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# Physiochemical and Sensory Evaluation of Developed Herbal Bars

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***Abstract: High Altitude Sickness also is known as AMS (Altitude Mountain Sickness) is a bundle of health problems faced by travellers ascending towards higher ranges. There are various types of altitude illness and can be managed by the proper treatments with the help of drugs and herbs. The following research study justifies the curing of ailment by formulating a combination of herbal bars one can consume and carry at the higher altitude to stay healthy and prevent the sickness.***
***Keywords: Altitude Mountain Sickness, Acclimatization, High Altitude Pulmonary Edema, Gingko Biloba.***

## I. INTRODUCTION

High Altitude region is referred to areas starting from 1500 m above the sea level. People traveling on higher ranges whether they are mountain climbers, trekking people or army people serving at higher altitudes, suffers from various health problems caused by the high altitude environment known as High Altitude Sickness. Taylor, 2011 classified high altitudes into different ranges: a) High altitude 1,500-3,500m or 5,000-11,500feet b) Very high altitude 3,500-5,500m or 11,500-18,000feet c) Extreme altitude above 5,500m or above 18,000feet. Since there is lack of oxygen pressure levels while ascending towards higher altitudes, it often leads to severe threatening illness. These sicknesses can be treated with various drugs or herbal treatments. It is advisable to have energy and carbohydrate dense diet to stay fit at these ranges. Acclimatization is considered a mandatory aspect of every individual traveling at higher altitude region.

### *A. Types of Altitude sickness*

Here is variously listed Altitude sickness one faces at higher Altitudes highlighted by numerous studies:

1) *AMS (Acute Mountain Sickness*): It is being characterized as one of the first illness difficulty faced during an attempt of ascending at higher altitude with a sudden speed. A person suffers from various symptoms of Headache, Fatigue, Gastrointestinal disorders, Insomniac and disorientation (Taylor, 2011).
2) *HACE (High Altitude Cerebral Edema):* it is often been recognized as one of a forward stage of AMS. Due to low atmospheric pressure at higher regions, results in a decreased amount of oxygen supply to brain cells causing edema/swelling. One of the biggest causation is the ignorance of earlier symptoms of AMS.
3) *HAPE (High Altitude Pulmonary Edema):* This illness is considered to be one of most deathly and threatening condition for the health. Lung's capillary leakage is seen leading to accumulation of fluid in lungs causing edema and worsening the condition of breathing. Often it is observed that the person suffers from severe chest pain, discomfort, and incessant coughing.
4) *Frostbite and chilblains:* A condition faced by a person with heavy exposure to cold environment causing skin color goes pale and rough due to the formation of ice crystals in red blood cells. With lethal conditions, there is redness and inflammation of the skin.

### *B. Nutrition at Higher Altitudes*

The highly rated recommendation for any traveler ascending for higher altitudes is to keep them hydrated in a best possible way. Dehydration results in health deterioration and worsens the condition to survive at altitudes. Carbohydrate and energy-rich diets help to endure the physical activity of an individual and keep a fit status.

An adequate amount of protein is recommended for preventing the muscle functioning loss. A high-fat diet might be dense in calorie intake aspect but is not well tolerated during higher altitude era, as fat requires more oxygen consumption to get digested which becomes difficult because of hypoxic conditions (i.e. lack of oxygen) at altitude ranges.

Few of the items listed for the best source of snacks for carrying at a higher altitude to provide the copious amount of nutrition. They need to be handy and should occupy less space to carry such as- Granola energy bars, nutrient dense chips, herbal tea products, yogurt packets, energy-rich candies and dry fruits.

Antioxidant-rich foods help to eliminate the free radicals in the body and remove toxicity for a healthily balanced status. Foods rich in Vitamin C & E can be incorporated in diet, as they play a good antioxidant role and circumvent the sickness.

Drug and herbal treatments for high altitude sickness:

There are lots of drugs and herbal remedies for treating sickness, some are listed below:

1) *Acetaminophen and Ibuprofen*- it is an Anti- Inflammatory drug used for curing headache complications and efficient painkiller.
2) *Benzodiazepines & Hypnotic medications*- These medications minimize the problems of an insomniac and need to be prescribed on a regular basis as its discontinuation can result in reoccurrence of the sleeping problems.
3) *Acetazolamide and Dexamethasone*- it has functional qualities of relieving from the pain of altitude sickness at a fast pace and are used in emergency cases.
4) *Gingko Biloba*- It is generally used in form of herbs but can also be taken as an extract of medicinal tablets. Lots of studies have supported the effect of this herb in improving the altitude sickness disorientation problems by stimulating the cognitive power of the human body.
5) *Herbs like Shilajit*, ginger, peppermint, cinnamon helps in reducing the hypoxic stress of the body, relieves problem like ataxia, minimize chest pain and disorientation and energize the performance levels of the body.

Development Of Bars Using Different Herbal Combination For Treating High Altitude Sickness

## II. MATERIALS AND METHODS

A backbone of numerous studies supports the consumption of Energy-rich bars while traveling towards higher altitude ranges. In the present, the bars have been modified with the help of herbal combinations not only to provide energy dense in diet but also to circumvent the altitude illness one faces because of high altitudes.

### *A. Procurement of the listed herbal products and other Different Ingredients for Development of The bars*

| Herbal Ingredients | Other Ingredients |
|---|---|
| Nutmeg | Dark chocolate compound |
| Ginger | Coconut Dry |
| Cinnamon | Milkmaid |
| Black Pepper | Chocolate Molds |
| Peppermint oil | Aluminium sheets |
| Gingko biloba tablets (60mg dose) | |
| Tea leaves | |
| Cardamom | |

### *B. Formulation and PREPARATION of the Chocolate Bars*

In the present study- all the herbal ingredients were collected and were grinded into fine powder form and stored in an air tight container separately. Bars were developed using these herbs with different combinations. A standard bar (BO) was developed using Dark chocolate, caramelized milk, desiccated coconut dry and then herbs were added to the bars by different propositions:

| BAR CODES | INGREDIENTS |
|---|---|
| B1 | Gingko biloba, Tea leaves & Cinnamon |
| B2 | Peppermint, Nutmeg & Ginger |
| B3 | Gingko biloba, Black pepper & Cardamom |
| B4 | All herbs (Gingko biloba, Tea leaves, Cinnamon, Peppermint, Nutmeg, Ginger, Black pepper, Cardamom) |

Preparation of bars: (1)The first step involved melting of the dark chocolate compound in the double pan boiler at around 110 degrees F. (2) The milkmaid bought from the local market was dipped in deep pan boiling water on a low flame heat for at least 3 hours covered with a lid. (3) After this procedure, the milkmaid was taken out from the pan (not to be opened immediately) and was cooled down for next 12 hours. (4) After the milkmaid was cooled down, the tin of the can was opened gently and carefully (dark golden brown color-caramelized milkmaid was obtained). (5) The desiccated coconut was mixed with the caramelized milk and was kept aside. (6) In meanwhile the Chocolate shape molds were taken- a bit of dark chocolate was added as a base layer cover and was set for 2 min after which there was an addition of caramelized milk and desiccated coconut dry mixture as filling source and then the

remaining dark chocolate was poured to cover the bars. (7) The molds were set in the refrigerator for 15 min and were de-molded & packed with aluminum sheets.

(At step 5 the herbs of different compositions i.e.1g were added for the various combinations of the bars)

| INGREDIENTS | AMOUNT (For each Bar) |
|---|---|
| Dark chocolate compound | 20gm |
| Caramelized Milk | 15gm |
| Desiccated Coconut | 14gm |
| Herbal combination | 1gm |

*C. Organoleptic Evaluation of the developed Bars*

All the bars were evaluated for the organoleptic qualities- Appearance, Color, Taste, After Taste and Overall Acceptability Compared with the standard bar by the semi-trained panel of five people using a five-point rating scale. The best acceptable bar was chosen for the further proximate analysis.

*D. Estimations of Proximate Analysis and Antioxidants in the Developed Product*

The method used for estimating proximal components was determined by the standard AOAC & I.S. techniques. The nutrients estimated were as follows: Moisture Content (%), Protein (g), Total Fat (g), Carbohydrates (g), Dietary Fiber (g). The Antioxidant components estimated were: Vitamin C, Beta-Carotene, and Total Polyphenols.

*E. Estimations of certain Physiochemical parameters were also evaluated:*

Average weight, measurement of PH and Shape of the developed bars.

*F.* Shelf Life of the developed bars was estimated by the TPC (Total Plate Count) method to determine the colonies forming unit of the product per gm.

*G. Cost analysis and packaging of the prepared Bars:*

*1)* The cost of the formulated bar was calculated.

*2)* The packagings of the bars were done by highly malleable colored aluminium sheets.

## III. RESULTS AND DISCUSSIONS

Herbs are considered to be one of the most natural treatments to solve any ailments related to health. They tend to decrease the oxidative stress in the body as they are considered to have good properties of antioxidant activity. Bars are formulated by numerous composition stated as an energy-rich granola bar, fig bars, dry fruit bars or chocolate bars. They mainly carry copious density of calories providing energy and carbohydrate. It is easy to make and easy to handle and carry, as they are lightweight pocket-friendly snacks. In the present study, there is the development of a herbal bar product which solves the purpose of providing energy nutrient adequate diet and simultaneously treating the problem of High Altitude Sickness.

*A. Organoleptic Result Score*

| BAR CODES | APPEREANCE | COLOR | TASTE | AFTER TASTE | OVERALL ACCEPTABILITY |
|---|---|---|---|---|---|
| BO | 5 | 5 | 5 | 5 | 5 |
| B1 | 4.8 | 4.7 | 3.7 | 3.7 | 4.1±0.52 |
| B2 | 4.8 | 4.9 | 4.4 | 4.4 | 4.5±0.23 |
| B3 | 4.8 | 4.8 | 4.2 | 4.5 | 4.5±0.25 |
| B4 | 4.8 | 4.8 | 4.5 | 4.5 | 4.7±0.15 |

The results concluded that the overall acceptability was found to highest in B4 scoring 4.7 ±0.15 when compared with the other bars and was selected for the best acceptance and further analysis of the nutritional proximate. Herbs selected are supported by lots of studies helping in treating the health attribute sickness property in them. Gingko biloba among these herbs have been used a lot in nursing the medical condition of altitude sickness and equally promotes brain stimulation power. Herbs like Tea leaves, Ginger, Cinnamon and Peppermint helps in relieving stress, headache and chest pain. It is termed beneficial by improvising the oxygen supply and regulation.

*B. Nutrient estimations and Antioxidant Analysis*

The Moisture Content in the developed herbal bars was found to be 3.52% which considered a good score as a less chance for the spoilage and occurrence of rancidity in the product. Whereas numerous studies supported the adequate amount of protein in diet and the developed bar is providing 6.48gm/100gm of the protein considered qualitative for improving the muscle performance task at higher altitudes. The Total Fat estimation determined was 17.68gm/100gm which is considered safe as a study of Parcell, 2018 suggests that fat intake should be in moderate or less amount as it requires more of oxygen to get digested in body which worsens the health of an individual suffering from altitude illness. Number of studies supported the fact of Carbohydrate dense diet which equally justifies the result of the estimated value of carbohydrate content in the developed bar found to be 70.35gm/100gm.The Dietary Fiber present in the bar was 2.14gm/100gm respectively. Schepps, 2018 stated in the study for the need of iron rich source in food intake for good formations of red blood cells and the absorption of iron is an utmost factor which is completely absorbed by body with the help of Vitamin C and the amount present in sample was 9.70mg/100gm. The Beta-Carotene present in the bar was 4.88µg/100gm and the Total polyphenolic content present in sample was 0.8mg/100gm observed under the spectrophotometer at absorbency of 690nm respectively which helps to play the role as an antioxidant in body to kill the free radical effects.

*C. Physiochemical Parameters*

The average weight calculated of the developed bar was 50gm which is light weighted product and can be carried easily within pockets of the altitude traveler. A study of Hooda, 2015 candies formulated pH was 4.4 which is quite acidic by nature and the present study developed bar pH value scored 7.0 considered to be neutral by nature. The shape of the bar was given by the rectangle shaped mold, so the bar produced were rectangle in the shape.

*D. Shelf life of the formulated Bars*

A standard method using TPC (Total Plate Count) was performed to estimate the shelf life of the product for One month (O day, $15^{th}$ day, $30^{th}$ day). The colonies obtained were as follows:

| DAYS | NO. OF COLONIES |
|---|---|
| Zero day | $8\times10^{6}$ cfu/gm |
| $15^{th}$ day | $52\times10^{6}$ cfu/gm |
| $30^{th}$ day | $96\times10^{6}$cfu/gm |

According to Chilled Food Association Ltd, 2010 (Guidance used for Food Business Operators) states that fresh produce food products & Ready To Eat should not exceed their colonies count above 100cfu/gm for a good shelf life and a maximum acceptance level to be 1,000cfu/gm. So stating the above guidance, it can be concluded that the developed herbal bars have a good shelf life of one month period.

*E. Cost analysis and Packaging the developed Bars*

The cost calculated of the prepared herbal bar is Rs. 7.34/- per bar including the packaging material, it seems to be a cost effective development. The packaging of the developed bars was done by the metallic colored aluminum sheets to make it look attractive and pleasant.

## IV. CONCLUSIONS

From the above experimented study the conclusion can be drawn that the herbal developed bars are not only acceptable to the palate but also supports the different studies of highlighting good amount of carbohydrate to be incorporated in diet along with less amount of total fat content. The bar also seems to have good amount of energy value of 466.44 kcal. And with less amount of moisture

content it can be assumed that the bars can run with a longer shelf life period at higher altitudes. Hence the conclusion of the study justifies that Herbal Bars can be developed as a beneficial method for curing the High Altitude Sickness.

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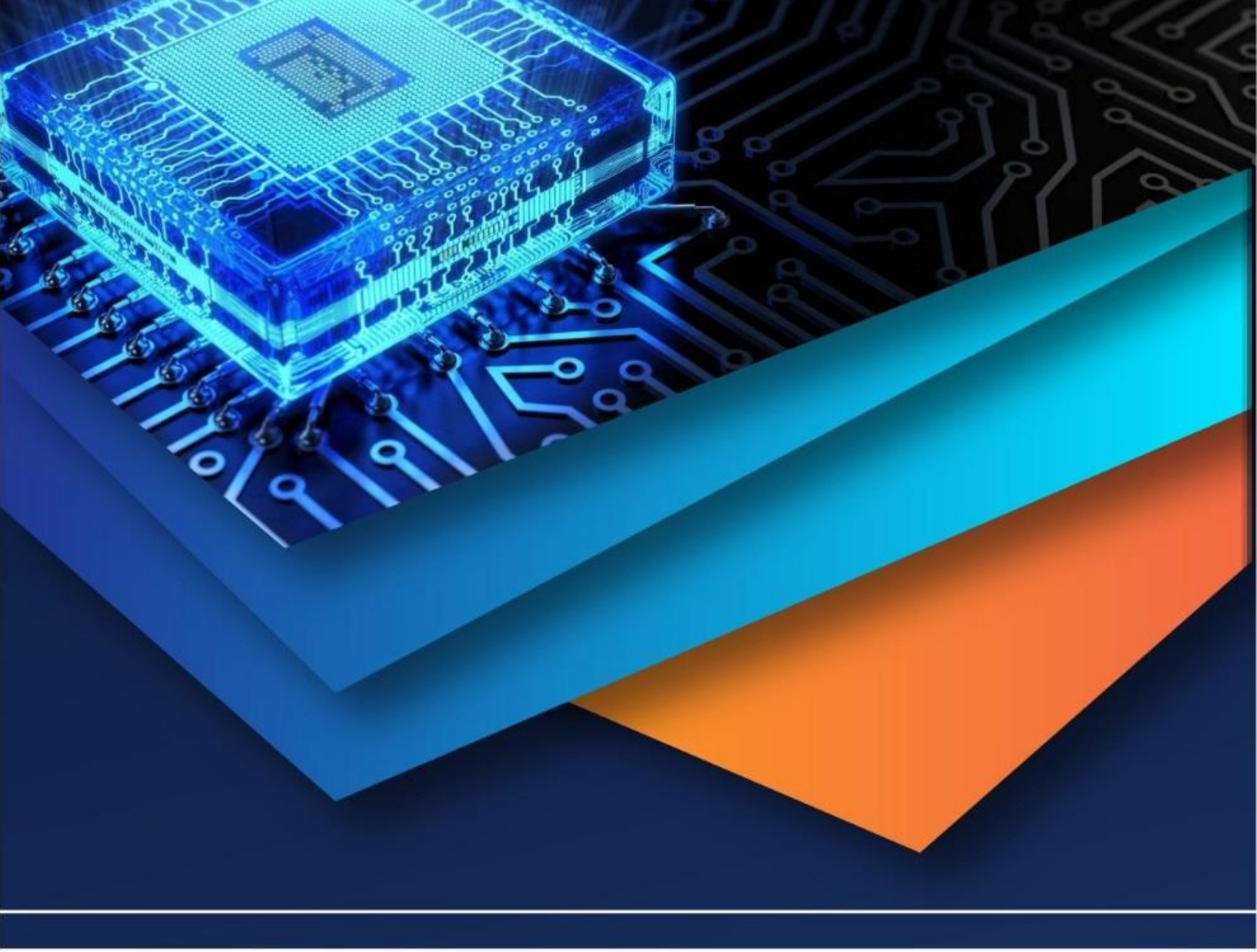

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