

## ORIGINAL RESEARCH ARTICLE

**International Journal of Futuristic  
Research in Health Sciences**Journal homepage: [www.ijfrhs.com](http://www.ijfrhs.com)**BIOAVAILABILITY ENHANCEMENT OF ABC THROUGH LIQUID DOSAGE FORM: PHARMACEUTICAL AND PHARMACOLOGICAL APPROACH**

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**Abstract**

Fruits and vegetables are good to human health, and certainly good for all age categories as it forms an important portion of a healthy diet. An apple is an edible fruit produced by an apple tree (*Malus domestica*). *Malus domestica* are among the most widely consumed fruits in various countries. It gives various benefits such as anti-mutagenic, antioxidant, anti-inflammatory and anti-carcinogenic. Beetroot (*Beta vulgaris*) has been primarily driven by the discovery that sources of dietary nitrate may have important implications for managing cardiovascular health. *Daucus carota* were first used for medical purposes and gradually used as food. *Daucus carota* have phenols and polyacetylenes which gives various health benefits to human. In combination, ABC Medicated mixture (apple, beetroot, carrot) gives lot of beneficially additive & synergistic effects. The aim of this study was to formulate the ABC medicated mixture. This formulation is prepared by using Multi fruit juice extractor and physicochemical and organoleptic analysis was evaluated. Bioavailability of this formulation is very high in oral liquid dosage form than solid dosage form.

**Keywords:** *ABC Medicated drink, ABC Detox drink, Healthy beverages, ABC juice, Nutrition supplement.*

**Introduction****BACKGROUND**

Cardiovascular diseases have been gaining importance in India recently because of increased incidence of the disease. It is the first among top 5 causes of deaths in Indian population. In 2000, there were an estimated 29.8 million people with coronary heart disease (CHD) in India out of a total estimated population of 1.03 billion [1]. Cancer is one of the leading causes of adult deaths worldwide. In India, the International Agency for Research on Cancer estimated indirectly that about 635,000 people died from cancer in 2008, representing about 8% of all estimated global cancer deaths and about 6% of all deaths in India [2] Obesity is reported in terms of body mass index (BMI) and waist circumference (WC) but the cut off points differ by ethnicity. A recent study demonstrated that India has raced to third place, after the United States of America and China in the highest number of obese people worldwide; the United States of America accounting for 13% of obese people globally and India together with China accounting for 15% of the world's obese. Obesity increased cardiovascular mortality fourfold and cancer-related mortality twofold [3]. Hypertension exerts a

substantial public health burden on cardiovascular health status and healthcare systems in India. HTN is directly responsible for 57% of all stroke deaths and 24% of all CHD deaths in India [4]. According to the Food and Agriculture Organization report on State of Food Security and Nutrition in the World, it is estimated that 190.7 million (14.5%) people were undernourished in India during 2014-2016. Every day, more than 6,000 children below the age of five die in India. More than half of these deaths are caused by malnutrition-mainly the lack of Vitamin A, iron, iodine, zinc and folic acid. About 57% of pre-schoolers and their mothers have subclinical Vitamin A deficiency [5].

Liquid dosage forms are homogenous liquid preparations, usually contain a solution of one or more active ingredients in a suitable liquid. Liquid dosage forms can be supplied as ready-to-use liquids. 'Oral Liquids containing one or more active ingredients dissolved in a suitable vehicle'. Liquids are easier to swallow and has better absorption than solids and are therefore particularly acceptable for pediatric and geriatric use [6]. Fruits and vegetables are good to human health, and certainly good for all age categories as it forms an important portion of a healthy diet.

An apple is an edible fruit produced by an apple tree (*Malus domestica*). *Malus domestica* are among the most widely consumed fruits in various countries. As children, many of us were told to "eat your vegetables because they are good for you", and the adage "an apple a day keeps the doctor away" is still quite popular. *Malus domestica* contain a large concentration of flavonoids, as well as a variety of other phytochemicals. Some phytochemicals presents in *Malus domestica* such as quercetin-3-galactoside, quercetin-3-glucoside, quercetin-3-rhamnoside, catechin, epicatechin, procyanidin, cyanidin-3-galactoside, coumaric acid, chlorogenic acid, gallic acid, and phloridzin [7]. *Malus domestica* form an important part of human diet as they are a rich source of sugars, minerals, dietary fibre and functional compounds such as ascorbic acid and phenolics [8]. Phenolics in *Malus domestica* used as anti-mutagenic, antioxidant, anti-inflammatory and anti-carcinogenic [9]. *Malus domestica* consumption with a reduced risk for cancer, especially lung cancer. In the Nurses' Health Study and the Health Professionals' Follow-up Study, involving over 77,000 women and 47,000 men, fruit and vegetable intake was associated with a 21% reduced risk in lung cancer risk in women, but this association was not seen in men [10]. Flavonoid intake was strongly correlated with a decreased mortality from heart disease in elderly men and also negatively correlated with myocardial infarction. *Malus domestica* consumption has been inversely linked with asthma and has also been positively associated with general pulmonary health [11]. *Malus domestica*, and especially its peels, have been found to have a potent antioxidant activity and can greatly inhibit the growth of liver cancer and colon cancer cells [12]. The unique combination of phytochemicals in the *Malus domestica* that are responsible for inhibiting the growth of tumor cells. *Malus domestica* had the third highest anti-proliferative activity when compared to eleven other commonly consumed fruits [13]. Beetroot (*Beta vulgaris*) has been primarily driven by the discovery that sources of dietary nitrate may have important implications for managing cardiovascular health. Also, *Beta vulgaris* is rich in several other bioactive compounds that provide health benefits, particularly for disorders characterized by chronic inflammation [14]. *Beta vulgaris* contains nitrate which is metabolized to nitrite, which can be further reduced to produce NO (Nitric oxide). One of the most important functions of endogenous NO is to maintain endothelial function. The endothelium plays a critical role in the regulation of vascular homeostasis by maintaining thrombotic activity, platelet function, vascular tone and the delicate balance between the release of vasodilating (*i.e.*, NO,

prostacyclin) and vasoconstriction agents (*i.e.*, endothelin-1, thromboxane). Because NO mediates many of the endothelium's functions [15]. Nitrate diet in beet stimulated a substantial and preferential increase in frontal cortex perfusion, a region of the brain responsible for essential cognitive processes such as executive function, working memory and task-switching [16]. *Beta vulgaris* contains betalain which suppressed COX-2 synthesis, betanidin, extracted from beet, dose dependently inhibited lipoxygenase (LOX), a catalytic enzyme vital for the synthesis of pro-inflammatory leukotriene molecules [17]. Carrot (*Daucus carota*) is the most important crop of *Apiaceae* family. It is a root vegetable that has worldwide distribution. *Daucus carota* were first used for medical purposes and gradually used as food. *Daucus carota* have phenols, including chlorogenic, caffeic and p-hydroxybenzoic acids along with numerous cinnamic acid derivatives. Among this hydroxycinnamic acid and its derivatives, chlorogenic acid represents 42.2% to 61.8% of total phenolic compounds detected in *Daucus carota* tissues [18]. Falcarinol is the most bioactive phytochemical of the *Daucus carota* polyacetylenes. This compound may stimulate cancer-fighting mechanisms in the human body. The mode of action behind the favourable effect of falcarinol may be due to its hydrophobicity and its ability to form an extremely stable carbocation with the loss of water thereby acting as a very reactive alkylating agent toward proteins and other biomolecules [19]. Researchers assessed the immunomodulatory effect of *Daucus carota* extracted carotenoid using 24 albino rats. The percentage variation in lymphocytes, eosinophils, monocytes and platelet count was evaluated. Interestingly, carotenoid administered rats showed a significant increase in lymphocytes, eosinophils, monocytes and platelet concentration. The beneficial effect was due to *Daucus carota*  $\alpha$ - and  $\beta$ -carotenoids [20]. *Daucus carota* showed cholesterol absorption reducing effects in experiments on *Daucus carota* fed rats, regulation in bile acid secretion and antioxidant status [21].

ABC Medicated mixture is the oral liquid formulation. The combination of the ABC are: **Apple**, **Beetroot** and **Carrot** and these classical constituents are known to give a healthy mind and body since ages. According to Nutritionist, Lokendra Tomar from the Weight Loss Clinic, New Delhi, "ABC Detox Diet is a body rejuvenation plan, which can be done for one to three days depending upon person to person. There are four major ways to remove toxins from the body: liver will remove fat soluble toxins, kidney will remove water soluble toxins, intestines will remove undigested toxins

and the skin will remove metabolic toxins. ABC Medicated mixture help you flush out all these toxins through these organs." There are a plethora of health mixture about which you must have heard, but this ABC Medicated mixture is definitely going to improve your overall health and well-being. This power-pack mixture was introduced by a Chinese Herbalist for the treatment of lung cancer and many other diseases ages ago. But currently, it has gained massive popularity all over the world because of its phenomenal health benefits. ABC Medicated mixture in liquid dosage form has low fibre content, hence it give better bioavailability than solid dosage form in human especially children and elder people.

Individually *Malus domestica*, *Beta vulgaris*, *Daucus carota* has various nutrients and phytoconstituents which provides various health benefits. But in combination, it give lot of beneficially additive & synergistic effects. *Malus domestica* contains catechin which has potent antioxidant property as well as *Daucus carota* has carotenoids which also has potent antioxidant property. Hence the antioxidant property in ABC Medicated mixture is tremendously increased. *Beta vulgaris* contains Betalain which has anti-inflammatory property as well as *Malus domestica* contain quercetin which also has anti-inflammatory property. Hence anti-inflammatory effect of ABC juice is synergized. *Daucus carota* contains two coumarin glycosides which decrease the arterial blood pressure. *Beta vulgaris* contain nitrates, which is metabolized to nitrite and generate nitric oxide. Nitric oxide dilate the vascular endothelium by Mechanism of nitric oxide activation results decrease in blood pressure. Hence both constituents give synergistic effects to decrease elevated blood pressure.

*Beta vulgaris* and *Daucus carota* synergize to provide benefits to eyes. As a combination of all the three-*Malus domestica*, *Beta vulgaris*, *Daucus carota*, it detoxify the central organs such as liver, kidney, lungs, etc. and increase the red blood cells synthesis (erythropoiesis) and give freshness and instant energy to whole body.

## MATERIALS AND METHODS

### Formulation of ABC Medicated mixture

The fully matured, freshly harvested *Beta vulgaris*, *Daucus carota* and *Malus domestica* were obtained from the market. They were washed properly under running tap water and peeled to remove adhered soil particles and other impurities. Mixed all the ingredients in equal ratio (1:1:1) - *Malus domestica*, *Beta vulgaris*,

and *Daucus carota*. The mixed ingredients were sliced and filled in the hopper of *Multi fruit juice extractor*. As the screw conveyor of multi fruit juice extractor rotates within the conveyor housing, the screw collects the sliced fruit from the base of the hopper and moves them through the extraction chamber toward the collection point. During this movement, the sliced ingredients is crushed and juice is squeezed out due to the gradual reduction of gap between the conveyor housing and screw conveyor.

The juice extracted is filtered through a screen and channel into a juice collector, while the waste is channel through the waste collector. Required quantity of purified water, lemon, and honey was added to the filtrate to make the formulation.

### Preformulation testing

Preformulation studies is the first step in the rational development of dosage form of a drug substance. It can be defined as an investigation of physical and chemical properties of a drug substance alone and when combined with excipients. The objective of preformulation studies is to generate information useful to the formulator in developing bioavailable dosage forms that can be mass produced.

#### Fiche's test

This test used to detect whether the honey is natural or adulterated. An adulterated honey contain Furfural which give instant red colour with resorcinol in hydrochloric acid.

### Evaluation of ABC Medicated mixture

#### Organoleptic Evaluation

Organoleptic evaluation is a scientific discipline that is used to measure and analyse people's responses to products as perceived through the 5 senses. The ABC Medicated mixture blends after preparation was subjected to sensory evaluation. The organoleptic qualities to be evaluated: Taste, odour, colour, palatability.

#### Determination of pH

pH is one of the main quality characteristics that describe the stability of bioactive compounds in ABC Medicated mixture. Digital pH meter is used to evaluate the pH of the ABC Medicated mixture.

#### Determination of Viscosity

Viscosity is also one of the main characteristics of the formulation that used to describe the stability and flow

property of the formulation. Capillary viscometer is used to evaluate the viscosity of the ABC Medicated mixture. The ABC Medicated mixture is poured using a pipette to the left arm till mark A. The liquid is sucked into the right arm slightly above the point B and left arm is closed with the thumb to keep the liquid without dropping down. The thumb is removed so as to allow the liquid to fall from mark B to mark C. The time required for it to fall from mark B to mark C is noted using a stop clock. This is repeated for three times to ensure the accurate time. The density of the liquid is measured by using specific gravity bottle. The viscosity is found by using equation,

$$\eta_1 = \frac{\rho_1 t_1 \times \eta_2}{\rho_2 t_2}$$

### Test for carbohydrate

Molisch test is the general test for the detection of carbohydrates. The strong  $H_2SO_4$  hydrolyses carbohydrates (poly and disaccharides) to liberate monosaccharides. The monosaccharides get dehydrated to form furfural (from pentoses) or hydroxy methyl furfural (from hexoses) which condenses with alpha - naphthol to form a violet coloured complex.

### Test for reducing sugar

The presence of reducing sugar was tested using Fehling solution. In this test, 3 ml of the sample was taken in a test tube and 2 ml of a mixture of Fehling's A and Fehling's B solutions in equal amount was added. The test tube was heated in a water bath for 10 min and the appearance of brown precipitation confirmed the presence of reducing sugar.

### Test for Flavonoids

The extract has to be treated with a few drops of sodium hydroxide solution. Formation of intense yellow colour, which becomes colourless on the addition of acid, indicates the presence of flavonoids.

## RESULTS AND DISCUSSION

### Preformulation testing

#### Fiche's test

The honey sample does not give instant red colour when treated with resorcinol in hydrochloric acid. It revealed the honey sample used in the study was natural.

### Evaluation testing

#### Organoleptic evaluation

The organoleptic qualities of the formulated ABC Medicated mixture were evaluated.

- **Colour** : Reddish pink
- **Odour** : Characteristic
- **Taste** : Sweet
- **Palatability (Mouth feel)** : Palatable

#### pH determination

The pH of the formulated ABC Medicated mixture were evaluated by using Digital pH meter is 5.56.

#### Viscosity

The viscosity of the formulated ABC Medicated drink was found to be 1.126 centipoise by using the formula,

$$\eta_1 = \frac{\rho_1 t_1 \times \eta_2}{\rho_2 t_2}$$

**Table 1. Viscosity of ABC Medicated mixture**

S.no	Solution	Flow time (sec)				Density (g/ml)	Viscosity (Cp)
		T1	T2	T3	Avg		
1.	Water	26	25	25	25.33	0.998	1
2.	Sample	28	27	28	27.66	1.0294	1.126

#### Test for Carbohydrates

Appearance of the Purple ring at the interface indicate the presence of carbohydrates in the formulated ABC Medicated mixture.

#### Test for reducing sugar

Appearance of Reddish brown precipitate in this test confirm the presence of reducing sugar in the ABC Medicated mixture.

#### Test for flavonoids

Appearance of yellow colour in the sample which disappeared when treated with acid indicates the presence of flavonoids.

## SUMMARY AND CONCLUSION

The ABC Medicated mixture was successfully formulated and evaluated in liquid dosage form. Usually other various health drinks available in market and it give several beneficial as well as side effects. But ABC Medicated formulation give tremendous beneficial effects to human. ABC Medicated mixture in liquid dosage form has low fibre content, hence it give better bioavailability than solid dosage form in human especially children and elder people. This formulation detoxifies the liver, kidney, lungs and other central organs, combat the elevated blood pressure in Hypertension people, reduces the risk of Cardio vascular disease, increases glutathione level in the body, boosts the immune system. It helps to lowers the bad cholesterol levels and raises healthy cholesterol levels in the obese people. It helps to recover from Anemia by increasing hemoglobin and RBC production. It protects against several types of cancer, improves eye health. It reduces inflammation in joints, bones and blood vessels. It corrects menstrual problems in women and provide protection against birth defects. ABC Medicated mixture increases stamina in athletes.

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