

Study the Sensory Attributes and Shelf Life of Developed Digestive Pills from Makoi (*Solanum nigrum*)

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Abstract

Solanum nigrum belongs to family Solanaceae. Blacknight-shade and Makoi are the common name for it. The chemical constituents commonly found in *Solanum nigrum* are glycoalkaloids, glycoproteins, polysaccharides, polyphenolic compounds such as gallic acid, catechin, protocatechuic acid, caffeic acid, epicatechin, rutin etc. *Solanum nigrum* has very much importance as a medicinal plant. Root, whole plant and leaves are used but fruits of black colour are not used as they possess toxicity, therefore they are not used for medicinal purposes. Reddish-brown coloured fruits are used for edible purpose. It has been also extensively used in traditional medicine in India and other parts of world to cure liver disorders, digestion, chronic skin ailments, inflammatory conditions, painful periods, fevers, diarrhoea, eye disease, hydrophobia etc. Extracts prepared with using spices condiments exhibited stomach disorders and also improved digestion activity as compared to other digestive pills.

Keywords: *Solanum nigrum*; Medicinal; Liver disorders; Digestion; Condiments; Digestive pills

Introduction

India is the largest producer of medicinal plants and brightly called as the “Botanical garden of the world”. Plant derived drugs even today remain important resource especially in developing countries to combat serious diseases. Approximately 62% to 80% of world’s population still relies on traditional medicines for the treatment of common illness [1]. *S. nigrum* is an important ingredient in traditional Indian medicines. Infusions are used in dysentery, stomach complaints, and fever. In India, the berries are casually grown and eaten, but not cultivated for commercial use. The quest to manufacture foods for healthy benefits is an underpinning goal of the modern food industry. Food processing has evolved to carryout steps for the controlled destruction of natural food structures. These steps facilitate separation of valuable components from the original matrix in which they are embedded [2-7]. The separated ingredients are then converted into recognizable processed foods with desirable’s textural and sensorial properties by application of one or more processing steps. Recent evidence indicates that how the food structure breaks down during gastric digestion significantly affects the rate of uptake of nutrients in the gastrointestinal (GI) tract. The digestion process has been well studied in terms of secretion of gastric fluids, enzymatic breakdown of fats, proteins and carbohydrates, and molecular and ionic transport across the intestinal epithelium. However, there remains a notable lack of understanding about the food disintegration kinetics and the extraction of small molecules from complex food structures in the gastric environment. The rate of food disintegration in stomach is a key factor influencing emptying rate and subsequently affecting absorption of nutrients in the intestine. Faster disintegration and emptying of drug tablets is responsible for the faster absorption of drug ingredients in the intestine. The stomach contraction, particularly terminal antral contraction, imposes a considerable mechanical destructive force on food particulates and thus is crucial on the disintegration of solids. Researchers have measured contraction forces present in the stomach ranging from 0.2 N to 2 N [8-11].

Findings from this research will provide an improved understanding of the interaction of the food matrix and active ingredients during gastric digestion. The computational modeling of the human stomach will predict the kinetics of disintegration of a food matrix under known

physiological conditions of the stomach. These findings should provide new information for the food processing industry to develop structured foods for healthful benefits and develop strategies for controlled release of food nutrients at desired sites in the GI tract [12-15]. The anticipated information will enhance understanding of the stomach emptying of foods to develop approaches to control it. Control of gastric emptying is essential for ensuring optimal digestion. The rate of food disintegration in the stomach appears to be a key factor influencing emptying rate and subsequently affecting absorption of nutrients in the intestine [16-23]. The potential for modulation of the rate of gastric emptying to control obesity and diabetic patients is now being explored vigorously by the pharmaceutical industry. Study of gastric disintegration of foods should also help our understanding of the interactions between food and drugs during digestion [5,8,9]. The disintegration activity of a drug is substantially affected by the presence of food components. Thus the understanding of food disintegration should help improve the control of pill dissolution in stomach.

Kakamachi (*Solanum nigrum*) is widely described in the Ayurvedic classics & also have references in Vedas. This herb has its own ortho-medical importance since it plays a significant role in the treatment of various diseases. It is having both curative & nutritive value [21,24-28]. It is used as single drug & in compound formulations. In this research, we use different ingredients along with *Solanum nigrum* to increase their pharmacological properties, therapeutic or dietary utility indigestion. Hence the project is carried out under the above objectives.

Materials and Methods

This chapter deals with the description of various materials and

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methods which was used to accomplish the experimental work done to attain the desired objectives of the work entitled, Study the sensory attributes and shelf life of developed digestive pills from Makoi (*Solanum nigrum*). The experimental technique, materials which was used in this study and the associated methodology for product development and their sensory analysis was elaborated in this chapter. The experimental plan was shown in Table 1 with different variables, levels and description [27-31].

From the above formula, the development of product from different treatments were done and in these treatments the treatment T_1 was widely accepted by the judges and the further experiments were carried-out by using this formula [32-35] (Table 2). According to the judge's confirmation for treatment T_1 , the alteration in moisture were calculated and by this alteration the total effect on the Physico-chemical properties of the developed product was estimated (as R_1 , R_2 and R_3) and the mean value of the data for the product was selected which were given as follows. All the Physico-chemical values were calculated as per 100 g of the developed product (Table 3).

Methods

After the development of the product, the pills were further brought for study the sensory attributes and storage conditions from the following methods which were explained follows:

Organoleptic evaluation: Sensory attributes including colour, aroma, taste and overall acceptability was determined by hedonic rating tastes as recommended by Karmakar [18]. Hedonic rating taste was used for evaluation of sensory characteristics. This test was used for acceptability by consumer for the product. The detail methodology was presented below. A panel of 5 expert judges of different age group having different habit was be selected and samples were served to them [36-39]. The expert panellist was be asked to rate the acceptability of the product through sense organs on scale of nine (9) points ranging from like extremely to dislike extremely.

Packaging material: The protection offered by a package was determined by the nature of the packaging materials and by the type of package condition. A great variety of materials were used in packaging, as LDPE, HDPE and Glass bottles.

Results and Discussion

This chapter deals with the findings of the study and effect of developed pills with different spices condiments, on the parameters such as sensory attributes and shelf life of developed digestive pills from Makoi (*Solanum nigrum*).

Sensory evaluation

Sensory attributes including colour, taste, aroma, and overall

S.no.	Variables/ Parameters	Levels	Description
1	Product	1	Digestive pills
2	Ingredients	8	Makoi (<i>Solanum nigrum</i>), Hing, Piper longum and Tailed pepper, Ajwain, Jeera, Black Salt, Imli Paste and Artificial sweetner.
3	Treatment	1 × 5	T_0, T_1, T_2, T_3, T_4
4	Replication	3	R_1, R_2, R_3
5	Physico-chemical Analysis	7	Moisture, Protein, Fat, Total ash, Crude fibre, Carbohydrate and Calories.
6	Storage condition	1	Ambient temperature
7	Storage period	1	Two months
8	Packaging material	3	LDPE, HDPE, Glass bottle
9	Sample size	1	100 gms

Table 1: Experimental plan.

Ingredients	Treatments				
	T_0	T_1	T_2	T_3	T_4
Makoi	12%	20%	24%	25%	26%
Piper longum and Tailed pepper	5%	4%	3%	3%	3%
Hing	1%	1%	1%	1%	1%
Artificial sweetner	12%	12%	14%	15%	15%
Ajwain	20%	8%	8%	8%	7%
Jeera	15%	10%	10%	8%	8%
Black salt	10%	15%	15%	15%	15%
Imli paste	25%	25%	25%	25%	25%

Table 2: Experimental design.

Physico-chemical properties	Replication			Mean Value
	R_1	R_2	R_3	
Moisture	22.43%	16.23%	15.02%	17.89%
Protein	0.82%	0.85%	0.86%	0.84%
Fat	1.95%	1.97%	1.98%	1.97%
Total Ash	2.40%	2.60%	2.80%	2.60%
Crude Fibre	1.62%	1.60%	1.59%	1.60%
Carbohydrate	72.40%	78.35%	79.34%	76.70%
Calories	310.43 Kcal	334.53 Kcal	338.62 Kcal	327.89 Kcal

Table 3: Experimental design for the developed product.

acceptability was determined by hedonic rating tastes recommended by Hedonic rating taste which was used for evaluation of sensory characteristics. This test was used for acceptability by the consumer for the developed product [40]. The colour, taste, aroma and overall acceptability of developed digestive pills were accepted at different storage periods at ambient temperature by the judges (Tables 4-6). Effect of packaging materials and ambient storage period on sensory evaluation of developed digestive pills [41,42] (Figures 1-3).

Summary

This present study on sensory attributes and shelf life of developed digestive pills from Makoi (*Solanum nigrum*) was undertaken in the Department of Food Process and Engineering, Vaugh school of Agricultural Engineering and Technology, Sam Higgin bottom Institute of Agriculture, Technology and Sciences Allahabad. In the present investigation efforts were made to develop the digestive pills

Packaging Material	Colour	Taste	Aroma	Overall Acceptability
LDPE	8.5	8.6	8.42	8.22
HDPE	8.5	8.6	8.42	8.22
Glass Bottle	8.5	8.6	8.42	8.22

Table 4: Sensory scores of digestive pills on day one.

Packaging Material	Colour	Taste	Aroma	Overall Acceptability
LDPE	8.5	8.5	8.40	8.20
HDPE	8.5	8.5	8.42	8.21
Glass Bottle	8.5	8.6	8.42	8.22

Table 5: Sensory scores of digestive pills on 30th day.

Packaging Material	Colour	Taste	Aroma	Overall Acceptability
LDPE	8.5	8.4	8.30	8.0
HDPE	8.5	8.5	8.41	8.20
Glass Bottle	8.5	8.5	8.42	8.21

Table 6: Sensory scores of digestive pills on 60th day.

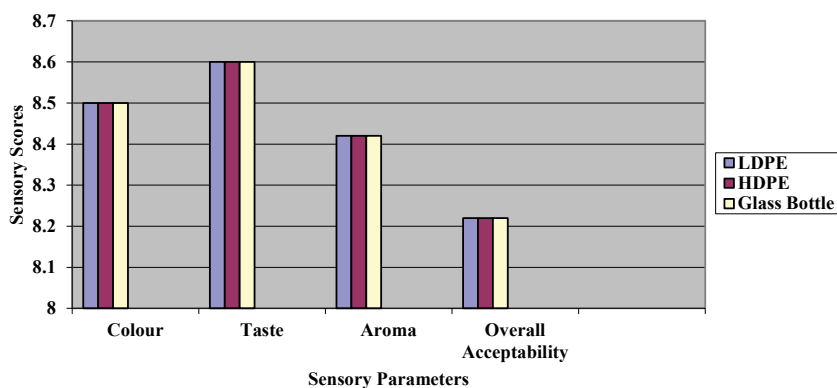


Figure 1: Sensory scores of digestive pills on day one.

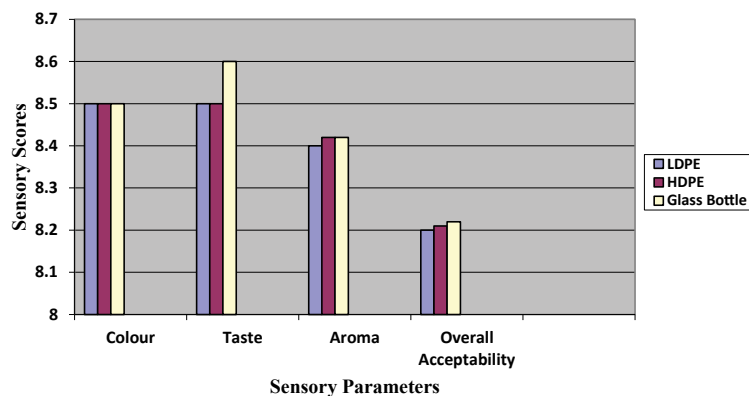


Figure 2: Sensory scores of digestive pills on 30th day.

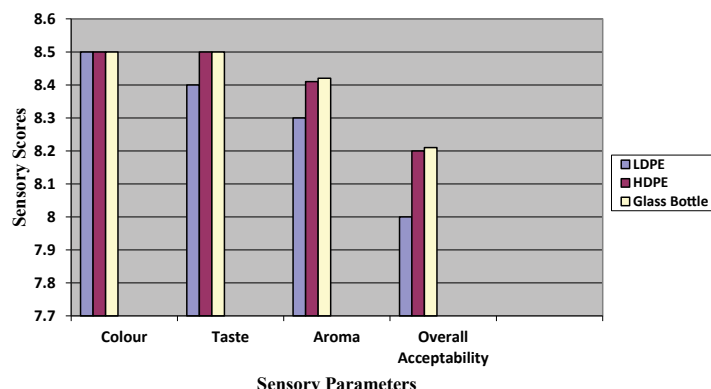


Figure 3: Sensory scores of digestive pills on 60th day.

with incorporation of other digestive ingredients which also helped the sensory characteristics to the developed digestive pills [43-45]. The sensory attributes such as colour, taste, aroma and overall acceptability was higher at initial packaging period i.e. at day one in LDPE, HDPE and Glass bottle and it was slightly decreases with increase in storage period at ambient temperature but in case of Glass bottle, it was not much affected. It was also found from Annova that the variation between the product treatments was non-significant and the variation within the product replications was significant.

Conclusion

From this preliminary investigation and research, it has been concluded that the development and Physico-chemical properties of developed digestive pills have good source of protein, fat, crude fibre, carbohydrate and calories which also lies under the dietary limit of daily intake. The developed digestive pills have found satisfactory in the stomach digestion after testing their physico-chemical analysis like moisture, ash, protein, fat, crude fibre, and also depended upon different sensory attributes like colour, taste, aroma, and overall acceptability during shelf life study in two months were not much effected from controlled sample i.e. Physico-chemical and Organoleptic characteristics were good and was acceptable. Thus, we concluded that the developed digestive pills were gave good response in HDPE and Glass bottle, storage at maximum storage period at ambient temperature compared than LDPE; while the extract mechanism of action remains to be elucidated in many cases of disease. The Makoi (*Solanum nigrum*) has wide-ranging Therapeutic properties needs to be investigated in well-designed studies and further research is in process to find more uses of *Solanum nigrum*.

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