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Preparation and evaluation of physicochemical characteristics of herbal drink concentrate

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Abstract: The herbal drink in concentrated liquid form was prepared by utilizing indigenous raw materials such as natural herbs source. The product was formulated by developing economically feasible process and also save foreign exchange spends on the import of synthetic products. A process consists cleaning of the herbs to remove dust and other foreign matters, grinding into semi powder form and distilling to obtain mix herbal distillate. Preparing concentrated sugar syrup of brix 88º, filtering through muslin cloth, mixing with herbal distillate, adding of color and flavor to obtain liquid mixture of brix 75º, cooling, filling in bottles and labeling. The product upon addition of water or milk has good flavor and refreshing taste.

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INTRODUCTION

Pakistan is one of those countries where the demand for beverages and drinks is very high due to location in the temperate region. After the long boom of the soft drinks industries, the trend is now changing towards "back to natural style" i. e those based on fruits and herbs. Keeping in view the present day trend a process for the preparation of a beverage based on natural herbs had been developed. The main ingredients of the extract on which the drink is based are obtained from local herbal sources as; Gul-e-Nelofar (*Nelubium nucifera*), Khas (*Vetiveria zizanoides*), Gul-e-Galhar (*Hibiscus rosasineses*), Gul-e-Gaozoban (*Onusma bracteatum*), Sounf (*Foeniculum vulgare*), Dania (*Coriandrum sativum*), Rashana (*Pluchea lanceolata*), Laung (*Sizygium aromatium*), Ajwain (*Trahyspermum ammi*), which are commonly used in "Tibb" for pro health characteristics. These herbs have carminative, cooling and stimulating effects. Some are even used as tonics.

Coriander (*Coriandrum sativum*) has been used as a folk medicine for the relief of anxiety and insomnia[1]. Coriander seeds are used in traditional Indian medicine as a diuretic by boiling equal amounts of coriander seeds and cumin seeds, then cooling and consuming the resulting liquid[2]. In holistic and traditional medicine, it is used as a carminative and as a digestive aid[3, 4].

The (*Onusma bracteatum*) plant is alterative, demulcent, refrigerant and tonic. A decoction is used in the treatment of rheumatism, syphilis and leprosy. The plant is considered to be useful in relieving excessive thirst and restlessness in febrile excitement, and also to be useful in relieving functional palpitation of the heart, irritation of the bladder and stomach[5]. Chinese *Hibiscus rosasineses* (Gul-e-Galhar) is a sweet, astringent, cooling herb that checks bleeding, soothes irritated tissues and relaxes spasms. The flowers are aphrodisiac, demulcent, emmenagogue, emollient and refrigerant. They are used internally in the treatment of excessive and painful menstruation, cystitis, venereal diseases, feverish illnesses, bronchial catarrh, coughs and to promote hair growth[5, 6]. An infusion of the flowers is given as a cooling drink to ill people[7, 8].

Vetiveria zizanioides **(**Linn.) commonly known as Vetiver, a member of the family Poaceae, also known as the *Khas-Khas*, *Khas* or *Khus* grass in India, are aromatic and highly valued. Roots used as water flavouring agent and preparing *Sharbat* (sherbet) or soft drink during summer, especially in North India. Vetiver has been used in traditional medicine in South Asia, Southeast Asia, and West Africa[9]. Different parts of the grass for many of their ailments such as mouth ulcer, fever, boil, epilepsy, burn, snakebite, scorpion sting, rheumatism, fever, headache, etc.[10]. Cloves (*Syzygium aromaticum*, syn) are used in Indian Ayurvedic medicine, Chinese medicine, and western herbalism and dentistry, where the essential oil is used as an anodyne (painkiller) for dental emergencies. Cloves are used as a carminative, to increase hydrochloric acid in the stomach and to improve peristalsis. Cloves are also said to be a natural anthelmintic[11].

Fennel (*Foeniculum vulgare)* is a highly aromatic and flavorful herb with culinary and medicinal uses. Fennel contains anethole, which can explain some of its medical effects, it, or its polymers, act as phytoestrogens[12]. It has carminative and purgatives properties[13], In the Indian subcontinent, fennel seeds are also eaten raw, sometimes with some sweetener, as it is said to improve eyesight. Root extracts were often used in tonics to clear cloudy eyes[14]. Some people use fennel as a diuretic and it may be an effective diuretic and a potential drug for treatment of hypertension[15, 16].

Pluchea lanceolata (Asteraceae) commonly known as 'Rasna' is an important xerophytic medicinal herb. It has anti-inflammatory and analgesic activities and is extensively used in drug formulations given in rheumatoid arthritis, bronchitis, dyspepsia, edema, neuralgic disorders, etc[17]. Keeping in view the nutritive and medicinal value of the selected herbs the present study was undertaken with the objectives of developing economically feasible process based on utilization of indigenously available resources and also save foreign exchange spends on the import of synthetic drinks. The commercialization of product would be a great achievement and will be beneficial for food/pharmaceutical industries to promote economical products.

MATERIALS AND METHODS

The present study was undertaken to evaluate chemical characteristics of herbal drink concentrate prepared from the natural herbs in order to highlight their nutritional significance.

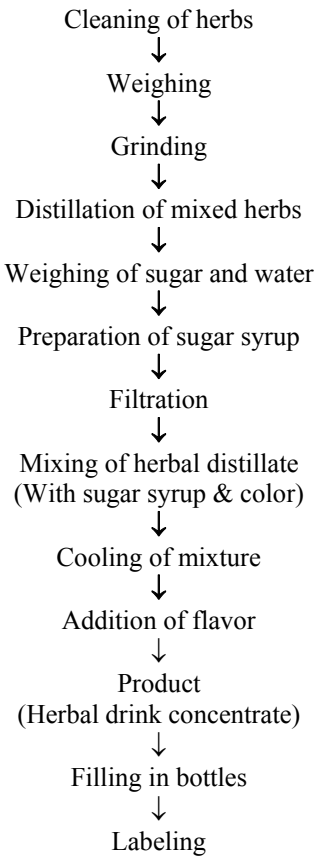
Preparation of herbal drink concentrate

Dried herbs such as Gul-e-Nelofar, Khas, Gul-e-Galhar, Gul-e-Gaozaban Sounf, Dania, Rashana, Laung and Ajwain were cleaned by removing their stems, leaves, thorns. The cleaned herbs were grinded to semi powder form by pin grinder. The weighed quantity of grinded herbs at different proportions was distilled by steam distillation to obtained mixed herbal distillate. The weighed amount of sugar and water was heated to obtained concentrated sugar syrup of brix 88º and then the herbal distillate was mixed with concentrated sugar syrup. The concentrated liquid mixture was filtered through muslin cloth and the known quantity of food color and flavor were added in filtrate to get liquid mixture of brix 75º. The final product obtained was cooled at room temperature, filled in pet bottles and labeled.

Chemical analyses

All chemicals and reagents were of analytical grades (Merk, Germany). Deionized and double distilled water was used for preparing solutions and dilutions. Standard solutions, prepared for the study of elements, were stored in polyethylene containers. Chemical analysis i.e. moisture, ash and total sugars were performed using standard methods of AOAC[18]. The acidity was determined by titration against 0.1N Sodium hydroxide and total soluble solids were measured by an Abbe refractometer [18, 19], pH was recorded on pH meter, Model pH-220L, ISTECK Co. Ltd, Korea. Triplicate determinations were performed for all parameters and standard deviation was calculated[20].

Flow sheet diagram for the product



Estimation of micro and macro minerals

For minerals estimation, nitric acid-perchloric acid digestion was performed. Briefly the herbal drink concentrate (2.0g) were digested with (20 ml) of concentrated nitric acid and then (10 ml) of concentrated perchloric acid. Then the contents were evaporated until the volume was reduced to about 1-2 ml, but not to dryness. After cooling, diluted with distilled water and filtered through pretreated Whatman No.1 filter papers. Filtrate and washing were collected in 100 ml volumetric flasks and made up to the mark with distilled water. Blanks, standard solutions and samples were aspirated and absorbance values measured[21].

Instrumentation

The samples were analyzed for micro minerals (Co, Cu, Fe, Ni, Zn) and macro minerals (K, Na, Ca, Mg) by atomic absorption spectrophotometer Hitachi, Model Z-8000, Japan equipped with standard hollow cathode lamps as radiation source using air acetylene flame. The instrument setting and operations were done in accordance with the manufacturer user's specification[21].

The sample solutions were appropriately diluted, if required, prior to direct measurements and calibration curves were obtained for micro and macro minerals using standard solutions. They were linear and correlation coefficient of each curve was above 0.9900, which indicated a best fit between concentration of the standard solutions and respective absorbance values. Accuracy, precision of the method was verified by standard addition/recovery method[22]. Analysis of each element was carried out in triplicate and standard deviation was calculated[20]. For background correction, blank was analyzed under instrumental conditions. The concentration of minerals was recorded in ppm, converted into mg/g and calculated as mg/100g.

Sensory evaluation

Samples were evaluated by a panel of six judges for sensory evaluation like color, taste, flavor, texture and overall acceptability at room temperature as described by the Larmond[23].

RESULTS AND DISCUSSION

Dry herbs were processed for the preparation of herbal drink concentrate. The process parameters and addition of food grade ingredients have been standardize for the product development. In order to evaluate its suitability for nutritional purpose the chemical analyses of the herbal drink concentrate are presented (Table 1).

Table 1: Chemical composition of herbal drink concentrate.

No	Parameters	Herbal drink concentrate
1	pH	6.20
2	Moisture (%)	22.0
3	Ash (%)	0.01
4	Acidity (%)	0.08
5	Total sugars (%)	74.0
6	Total soluble solids (%)	75.3

It was observed that the pH, moisture, ash, acidity, total sugar and total soluble solids of herbal drink concentrate were (6.20), (22.0%), (0.01%), (0.08%), (74.0%) and (75.3%) respectively. The macronutrients provide structural material (amino acids from which proteins are built and lipids from which cell membranes and some signaling molecules are built), energy. Some of the structural material can be used to generate energy internally and in either case it is measured in Joules or kilocalories (often called "Calories" and written with a capital *C* to distinguish them from little 'c' calories). Carbohydrates and proteins provide 17 kJ approximately (4 kcal) of energy per gram, while fats provide 37 kJ (9 kcal) per gram [24].

Estimation of some micro (Fe, Zn, Mn, Cr, Cu) and macro (Na, K, Ca, Mg) minerals in herbal drink concentrate were carried out by atomic absorption spectrophotometer and their concentration have been shown as milligram per hundred gram (mg/100g) (Table 2). The mean and standard deviation were also determined.

Table 2: Minerals composition of herbal drink concentrate

Micro minerals (mg/100g)					Macrominerals (mg/100g)			
Fe	Zn	Mn	Cr	Cu	K	Na	Ca	Mg
2.02* ±0.01**	1.2 ±0.1	0.60 ±0.03	0.011 ±0.002	0.30 ±0.02	220 ±3.0	160 ±2.0	90 ±2.5	65 ±1.5

* Average of triplicate determination

** Standard deviation values

In the product, among the micro minerals the concentration of Fe (2.02±0.01mg/100g) was maximum; Zn (1.20 ±0.1mg/100g) showed higher amount then Mn (0.60±0.03 mg/100g) and Cu (0.30±0.02 mg/100g) which were on moderate level, while Cr (0.011±0.002 mg/100g) was the lowest. In the macro minerals, the amount of K (220±3.0mg/100g) was maximum; Na (160±2.0mg/100g) showed higher amount then Ca (90±2.5 mg/100g), which was on moderate level, while Mg (65±1.5mg/100g) was the lowest.

The role of minerals in increasing the body resistance to environmental stress, reducing the risk of disease has been very important topic in the last few decades. It has claimed that the regular intake of protective minerals in correct proportions may one day be recognized as an important measure in the maintenance of health and prevention of disease. Minerals in biological sources are more efficient than pure elemental status, because of presence of elements as well as presence of vitamins and other physiological active compounds[25].

Table 3: Sensory evaluation of the herbal drink concentrate and two commercial brands of red syrup.

Parameters	Sample A	Sample B	Herbal drink
Color	6	7	6
Taste	8	5	7
Flavor	7	6	8
Texture	5	6	5
Overall acceptability	7	6	8

1=extremely dislike, 2=strongly dislike, 3=moderate dislike, 4= slight dislike, 5= neutral, 6=slight like, 7=moderate like, 8=strong like, 9=extremely like

The sensory evaluation like color, taste, flavor, texture and overall acceptability at room temperature of the herbal drink concentrate and two commercial brands are presented (Table 3). On the basis of this evaluation herbal drink concentrate has good taste,

flavor and overall acceptability as compare to commercial brands available in the market.

CONCLUSION

The novelty of present product is to utilize the locally available natural herbs for the manufacture of a pro-health drink concentrate which has an appealing flavor, good taste and color, incorporating the original characteristics of the herbs used. This will be beneficial for food/pharmaceutical industries to promote economical food product. The large scale manufacturing is therefore, necessary to explore ways and means for utilization of indigenous materials by converting it into value added food product.

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