

ORIGINAL ARTICLE

Addition of Black Cumin in Stevia Apple Jam and to Check Effect on its Nutrition Profile on Storage

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ABSTRACT

Background: Stevia is nontoxic and non-caloric sweetens nearly 300 times more sweetener than any other source. Numerous health benefits for chronic patients and its reach source of essential nutrients pooling the world.

Objective: This study tried analyzed the effect of black cumin added in stevia apple jam in place of sugar as functional ingredient due to health promoting effects in case of hypertension.

Method: A stevia-sweetened apple jam sample was mixed with black cumin. And the effect was measured and recorded by sensory evaluation and proximate analyses over a six-month period.

Practical implication

Conclusion: Finding revealed that black cumin contained stevia apple jam significantly increased the total suspended solid level while, decreased moisture contents in sampled experiment. Unlikely, it increased nutritional components such as proteins, carbohydrates and fat due to black cumin addition. Thus, black cumin in stevia apple jam paramount important with magnifying essential nutrients for current novel chronic disease remedy.

Keywords: Stevia, Black cumin, Nutrition, Jam, Hypertension, chronic disease,

INTRODUCTION

Jam is a mixture or combination of various ingredients including fruits, water, sweeteners, flavouring agents, colouring agents, preservatives, emulsifiers, gelling and thickening agents, which undergoes boiling process to give a good texture and smell^{1,2}. There is a 67 to 69% soluble sugar content level in jam which is a quality parameter for a standard jam and jam should contain a define range of fruit pulp content which is 44 to 46%³. It has been seen in many instances that high doses of sweeteners like sucrose resulted in increased cases of diabetic patients, hypertension, and other related diseases^{4,6}.

Diabetes Disorders: Type 2 Diabetes is becoming one of the typical chronic diseases worldwide and its consequences have been knocking all city and village in the world⁷. This increment in diabetic patients not only affecting health of the people but also impacting the wealth of the people^{8,9}. In modern era, people are more careful about their diet routine and main focusing of calorific and nutritional profile of their food and changing their diet pattern with suitable and health regarding changes^{5,10}. People are prioritizing toward healthier diet instead of bulk quantity of diet regardless of its nutrition. So, trend of food selection is changing, and it is shifting toward low calorie diet⁴.

Natural Sweetener: There are a lot of nutrients containing foods but natural types of foods like vegetables and fruits are good source of nutrients which are unable to produce our body⁵, these sources are low in fat which cause less heart related diseases and natural sweeteners which are considered good for health as compared to fully refined sweeteners like sucrose which is main factor for diabetes¹¹. There are a lot of fruits among apple is considered 3rd most important fruits which decrease proliferation and decrease the burden of many disease¹².

Trends of Low Glycemic Foods: Trend is shifting toward low calories diets due to negative health effects of high calories diets. Diseases which mostly associated with high calories diet are diabetes, blood pressure fluctuations, obesity, and other related diseases¹³. People who are aware from the negative effects of high calories intake and its possible effects on the health are preferring low calorie intakes like stevia instead of sugar^{1,14} which is a high

calorie sweetener, and its glycaemic index is very high, and it is considered main cause of diabetes now days¹⁵.

Food Additives Parameters: It is necessary for addition of any food additive in a new product that is why we conducted a series of tests in which sensory tests are the primary tests. These tests are performed for the checking of desirability and compatibility of food additive like sweetener into the food product in which we are going to be added⁸. Next is the safety of the food additive which is the main criteria for the addition of any food additive. Finally, the law regarding that additive allows to addition of that ingredient or not because some countries have banned some ingredients due to their negative effects on health^{16,17}. So, we consider all the factors before adding any ingredient and checked its effect in the food product by sensory evaluation¹⁶.

Stevia Health Effects: A perennial plant of stevia [Stevia rebaudiana] which is shrub in nature¹⁶, has gained importance from Southern America where initially it proved many health and economic benefits as compared to other sweeteners^{8,14}, and it is all due to a compound which is known as sativoside's or diterpene glycosides which is extracted from its precious leaves. Stevia is not only famous for its natural intense sweetness but also it is famous for its therapeutic effect on health because it has health promoting effects in case of diabetes, cardiovascular diseases, blood pressure problems, obesity^{1,3,18,19}.

Black Cumin Effects on Hypertension Level: Hypertension is a common disease in our society and nearly every family has some cases of this disease. Main causes of hypertension are our diet and tensions which promote this disorder. Hypertension present in every society of the world and effecting every age of people. A study was conducted to check black cumin effects on the hypertension level, and it was concluded by the scientists that black cumin has significantly reduced the hypertension level and maintained the hypotension level to a normal level^{3,20,21}. Several studies were conducted to check the hypertension level reduction after administration of black cumin dose, scientists concluded that effectively black cumin reduced the hypertension level and achieved a safe limit after consumption orally, other than this they

also concluded that diabetes level was also reduced to a safe limit after consumption of black cumin prominent level^{8,21}.

Recent Studies on Hypertension: Recent study has been done in which it has been revealed that hypertension and related heart failure diseases has been spread in our society and effecting many lives throughout the world and significantly becoming source of many lives' mortality. Other related diseases like stroke and heart attack also contributing to death of many peoples in world. Previous research work reveals that heart has to extra work to push the blood to distance in the body and in all organs, there are chances to over the blood rate and increase the risks of heart problems and many times these conditions become severe when constantly heart must work and remained high blood pressure conditions in humans and death has been done in these cases^{22,26}.

METHOD AND MATERIALS

First Trial: We prepared black cumin contained stevia apple jam in which used stevia as a best replacement of sugar due to its low calories and intense sweetness. Stevia made product consumable for diabetic patients. Black cumin added as phytochemical in stevia apple jam to check its effect on the hypertension level due to positive effects of black cumin on various diseases other than hypertension. Black cumin contained stevia apple jam and did various types of experiments like sensory analysis, proximate analysis and checked effects on hypertension patients. We conducted two trials to get optimized sample and in first trial made 5 samples and in second trial, made 3 samples. Followings are the detailed procedures and tests given **Table 1**.

RESULT AND DISCUSSION

The study try to find the effects of black cumin contain stevia apple jam on nutritional profile and compared with the jam samples without contain black cumin. In this study, we replaced sugar with zero caloric stevia in the jam and added black cumin as functional Phytochemical which has great effect in curing various diseases^{4,8,20}, and similarly physicochemical characteristics and nutritional components was checked and noted value of protein, fat and carbohydrates; fructose and glucose.

Table 1: Stevia Quantity and Brix and PH Level

Samples	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Quantity of stevia added	0.3g	0.6 g	0.9g	1.2g	1.5g
Brix level	43 degrees	44 degrees	46 degrees	47 degrees	48 degrees
Initial PH recorded as	3.65	3.67	3.68	3.67	3.67

g;gram

Stevia and its effect on the brix of jam in Sensory Analysis of 1st Trial varying with the addition of stevia quantity addition because soluble solid contents are increasing a range of 43 to 48 as stevia addition start from the 0.3g to the 1.5g and PH of the product is nearly constant at initial time when jam was ready and after every week PH noticed.

Table 2: Sensory Analysis of First Trial

Attributes	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Flavour	7	6	8	7	8
Aroma	6	7	7	7	8
Colour	8	8	7	7	7
Texture	7	8	5	6	8
Appearance	5	7	6	8	8
Spread ability	8	6	7	9	7
Mouth feels	9	6	7	9	7
Acceptability	6	5	7	9	10

After brix and PH check, sensory analysis was made on the product because, it is considered main testing, from the success or failure of the product point of view, consumers acceptance depends upon the senses through which judge the product so these should be mandatory to check for a novel product otherwise

there will be no guarantee of the product acceptance. Sensory analysis contains all perception which a normal person can distinguish things like color by eyes, taste by tongue like sour taste on the sides of tongue, sweet taste on the front or tip of tongue, bitter at the last portion of the tongue, and same salty at the sides of tongue but closer to the sweet taste receptors of tongue Table 2.

We also made confirmation through prepared a chart and given to different students, teachers, and other people to check the sensory qualities of the product. Then, we used hedonic scale to record the given points marked as good, very good, excellent, and not good and so on to evaluate the sample parameters. We used a 10 number scale for sensory analysis in which every statement contained a point. Excellent 10 points, extremely good 9 points, very good 8 points, Moderate good 7 points, slightly good 6 points, neither liked nor disliked 5 points, slightly disgusted 4 points, Moderate disgusted 3 points, very disgusted 2 points, extremely disgusted 1 point. So, based on these values, we made sensory analysis to check the final sensory characteristics of my product.

In sensory analysis, we got data by checking all parameters of my product like colour sensory by simple seeing the product whether it is good for related food product or not and suit that product or not. Other parameters also checked by senses and nearly 10 members results were accumulated on average bases and result was concluded by taking overall average of the sample and nearly 4th and 5th remained up to the mark, but more concisely simple 5th remained best overall due to all parameters got good gradings all the tastings, but always some room for the improvement and betterment.



Figure 1: Final Product of 1st trial

2nd Trial: Second trial was done to improve the first trial deficiencies and week points of my product and improved in my 2nd trial, and it made easy to do next trial and improve the product by result of first trial. For 2nd trial we again managed all things which were purchased and added some food additive to make it more attractive and fuller of nutritional and other aspects for the samples.

Sensory Analysis of Second Trial: After sample preparation we did sensory analysis to check its quality standards and other important factors to get optimized sample. We used hedonic scale to evaluate the sample on the sensory basis. We tried to do sensory analysis to the related persons of food science who have knowledge about this method of analysis. We also checked sensory analysis based on texture, mouth feel, color, spread ability, sweetness and other related parameters were used to extract the optimized sample. Hedonic scale contains values from 1 to 9 and contain grades like 'Dislike extremely' gives score 1 to the product and in this way grade 'Like extremely' gives score 9 Table 3.

Study Effect on Nutrition Profile on Storage: After sensory evaluation, we checked effect on the nutritional level on storage of jam and compared with the nutrition profile of controlled sample. We checked physicochemical parameters such as TSS, Ash, Moisture, PH, and nutrients like protein, carbohydrates, fat, dietary

and fibres. During study samples were maintain and stored at room temperature.

Table 3: Sensory Analysis second trial

Attributes	Sample 1	Sample 2	Sample 3
Flavour	8	9	8
Aroma	6	7	6
Colour	8	8	7
Texture	7	8	5
Appearance	6	9	6
Spreading	8	9	7
Mouth feels	9	9	7
Acceptability	7	8	7
Average	8	9	7

Proximate analysis: We did proximate analysis to check composition of stevia apple jam. Kjeldhal apparatus was used to determined protein, ash by muffle furnace, moisture by hot air oven, dietary fibbers were checked by acid base treatments, and shelf life compared by sensory analysis

Protein Determination: After sensory analysis, we did protein analysis by kjeldahl apparatus in which we took the 5-grams sample of jam and added sulfuric acid and digestion tablets contains the potassium sulphate and copper oxide to mix well and heated 3 to 4 hours to digestion complete and greenish colour achieved which showed the end point of the digestion procedure and then diluted with 150ml and made it homogenized and stirred well. Then we did distillation procedure in which we took 40 percent sodium hydroxide in reaction flask and added nearly 10 ml in reaction flask and then took boric acid in the receiving flask and added methylene blue indicator and heated the reaction flask and fumes generated from reaction flask as ammonia liberated and reacted with the boric acid of the receiving flask and showed the pinkish colour which showing the protein presence. Last step titration made with sulfuric acid drop by drop and noted the usage of acid used for changed the color of solution.

Ash Determination: After protein determination, we determined the ash contents of black cummin containing stevia apple jam. Materials required for performing the ash determination of sample were measuring dish, dish holder, scale, muffle furnace, crucible, desiccator, food sample. We took the sample of 6 gram in the crucible and before placing in furnace, and incinerate the sample contents on lower temperature as compared to the furnace temperature of 400 to 500 degree centigrade. After low temperature heating, we placed the sample content in the furnace for further heating at a temperature of 400 to 500 degree centigrade then waited to cool it nearly 250 degrees centigrade. Before procedure starting, we measured weight of sample and same way at the end of ash determination procedure, also measured the weight of crucible in the sample.

Table 4: Moisture analysis and shelf life

Samples	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
Quantity of stevia added	0.3g	0.6 g	0.9g	1.2g	1.5g
Brix level	33 degrees	34 degrees	38 degrees	45 degrees	48 degrees
Sweetness	Less sweet	Sweet	More sweet	Sweetness	Less sweet

Moisture Analysis and shelf life: Moisture analysis is important factor for the estimation of shelf life of any food product and if more water present in the jam, then microbial agents gain access to manipulate and spoilage caused by them, and shelf life of the product decreases quickly. We daily observed the samples shelf life and noticed changes in sense of color, texture, spreading ability, moisture level and other same kind of sensory analysis. And all the parameter in samples was measures and recorded its changes within 20 to 30 days Table 4. First, we used stevia in jam in varying quantities to get optimized sample in trial 1 and trial 2 to get a standardized sweetness level in the jam and to get optimize level of brix in the jam. Sensory method was used to evaluate the jam based on varying parameters like color, texture, spreading

ability, and sweetness level and so on. The comparison among the stevia levels and its brix effects in first trial was made in first trial. The tested samples showed that as the level of stevia decreased, simultaneously brix level also decreased. Therefore, it had a direct relation of stevia concentration and brix^{8,16,29}.

In 1st trial, we added varying amount of the stevia concentrations in apple jam which contain black cummin as functional ingredient due to thymoquinone phytochemical and this chemical has been associated with the curing and prevention of many chronic diseases like cardiovascular disease, diabetes and hypertension²⁰. However, we added ingredient like stevia in varying quantities, so results on brix of jam which was measured manually and by usage of refractometer⁵.

We checked physicochemical components of jam such as moisture, ash, TSS, PH. On 1st day, we noticed moisture, which was 37% in optimized sample, after a month we checked again which was 35% while control sample moisture shifted from 36% to 33% in a month. In this way, we checked ash contents which were 2.01% in optimized sample and after 30 days of supervision, these checked again which were 1.90%, while in controlled shift was 1.98% to 1.89%. TSS was checked on 1st day which were 70% and after 30 days these were 72%, in controlled 68% to shift on 70.5%. At 1st day PH was 3.3 and after month later it was recorded at 3.28 while in controlled it was shifted from 3.34 to 3.30.

Following are the results of proximate analysis which we performed above table showing the proximate analysis, in which we did protein determination by kjeldhal apparatus and protein contents was approximately 0.09 gram per 100 gram that was negligible quantity after 30 days. We again checked and recorded 0.1 gram per 100 gram while, 0.03gram and shifted to 0.04 gram per 100 gram on the control sample, and similarly, dietary fibre also varying in shorter range from 0.8 to 1.2 gram per 100 gram and it was 4 percent of total composition, dietary fibre source was the apple in apple jam.

Table 5: Storage effects on Physicochemical and Nutritional components

Proximate Analysis	1st day	30days after storage
TSS (%)	So = 70 Sc = 68	So = 72 Sc = 70.5
Ash (%)	So= 2.01 Sc= 1.98	So=1.90 Sc=1.89
Moisture (%)	So=37 Sc=36	So=35 Sc=33
PH	So=3.3 Sc=3.34	So=3.28 Sc=3.30
Dietary fibre (%) of whole sample	So=4 Sc=2.5	So= 4.58 Sc=2.95
Protein(g)	So=0.09 Sc=0.03	So=0.1 Sc=0.04
Fat (grams)	So=0.3 Sc=0.2	So=0.34 Sc=0.21
Carbs (Fructose in grams)	So=6 Sc=6	So=6.02 Sc=6.2

TSS: Total Suspended Solid, So; Experimental sample; Sc; Control Sample, g; gram

Black cummin containing stevia apple jam contributes to novel product of functional properties which have beneficial effects for hypertension and diabetes. The phytochemicals properties, which proved significant to lowering of hypertension to magnificent level and other health benefits for diabetic patients also considered. Sensory evaluation supported the stevia on hedonic scale which made a successful replacement of sugar with stevia and remained a chief ingredient in making low caloric black cummin contain stevia apple jam.

Moreover, black cummin contained stevia apple jam significantly increased the TSS level but decreased moisture somehow may be due to dehydration while storage done at room temperature and it also increased nutritional components like proteins, carbohydrates and fat due to black cummin addition and it produced no effect on shelf life while storing for a month.

In the future more research to be needed in this area because black cummin, which contains stevia apple jam and essential nutrients that promising remedy for novel chronic

disease. In addition it helps with making a standard recipe by keeping nutritional profile storage effects. As Muslim we have a strong believe on the Hadith that black cumin is a remedy for all disease except death so there are a lot of research areas to find beneficial effects of black cumin on human health

CONCLUSION

From the above study it may be concluded that the Black cumin containing stevia apple jam contributes to novel product of functional properties which have beneficial effects on the hypertension and good for diabetes. Black cumin contains phytochemicals which proved significant to lowering of hypertension to magnificent level and other health benefits for diabetic patients also considered. Sensory evaluation supported the stevia on hedonic scale which made a successful replacement of sugar with stevia and remained a chief ingredient in making low caloric black cumin contain stevia apple jam.

In this study, I made black cumin contains stevia apple jam and I replaced sugar with stevia to make a consumable food product for diabetic and cardiovascular people. In this study, I did various proximate analysis, sensory evaluations and finally checked the effects of stevia and black cumin on hypertension level. After research study, it has been concluded that black cumin contained stevia apple jam significantly decreased the level of hypertension and proved important alternative to medications.

Limitation of the study: The study conducted with equipped limited resource to investigate the effect of adding black cumin on stevia apple jam to evaluate its physicochemical improvement on counterparts, and health benefits specifically the remedy for chronic illness, therefore it needs an advanced experimental analysis to justified scientific evidence.

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Authors' contribution: MA and KA prepare and analyzed the experimental study; SRG, SK and MA interpret the findings and wrote the manuscript. All authors read and approved the manuscript.

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