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Effect of Incorporation of Ashwagandha (*Withania somnifera*) root on physico-chemical properties of low fat flavoured milk

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Abstract
The present investigation entitled "Utilization of ashwagandha (*Withania somnifera*) root powder for preparation of low fat flavoured milk" was undertaken during the year 2019-2020. Milk was cream separated to 0.5 per cent fat and the flavoured milk was prepared with different combinations of milk and ashwagandha root powder in proportion of 100:0 (T1), 99.8:0.2 (T2), 99.6:0.4 (T3), 99.4:0.6 (T4) and 99.8:0.2 (T5) with five treatments and four replications in completely randomized design (CRD). The data observed that the physico-chemical composition of flavoured milk i.e. protein was significantly decreased while total solids, fat, ash and acidity percentage significantly increased with increased levels of ashwagandha root powder. Flavoured milk prepared by blending with 0.4 parts of ashwagandha root powder (T3) has 0.48 per cent fat, 9.43 per cent T.S., 0.16 per cent acidity, 3.41 per cent protein and 0.78 per cent ash.

Keywords: Ashwagandha, low fat flavoured milk, Physico-chemical composition

Introduction
Plain milk is most consumed liquid product, but when this milk is converted to flavoured milk that will be more acceptable by the peoples of all age groups. Flavoured milk is the second largest widely consumed liquid dairy product after plain milk, having numerous nutritional as well as physiological benefits. It contains same essential 9 nutrients as the milk. Adding flavour and colour to milk increases its palatability value. Some natural as well as artificial flavours are used in the preparation of flavoured milk. Flavoured milks are also prepared by adding various types of herbs to provide therapeutic value to the flavoured milk. Several vitamins and minerals are also added in flavoured milk to enrich with health providing components. Fruit based flavoured milk are prepared by adding fruit pulps or fruit juices to add the variety to the flavoured milks (Tiwari and Asgar, 2017) [1].

Among various medicinal plants, *Withania somnifera* is a popular Indian medicinal plant belonging to family Solanaceae and is also known as ashwagandha, Indian ginseng and winter cherry. It is one of the most valuable plants in the traditional Indian systems of medicine (Gulati *et al*., 2017) [2].

The roots of *Withania somnifera* (WS) are used extensively in ayurveda, the classical Indian system of medicine, and WS is categorized as rasayana, which are used to promote physical and mental health, to provide defense against disease and adverse environmental factors and to arrest the aging process. WS has been used to stabilize mood in patients with behavioral disturbances (Bhattacharya *et al*., 2000) [3].

Ashwagandha roots contain crude fiber 21.0 to 25.0%, starch 6.09 to 9.46 mg/g, tannins 0.39 to 0.82 mg/g, minerals K, Mn, Na, Fe, Zn, Cu, Al, Ca, Cd & Ni, total sugars 2.52 to 9.52 mg/g, reducing 5 sugars 0.15 to 2.10 mg/g and non-reducing sugars 2.37 to 7.62 mg/g (Gulati *et al*., 2017) [2].

The present study was effective for future research in order to maximize the use of medicinal plant. Now a day's value and demand of ayurvedic products is increased. The addition of ashwagandha improves flavour, acceptability and nutritional quality of product.

Material and Methods
The present research work entitled "Utilization of ashwagandha (*Withania somnifera*) root powder for preparation of low fat flavoured milk" was undertaken in the section of Animal Husbandry and Dairy science, College of Agriculture Nagpur, during 2019-20.

Materials

In this investigation cow milk was used for conducting the experimental trials. The fresh, clean cow milk was obtained from section of Dairy Science and Animal Husbandry, College of Agriculture Nagpur. Obtained milk was filtered through the muslin cloth to avoid dirt and extraneous matter. The milk sample was analyzed for different milk constituent's *viz*. fat, total solids, protein, ash and acidity

Cow milk was used for conducting the trial throughout the experiment the milk was cream separated at 0.5 per cent fat skim milk by using cream separation by gravimetric method for each trial for preparation of flavoured milk.

Different equipments *viz*., Muslin cloth, Conical flask., Weighing balance, Test tube, Thermometer, Grinder/Juicer, Gas burner, Ladle, Pipette, Burette, Stainless steel container with diameter of 30 cm and depth 20 cm, etc were available in the department. Analytical reagent grade chemicals were used for the chemical analysis.

Methods

This experiment was done with five treatments and four replications for preparation of flavoured milk. The levels of ashwagandha root powder in flavoured milk were given below.

Table 1: Show the treatments of ashwagandha rot powder

Treatments	Milk (parts)	Ashwagandha root powder (parts)
T1	100	00
T2	99.8	0.2
T3	99.6	0.4
T4	99.4	0.6
T5	99.2	0.8

5 per cent sugar and 0.15 percent cardamom powder was added for all treatments.

Procedure for preparation of ashwagandha flavored milk

Method of preparation of flavoured milk suggested by De (2013) [4] was used. Sugar was weighed as per proportion. At the same time milk was cream separated to 0.5 per cent fat by using cream separator. The milk was filtered and heating to 63ºC for 30 minutes. After cream separation, boiling of milk was carried out. The sugar and ashwagandha root powder were properly in desired amount added in milk. The mixture was then kept for cooling to room temperature and after cooling the mix was put in the sterilized bottle and kept under refrigeration storage at (5ºC) until use.

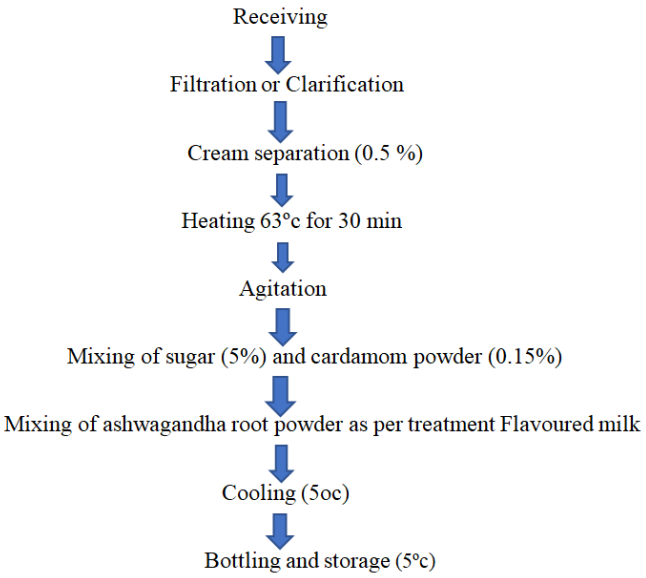

Fig 1: Flow chart for preparation of ashwagandha root powder based flavoured milk

Bottling Immediately after cooling, flavoured milk was filled into 200 ml clean bottles followed by sterilization. For each treatment, five bottles were sealed and sterilized and labeled properly for identification and kept in a refrigerator.

The product was subjected to chemical analysis of the fat estimated by Gerber's method as per the procedure recommended by ISI bulletin no IS: 1224, Part 1 (1977) [8]. total solid content in milk and flavoured milk was determined by gravimetric method as described in BIS handbook of food analysis SP-18 part XI (1981). The acidity percentage of the milk and flavoured milk was determined as per the procedure recommended in ISI Handbook of food analysis, SP-18, (Part XI) Dairy products (1981). Protein was determined by estimating the per cent nitrogen by macrokjeldahl method as procedure recommended in IS 1479 (part II) 1961 [6]. The ash content in ashwagandha flavoured milk is determined by procedure recommended in Handbook of food analysis. IS: 1167 (1967) [7].

Results and Discussion

The finished product of flavoured milk was subjected for the proximate analysis *viz*., fat, protein, total solids, ash, acidity. The results obtained on account of this parameter are presented in Table 2.

Table 2: Overall average of physico-chemical attributes of flavoured milk as affected by different levels of ashwagandha root powder (per cent)

Treatment	Fat	Total Solid	Acidity	Protein	Ash
T_1	0.47^{d}	9.10^{e}	0.14^{e}	3.42^{a}	0.74^{e}
T_2	0.48^{c}	9.27^{d}	0.15^{d}	3.41^{b}	0.76^{d}
T_3	0.48^{c}	9.43^{c}	0.16^{c}	3.41^{b}	0.78^{c}
T_4	0.49^{b}	9.60^{b}	0.18^{b}	3.40^{c}	0.80^{b}
T_5	0.50^{a}	9.76^{a}	0.19^{a}	3.40^{c}	0.82^{a}
S.E.(m) ±	0.004	0.015	0.003	0.013	0.01
C.D.	0.013	0.047	0.010	0.040	0.03
Result	Sig.	Sig.	Sig.	NS	Sig.

Values with different superscripts differ significantly ($P< 0.05$)

Fat

The highest fat content in flavoured milk (0.5 per cent) was observed for treatment i.e. with 0.8 per cent ashwagandha root powder (T5) and the lowest (0.47 per cent) for treatment T1 i.e. 0 per cent level of ashwagandha root powder. Fat content of flavoured milk was gradually increased with the increase in level of ashwagandha root powder.

Total solids

The maximum total solids content (9.76 per cent) was noticed in flavoured milk with 0.8 per cent ashwagandha root powder i.e. T5, whereas the lowest (9.10 per cent) was recorded in flavoured milk with 0 per cent ashwagandha root powder i.e.T1. Total solid content of flavoured milk increased with an increase in the level of ashwagandha root powder.

Acidity

The highest acidity (0.19%) was observed in flavoured milk at treatment T5 i.e. at 0.8 per cent level of ashwagandha root powder and the lowest (0.14%) for treatment i.e. flavoured milk with 0 per cent ashwagandha root powder (T1). Addition of ashwagandha root powder gradually increased the acidity of flavoured milk.

Protein

The highest protein content in flavoured milk (3.42%) was observed in treatment T1 i.e. with 0 per cent ashwagandha root powder and lowest (3.40%) in treatment T5 i.e. 0.8 per cent level of ashwagandha root powder. Addition of ashwagandha root powder decreased the protein content of flavorured milk.

Ash

Ash content of flavoured milk was increased due to the addition of different levels ashwagandha root powder. The highest ash content in flavoured milk (0.82%) was observed in treatment T5 i.e. with 0.8 per cent ashwagandha root powder and lowest (0.74%) in treatment T1 i.e. 0 per cent level of ashwagandha root powder.

Conclusion

The chemical composition of flavoured milk i.e. protein was significantly decreased while total solids, fat, ash and acidity percentage significantly increased with increased levels of ashwagandha root powder**.**

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