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A Critical Review on multifold potentiality of *Prakshepa Dravyas* in Ayurvedic dosage forms

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ABSTRACT

The dosage forms in Ayurveda are given utmost importance. Our Acharyas offer a treasure of practical knowledge on the preparation of medicines and emphasized that the *Samyoga* (combination) of many drugs in a formulation greatly influence the healing power. One such category of drugs which are added in small quantities other than the main drugs so as to expand the field of activity of the main drugs are labelled as *Prakshepa Dravyas*. These *Dravyas* are distinctive to each *Kalpana* (dosage form). Although there are few drugs which are used as *Prakshepa Dravyas* irrespective of the dosage forms such as *Madhu, Sita, Guda, Trikatu, Chaturjata, Taila, Ghrita, Lavana, Hingu, Kshara, Jeeraka, Shilajatu* and *Bhasmas* of few metals. *Prakshepa Dravyas* can be considered as additives of modern pharmaceutical science which are limited only to pharmaceutical processing. *Prakshepa Dravya* acts as a synergizer and also attributes to the pharmacological action. They boost the patient acceptability by providing good taste, fragrance and appearance. The antioxidant and preservative properties are inherent in them. They also promote and augment the absorption of the drug by their bioenhancing activity. The present review aims to provide the comprehensive summary of *Prakshepa Dravyas* and also illustrates their multi dimensional activity.

Key words: *Prakshepa Dravyas, Additives, Synergizer, Antioxidants, Preservatives, Bioenhancers.*

INTRODUCTION

Bhaishajya Kalpana is an art and science of preparing and dispensing medicines. No branch of Ayurveda can exist independently without the aid of *Bheshajas*. The quest for health in man has led to investigate every existent article under the sun from a therapeutic point of view but the mere need is proper processing and modification for improving its beneficial effect besides eliminating the untoward effect.^[1] And this was the

basic thought which gave rise to variety of *Kalpanas* (dosage forms).

Ayurvedic dosage forms can be classified as primary dosage forms i.e. *Pancha Vidha Kashaya Kalpanas* like *Swarasa, Kalka, Kwatha, Hima, Phanta* and secondary dosage forms like *Avaleha, Ghrita, Taila, Asava, Arishta, Vati* etc.

Our *Acharyas* have designed these formulations in such a way that apart from the active pharmaceutical ingredient, there is the addition of other ingredients which are responsible for the physical state of the formulation, chemical stability, organoleptic characters, bioavailability and also bypassing the antagonistic action of the drug.

Prakshepa Dravyas fall under this category of ingredients. The word *Prakshepa* is derived from the root 'pra + kshipa + jna' which means throwing forward, casting, scattering upon. *Prakshepaha Aushadhadishu Kshepaniyadravyam*.^[2] - The drugs which are added in small quantities other than the main ingredients in a formulation so as to incorporate

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certain benefits are termed as *Prakshepa Dravyas*. They can be classified as plant origin (*Pippali, Maricha, Twak, Patra, Ela* etc.), animal origin (*Ghrita, Madhu*) and mineral origin (*Loha Bhasma, Swarna Bhasma, Swarna Makshika Bhasma* etc.). This review encompasses different *Prakshepa Dravyas* mentioned in Ayurvedic classics and their beneficial components.

Prakshepa Dravyas in different dosage forms of Ayurveda

In Ayurvedic classics, the descriptions pertaining to the concept of addition of *Prakshepa Dravyas* are in scattered manner. *Acharyas* have dealt about the *Prakshepa Dravyas*, quantity and their usage while describing the respective *Kalpanas* thereof. *Prakshepa Dravyas* mentioned in Ayurvedic classics for different *Kalpanas* are enlisted in table 1.^{[1],[3]}

Table 1: Prakshepa Dravyas for different dosage forms mentioned in Ayurvedic classics.

Kalpana (dosage form)	Prakshepa Dravya	Quantity
<i>Swarasa</i>	<i>Madhu, Shweta (sugar candy), Guda, Kshara, Jeeraka, Lavana, Ghrita, Taila, Churna</i>	1 <i>Kola</i>
<i>Kalka</i>	<i>Madhu, Ghrita, Taila</i>	2 parts
	<i>Sita, Guda</i>	Equal part
	<i>Drava</i>	4 parts
<i>Churna</i>	<i>Guda</i>	Equal part
	<i>Sita</i>	2 parts
	<i>Hingu</i>	Quantity which does not cause <i>Utkleda</i>
	<i>Ghrita, Taila, Madhu</i>	2 parts
	<i>Ksheera, Jala</i>	4 parts

<i>Kwatha, Hima, Phanta</i>	<i>Sita</i>	<i>Vataja Vyadhi- 1/4th</i> <i>Pittaja Vyadhi- 1/8th</i> <i>Kaphaja Vyadhi- 1/16th</i>
	<i>Madhu</i>	<i>Vataja Vyadhi- 1/16th</i> <i>Pittaja Vyadhi- 1/8th</i> <i>Kaphaja Vyadhi- 1/4th</i>
	<i>Jeeraka, Guggulu, Kshara, Lavana, Shilajatu, Hingu, Trikatu</i>	1 <i>Shana</i>
	<i>Ksheera, Ghrita, Taila; Guda; Kalka; Churna</i>	1 <i>Karsha</i>
<i>Gudapaka and Khanda</i>	<i>Trikatu, Chaturjata, Loha Bhasma</i> etc.	Depending on the individual formulation
<i>Avaleha</i>	<i>Madhu, Trikatu, Chaturjata, Vamshalochana, Manashila (Haritaki Lehya); Pravala, Swarna, Rajata, Tamra, Loha (Dwitiya Brahma Rasayana)</i>	Depending on the individual formulation
<i>Vati, Guggulu</i>	<i>Trikatu, Triphala, Musta, Chitraka, Guduchi, Trivrut</i> etc.	Depending on the individual formulation
<i>Asava, Arishta</i>	<i>Chaturjata, Lavanga, Priyangu, Dhataki Pushpa</i> etc.	1/10 th of <i>Guda</i>

The exact timing and the nature of addition of the *Prakshepa Dravyas* has been a subject matter of discussion among various scholars. As *Pancha Vidha*

Kashaya Kalpanas are meant for instant use, it is added at the time of administration; in case of *Avaleha Kalpanas*, it is advised to add after removing the vessel from the fire (*Asannpakvavastha Lakshana-Vaidya Yoga Ratnavali*) and stirred continuously to get a homogenous mixture; in *Vati* and *Guggulu Kalpanas*, it is added during the pharmaceutical processing; whereas in *Asava* and *Arishta Kalpanas*, Some would prefer it to add right on 1st day, some on 4th day, some on 15th day, some on completion of fermentation and some after filtration. Besides, some prefer to sprinkle the coarse powder of the *Prakshepa* topping the wort and some immersing the *Prakshepa* after tying it in a *Pottali* (bolus form wrapped by a cloth) form. But by considering all the benefits of *Prakshepa Dravyas*, unless and otherwise specified, these should be added on 1st or by 4th day.

Regarding the nature of *Prakshepa Dravyas*, in the dosage forms like *Churna*, *Avaleha*, *Vati*, *Guggulu* it is advised to add fine powders whereas in *Asava* and *Arishta Kalpana*, *Yavakuta Churna* (coarse powder) is sufficient.

Accountability of *Prakshepa Dravyas*

Prakshepa Dravyas can be considered as Additives. Additives are the substances other than the active medicament(s) in the formulation which do not have any pharmacological action. They are used to give a particular shape to the formulation, to increase the stability and/ or to increase the palatability and elegance of the preparation.^[4] Hence additives are limited to pharmaceutical processing. On the counterpart, *Prakshepa Dravyas* used in Ayurvedic preparations are influential not only in the pharmaceutical aspects of the dosage form but also aids the pharmacological action of the main drug.

Prakshepa Dravyas bestows to the good taste, fragrance and consistency of the formulation making it better in terms of patient compliance. These drugs are bound to give the synergistic effect and also nullify the side effects of the other drugs. They not only aid in the absorption and assimilation of the other herbs in the formulation but also act as eliminators so that there is no build up of toxins or

waste materials. Hence the attributes of the *Prakshepa Dravyas* in a dosage form can be specified as,

- To improve organoleptic characters
- As antioxidants
- As preservatives
- As bioenhancers
- To assist the pharmacological action

Prakshepa Dravyas to improve the organoleptic characters

Organoleptic agents promote appearance and palatability of pharmaceutical preparations. If the product does not have acceptable color, taste or odour, the patient would try to avoid using it. It is well known fact that *Prakshepa Dravyas* has the above characters. Certain sweet substances like *Madhu*, *Sita* etc. gives the product an acceptable taste with regards to *Pancha Vidha Kashaya Kalpanas* wherein the dominant Rasa is *Tikta*. *Avaleha Kalpanas* which contains *Twak*, *Patra*, *Ela*, *Nagakesara* etc. contribute to the aroma and also can stimulate the secretion of saliva. Several drugs used as *Prakshepa Dravyas* in *Asava Arishta* preparations are responsible for darkening of the color.

Prakshepa Dravyas as Antioxidants and preservatives

The capability of a particular formulation to remain within the physical, chemical, microbiological, therapeutic and toxicological specifications is termed as the stability of a product. The substances which are used to control these are stabilizers.^[4] Among them, antioxidants and preservatives are on the top list. Honey is a novel antioxidant which can prevent the oxidative degradation of the drug. Darkening of color by *Prakshepa Dravyas* in *Asava Arishta Kalpanas* is due to the enhanced phenolic compounds. The Phenolic compounds are generally found in almost all botanicals and are known to prevent oxidative stress conditions via their antioxidative capacity.^[5]

The preservative action of *Prakshepa Dravyas* like *Twak*, *Patra*, *Ela*, *Nagakesara* etc. are due to their

antimicrobial property which can be appreciated both in primary and secondary formulations. Various researches state that many compounds isolated from few of the herbs have shown antimicrobial activity against some of the most common microorganisms that affect the quality of the product and shelf life which is depicted in table 2.

Table 2: Antimicrobial potential of few herbs used as Prakshepa Dravyas

Sanskrit name	Botanical name/ Common name	Major constituents	Microorganisms / model
Maricha	<i>Piper nigrum</i> (Black pepper)	Piperine	St. aureus, E. Coli, B. cereus, P. aeruginosa ⁶
Ardraka	<i>Zingiber officinale</i> (Ginger)	Gingerol, Shogool, Methyl-isogingerol	E. coli, Salmonella spp, Staphylococci, Streptococci ^[7]
Jeeraka	<i>Cuminum cyminum</i> (Cumin)	Cuminal	B. cereus, B. subtilis, C. albicans, A. niger ^[8]
Twak	<i>Cinnamomum verim</i> (Cinnamon)	Cinnamic aldehyde, Eugenol	E. coli, Ps. fluorescens ^[9]
Ela	<i>Elettaria cardamomum</i> (Green cardamom)	1,8-Cineole, Linalool, α-Terpinyl acetate	B. cereus, Ls. Monocytogenes ^[10] St. aureus, S. Enteritidis ^[11]
Hingu	<i>Ferula foetida</i> (Asafoetida)	α-Pinene, α-Terpineol, Azulene	E. coli, B. subtilis ^[12]
Krishna Jeeraka	<i>Carum carvi</i> (Caraway)	Carvone, Limonene, Carvacrol, Anethole	E. coli, P. aeruginosa ^[13]

Prakshepa Dravyas as Bioenhancers

The concept of bioenhancers in Ayurveda can be associated to *Yogavahi Dravyas* which are used to enhance the bioavailability, tissue distribution and efficacy of the drugs especially those with poor availability. Few of the *Prakshepa Dravyas* like *Madhu*, *Ghrita*, *Shilajatu*, *Bhasmas* of metals etc. contribute to the *Yogavahi* property. *Trikatu* and *Jeeraka* are said to be the effective bioenhancers which can decrease the dose of the drug.

Different mechanisms for the bioenhancer activity have been proposed. For example, piperine inhibits drug metabolizing enzymes, stimulates absorption by stimulating gut amino acid transporters, inhibits the cell pump responsible for drug elimination from cells and inhibits intestinal production of glucuronic acid, thus permitting a more active form of drug to enter the body.

Prakshepa Dravyas to assist the pharmacological action

Prakshepa Dravyas are also called as balancing drugs. They help to balance the *Doshas* and *Dhatus* of the body. For instance, *Vata Dosh* is mitigated by the use of *Tailas*, *Pitta* by *Ghrita* and *Kapha* by *Madhu*.^[14] Few of the drugs have *Ushna* and *Teekshna Guna* like *Pippali*, *Maricha* etc. which promotes the *Agni (Agnideepana)* and indirectly help in the absorption and metabolism (*Pachana*) of the active principles. *Lavana* has the ability to penetrate the *Srotas* easily (*Sukshma*) and facilitates the drug to spread all over the body first and later undergoes transformation (*Vyavayi*). *Sneha Kalpana* when processed with *Triphala*, *Pippali*, *Pathya*, *Guggulu* etc. produces no abnormalities (*Avikarina*). Certain drugs possess *Yogavahi* property like *Madhu*, *Pippali* and few of the *Rasaushadhies* which can absorb the property of the active drug and reaches the target efficiently. In *Asava Arishta* preparations, *Acharya Sushruta* clearly indicates that for the preparation *Loharishta*, *Pippalyadi Gana* to be used as *Prakshepa*. Beside this *Eladi*, *Haridradi*, *Priyanguvadi* etc. *Gana* are also in common use due to their specific medicinal properties. *Pippalyadi Gana* is indicated as *Kaphahara*,

Ama Pachaka etc. likewise *Eladi Gana* have *Vata Kapha Nashaka*, *Vishahara* properties. Collectively these enhance the medicinal values of *Asava Arishta*.^[15]

Irrespective of the dosage forms, few of the drugs which are used as *Prakshepa Dravyas* are *Madhu*, *Sita*, *Guda*, *Trikatu*, *Chaturjata*, *Taila*, *Ghritha*, *Lavana*, *Hingu*, *Kshara*, *Jeeraka*, *Shilajatu* and *Bhasmas* of few metals. Some researches have been done on various natural agents, which clearly show their potential in all the above said attributes of *Prakshepa Dravya*. Some of those researches are described below.

Madhu (Honey)

Madhu can be considered as one of the best *Prakshepa Dravya* having all the above said benefits. It masks the bitter taste of the drugs in the formulation. It is a safe sugar to a diabetic because of its rich content of fructose. Being one of the best *Yogavahi Dravya*, it helps the drugs to reach the deeper tissues. Pharmacological activities of honey include antioxidant, anti inflammatory, anti bacterial, antihypertensive, hypoglycaemic, wound healing property etc.

Natural honey contains many flavonoides (such as apigenin, pinocembrin, kaempferol, quercetin, galangin, chrysin and hesperetin), phenolic acids (such as ellagic, caffeic, p-coumaric and ferulic acids), ascorbic acid, tocopherols, catalase, superoxide dismutase, reduced glutathione, Maillard reaction products and peptides. Most of the above compounds work together to provide a synergistic antioxidant effect.^[16-18] Hence, it has been suggested that honey as a natural antioxidant, may serve as an alternative to some artificial preservatives. Above all it is a best source for many trace elements like Zn, Fe, Mg, Cu, Ca, K etc.^[19]

Honey exhibits bactericidal activity against many organisms. It has been reported to have an inhibitory effect to around 60 species of bacteria.^[20] The factors responsible for the antibacterial property of honey are,

- a) Honey draws moisture out of the environment and thus dehydrates bacteria.
- b) The sugar content of honey is also high enough to hinder the growth of microbes.
- c) The pH of honey is between 3.2 and 4.5, and this acidity is low enough to inhibit the growth of most microorganisms.
- d) Hydrogen peroxide produced by the glucose oxidase.
- e) Several phytochemical factors for antibacterial activity have been identified in honey.

Sita (Sugar)

The prime quality of any *Prakshepa Dravya* is to enhance the taste and potency of the formulation. *Sita* is one of the choicest drugs to achieve them. It is considered as superior among the *Ikshu Varga*.^[14] The sweet taste of it makes the formulation more palatable and more convenient to use. The concentration of sugar to act as a preservative is 66.7% which is achieved in *Sharkara Kalpana*. A research says *Tulasi Sharkara* which was prepared by adding *Sita* to *Tulasi Swarasa* showed the preservative action.^[21] Sugar can also act as a source material for fermentation in the preparation of *Asava and Arishtas*. Being associated with the sugar, the absorption of the drug becomes faster. Now a days in pharmaceutical industries, sugar is used as binding agent and also as a diluent to control the concentration of active ingredients in tablets.

Guda (Jaggery)

As said in the classics, *Purana Guda* is good for heart and is suitable for health. It is the store house of nutrients. The micronutrients present in the jaggery possess antitoxic and anti-carcinogenic properties.^[22] Jaggery is loaded with antioxidants which in turn helps in preventing the free radical damage and also boosts resistance against diseases. It is high calorie sweetener and as it contains minerals, protein, glucose and fructose, it is known to be healthier in comparison to white sugar.^[23]

Trikatu (Shunti, Maricha and Pippali)

The abundant use of these drugs as *Prakshepa Dravyas* in the Ayurvedic formulations fascinates to the fact of its advantages. These drugs either play a role as a main ingredient in a formulation to combat the disease conditions or may enhance the therapeutic efficacy of the other ingredient when combined with them. *Ushna* and *Tikshna* properties in them promote the *Agni* and indirectly helps in absorption and metabolism of active principles. They also act as preservatives due to their antibacterial, antifungal properties.

Piperine (1-piperoyl piperidine) which is present in *Pippali* (*Piper longum*) and *Maricha* (*Piper nigrum*) has the bioenhancing property which was first utilized in the treatment of tuberculosis in human. Piperine was found to increase the bioavailability of rifampicin by about 60% and hence reduce the dose from 450 to 200mg.^[24] Piperine was found to increase bioavailability of different drugs ranging from 30 to 200%. Piperine also increases the bioavailability of curcumin, the active principle of *Haridra* (*Curcuma longa*) by 20 fold in humans.^[25]

Shunti (Ginger) contains Gingerol which facilitates better absorption by regulating GI tract function. The effective dose of the bioenhancer extract is in the range of 10 - 30 mg/kg body weight. The composition containing *Z. officinale* alone provides bioavailability / bioenhancing activity in the range of 30 - 75%, and piperine and *Z. officinale*, provides the bioavailability of drugs in the range of 10 - 85%.^[26]

Trijata (Twak, Patra, Ela)

These drugs otherwise called *Trisugandhi Dravyas* are known for their flavouring, coloring and especially preservative properties throughout the world. In Ayurvedic preparations like *Avaleha Kalpana*, *Ghrita Kalpana* they are used to augment the fragrance and promote *Deepana* (appetite) and *Pachana* (digestion). *Twak*, *Patra* and *Ela* along with *Nagakesara* are termed as *Chaturjata*. A research work has been carried out on *Chaturjata Arka* wherein it was used as a preservative agent for *Guduchi Kwatha*. The results

showed that the shelf life of the *Kwatha* was prolonged upto 7 days.^[27]

CONCLUSION

Prakshepa Dravyas often have more than one action. But their main action will depend upon the dosage forms to which they are added. Several benefits of *Prakshepa Dravyas* like improvement in patient acceptability, using them as additives, their antioxidant and preservative action makes them a better choice in pharmaceutical processing. The chief attribute of the dosage forms is to deliver the medicament to its site of action at a rate and amount sufficient to elicit the desired pharmacological response which can be achieved by the bioenhancing property of *Prakshepa Dravya*. Hence the realm of *Prakshepa Dravyas* in Ayurveda is not just limited to pharmaceutical field but is extended with the diverse pharmacological profits.

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