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Preparation and Evaluation of Beverage of Mahua Flowers and its Reducing Power Assay

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Abstract

Objective: The objective of present study is to prepare beverage from mahua flowers and to evaluate its physicochemical parameters including alcohol content. Another one objective is to determine its antioxidant potential by means of reducing power assay.
Materials and methods: The beverage prepared by boiling ripe fruits of mahua in water. This beverage evaluated for alcohol content, appearance (color, odour and taste), pH, viscosity, specific gravity and refractive index. The reducing power of mahua beverage was determined with different concentrations using UV-visible spectrophotometer.
Result: The beverage was prepared from mahua flowers and subjected for the evaluation of physicochemical parameters, which found to express significant result. The reducing power of beverage was increases with increasing amount of sample. The reducing capacity serves as a significant indicator of its potential antioxidant activity has been reported to be concomitant with the development of reducing power. The presence of antioxidant constituents in beverage causes the reduction of ferric cyanide complex to ferrous form.
Conclusion: The present study indicates that fresh mahua beverage express antioxidant potential as determined by reducing power assay. Previous research studies explore its enrichment in potential phytochemicals hence it can be conclude that beverage of mauha flower may use as a potential drink with nutritional value.
Keywords: *Madhuca indica*, beverage, antioxidant activity, reducing power.

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1. Introduction

Plants have been used for medicinal purposes long before recorded history. Primitive men observed and appreciated he great diversity of plants available to them. Plants provide food, clothing, shelter, and medicine. *Madhuca* plants are considered as divine in origin and were worshipped as Mother (Goddess). They have played significant role in maintaining human health and improving the quality of human life for thousands of years. In the last few years there has been an exponential growth in the field of herbal medicine and these drugs are gaining popularity both in developing countries because of their origin and less side effects. *Madhuca indica* is highly regarded as a universal panacea in the Ayurvedic medicine. *Madhuca indica* is a large evergreen tree distributed in India, Sri Lanka and Nepal. *Madhuca* has commonly known as mahua or butternut tree, 15-20 m height with a large top. It belongs to the family *Sapotaceae.* It has a significant place in tribal culture. The bark is yellowish grey to dark brown red in color and milky inside [1].

Inner bark is dark red, branches are numerous. Leaves are 10-30 cm long, thick and leathery, most of leaves pointed at the tip, crust scent, glabbered near end of the branches, epileptic or elliptical belongs to 7.5 to 23 cm into 3.8 to 11.5 cm. Mahua flowers are in dense fascicles near end of the branches having 1.5 cm long, fresh cream colored corolla tubular, freshly pale yellow, aromatic and cad cells, fruits are 2-6 cm long, fleshy and greenish. The species is drought resistant, strong light demander and readily suppressed under shade [2].

The fresh flowers of mahua contains 2-acetyl-1-pyrroline, the aroma molecule, they contain polysaccharide which on hydrolysis give D-galactose, D-glucose, L-arabinose, D-xylose and D-glucoronic acid. Chemical composition of Mahua flower reveals its high nutritional value. Apart from being rich sources of sugar and protein, the flowers also contain essential minerals like Ca, P, Fe and K. They also contain a good quantity of sugars, enzymes yeast and albuminoids. Total sugars content is of 40-70% (on dry weight basis). As reported by different scientist in samples collected from different geographical region. The nitrogen content of the flower varies from 0.65-1.1% being apparently higher in the well-developed flowers. The protein content of the flower varies from 4.4-7%. They also contain vitamin A and B[3].

Bark reported the presence of ethylcinnamate, sesquiterpene alcohol, α-terpeneol, 3β-monocaprylic ester of erythrodiol and 3β-capryloxyoleanolic acid, α and β-amyrin acetates.Seeds mainly contain arachidic acid, linoleic acid, oleic acid, myristic acid, palmitic acid, stearic acids, α-alanine, aspartic acid, cysteine, glycine, isoleucine and leucine, lysine, methionine, proline, serine, threonine, myricetine and quercetin. Leaves were found to rich in β-carotene, xanthophyllus, erthrodiol, palmitic acid, myricetin, quercetin, oleanolic acid, β-sitosterol and its glucoside, stigmasterol and n-hexacosanol[4].

The number of research paper explore its medicinal potential including antiepileptic activity, anti-inflammatory activity, analgesic activity, antipyretic activity, anti-hyperglycemic activity, antioxidant activity, antibacterial activity, dermatological activity, wound healing activity, hepatoprotective activity etc[5-12].

2. Materials and Methods

2.1 Collection of plant material:

The dried mahua flowers are collected from Sakoli, Dist. Bhandara and authenticated at Department of Botany, M. B. Patel College, Sakoli. Dried mahua flowers are washed thoroughly with water in order to remove the impurities and allowed for shade drying for 10 days, in order to make them completely free from moisture and store in well tight container for further use.

2.2 Preparation of beverage:

Fresh ripe fruits washed and de-stoned, cut into small pieces, boil 100g fruits with 100ml water for 20-30 min and filter through a muslin cloth to produce a clear juice. Add 50 g sugar, 1 g citric acid and 250 ml water per 100ml extracted juice, boil for 10 to 15 minutes to dissolve the sugar, and filter through a muslin cloth to remove any impurities and sediment. Pour into bottle, pasteurize at 80-90^{o}C for 10 to 20 min and cool [13].

2.3 Evaluation of Physicochemical Parameters:

The mahua beverage was evaluated with the concern of following physicochemical parameters.

Color: Color was observed by visual examination.

Odour: Odour of beverage was determined by smelling method.

Taste: A small quantity of beverage was taken and examined for its taste on buds of the tongue.

pH: pH was determined with the help of calibrated Digital pH meter.

Viscosity: The viscosity was measured by Brookfield viscometer which measures the shearing stress on spindle rotating at a definite, constant speed while immersed in the sample.

Specific Gravity: By using differential weighing method, the mass of given volumes of the mahua beverage (m) at the temperature 20±0.1^{o}C was determined.

Refractive index: The refractive index was measured using Abbe's refractometer.

Alcohol Determination: Alcohol content of mahua beverage was determined by potassium dichromate method. This is the titrimetric method, involve a titration of sample as well as blank titration [14].

Reducing Power Assay: The various concentrations of mahua beverage were mixed with phosphate buffer (2.5ml) and potassium ferricyanide (2.5ml). This mixture was kept at 50^{o}C in water bath for 20 minutes. After cooling 2.5ml of 10% Trichloro acetic acid was added and centrifuge at 3000 rpm for 10 minutes whenever necessary. The upper layer of solution (2.5ml) was mixed with distilled water (2.5ml) and freshly prepared ferric chloride solution (0.5ml). The absorbance was measured at 700nm using UV visible spectrophotometer (Systronic-2201). Control was prepared in similar manner excluding sample. Ascorbic acid at various concentrations was used as standard. Increased absorbance of the reaction mixture indicates increase in reducing power [15].

3. Results and discussion

The present study deals with preparation of beverage of mahua flower and evaluation of physicochemical parameters including pH, viscosity, specific gravity and refractive index. The alcohol content was determined by titrimetric method. The results obtained were mentioned in Table 1.The reducing power assay was carried out in order to determine its antioxidant potential. The reductive capability of extract of Mahua flowers was compared with ascorbic acid for the reduction of Fe^{3+} to Fe^{2+} transformation. Finally Fe^{2+} complex formed were monitored by measuring the formation of Pearl's Prussian blue at 700nm using UV visible spectrophotometer. The reducing power of mahua beverage, as a function of their

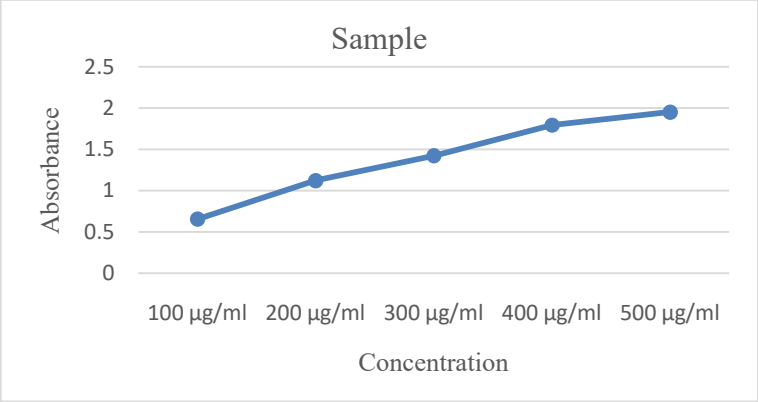
concentration is shown in figure 1. The reducing power of beverage was increases with increasing amount of sample. The yellow color of test solution changes to various green and blue colors depending upon the reducing power of beverage. The reducing capacity serves as a significant indicator of its potential antioxidant activity has been reported to be concomitant with the development of reducing power. The presence of antioxidant constituents in beverage causes the reduction of ferric cyanide complex to ferrous form. Therefore Fe^{2+} can be monitored by measuring the formation of Perl's Prussian blue at 700nm. The reducing properties are generally associated with the presence of reductones. The antioxidant action of reductones is based on the breaking of the free radical chain by donating a hydrogen atom. Reductones also react with certain precursor of peroxide, the preventing peroxide formation [16]. The reducing power assay indicates that beverage prepared from mahua flower have potential antioxidant effect and its phytochemical enriches its nutritional value.

4. Conclusion

The present study indicate that fresh mahua beverage express antioxidant potential as determined by reducing power assay and these properties are generally associated with the presence of reductones. Previous research study explore its enrichment in potential phytochemical hence it can be conclude that beverage of mauha flower may use as a potential drink with nutritional value. Certain preservatives can be used in order to inhibit the growth of microbes and it can be stored for more days.

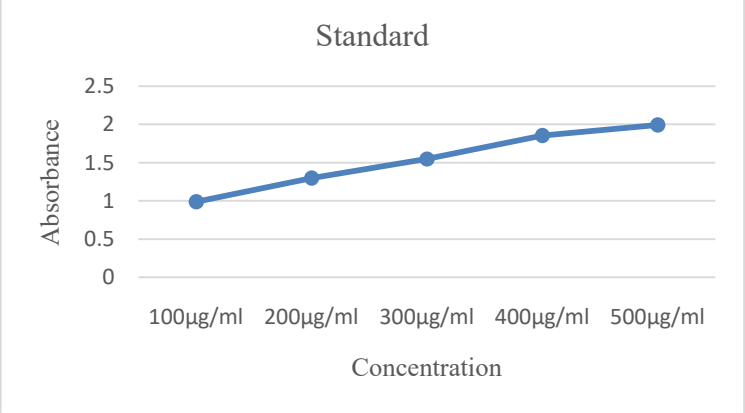
Table1: Evaluation of physicochemical parameters.

Sr. No.	Physicochemical parameters	Observation
1.	Color	Reddish Brown
2.	Odour	Unpleasant
3.	Taste	Bitter
4.	pH	4
5.	Viscosity	Spindle no-62, CP-11760, Torqe -78.2%, Rpm-2.0
6.	Specific Gravity	0.94 gm/ml
7.	Refractive index	1.349 at 25◦C
8.	Alcohol content	3.23%



Concentration	Absorbance
100 µg/ml	0.654
200 µg/ml	1.121
300 µg/ml	1.423
400 µg/ml	1.794
500 µg/ml	1.952

Fig. 1 Reducing Power assay of beverage sample



Concentration	Absorbance
100µg/ml	0.989
200µg/ml	1.299
300µg/ml	1.547
400µg/ml	1.853
500µg/ml	1.992

Fig. 2: Reducing Power Assay of standard Sample

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