



ANTIOXIDANT STUDIES ON *TRIKATU*, A NATURAL BIO ENHANCER IN AYURVED FORMULATIONS: A REVIEW

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ABSTRACT

Now a days anti-oxidant drugs are on demand due to increasing oxidative stress over biological system due to changing in life style and external factors such as pollution. This oxidative stress leads to cellular damage and number of pathological conditions such as auto immune diseases, immune compressive disorders, various inflammatory conditions etc. For combatting this stress various herbal remedies are practiced and hence at global platform Ayurveda classics formulations has its own importance due to its unique characteristics and its distinctive contents especially addition of drugs such as *Trikatu* (combination of Sunthi (*Zingiber officinalis*), Maricha (*Piper nigrum*) and Pippali (*Piper longum*)). It is natural bio enhancer helps in digestion, absorption and assimilation of particular formulation. It is widely used as ingredient in single, polyherbal and herbomineral formulation. Various antioxidant properties of *Trikatu* are explored by recent research work which proves its purpose in related formulations. Present review shows that although *Trikatu* has strong antioxidant potential but it need to study thoroughly as most of the antioxidant properties are depends on extraction techniques, extraction solvents, thermo sensitivity of phyto constituents and method of antioxidant studies. Also there is need to study thermo labile phyto constituent having antioxidant potential by different extraction techniques. Hence further imminent study will definitely ensure conformity of its antioxidant properties.

KEYWORDS: Anti oxidant, *Trikatu*, polyherbal.

INTRODUCTION

Now a days an anti-oxidant drugs are on demand due to increasing oxidative stress over biological system due to changing in life style and external factors such as pollution. This oxidative stress leads to cellular damage and number of pathological conditions such as auto immune diseases, immune compressive disorders, various inflammatory conditions etc. For combatting this stress various herbal remedies are practiced and hence at global platform Ayurveda classics formulations have its own importance due to its unique characteristics and its distinctive contents. These remedies are always been center of attraction for modern medical science in life style disorders. There are single, Polyherbal and Herbomineral formulations which have been used according to its purpose. Use of Ayurvedic preparation "*Trikatu*" from the period between the 7th century B.C. and the 6th century A.D., which is a Sanskrit, word meaning three acrids. It refers to a combination of black pepper (*Piper nigrum* Linn.), long pepper (*Piper longum* Linn.), and ginger (*Zingiber officinale* Rosc.), which contains active component piperine, which enhances the bioavailability of drugs, nutrients, and vitamins.^[1] It is used in most of the formulations due to its unique

properties such as *Deepana*(Appetizer), *Pachana*(Digestion). *Trikatu Churna* is used in the treatment of *Agnimandya* (digestive impairment), *Gala roga* (Throat diseases), *Svasa*(Dyspnea), *Kushtha* (skin diseases), *Pinasa* (sinusitis), *Kasa* (cough) and *Slipada* (filariasis)^[2]

Various phytochemicals presents in plant based formulations plays important role in relieving oxidative stress. About 10,000 phytochemicals have been identified, and still a large percentage remains unknown. These identified phytochemicals include tannins, flavonoids, triterpenoids, steroids, saponins, and alkaloid.^[3] Oxidative stress and free radical load (reactive oxygen species and reactive nitrogen species) increases the risk of damage to the heart. Bioactive ingredients and phyto constituents present in *Trikatu* possess strong antioxidant properties. Antioxidants present in *Trikatu* fight oxidative stress and help in the removal of free radicals from the body. Thus, it protects the heart and improves overall heart health.^[4] Recent studies have been proving its antioxidant properties with its overall health benefit. Owing to the side effects of synthetic antioxidant agents, natural antioxidant agents is the need of hour. As

Trikatu has mentioned in various formulations of Ayurveda and also it is used widely in number of ailments in single and in combination form hence present paper aimed to review the studies on its antioxidant properties.

Pippali (*Piper longum* Linn.) as an anti-oxidant

Pippali (Long Piper) is considered as *Rasayana* (Immuno modulatory) in properties. Chemically it contain volatile oil, *Piperine* and *piplartine* alkaloids.^[5] These alkaloids are considered as a main marker and phytochemicals responsible for its therapeutic actions. Chikkanna D. et al(2016) mentioned in the study conducted in vitro antioxidant studies for the *Piper longum* proteins using superoxide radical scavenging method in which ability of the proteins was compared with standard antioxidant like BHA and Ascorbic acid at a maximum dosage of 8µg, where *Piper longum* protein showed a maximum inhibition of 48% and BHA and Ascorbic showed 60% respectively.^[6] Dinesha R et al (2015) concluded in the study on antioxidant properties of *Pippali* to analyze antioxidant ability against Hydroxyl radical scavenging activity and inhibition of formation of lipid peroxidation compared with Alpha tocopherol, BHA and Ascorbic acid as standard antioxidants at 400µM concentration and 10µ g of Long Pepper protein extract showed an inhibitory activity of 81% and 83%. Further the extract and Ascorbic acid were subjected to thermal stability test by keeping the extract in boiling water bath for 60 minutes and further its antioxidant activity was analyzed using Hydroxyl radical scavenging activity. It showed 65% of inhibition when compared to Ascorbic acid which showed only 41%, which confirms its stability.^[7]

Marich (*Piper nigrum* Linn.) as an anti-oxidant

Black pepper contains alkaloids named Piperine, Piperidine, Pipretine and Chavicine. The pungent taste of it is due to these alkaloids.^[8]

Sruthi, D. and John Zachariah et al (2017) carried out *in vitro* antioxidant activity of sequential extracts of four important *Piper* species viz. *P. nigrum*, *P. chaba*, *P. longum* and *P. colubrinum* and six black pepper varieties viz. Sreekara, Subhakara, IISR Malabar Excel, Panniyur-1, Panchami and IISR Thevam with methanol and chloroform extracts. Methanol extract of IISR Malabar Excel and chloroform extract of *P. colubrinum* were screened as extracts with highest antioxidant activity. Significant positive correlation was obtained for total phenolic content of methanol and chloroform extracts with their antioxidant activity by all the four assays.^[9]

In one of the study on Antioxidant activity of Black Pepper (*Piper Nigrum* L) oil obtained by supercritical CO₂ by Kátia Suzana Andradea and Sandra Regina Salvador Ferreira showed the best results for the antioxidant activity by the ABTS method. The antioxidant activity by β-carotene bleaching method

decreases with temperature suggesting the degradation of substances responsible for the antioxidant potential.^[10]

Sunthi (*Zingiber officinale* Rosc.) as an Antioxidant

Sunthi(Dry ginger) is considered as multi-dimensional and multipurpose medicine in Ayurveda. It contain alkaloids named Gingerol, Shagaol and Zingerone.^[11]

Ekka Deepak et al. (2017) mentioned in the study on Antioxidant and Anti-Inflammatory Effect of *Sunthi* in Pranvaha Srotas(Respiratory tract) that it is undoubtedly protect human against many chronic disease. 6-Shagaol has exhibited the most potent anti-oxidant in Ginger which can be attributed to the presence of alpha, beta unsaturated Ketone moiety. Particularly fresh Ginger methanol extract of drug were found to have better antioxidant action then the n-hexane extract.^[12]

Rina Andriyani et al. (2015) in the study on “Effect of Extraction Methods on Total flavonoids, Total Phenolic Content, Antioxidant and anti-Bacterial activity of *Zingiberis Officinale* Rhizomes” mentioned ethanol extract from dried Rhizomes proceed for 24 hours shows best results for total flavonoids, total phenolic content and antioxidant activity.^[13]

Antioxidant components (polyphenols, flavonoids and total tannin) were higher in hot water (100°C) extract than other solvent extracts and 30°C water extract. Antioxidant activity by three different methods showed higher activity in solvent extract than water extract. Order of antioxidant activity by reducing power and free radical scavenging activity by DPPH was as follows, 80% methanolic > 80%ethanolic > methanolic > ethanolic > 30°C water >100°C water > acetonc extract.^[14]

Trikatu as an Antioxidant

It is also called as *Katutrik* (due to pungent tastes) or Trayushana (Hot properties) hence act on *Vata* and *Kapha* predominated disorders especially Agnimandhya, Arochak, Swash, Kasa, Pinasa, Gulma, Prameha, Sthowlya, skin disease etc.^[15]

Trikatu has also gained importance in modern medicine due to piperine which enhance the bioavailability of drugs, like phenytoin, theophylline, vasicine, oxyphenylbutazone and indomethacin etc. Improved oral bioavailability of poorly absorbed drugs can help in altering the therapeutic dosage of such drugs or even routes of drug administration.^[16]

In vitro antioxidant activity of petroleum ether, benzene, chloroform, ethyl acetate, 70% ethanol and aqueous extract of *Trikatu* was performed. *Trikatu* mega Ext exhibited significant scavenging effects on 2, 2-diphenyl-2-picryl hydroxyl (DPPH) free radicals, super oxide anion. The scavenging effect of sample was found lower than that of ascorbic acid. The sample possess statistically significance DPPH free radical scavenging

activity at a concentration of 100 µg /ml Inhibited the production of superoxide anion radical by 89.74% showing strong superoxide radical scavenging activity.^[17]

DISCUSSION

Due to changing life style oxidative stress has become common. The excess free radicals circulating in the body oxidize the low density lipoproteins (LDL), making them potentially lethal; the excess free radicals can also accelerate aging processes and have been linked to other very serious pathologies, such as brain stroke, diabetes mellitus, rheumatoid arthritis, Parkinson's disease, Alzheimer's disease and cancer.¹⁸ It encourage need of organic or plant based antioxidant agents. *Trikatu* has been using in Ayurvedic medicines as it helps to improve digestion capacity of drugs. *Sunthi* and *Pippali* are considered as *Rasayana* due to its multi systemic action and improves bioavailability of drugs due to its pungent and hot properties. Combination of *Sunthi*, *Marich* and *Pippali* is one of such unique combination which alleviate *Kapha* and *Vata* predominated disorders hence is essential component of various preparation which initiates metabolic disorders.

Anti-oxidant study on *Pippali* shows good results when compared with ascorbic acid and also shows stability in anti-oxidant properties on heating which indicates that even after application of mild heat its formulation does not hamper its properties. Antioxidant properties of *Marich* shows difference in its antioxidant potential with different solvent of extraction and thermo sensitivity. *Sunthi* shows good antioxidant potential in hot water extract than other extraction solvent. *Trikatu* shows dependent antioxidant properties with different antioxidant methods.

From above review it shows that although *Trikatu* has strong antioxidant potential but it need to study thoroughly as most of the antioxidant properties are depends on extraction techniques, extraction solvents, thermo sensitivity of phyto constituents and method of antioxidant studies. Also there is need to study thermo labile phyto constituent having antioxidant potential by different extraction techniques.

CONCLUSION

Trikatu always remain a main constituent of various important formulation which serve a purpose of its *Deepan* and *Pachan* but its unexplored properties like antioxidant properties are need to study in the context of increasing oxidative stress over biological system as it is a plant based and easy available remedy in most of the houses. Present review strongly supports the possibility of its antioxidant potential with important solvents including water. Hence further study will definitely ensure conformity of its antioxidant properties.

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