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PHARMACEUTICO-ANALYTICAL AND AYURVEDIC PHARMACOLOGICAL PROFILE OF PANCHA TIKTA GHRITA GUGGULU IN PURVIEW OF JARAJANYA- PANDU (IRON DEFICIENCY ANEMIA)

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ABSTRACT

Iron deficiency anemia is one of nutritive deficient anemia which is mainly characterized by decreased iron incorporation in erythrocytes leading to low levels of serum iron and decrease in normal functions of cell. The world health organization defines Anemia as, Hemoglobin concentration <12gm/dl in non-pregnant women, < 13gm/dl in men and to consider as an "established anemia". Ayurveda corelates Iron deficiency anemia with Pandu, a condition hindering the absorption, assimilation process resulting in vascular pathology. Pancha tikta Ghrita Guggulu, a Classical Ayurvedic formulation is utilized for its anti-inflammatory, detoxifying and antioxidant effects. This study evaluates the pharmacological insights and therapeutic aspects of pancha tikta Ghrita guggulu in the context of Pandu. A comprehensive review of classical Ayurvedic texts, API guidelines, and biomedical literature was conducted. Pancha tikta Ghrita guggulu was prepared as per the Ayurveda Formulary of India and analysed for organoleptic, physicochemical, and elemental parameters at Shree Dhootapapeshwar Ayurvedic Research Foundation.

Keywords: Anti-inflammatory, Pharmacology, Iron deficiency Anemia, Pancha tikta Ghrita Guggulu, Pandu

INTRODUCTION

Iron Deficiency Anemia is mainly characterized by decreased iron incorporation in erythrocytes leading to low levels of serum iron and decrease in normal functions of cell. Mainly caused by decreased dietary iron consumption, malabsorption, G.I disorders associated with bleeding. But in case of Geriatrics we encounter the IDA as long standing of inflammation (anemia of inflammation), EPO resistance and insufficiency, decreased iron absorption and assimilation **[1]**. IDA in geriatrics is induced as a complication of systemic inflammatory disorders of long time standing like RA/OA or any other inflammatory conditions, presence of inflammation is mainly marked by 'Hepcidin' a peptide protein **[2]**. It mainly targets the iron transporter 'ferroprotein' and degrades and inhibits the intestinal iron absorption. EPO (erythropoietin) resistance and insufficiency are directly related as aging advances there is decreased sensitivity of heamopetic stem cell to EPO, and it the consequence of aging physiology and there is failure of normal compensatory increased levels required to maintain Hb levels **[2, 3]**. While the etiopathogenesis and clinical presentation of Iron Deficiency Anemia do not align precisely with a single Ayurvedic condition, Pandu. Based on the NAMC code for Pandu (Anemia/Pale) **[4]** disease, which is characterized by change in complexion of person to *pandu* varna. The endogenous factors, exogenous factors like *kshara,amla, atiushna, astamya anna, Vidagdha anna, divasapna, ativyama, ativyayava etc* readily predispose a person to *prakopa* of *pitta* and cause *dhatu pradushana* and this *prakupita pitta* is thrown into circulation through *dasha dhamani* leading to *raktavaigunya* and spreads throughout the body and *lodges in between twak and mamsa leading to pandu* **[5, 6]**.

Panchatikta Ghrita Guggulu is a classical Ayurvedic formulation combining Panchatikta-nimba, patola, vyaghri, guduchi, vasa, Ghrita, patha, vidanga, suradaru, gajopakulya, yavakshara, sarjikashara, nagara, Nisha, misherya, chavya, kustha, tejovati, maricha, vatsaka, deepyaka, agni, rohini, arushkara, vacha, kanamoola, yukta, manjitsha, ativisha, vishani, yavani, guggulu which are togetherly acting as anti-inflammotory with detoxifying properties.Its Deepana(digestive stimulant), srotoshodhana (channel clearing),anulomana (purgative) actions help in eliminating toxins(ama) and corrects absorption and assimilation with balancing Pitta and Rakta dosha .This paper delves into phamaceutico-analytical study and

therapeutic actions of Pancha tikta Ghrita guggulu in the context of of Pandu(Iron deficiency anemia) **[7]**.

MATERIALS AND METHODS

Data for the review of literature was collected through classical texts of Bhaishajya Ratnavali, Ayurvedic Pharmacopoeia of India (API) and the Ayurveda Formulary of India (AFI). The contemporary review was done from textbooks of bio-medical medicine and peer reviewed scientific research journals on Google Scholar, Scopus, Elsevier, PubMed and other relevant databases. In pharmacological addition, actions, the and chemical compositions, Ayurvedic qualities (pharmacodynamic attributes) of each ingredient in Pancha tikta Ghrita Guggulu were assessed.

Classical Reference Of Panchatikta Ghrita Guggulu

Panchatikta Ghrita Guggulu (prepared according to Bhaishajya Ratnavali Kustha Rogadhikara or Ashtanga Ayurveda Chikitsasthana) is a widely used and research-backed Ayurveda formulation in the spectrum of Vatavyadhis as well as in Pandu. The reference dealt with in this paper is from the Ayurveda Formulary of India, derived from Bhaishajya Ratnavali, Kustha Rogadhikara. Studies have shown the efficacy of Panchatikta Ghrita guggulu in Nutriton deficiency anemia more specifically with Iron based on previous clinical studies. Also, the clinical efficacy and safety of the same have been tested in multicentric studies. The classical Refernce of pancha tiktaghrita guggulu is based on Bhaishajya Ratnavali, explained detailed in **Table 1**.

Table 1: Components of Panchatiktaghrita Guggulu as per AFI

S. No.	Ingredient (Ayurvedic)	Botanical Name	Parts
1	Nimba	*Azadirachta indica*	480 gm
2	Patola	*Trichosanthes dioica*	480 gm
3	Vyaghri	*Solanum surattense Burm*	480 gm
4	Guduchi	*Tinospora cordifolia*	480 gm
5	Vasa	*Adhatoda vasica*	480 gm
6	Patha	*Cissampelos pareira*	12 gm
7	Vidanga	*Embelia ribes*	12 gm
8	Suradaru	*Cedrus deodara*	12 gm
9	Gajopakulya	*Scindapsus officinalis*	12 gm
10	Yavakshara	*Hordeum vulgare*	12 gm
11	Sarjakshara	*Salsola stocksii/Sodium carbonate*	12 gm
12	Nagara	*Zingiber officinale*	12 gm
13	Nisha	*Curcuma longa*	12 gm
14	Mishreya	*Foeniculum vulgare*	12 gm
15	Tejovati	*Zanthoxylum armatum*	12 gm
16	Maricha	*Piper nigrum*	12 gm
17	Vatsaka	*Holarrhena antidysenterica*	12 gm
18	Deepyaka	*Trachyspermum ammi*	12 gm
19	Agni	*Clerodendrum phlomidis*	12 gm

20	Rohini	*Soymida febrifuga*	12 gm
21	Arushkara	*Semecarpus anacardium*	12 gm
22	Vacha	*Acrous calamus*	12 gm
23	Kanamoola	*Cinnamomum malabatrum*	12 gm
24	Yuktha	*Pluchea lanceolata*	12 gm
25	Manjistha	*Rubia cordifolia*	12 gm
26	Ativisha	*Aconitum heterophyllum*	12 gm
27	Vishani	*Gymnema sylvestre.*	12 gm
28	Yavani	*Trachyspermum ammi*	12 gm
29	Chavya	*Piper retrofractum*	12 gm
30	Kushta	*Saussurea lappa*	12 gm
31	Shuddha guggulu	*Commiphora mukul*	240 gm
32	Ghrita	*Cow-ghee*	768gm

Method Of Preparation as Per Ayurveda Formulary Of India:

Coarse powder of ingredients from Neem to Vasa is boiled with specified quantity of water to prepare decoction. Ingredients from Patha to Yavani is powdered, weighed separately and then mixed. Ghee is added to the decoction and heated. Purified guggulu is added, stirred and then powdered ingredients are added. Mixture is stirred continuously to obtain semisolid consistency and then rolled into pills. It is stored in a tightly closed containers.

Pharmaceutical Analysis of Panchatikta Ghrita Guggulu

Pharmaceutical Source: Panchatikta Ghrita Guggulu Tablet (Batch No. RD20732025) manufactured by Shree Dhootapapeshwar Ayurvedic Research Foundation was used for analysis.

Pharmaceutico-Analytical Evaluation: Organoleptic characters: colour, odour, and physical appearance.

Tablet quality parameters: average weight, uniformity of weight, hardness, friability, thickness, diameter, and disintegration time.

Physicochemical parameters: loss on drying, total ash, acid-insoluble ash, water-soluble extractive, alcohol-soluble extractive, and pH (1% aqueous solution).

Microbial analysis: total plate count, total yeast and mould count, and presence of specific pathogenic organisms as per API guidelines.

RESULTS AND DISCUSSIONS

Organoleptic evaluation revealed yellowish-brown, round, convex, coated tablets with characteristic odour. The average tablet weight was 680.1 mg, and uniformity of weight was within acceptable limits. Loss on drying was 3.17%, indicating good stability. Friability was 0.02%, and hardness was 2.33 kg/cm², confirming adequate mechanical strength. Disintegration time was observed at 33 minutes. Physicochemical analysis showed total ash value of 19.39%, acid-insoluble ash

of 1.62%, water-soluble extractive value of 35.19%, alcohol-soluble extractive value of 27.55%, and pH of 5.24, indicating consistency and presence of extractable active constituents. Microbial analysis demonstrated a total plate count of 845 cfu/g, total yeast and mould count less than 10 cfu/g, and absence of *Escherichia coli, Salmonella spp., Pseudomonas aeruginosa,* and *Staphylococcus spp.,* confirming microbiological safety. The pharmaceutical analysis of this batch, including parameters and observations, is documented in **Table 2**, while the Ayurvedic pharmacological properties are detailed in **Table 3**.

Table 2: The Pharmaceutical Analysis of Pancha tikta Ghrita Guggulu

S. No.	Parameters	Observations
1	Description	Yellowish brown color, round convex coated tablet having SDL mark on one side
2	Loss on drying (%)	3.17
3	Friability (%)	0.02
4	Average weight (mg)	680.1 mg
5	Uniformity of weight	None of tablets deviate by more than 5% of the average weight
6	Disintegartion time (minute)	33
7	Hardness (kg/cm^2)	2.33
8	Thickness (mm)	5.22
9	Diameter (mm)	12.06
10	Ash (%)	19.39
11	Acid insoluble ash(%)	1.62
12	Water soluble extractive (%)	35.19
13	Alcohol soluble extractive (%)	27.55
14	pH(1% aq.solution)	5.24
15	Microbial Analysis	
	Total plate count (not more than 10^5 cfu/g)	845 c.f.u/g
	Total yeast and mould count (not more than 10^3 cfu/g)	<10 c.f.u/g
	E. coli (absent/g)	Absent
	Salmonella sp.(absent/g)	Absent
	P.aeruginosa (absent/g)	Absent
	Staphylococcus sp (absent/g)	Absent

Table 3: Ayurvedic Pharmacological Actions of Drugs in Panchatikta Ghrita Guggulu [14]

S. No.	Dravya	Rasa (taste)	Guna (attributes)	Veerya (potency)	Vipaka (biotransformation)
1	Nimba	Tikta,kashaya	Laghu,ruksha	Sheeta	Katu
2	Patola	Tikta	Laghu,Ruksha	Ushna	Katu
3	Vyaghri	Tikta,kashaya	Laghu,Ruksha	Ushna	Katu
4	Guduchi	Tikta,Kashaya	Laghu,Snigdha	Ushna	Madhura
5	Vasa	Tikta,Kashaya	Laghu, ruksha	Sheeta	Katu
6	Patha	Tikta	Laghu,teekshna	Ushna	Katu
7	Vidanga	Katu,Kashaya	Laghu,ruksha,teekshna	Ushna	Katu
8	Suradaru	Tikta,katu	Laghu, ruksha	Ushna	Katu
9	Gajopakulya	Katu	Laghu,ruksha, teekshna	Ushna	Katu
10	Yavakshara	Katu	Laghu,teekshna, sookshma	Ushna	Katu
11	Sarjakshara	Katu	Laghu,teekshna,sookshma	Ushna	Katu
12	Nagara	Katu	Guru, teekshna	Ushna	Katu
13	Nisha	Tikta,katu	Laghu, ruksha	Ushna	Katu
14	Mishreya	Katu	Teekshna	Ushna	Katu

15	Tejovati	Katu, tikta	Laghu, teekshna	Ushna	Katu
16	Maricha	Katu	Laghu,teekshna, sookshma	Ushna	Katu
17	Vatsaka	Tikta,Kashaya	Laghu, ruksha	Sheeta	Katu
18	Deepyaka	Katu	Laghu, teekshna	Ushna	Katu
19	Agni	Katu	Laghu, ruksha	Ushna	Katu
20	Rohini	Tikta	Laghu, ruksha	Ushna	Katu
21	Arushkara	Katu,tikta,kashaya	Laghu, teekshna	Ushna	Katu
22	Vacha	Katu,tikta	Laghu	Ushna	Katu
23	Kanamoola	Katu	Laghu,ruksha	Ushna	Katu
24	Yuktha	Tikta	Guru	Ushna	Katu
25	Manjistha	Madhura,tikta,kashaya	Guru	Ushna	Katu
26	Ativisha	Katu,tikta	Laghu,ruksha	Ushna	Katu
27	Vishani	Katu,tikta	Laghu, teekshna, vyavayi	Ushna	Katu
28	Yavani	Katu	Laghu, teekshna	Ushna	Katu
29	Chavya	Katu	Laghu,ruksha	Ushna	Katu
30	Kushta	Madhura,katu,tikta	Laghu	Ushna	Katu
31	Shuddha guggulu	Katu	Laghu, sookshma, teekshna	Ushna	Katu
32	Ghrita	Madhura	Guru, Snigdha, brimhana	Sheeta	Madhura

The organoleptic evaluation of Panchatikta Ghrita Guggulu Tablet revealed a yellowish-brown colour, characteristic odour, and a coated, round, convex tablet form. These features are indicative of the presence of Panchatikta dravyas processed in Ghrita along with Guggulu, which collectively impart the characteristic appearance and aroma of the formulation. The yellowish-brown colour reflects proper processing of Tikta rasa–dominant herbal ingredients and Ghrita, while also suggesting absence of charring, over-heating, or degradation during pharmaceutical processing. The characteristic odour of the formulation can be attributed to the volatile and resinous components of Guggulu along with phytoconstituents of the Panchatikta group of drugs. Retention of this odour indicates preservation of active principles and minimal loss of volatile components during tablet manufacturing. The coated tablet form contributes to palatability, improved patient compliance, and protection of the formulation from moisture and environmental degradation. Overall, the organoleptic characteristics confirm the identity, purity, and acceptable pharmaceutical processing of Panchatikta Ghrita Guggulu Tablet, thereby supporting its quality, stability, and suitability for therapeutic use in chronic conditions such as Pandu Roga (Iron Deficiency Anemia).

The clinical relevance of Panchatikta Guggulu Ghrita (GTG) in iron deficiency anemia can be understood through its multidimensional action on the pathogenesis of Pandu Roga, particularly by correcting impaired Agni, supporting Rakta Dhatu, and enhancing nutrient absorption. Rather than functioning as a direct iron supplement, GTG acts by modifying the underlying metabolic and

inflammatory milieu responsible for defective iron utilization. Panchatikta Dravya may be mechanistically correlated with modern concepts of iron metabolism and inflammation-driven anemia. Chronic inflammatory states are known to elevate pro-inflammatory cytokines such as interleukin-6 (IL-6), which in turn upregulate hepatic hepcidin synthesis, leading to reduced intestinal iron absorption and impaired iron release from macrophage stores **[8]**. The phytoconstituents present in Panchatikta Dravya—particularly flavonoids, terpenoids, and alkaloids—exhibit documented anti-inflammatory and antioxidant effects that may attenuate cytokine-mediated pathways, thereby indirectly downregulating hepcidin activity **[9, 7]**.

The ghrita-based lipid matrix facilitates enhanced bioavailability of both fat- and water-soluble phytoconstituents, analogous to a liposomal drug delivery system, thereby promoting deeper tissue penetration, including the bone marrow (Majja Dhatu) **[10]**. This is particularly relevant in chronic IDA, where impaired tissue-level iron utilization contributes to persistent anemia.

Correction of Agni is a central therapeutic target in Pandu. The presence of Trikatu (Zingiber officinale, Piper nigrum, Piper longum L) enhances digestive and metabolic activity, improving gastrointestinal absorption of dietary iron and other micronutrients **[11]**. From a modern perspective, this may translate into improved intestinal uptake and bioavailability of iron. It is also reported to exhibit hematinic and depurative actions, contributing to improved hemoglobin synthesis while reducing metabolic toxins (Ama) that interfere with normal erythropoiesis **[12]**. The Tikta Rasa–dominant herbs such as Nimba and Guduchi exert Srotoshodhana effects, facilitating efficient nutrient transport to Rakta Dhatu and improving systemic iron distribution. Importantly, it addresses inflammation-mediated iron dysregulation, a key mechanism in functional iron deficiency **[13]**. Chronic inflammation increases hepcidin levels, leading to reduced intestinal iron absorption and impaired iron release from stores. The anti-inflammatory guggulsterones present in Guggulu may help modulate pro-inflammatory cytokine pathways, thereby indirectly normalizing hepcidin activity and improving iron availability **[14]**. This positions Panchatikta guggulu Ghrita as particularly beneficial in anemia secondary to chronic inflammatory conditions **[15, 16]**.

CONCLUSIONS

Overall, it demonstrates clinical significance in Iron deficiency Anemia by acting at

digestive, metabolic, inflammatory, and tissue levels, aligning with both classical Ayurvedic principles and contemporary understandings of iron metabolism and anemia pathophysiology.

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