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Studies on quality of herbal tea incorporated *Moringa olefera* leaf powder

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Abstract
The present investigation was aimed to development of herbal tea with incorporation of different proportions *Moringa olefera* leaf powder. The formulation was carried out using *Moringa olefera* leaf powder, basil, lemon grass and tea powder in Preparation of herbal tea. Different formulation was made with variation in *Moringa olefera* leaf powder level from 0 to 50% for T_0, T_1, T_2, T_3 and T_4 respectively. Prepared herbal tea then evaluated for organoleptic properties with respects to colour and appearance, flavour, texture, taste and overall acceptability using 9 point hedonic scale. The results revealed that herbal tea prepared with supplementation of 50% *Moringa olefera* leaf powder (T1) secured highest score (i.e. 8.0) was superior as compared to rest of samples. It was found that *Moringa olefera* leaf powder prepared with *Moringa olefera* was rich source of proteins. Thus, *Moringa olefera* can be well utilized as a functional ingredient for preparation of herbal tea with good nutritional and medicinal value.

Keywords: *Moringa olefera*, herbal tea, sensory evaluation

Introduction
This may probably be due to the absence of distinctive flavour properties. It may therefore be necessary to combine Moringa with other herbs in developing herb teas as a way of improving its sensory appeal. This is crucial because consumers are generally unwilling to buy food with poor sensory appeal, irrespective of health or nutritional benefits [3]. The *Ocimum basilicum* essential oils exhibit a wide and varying array of chemical compounds, depending on variations in chemotypes, leaf and flower colours, aroma and origin of the plants. The chief constituents include chavicol methyl ether or estragole, linalool and eugenol. Recently due to the alarming increase in the rate of infection by antibiotic resistant microorganisms, immense clinical problems have been encountered in treatment of infectious diseases. Extensive research work has to be done to eliminate this serious problem. Fortunately, natural products particularly essential oils can participate effectively in this scope. One of these microorganisms is *A. flavus* fungus which produces secondary metabolites known as aflatoxins that are potentially harmful to crops, animals and humans. *A. flavus* causes a broad spectrum of diseases in humans, ranging from hypersensitivity reactions to invasive infections associated with angioinvasion. *A. flavus* is the second leading cause of invasive and noninvasive aspergillosis. Multiple resistances to known antifungal drugs with high mortality rate have been reported. This increases the need to explore natural drugs of high potency and effectiveness against *A. flavus* and their aflatoxins [10]. Breast cancer is one of the most common diseases among women worldwide and the majority of cases have been reported in Asian countries over the past two decades. Currently, many studies have been carried out worldwide to isolate the active novel compounds from plants for cancer treatment. Several secondary metabolites including alkaloids, polyphenols, flavonoids and triterpenes were purified from medicinal plants. These products cause apoptosis which is modulated by direct or indirect modulating expression of some genes such as p53, bcl2 and caspase-3. *A. maurorum*, *C. officinalis*, *Ocmium basilicum* and their parasite *C. campestris* against breast cancer cell lines MCF7 and MDA-MB231) and human normal breast cancer cell line MCF 10A [9]. Tulsi is an aromatic shrub in the basil family Lamiaceae (tribe ocimeae) that is thought to have originated in north central India and now grows native throughout the eastern world tropics. Within Ayurveda, tulsi is known as “The Incomparable One,” “Mother Medicine of Nature” and “The Queen of Herbs,” and is revered as an “elixir of life” that is without equal for both its medicinal and spiritual properties. Within India, tulsi has been adopted into spiritual rituals and lifestyle practices that provide a vast array of health benefits that are just beginning to be confirmed by modern science. Laboratory studies have shown that tulsi protects against toxic chemical-induced injury by increasing the body‟s levels of anti-oxidant

molecules such as glutathione and enhancing the activity of anti-oxidant enzymes such as superoxide dismutase and catalase, which protect cellular organelles and membranes by mopping up damaging free radicals caused by lack of oxygen and other toxic agents. Many of the physiological benefits of tulsi can be attributed to its ability to assist with the body‟s internal housekeeping and protection of the body from toxin-induced damage. These functions are often attributed to tulsi‟s high content of phenolic compounds and anti-oxidant properties, with Krishna tulsi (black/purple variety) having a higher phenolic content and anti-oxidant capacity than white Vana. Metabolic stress due to poor diet, low physical activity and psychological stress is a prominent feature of modern. The beneficial metabolic effects of tulsi are multiple and include protecting the liver, kidneys and pancreatic islet cells from free radical damage enhancing liver bile acid synthesis and reducing liver lipid synthesis; enhancing insulin secretion and action; lowering cortisol levels; and reducing inflammation. The anti-inflammatory action of tulsi, which has been observed in both acute and chronic inflammatory models in animals, is attributed to tulsi‟s eugenol and linoleic acid content and the inhibition of both the cyclooxygenase and the lipoxygenase pathways of arachidonic acid metabolism. This enables tulsi to exert anti-inflammatory effects comparable to nonsteroidal anti-inflammatory drugs such as phenylbutazone, ibuprofen, naproxen, aspirin and indomethacin, Metabolic stress due to poor diet, low physical activity and psychological stress is a prominent feature of modern. The commercial development of plants as sources of antioxidants to enhance health and food maintenance is of present interest [11]. Scientific studies have established that compounds in basil oil have potent antioxidant activity, it works as a good anti-aging, it is proved that it also has as anti-cancer, anti- viral, and antimicrobial properties [2]. Due to antioxidative effects, basil is used to enhance the shelf life of many food products. Basil parts are also used for the preparation of sausages and other meat products [5]. The recent research activities are focused on finding the natural sources of antioxidants as consumers are more conscious about their diet and the synthetic antioxidants are being restricted these days due to their carcinogenicity. So there is more growing trend in searching for antioxidants of natural origin. Spices are an excellent source of antioxidants, and some of them even outperform the synthetic antioxidants, and are safer also from the health point of view [12]. (Cymbopogon citrates) **c**ommonly known as lemongrass and other Cymbopogon species is a tall, coarse grass with a strong lemontaste. Lemongrass is a perennial herb widely cultivated in the tropics and sub-tropics, designates two different species, East Indian *Cymbopogon flexuosus* and West Indian, Cymbopogon citratus. Cymbopogon citratus has been cultivated over many years for medicinal purposes in different countries throughout the world. The use of lemongrass will found in folk remedy for coughs, consumption, elephantiasis, malaria, ophthalmia, pneumonia and vascular disorders. Researchers have found that lemongrass holds antidepressant, antioxidant, antiseptic, astringent, bactericidal, fungicidal, nervine and sedative properties. Further, many workers had reported about the antibacterial activity of lemongrass oil against a diverse range of organisms comprising gram positive and gram negative organism, yeast and fungi. Observed that gram positive organisms will more sensitive to the oil than gram negative organisms. The lemongrass oil will found to be effective against *Acinetobacter baumanii* (*A. baumanii*), *Aeromonas veronii* (*A. veronii*), *Enterococcus faecalis* (*E. faecalis*), *Escherichia coli* (*E. coli*), *Klebsiella pneumonia* (*K. pneumonia*), *Salmonella enterica* (*S. enterica*) serotype typhimurium, Serratiamarcesens (*S. marcesens*), *Proteus vulgaris* (*P. vulgaris*), *Enterobacter aerogenes* (E. aerogenes), *Corynebacterium equii* (*C. equii*) and *Staphylococcus aureus* (*S. aureus*). Developing new herb tea products from indigenous plants will provide novel uses for underutilized plants. It will further provide consumers with new alternatives to traditional teas. Moreover the research will bring to light the potential of the underutilized plants for food product development. The research will broaden understanding of the sensory characteristics and preferences of herb teas in particular and beverages in general. It will further advance research in herb tea product development. In view of the above facts the present study entitled “Production of Herbal Tea from moringa oleifera Leaf powder fortified with Basil and lemongrass” will have the following objectives to formulate Herbal tea from moringa oleifera, to evaluate quality characteristics of developed Herbal tea by incorporating basil and lemon grass, to study sensory evaluation of herbal tea from moringa oleifera, to study antibacterial effect of moringa herbal tea. This crop is grown for commercial and industrial purposes due to its essential oil (citronella oil) used in perfumes, as flavour additives, and even as pharmaceutical products. This crop is mostly grown in tropics and subtropics of Asia, America, and Africa. Traditionally, citronella oil is also well known for its insect repellent quality and antifungal nature, in addition to its medicinal use against various diseases. In a recent study, citronellal and linalool, constituents of citronella oil, were reported to have strong antifungal activity against several species of Aspergillus, Penicillium, and Eurotium. Moreover, citronella oil is used to control muscle spasms, expel worms from intestines, increase urine production (as a diuretic), and increase appetite [7]. Several studies have reported the antimicrobial activity of the essential oil of Cymbopogon citrates (DC) Stap against different Gram positive and Gram negative pathogenic bacteria, yeasts and filamentous fungi. Some authors attribute the oil’s antimicrobial properties to the presence of citral in its composition. Investigations on this oil’s activity over the genus Malassezia found that the growth of 100% strains was inhibited at 1.25 µL/mL concentration by a mechanism which certainly involved the essential oil-ergosterol interaction with the fungal membrane. In addition to the proven antifungal activity of the essential oil of *Cymbopogon citratus*, other preclinical *in vitro* and *in vivo* studies on toxicity confirmed the safety of this product at low concentations. Based on the aforementioned preclinical studies that confirmed the antifungal activity and safety of this oil, we conducted phase I and II clinical studies with two pharmaceutical formulations containing essential oil of C. citratus in the forms of shampoo and cream. Mentioned outpatient clinic. Mycological diagnosis of individuals with pityriasis versicolor was confirmed by direct examination with addition of potassium hydroxide (KOH) at 20% and permanent Quink Ink (Parker) at 2:1 and culture in Mycosel Agar supplemented with ox bile and olive oil. For identification of Malassezia species we followed the protocol proposed by Erchiga, Pregnant women, immune suppressed patients or those using antifungal drugs in the last 30 days were excluded from the survey [4]. Among the factors that affect the productivity and the quality of the grain, there are the diseases. Recent studies show an increase on the frequency of the fungus Curvularia lunata (Wakker) provoking diseases in maize cultivars in China [6]. Nowadays,

alternatives for reduction of the use of pesticides are searched, and some works have already been realized aiming at identifying new bioproducts based on medicinal plants with antimicrobial action [8]. Some works have already showed that the addition of essential oils in specific concentrations on the culture environments with phytopathogenic fungi is efficient in the inhibition of development of these organisms [13]. The research will broaden understanding of the sensory characteristics and preferences of herb teas in particular and beverages in general. It will further advance research in herb tea product development.

Materials and Methods

Materials

The Raw material like *Moringa olefera* leaves, basil, lemon grass and tea leaves etc. will be procured from the local market of allahabad. Chemical and reagent will be obtained from laboratory, Department of Food process engineering, SHUATS Allahabad.

Methods

Preparation of Moringa leaf powder

The fresh raw Moringa leaves were selected by visual appearance of fresh and dark coloured, fully matured without any physical damage, on the surface. Then the collected Moringa leaves were washed by pure water for removing of the dust. Then after Moringa leaf sample was placed in the dryer maintained at the temperature of 60 0 C for drying as per the requirement to obtain bone dry product**.** Then grinding of the dried Moringa leaf was done by the grinder to obtain Moringa powder. Sieving was done by the 32 number sieve size screen to obtain fine powder of the grounded Moringa leaf powder. By following the above procedure, the fine Moringa powder was obtained. The fine Moringa powder was then packed in the LDPE packing bags for the further storage.

Preparation of Basil leaf powder

The fresh leaves of Basil were selected by visual appearance; the leaves were washed by pure water for removing of the dust and soil. The leaves were detaches from branches. After that basil leaves were placed in the dryer maintained at the temperature of 70 ^{0} C for drying as per the requirement to obtain bone dry product**.** Grinding of the dried leaves was done by the grinder to obtain basil powder. Sieving was done by the 32 number sieve size screen to obtain fine powder of the grounded basil powder. By following the above procedure, the fine basil powder was obtained. The fine basil powder was then packed in the LDPE packing bags for the further storage.

Preparation of Lemon grass leaf powder

The fresh leaves of lemongrass were selected by visual appearance of fresh and dark coloured, fully matured without any physical damage, on the surface. Then the collected lemon grass leaves were washed by pure water for removing of the dust. Then after lemongrass leaf sample was placed in the dryer maintained at the temperature of 70^{0} C for drying as per the requirement to obtain bone dry product**.** Then grinding of the dried lemongrass leaf was done by the grinder to obtain lemongrass powder. Sieving was done by the 32 number sieve size screen to obtain fine powder of the grounded lemongrass leaf powder. By following the above procedure, the fine lemongrass leaf powder was obtained. The fine lemongrass leaf powder was then packed in the LDPE packing bags for the further storage.

Preparation of Tea Bags

The tea bags material was made using heap fill tea bags filter paper. The filter paper was been cut with a pair of scissors into rectangular shapes of 12 x 10cm after which it was been folded and the two sides was sealed with an electrical hand heat sealing machine and then was refilled with the crushed dried Moringa Herbal tea powder and then the top was also sealed by passing a thread (piece of string) that served with a paper label attached to the tea bag as a handle for dipping in the water after filling with 2g of each bag.

Determination of minerals composition of herbal tea

Raw materials such *Moringa olefera* leaves, basil, lemon grass, tea leaves and herbal tea were analyzed for proximate composition including moisture, fat, protein, total carbohydrate, crude fiber, ash and mineral composition was carried out as per the methods given by AOAC, 2005**.**

Determination of minerals composition of herbal tea

Two grams of defatted sample was weighed and heated at 550ºC. Then, the obtained ash were digested with concentrated Hydrochloric acid (HCL) on hot plate. The digested material was then filtered using whatman No. 42 filter paper and the final volume made to 100ml with distilled water that was further used for analysis with respects to iron, calcium, potassium, contents by using methods Ranganna (1986).

Table 1: Formulation of herbal tea incorporated with *Moringa olefera* leaf powder

Ingredient	T_0 (Control)	T_1	T_2	T_3	T_4
Moringa leaf powder (%)	0	50	40	30	20
Basil leaf powder (%)	65	15	25	35	45
Lemon grass powder (%)	25	25	25	25	25
Tea leaf powder (%)	10	10	10	10	10

Microbiological evaluation

The microbial analysis of fresh Herbal tea samples was determined by method given by using As per the WHO (1994) guideline. The powder was examined for microbial contamination. Total viable count of the final powder was determined by using standard plate count technique (0.1 ml) of the appropriate dilution was placed on nutrients agar plates. The plates were incubated at 35C for 48 hr and colony forming units per gram sample (cfu/gm) was estimated.

For mould and yeast count; the above procedure was repeated using potato dextrose agar and incubation was done at 25^{0} C for 72 hrs.

$SPC\ (cfu\ /ml)$ = Average no. of colonies × reciprocal of the dilution used. ---------- (Eq. 3.8)

Results and Discussion

Effect of storage period on moisture content of moringa herbal tea

The percent moisture content for sample T_0 was 8.630 on 0 days, 8.720 on 20 days, 8.840 on 40 days, 8.930 on 60 days. T_1 was 8.950 on 0 days, 8.970 on 20 days, 9.130 on 40 days, 9.240 on 60 days. T_2 was 8.770on 0 days, 8.820on 20 days, 8.850on 40 days, 9.120 on 60 days. T_3 was 8.430
on 0 days, 8.543 on 20 days, 8.710 on 40 days, 8.840on 60 days, and T_4 was 9.120 on 0 days,
9.230on 20 days, 9.360on 40 days, 9.420on 60 days. Similarly on 20 days, 40 days and 60 days shows increase in the moisture content in the sample. Basil, lemon grass powder

which is having the property of retain the moisture from environment. From ANOVA table was evident that the calculated value of F (11.569) due to treatment was greater than the tabulated value at 5 percent probability level (5.585). Therefore it concluded that significant effect of treatment on moisture content of T1 sample was observed at interval of 20 days during the storage period (Table 2)

Table 2: Effect of storage period on moisture content of moringa herbal tea

Treatment	0 days	20 days	40 days	60 days
T_0	8.630	8.720	8.840	8.930
T_1	8.950	8.970	9.130	9.240
T_2	8.770	8.820	8.850	9.120
T_3	8.430	8.543	8.710	8.840
T_4	9.120	9.230	9.360	9.420
F- test	S	S	S	N/S
SED±				0.07
C.D.(5%)				0.221

Effect of storage period on ash of moringa herbal tea

The ash in the food stuff represents the inorganic + matters remaining after the organic matter have been burnt. The percent ash content for sample T_0 on 0 days was 2.350, on 20 days was 2.010, on 40 days was 1.845, and on 60 days was 1.632. Ash content for T_1 on 0 days was 1.560, on 20 days were 1.892, on 40 days were 2.032 and on 60 days were 2.586. Ash content for

T_2 on 0 days 3.789, on 20 days were 3.372, on 40 days were 2.998, and on 60 days were 2.747.

Ash content for T_3 on 0 days 3.064, on 20 days were 2.783, on 40 days were 2.446 and on 60 days were 2.220. Ash content for T_4 on 0 days was 2.974, on 20 days were 2.573, on 40 days were 2.164 and on 60 days were 1.970. Similarly for 20 days, 40 days and 60 days shows slight decrease in ash content during storage. From ANOVA table was evident that the calculated value of F (6.505) due to treatment was greater than the tabulated value at 5 percent probability level (5.585).therefore it concluded that significant effect of treatment on moisture content of T1 sample was observed at interval of 20 days during the storage period. (Table 3)

Table 3: effect of storage on ash of moringa herbal tea powder during storage

Treatment	0 days	20 days	40 days	60 days
T_0	2.350	2.010	1.845	1.632
T_1	1.560	1.893	2.032	2.586
T_2	3.789	3.372	2.998	2.747
T_3	3.064	2.718	2.446	2.220
T_4	2.974	2.573	2.164	1.970
F- test	S	S	S	N/S
SED±				0.29
C.D.(5%)				0.0605

Effect of storage period on protein of moringa herbal tea

The protein content of Moringa Herbal tea powder samples for sample of T_0 was 7.431 on 0 days, 7.317 on 20 days, 7.161 on 40 days, 7.064 on 60 days. T_1 was 8.137 on 0 days, 8.073 on 20 days, 7.917 on 40 days, 7.646 on 60 days. T_2 was 10.473 on 0 days, 10.223 on 20 days, 10.123 on 40 days, 10.074 on 60 days. T_3 was 10.989 on 0 days, 10.754 on 20 days, 10.498 on 40 days,

10.174 on 60 days, and T_4 was 9.867 on 0 days, 9.570 on 20 days, 9.319 on 40 days, 9.117 on 60 days. Similarly on 20 days, 40 days and 60 days shows increase in the moisture content in the sample. From ANOVA table was evident that the calculated value of F (126.590) due to treatment was greater than the tabulated value at 5 percent probability level (5.585).therefore it concluded that significant effect of treatment on moisture content of T1 sample was observed at interval of 20 days during the storage period. (Table 4)

Table 4: Effect of storage period on protein of moringa herbal tea

Treatment	0 days	20 days	40 days	60 days
T_0	7.431	7.317	7.161	7.064
T_1	8.137	8.073	7.917	7.646
T_2	10.473	10.223	10.123	10.074
T_3	10.989	10.754	10.498	10.173
T_4	9.867	9.570	9.319	9.117
F- test	S	S	S	N/S
SED±				2.38
C.D.(5%)				0.0381

Effect of storage period on Carbohydrate of moringa herbal tea

The Carbohydrate content of Moringa Herbal tea powder samples for sample of T_0 was 9.632 on 0 days, 9.489 on 20 days, 9.489 on 40 days, 9.140 on 60 days 9.019. T_1 was 12.482 on 0 days,

12.321 on 20 days, 12.147 on 40 days, 12.092 on 60 days. T_2 was 10.912 on 0 days, 10.649 on

20 days, 10.374 on 40 days, 10.212 on 60 days. T_3 was 12.747 on 0 days, 12.532 on 20 days

12.321 on 40 days, 12.121 on 60 days, and T_4 was 12.874 on 0 days, 12.632 on 20 days, 12.496 on 40 days, 12.173 on 60 days. Similarly on 20 days, 40 days and 60 days shows increase in the moisture content in the sample**.** From ANOVA table A.4 was evident that the calculated value of F (111.237) due to treatment was greater than the tabulated value at 5 percent probability level (5.585). Therefore it concluded that significant effect of treatment on moisture content of T1 sample was observed at interval of 20 days during the storage period. (Table 6)

Table 6: Effect of storage period on Carbohydrate of moringa herbal tea

Treatment	0 days	20 days	40 days	60 days
T_0	9.632	9.489	9.140	9.019
T_1	12.482	12.321	12.147	12.092
T_2	10.912	10.649	10.374	10.212
T_3	12.747	12.532	12.321	12.121
T_4	12.874	12.632	12.496	12.173
F- test	S	S	S	N/S
SED±				2.31
C.D.(5%)				0.406

Effect of storage period on calcium of moringa herbal tea

The Calcium of moringa herbal tea samples for sample of T_0 was 216.36 on 0 days, 215.12 on 20 days, 214.75 on 40 days, 212.82 on 60 days. T_1 was 245.21 on 0 days,

242.71 on 20 days, 239.15 on 40 days, 237.94 on 60 days. T_2 was 139.47 on 0 days, 152.89 on

20 days, 151.70 on 40 days, 148.87 on 60 days. T_3 was 174.92 on 0 days, 171.64 on 20 days,

169.76 on 40 days, 169.14 on 60 days, and T_4 was 254.17 on 0 days, 252.19 on 20 days, 249.14 on 40 days, 247.63 on 60 days. Similarly on 20 days, 40 days and 60 days shows decrease in the calcium content in the sample. From ANOVA table was evident that the calculated value of F (582.727) due to treatment was greater than the tabulated value at 5 percent

probability level (5.585). Therefore it concluded that significant effect of treatment on moisture content of T1 sample was observed at interval of 20 days during the storage period. (Table 7)

Table 7: Effect of storage period on calcium of moringa herbal tea

Treatment	0 days	20 days	40 days	60 days
T_0	216.36	215.12	214.75	212.82
T_1	245.21	242.71	239.15	237.94
T_2	139.47	152.89	151.70	148.87
T_3	174.92	171.64	169.76	169.14
T_4	254.97	252.19	249.14	247.63
F- test	S	S	S	N/S
SED±				2.21
C.D.(5%)				5.541

Effect of storage period on iron of moringa herbal tea

The iron of moringa herbal tea powder samples for sample of T_0 was 8.237on 0 days, 8.132 on 20 days, 7.948 on 40 days, 7.787 on 60 days. T_1 was 9.123 on 0 days,
9.072 on 20 days, 8.992 on 40 days, 8.827 on 60 days. T_2 was 9.774 on 0 days, 9.543 on 20 days,
9.214 on 40 days, 9.102 on 60 days. T_3 was 8.910 on 0 days, 8.698 on 20 days, 8.416 on 40 days,
8.372 on 60 days, and T_4 was 9.537 on 0 days, 9.374 on 20 days, 9.257 on 40 days, 9.115 on 60 days. Similarly on 20 days, 40 days and 60 days shows increase in the moisture content in the sample. This might be due to drying at higher temperature will escapes or vaporizes some of the minerals like iron and calcium. From ANOVA table A.4 was evident that the calculated value of F (26.195) due to treatment was greater than the tabulated value at 5 percent probability level (5.585).therefore it concluded that significant effect of treatment on moisture content of T1 sample was observed at interval of 20 days during the storage period. (Table 8)

Table 8: Effect of storage period on iron of moringa herbal tea

Treatment	0 days	20 days	40 days	60 days
T_0	8.237	8.137	7.948	7.787
T_1	9.123	9.072	8.992	8.827
T_2	9.774	9.543	9.214	9.102
T_3	8.910	8.698	8.416	8.372
T_4	9.537	9.374	9.257	9.115
F- test	S	S	S	N/S
SED±				0.36
C.D.(5%)				0.339

Effect of storage period on Fat of moringa herbal tea

The fat of moringa herbal tea samples for sample of T_0 was 5.212 on 0 days,
5.132 on 20 days, 4.872 on 40 days, 4.638 on 60 days. T_1 was 5.630 on 0 days, 5.312 on 20 days, 4.784 on 40 days, 4.686 on 60 days. T_2 was 4.893 on 0 days, 3.474 on 20 days, 3.689 on 40 days, 4.712 on 60 days. T_3 was 3.745 on 0 days, 3.543 on 20 days, 3.171 on 40 days, 3.019 on 60 days, and T_4 was 5.942 on 0 days, 5.672 on 20 days, 5.432 on 40 days, 5.112 on 60 days. Similarly on 20 days, 40 days and 60 days shows decrease in the fat content in the sample. From ANOVA table was evident that the calculated value of F (14.526) due to treatment was greater than the tabulated value at 5 percent probability level (5.585).therefore it concluded that significant effect of treatment on moisture content of T1 sample was observed at interval of 20 days during the storage period. (Table 9)

Table 9: Effect of storage period on Fat of moringa herbal tea

Treatment	0 days	20 days	40 days	60 days
T_0	5.212	5.132	4.872	4.638
T_1	5.630	5.312	4.784	4.686
T_2	4.893	3.474	3.689	4.712
T_3	3.745	3.543	3.171	3.019
T_4	5.942	5.672	5.432	5.112
F- test	S	S	S	N/S
SED±				0.83
C.D.(5%)				0.672

Evaluation of quality characteristics of developed Herbal tea

Chemical composition represents the nutritional quality of product. Analysis of proximate composition of Moringa Herbal tea decides the nutritional profile of prepared tea powder, as

Moringa is a novel ingredient. The proximate composition of developed Herbal tea was determined in dry weight basis and the results are discussed in Table.

The judgment was made by rating product on a 9-point hedonic scale with corresponding descriptive term ranging from 9 “like extremely” to “dislike extremely” to determine the pleasurable and un pleasurable feel of Moringa Herbal tea. 10 untrained panelists aged between 18-35 years participated in the consumer test conducted at the department of Food Process Engineering, Sam Higgin bottom University of Agriculture, Technology and Sciences. Samples showed more acceptances as compared to other samples.

Table 10: Sensory Evaluation of herbal tea incorporated with *Moringa olefera* leaf powder

Treatments	Sensory Characteristics				
	Colour	Taste	Flavour	Appearance	Overall Acceptability
T_0	9.0	9.0	9.0	9.0	9.0
T_1	7.6	7.38	7.2	7.1	7.4
T_2	7.21	6.94	6.77	6.68	6.98
T_3	7.0	7.0	6.7	6.8	7.18
T_4	7.15	7.0	6.8	6.9	7.3

Organoleptic quality parameters of a product assume pivotal role in anticipating the consumer response to the product. On the basis of organoleptic evaluation of Moringa Herbal tea, samples were selected as best sample. The percent of Moringa was used separately in different proportions (50, 15, 25 and 10 per cent) in Herbal tea with Basil, Lemon grass and tea leaves proportion. The formulated Moringa based Herbal tea was further organoleptically analyzed for quality attributes like colour, flavour, taste, appearance and overall acceptability. The data pretaining to organoleptic evaluation of Moringa based tea are presented in Table

Note: T0= 10% (Tea leaves powder)
T1 = 50% Moringa powder;
T2 = 40% Moringa powder;
T3= 30%; Moringa powder;
T4= 20% Moringa powder.

The data pertaining to the sensory scores of appearance, colour, flavor, taste, texture and overall acceptability of Herbal tea prepared of *Moringa oleifera* with different proportions is given in the Table. A significant difference was observed for the scores obtained for Moringa Herbal tea for all the sensory parameters. Mean colour scores ranged from 6.5 to 9 with a mean of 7.55. The mean flavour scores ranged

from 6.1 to 9, with mean of 7.15. The mean taste score ranged from 6.3 to 9, with a mean of 7.2. The mean overall acceptability scores ranged from 6.4 to 9, with mean of 7.36. From ANOVA table was evident that the calculated value of F (118.547) due to treatment was greater than the tabulated value at 5 percent probability level (5.585). Therefore it concluded that significant effect of treatment on moisture content of T1 sample was observed at interval of 20 days during the storage period. (Table 4)

Microbial analysis of herbal tea

Microbial analysis was done to study the microbial quality of Moringa Herbal tea powder by using pour plate technique. The analysis was done at the interval of one month after the preparation of Moringa Herbal tea powder with concentration of lemon grass was kept constant. From Table, it can be concluded that samples of Moringa Herbal tea powder with 60 days storage period tend to have higher mean bacterial counts 3.8 x 10^5 CFU/g than those with 40 days 1.93 x 10^5 CFU/g and 20 days 1.48 x 10^3 CFU/g.

Table 5: Microbial analysis of Herbal Tea

Sr. No.	Storage period (days)	Total bacterial count (CFU/g)	Total yeast and mould count (CFU/g)
1	20 days	1.72 x 10^4	1.2 x 10^3
2	40 days	2.22 x 10^4	1.9 x 10^3
3	60 days	2.40 x 10^4	2.45 x 10^3

Total yeast and mould counts were highest 2.40 x 10^4 (CFU/g) in 60 days stored Herbal tea than 40 days 2.22 x 10^4 (CFU/g) and 20 days 1.72 x 10^4 CFU/g. There was growth of molds on the surface of Moringa Herbal tea with 60 days storage period. The growths of bacteria, yeast and mould were in increasing order as storage period increased. As per the WHO (1994) guideline the total plate count, and Yeast and mould count should be less than 2 x 10 5 and 1 x 10 ^{4} per gram respectively.

Conclusion

Formulated moringa herbal tea was beneficial for consumer and acceptable by all all panel members. The combination of different herbs gave good result i.e. excellent source of Protein, Carbohydrate, Anti-oxidants and Minerals content. Formulated Herbal tea not only fulfills the nutritional parameters, but also got best response of sensory parameters from panel members and from consumers.

References

1. AOAC. Official Methods of Analysis of the AOAC International, 18thed. Association of Official Analytical Chemists, Gaithersburg, MD, 2005.
2. Bozin BN, Mimica, Dukic N, Simin, Anackov G. Characterization of the volatile composition of essential oils of some Lamiaceae species and the antimicrobial and antioxidant activities of the entire oils. Journal of Agriculture and Food Chemistry 2006;54:1822-1828.
3. Cock de. Evaluation of diffussivity and acceptable mixing ratio for production of hibiscus-moringa tea bags. Arid zone Journal of Engineering, Technology and Environment, August 2005-2017;13(4):513-522.
4. Egberto Carmo, Neuza Maria, Cavalcante, de Oliveira Lima, Fillipe, Wanderley Gayoso. Treatment of pityriasis versicolor with topical application of essential oil of *Cymbopogon citratus* (DC) Stapf - therapeutic pilot study Approved by the Advisory Board, 2012.
5. Guseinov V, Shukyurov N, Movsum A, Ibragimov F, Sadykhova R, Askerova K *et al*. Manufacture of sausages. USSR Patent, SU, 1992, 1722371.
6. Gao S, Liu T, Li Y, Wu Q, Fu K, Chen J. Proteomics. Understanding resistant germplasm-induced virulence variation through analysis of proteomics and suppressi on subtractive hybridization in a maize pathogen *Curvularia lunata* 2012;12:3524-3535.
7. Kamalakshi Dev, Lochana Patar, Mahendra K, Priyabrata Sen. department of Agricultural Biotechnology, Assam Agricultural University, Jorhat, India. Distributed Information Centre (DIC), Assam Agricultural University, Jorhat, India, Volume 2017;11:1-11.
8. Muthaiyan A, Martin EM, Natesan S, Crandall PG, Wilkinson BJ, Ricke SC *et al*. Antimicrobial effect and mode of action of terpeneless cold-pressed valencia orange essential oil on methicillin-resistant *Staphylococcus aureus*, 2012.
9. Mandana Behbahani. Department of Biotechnology, Faculty of Advanced Sciences and Technologies, University of Isfahan, Isfahan Islamic Republic of Iran, 2014, 81746-73441.
10. Neveen, Mohamed Deabes, Lamia, Mona Khalil. Complementary Medicine Department, Medical Researches Division, National Research Center, El-Behouth Street, Dokki, 12311 Cairo, Egypt, Food Toxicology and Contaminants Department, National Research Center, El-Behouth Street, Dokki, 12311 Cairo, Egypt; Pharmacognosy Department - National Research Center- El-Behouth Street, Dokki, 12311 Cairo, Egypt; Biochemistry Department – Gizan University - K.S.A., Cairo, Egypt, 2015.
11. Rice CA, Miller NJ, Paganga G. Division of Biochemistry and Molecular Biology, UMDS-Guy's Hospital, London, UK, 1996.
12. Sarfraz Z. Characterization of basil parts for antioxidant potential. In African Journal of Food Science and Technology 2011;2(9):204-213.
13. Sarmen R, Castro H, Silva M, Sarmento R, Nascimento I, Santos GR. Vegetable oils effectonthe inhibition of mycelial growth of phytopathogenic fungi. Journal Biotech. Biodivers 2015;5:63-70.