trihydroxystilbene) is a naturalphytoalexin abundantly found in grapes and red wine, which has potent antioxidant property. Over the years severalanalogs, i.e., 3,4-dihydroxy-trans-stilbene (3,4-DHS), 4,40-DHS, 4-hydroxy-trans-stilbene, and 3,5-DHS, of resveratrol have been synthesized and have been found to have anattenuating effect on free radical-induced peroxidation ofrat liver microsomes. Thus, all these trans-stilbene derivatives are potent antioxidants against both 2, 20-azobis (2-amidinopropane hydrochloride) - and iron-induced peroxidation.

21.KARKANDU:

- Botanical name: *Saccharum officinarum*
- Family:Poaceae
- English name: Sugar candy

Fig 21: Karkandu*(Sugar candy)*

Table 27: Content of moisture, protein, ash, reducing sugars (RS) and saccharose (g.100 g–1 DBa)[60]

Moisture	4.33
Protein	0.87
Ash	1.39
reducing sugars (RS)	5.23
Saccharose	86.03

PHARMACOLOGICAL USES:

Anti-thrombotic activity:[61]

Policosanols and D-003 were examined for their platelet aggregation and antithrombotic activity in rats. Oral administration of D-003 at a single dose of 200 mg/kg and policosanols at a concentration of 25 mg/kg in rats, significantly increased the plasma level of 6 keto-PGF1-α (a stable metabolite of prostacyclin PGI (2) as compared to the control group. Furthermore, D-003 also significantly reduced the thromboxane, TxB (2), plasma levels and weight of venous thrombus in collagen-stimulated whole blood of rats

Antihepatotoxic activity:[62]

The aqueous extract of dried stems administered intraperitoneally to mice, at a dose of 25 mg/kg, was active against chloroform-induced hepatotoxicity

22.NEI:

Fig 22: Ghee

Table 28: Physicochemical Parameters of CG and HCG[63]

Physicochemical Parameters	CG (Mean ± S.D.)	HCG (Mean ± S.D.)
Specific gravity* (g/cc)	0.9390 ± 0.0007	1.1230 ± 0.0005
Melting range (0C)	37.2-37.4	41.8-44.2
Acid value*	0.374 ± 0.02	0.482 ± 0.02
Ester value*	224.126 ± 0.03	223.918 ± 0.03
Hydroxyl value	16.436 ± 0.16	16.430 ± 0.13
Iodine value*	36.72 ± 0.217	3.46 ± 0.114
Peroxide value*	8.1 ± 0.245	10.22 ± 0.286
Saponification value	224.5 ± 0.14	224.4 ± 0.14
Unsaponifiable Matter* (%)	0.9232 ± 0.0037	0.9872 ± 0.0070
Solidification temperature (^{0}C)	21.0-22.2	16.2-18.4
Anisidine value*	10.14 ± 0.167	17.24 ± 0.261
Heavy metals* (%)	0.0006 ± 0.0001	0.0008 ± 0.0001
Limit of nickel(µg/g)	>0.1	>0.1
TOV*	26.34 ± 0.59	37.68 ± 0.81

All the determinations are carried out five times. *Indicates the significance ($p \leq 0.05$)

PHARMACOLOGICAL USES:

Hepatoprotective:[64]

Panchgavya formulation when evaluated for hepatoprotective effects in rats using carbontetrachloride induced toxicity produced positive results. The parameters for protection was determined by measuring levels of serum marker enzymes like serum glutamate oxaloacetate transaminase (SGOT) serum glutamate pyruvate transaminase (SGPT), alkaline phosphatase (ALP) and acid phosphatase (ACP). Silymarin was used as the standard drug for comparison. Panchgavya Ghrita (150-300 mg/kg, p.o.) markedly prevented CCl4 induced elevation of levels of SGPT, SGOT, ACP and ALP. The results were comparable to that of standard drug Silymarin. Histopathological comparision of liver tissues exhibited almost normal architecture, as compared to control group.

II. Conclusion:

Treating anemia is a matter of how much food we eat that aid in haemoglobin synthesis. In general, to treat anemia, focus should be placed on foods that are good in sources of iron, copper, zinc, folic acid, Vitamin B-12 and protein. The combination of Iron and B-vitamins is especially good for treating anemia. All these are present in the ingredients of Vallarai nei. So Vallarai nei is good in treating anemia.

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