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ROLE OF HERBS, PAPAIN, MICROORGANISMS IN DIGESTION

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ABSTRACT
The treatment of Ayurveda is totally based on natural herbs and most importantly each herb has certain medicinal value or property. Various herbs have various effects on our body. Herbs work by supplying different nutrients to the body. Some herbs work as general tonic that cleanse, nourish and rebuild on a cellular level. Enzymes are extremely active components in the digestion systems of all animals. Papain is used as an enzyme which helps in digestion as well as it's usually produced as a crude, dried material by collecting the latex from the fruit of the papaya tree. The latex is collected after scoring the neck of the fruit. A purification step is necessary to remove contaminating substances. This purification consists of the solubilization and extraction of the active papain enzyme system through a government-registered process. This purified papain may be supplied as powder or as liquid. Microorganisms are also present in the digestive systems of all animals. Their main role is to break various components down in order to facilitate absorption. These findings highlight the importance of various herbs and papain enzyme as well as different types of microorganisms in digestion.

Key words: Herbs, Papain, Microorganisms, Digestion.

INTRODUCTION
Live in different parts of the Earth which is now badly affected by several kinds of environmental pollutions created by mainly cutting the trees even in this modern era of civilization. Effects of this results in increase in temperature of the environment and causes several diseases. Thus the new generations have got a very serious problem of facing multiple gastric and other fatal diseases [1]. Modern society due to erratic food habits, ingestion of excessive fat rich diet and environmental pollutions and also change in life style, suffer from multiple GI disorders. Due to inflammation and erosion at the GI tract caused by pathogenic bacteria and other indigestible substances present in the fast foods and fat rich diets , the irregular and severe GI disorders are increasing day by day amongst the residence of third world countries . It is very much prevalent in the Megacity dwellers specially amongst the lower-middle and middle class people [2, 3]. In order to monitor such type of disorders, there is need for development such formulation which can help in easy digestion of different food items by promoting the growth of commencular microorganisms residing at the stomach and thus enhancing the enzyme system much more stronger [4,5].

HERBS USED FOR DIGESTIVE PURPOSE
Drugs obtained from plant sources play an important role for procurement of several diseases. Plant drugs are very complex in nature and that is why it looks difficult to isolate them out. In spite of these, several studies on plant drugs are carried out for several years all over the world [6]. To facilitate digestive system of human body various plants, sometimes the whole plant or sometimes a specific part of the plant which contains the maximum no. of active constituents responsible for giving expected and desirable action, are used. Amongst them Chritaka, Dhania, Bahera, Guduchi, Hingu or Sunthi, Biranga, Bhringaraj, Indrajab, Mutha, Bhuiamlaki, Tewrimool, Ghritakumari, Pittapapada, Jau or Jab are very important [7]. Apart from this *Hydrastic canadensis*, *Gentian chirata, Carduas mar, Chelidonium maj, Curcuma longa* are also

used as digestive aid [8]. In ayurvedic pharmacy drugs obtained from sources like Hingu or Hing, Ginger, Garlic, Goldenseal, Calendine, is of greater value. Previously in Ayurveda single therapeutically active herbs were used for the disease management, or sometimes similarly therapeutically active herbs used as the substitute [9]. Goldenseal or *Hydrastis canadensis* was one of the major herbs used traditionally for the treatment of digestive disorders. It is said to stimulate appetite and generally have a toning effect on the whole body. It promotes the functioning capacity of the heart and respiratory system, the liver, the spleen, the pancreas and the colon [10]. Roots of Chritaka or *Plumbago zeylanica*, belongs to the family of Plumbaginaceae, contains mainly plumbagin which helps to increase digestion capability . On the other hand dried and mature stem of Guduchi or *Tinospora cordifolia* (Family: Menispermaceae) rich in terpenoids and alkaloids which is also used in several digestive formulation. Bohera is one of the known drugs that are used in various digestive formulations. Bohera or *Terminalia belerica* (Family : Combretaceae) which mainly contains Gallic acid , tannic acid and glycosides which is responsible for giving astringent property along with the treatment of dyspepsia and diarrhoea .The half ripe fruit of Bohera which contains maximum amount of fixed oil, responsible for giving purgative action. Its gum also used as a demulcent and purgative. Another important drug that is used in several digestive formulations is Biranga or *Embelia ribes* (Family: Myrsinaceae) which contains alkaloids, tannins, essential oil etc. It mainly contains hydroquinone derivative embelin and embllic acid which is effective against tapeworms. Due to its anthelmentic property decoction of its fruits along with milk is often given to the children to reduce tapeworm infection [7].

On the other hand dried rhizomes of Mutha or Musta (Sc.Name: *Cyperus rotundus*, Family: Cyperaceae) is used in a no. of digestive formulation. Volatile oil present in it as the chief constituent along with sesquiterpene , hydrocarbons , etc. ; responsible for giving Anti-inflammatory ,Estrogenic , Antipyretic , Anthelmentic , Diuretic and Hypotensive activity . It is also used as perfume and flavouring agent [11]. Bhuamlaki or Tamalaki (Sc. Name *: Phyllanthus niruri*, Family : Euphorbiaceae) reaches in numerous lignan derivatives, Tewrimool (Sc.Name : *Ipomoea turpethum* , Family : Convolvulaceae) reaches in specially Resinous glycosides ,Pittpapada (Sc. Name *: Fumeria parviflora* , Family : Fumaraceae) are also effective in improper digestion and used in several digestive formulation [7,11]. In conventional treatment like Ayurveda includes the avoidance of problem foods, such as Citrus fruits, Spicy foods, Milk and beans. Other herbs that may useful in digestion of foods such as Caraway (*Carum carvi*), Fennel (*Foeniculum vulgare*) , Ginger (*Ginger officinalis*) , Linden (Tilia spp.) , Peppermint (*Mentha piperita*) , Sage (*Salvia officinalis*) etc [7,8,12]. It has been seen that three major categories of herbs are used to treat indigestion when no cause for the condition is known such as Bitters (Digestive stimulant), Carminatives (Gas relieving herbs) and Demulcents (Soothing herbs). The effects of these different categories on heart burn and low stomach acid will be discussed individually.

Bitter herbs are used though to stimulate digestive function by increasing saliva production and promoting both stomach acid and digestive enzyme production. Some examples of bitter herbs are Bitter melon, Bitter orange, Centuary, Elecampane, Gentian, Juniper, Yarrow etc. Carminatives which are also called as aromatic digestive tonics or aromatic bitters may be used to relieve symptoms of indigestion , particularly when there is excessive gas . It is believed that Carminative agents work, at least in part, by relieving spasms in the intestinal tract. Among

the most notable and well-studied Carminatives are peppermint, fennel and caraway. Other includes in this category are Anise, Basil, Cardamom, Cinnamon, Clove, Coriander, Dill, Rosemary, Thyme etc. Demulcents belong to those categories of herbs used to treat indigestion and heart burn. These herbs seem to work by decreasing inflammation and forming a physical barrier against stomach acid or other abdominal irritants. Examples of demulcent herbs include Ginger, Liquorice and Slippery elm. Besides this herb like Condurango, Ceanothus, *Urtica urens, Sabal serrulata* plays an important role during the manufacturing of different digestive formulations. In addition to this herbs like Horehound or *Marrubium vulgare* (Fam : Labiatae), Hops or *Humilus lupulus* (Fam : Rosaceae),Ginseng or *Panax ginseng* (Fam : Araliaceae), Ginkgo or *Ginkgo biloba* (Fam :Ginkgoaceae) may be incorporated which can be used in such kind of digestive formulations meant for stronger digestion of food [9,10,13].

PAPAIN -THE ENZYME

Animals mainly depend upon two processes such as Feeding and Digestion. The digestive system of animals uses mechanical and chemical methods to break down into nutrient molecules that can be absorbed into the blood. Once in the blood, the food molecules are routed to every cell in the animal's body. As we ages, stomach cells responsible for acid production slow down. Taking antacids often worsen the problem. A wide variety of digestive enzymes can be used as digestive aid to help absorb and digest the food material such as Pepsin, Panereatin, Pancrilipase and Betaine HCl. From plant origin Papain, Bromelain are used as Digestive enzymes in several digestive formulations. There are several Digestive Ayurvedic Formulations are available in the market in which Papain is used as an enzyme. It is generally derived from the fruits of *Carica papaya* [14].

About the Plant [8, 15-17]:

Parts used – Fruit, leaves, seeds, latex.
Synonyms – Papaya tree, Papaw tree, Papeeta.
Scientific Name – *Carica papaya*
Family – Caricaceae
Chemical Constituents – It is an excellent source of Vit. A, Vit. C ,Pottasium . It contains thiamine, niacin , riboflavine . Mainly the fresh fruit contains papapain ,malic acid ,salts of Tartaric , Carotenoid , Pigments and Glucosides.
Uses –
1. Pureed with ginger and hot peppers, papaya marinade is a natural tendizer.
2 .Unripe, green papayas are picked or cooked and eaten like summer squash, especially in Thailand, Indonesia and the Phillippines.
3. The young leaves are sometimes eaten like spinach.
4. In traditional veterinary medicine medicine, papaya seeds are also used as dewormers. In Indonesia and the Phillipines, air-dried seeds are ground and mixed with water, papaya leave are used for animals after parturition.
5. In tropical folk medicine, the fresh latex is smeared on boils, warts and freckles and given as a vermifuge. A root decoction is claimed to expel round worms.
6. As papain is a digestive proteolytic enzyme, used in several digestive formulations.
7. Dried leaves have been smoked to relief asthma or as a tobacco substitute.

8. Papaya juice and nectar may be prepared from peeled or unpeeled fruit and are sold fresh in bottles or canned. In Hawaii, papayas are reduced to puree with sucrose added to retard gelling and the puree is frozen for later use in fruit juice blending or for making jam.

Scientific Studies on Papain [14, 18-20]:
In several studies of Cancer patients, oral enzyme supplements containing papain relieved treatment side effects such as mouth sores and difficulty swallowing. Papain may increase immune system function and also may promote the release of natural chemicals that attack tumour cells. Cold sores caused by Herpes zoster virus have been treated successfully with both oral and topical papain containing products. In one small study of individuals with Herpes zoster, an oral papain was an effective as a prescription antiviral medication in resolving pain, but not redness. Further study is needed to prove or disprove this effect, however. In a London Hospital in 1977 , a post-operative infection in a kind transplant patient was cured by strips of papaya fruit which were laid on the wound and left for 48 hours , after all medications had failed.

Papain Enzyme [21-25]:
Papain helps the body to digest proteins, fats and sugars, while amylase digests Carbohydrates and Sugars. Papaya Enzyme help us get the most nutrition from the food we eat and may ease the bloating ,gas and digestive disturbances that many people often expense after eating . The juice of the fruit is regarded to have medicinal property in India, Mexico, West Indies. Papain enzyme is a protein with papain profeinase, chymopapain and lysozyme. Enzymes accelerate reaction within body cells. In the human body the pancreas usually produces enzymes that break down foods into nutrients that the body can use for energy and other functions. Carica is a genus of about 20 species of evergreen trees native to tropical America. They all produce a acrid milky sap. The latex of the papaya and its green fruit contains two proteolytic enzymes Papain and Chymopapain. Papain, the proteolytic enzyme, present in the fruit of papaya, simply breaks down the proteins into amino acids. It acts through breaking the peptide linkage present in proteins. Almost all the foods that we consume, whether they belong to animal kingdom or plant origin, constituted of proteins. Proteins are containing a series of peptide linkage. By enzymatic interference those peptide linkages breaks down to amino acids which is known as the functional unit of proteins. Amino acids in the form of micronutrients become easily digested. In pharmaceutical industries as well as Food industries Papain is used in powder form. Isolation of papain powder goes through a number of steps:

1. The latex of the Papaya fruit is collected in aluminium trays.
2. To the collected latex, Potassium metabisulphite, at the amount of 5gm/Kg, is added.
3. Extraneous matters are cleared out by passing through sieves and latex is dried in Vacuum Shelf Drier at a temp. of 55^0 C-60^0 C.
4. The dried latex is collected and it is known as the powdered papain.

ROLE OF MICROORGANISMS IN DIGESTION

The entire race of mankind is the best creation of the "Almighty". With the time, we people of the Earth, continued the motion of development even in today also. For the betterment of our future prospect there is a need to be fitted for any kind of work. By using the vast sources of plants, animals, minerals and other things we are always approaching towards further prosperity. It is very essential to maintain our body by keeping the flow of development. As foods, nutrients, minerals; several microorganisms are there which help our body to develop. Most importantly

they have a vital role in food metabolism, which looks one the key factors for the development of our body. Probiotics and Prebiotics are two terms which are important to mention while discussion regarding the role of microorganisms in developing our body. Probiotics means "for life" and this name is now mostly used to refer to concentrate supplements of beneficial or good bacteria taken by humans and animals. A prebiotic, by the generally accepted definition, is a "live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance." Human beings, as all animals, play host to many types and high numbers of microbes. Microbes live on our skin, in our mouth. It has been observed that about 10^4 bacterial cells are associated with our body. In addition to the very large number of bacteria, there is also a very large diversity of bacteria. It has been estimated that more than 400 different species, or types, of bacteria make their homes on human [22, 25].

On the other hand Prebiotics are such kind of components which promote the growth of Probiotics. Unlike Probiotics, Prebiotics are easier to formulate into regular foods and therefore offer a better chance of success in restoring natural balance of the colonic micro flora and enriching the health of the large intestine [26]. Normally, if we think, it comes very easily to our mind that microorganisms are bad for our body, especially in case of the development of our body. Some kinds of bacteria are there that do cause illness and diseases in humans. "Strep throat" is an example of an illness caused by bacteria. However, the majority of bacteria do not cause disease. In fact, there are some "good bacteria" that are beneficial to our body. These same kinds of probiotic bacteria are present in our intestines and help to keep the digestive system running and thus processing waste. Probiotics are used in the manufacturing of food and beverages. Some examples of foods that have probiotic found ingredients are buttermilk, yogurt, cheese, sausage and acidophilus milk.

Lactobacillus species

Probiotics in the form of substances containing lactobacillus, bacidobacterium and acidophilus cultures have been used for centuries as food preservatives and natural sources to promote good human health without specific knowledge of their active ingredients or how they work. In addition to this to make sure the above mentioned facts contribution of Pasteur (1845-1895) of France and the Nobel prize wining Russian physiologist Metchnikoff(1845-1916) is beyond description . Recently, thanks to remarkable advances in microbiology and intestinal bacteriology, it has been made clear that certain lactobacilli, especially a Lactobacillus genus and Bifidobacterium genus, have high mucous membrane chemical affinity, and play important roles in human health [8, 27].

Apart from this lactobacilli and bifidobacteria maintain a healthy balance of intestinal flora by producing organic compounds such as lactic acid, hydrogen peroxide and acetic acid that increase the acidity of the intestine and inhibit the reproduction of many harmful bacteria. These probiotics also produce substances called bacteriocins, which act as natural antibiotic to kill undesirable microorganisms [20]. Among other bacteria such as Lactobacillus brevis, Lactobacillus leichmannii, Lactobacillus fermentum, Bifidobacterium bifidum, Bifidobacterium animalis, Bifidobacterium breve, Lactococcus lactis, are belongs to the group of probiotics.

Escherichia coli and Saccharomyses cerevisiae

Besides this E.Coli (Escherichia Coli) is one of the several types of bacteria that normally inhibit the intestine of humans and animals. As we know E.Coli is a gram negative bacteria and being a single cell, it doesn't need a circulatory system. This helps in the digestion, by excreting exoenzymes that digest large molecules and then absorbing the resulting small molecules. In several formulations Saccharomyses cerevesei and Saccharomyses boulardii are used to initiate fermentation process. This organisms are belong to the group of probiotics [28, 29]. As a result it looks clear that consume of a combination of probiotics and enzymes together will be much more beneficial for our health [30]. Lastly this much can be said that probiotics in terms of beneficial bacteria is very much needed for the entire growth of our body, to keep it healthy. Thus it is quite essential to consume such foods which increase or promote the growth of those [31]. Variety of enzymatic digestive formulations are available in the market amongst which some are allopathic and some belong to the category of Ancient Traditional Approaches of medicine system. The formulations derived from natural sources are less toxic than the synthetic formulations.

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