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Standardization of Level of Herbs in Quarg Cheese

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ABSTRACT

Background: Cheese is one of the most popular manufactured dairy products. Quarg is milky white in colour, may be even faintly yellowish, body and texture are homogeneously soft, smooth, good spreadable and it is essentially milk protein paste. Quarg cheese appeals to palate of Indian people who don't like the typical sharp flavour of other varieties of cheeses.

Methods: Ashwagandha, turmeric, betel vine and tulsi are most common herbs traditionally used in Indian culinary dishes particularly spread. Initially, work was carried out to select the levels of four herbs (Ashwagandha, Turmeric, Betel vine and Tulsi) for the preparation of quarg cheese and tried in preliminary study. On the basis of sensory evaluation best treatment of each herb selected for further experiment.

Result: In final experimental treatment were as control; 1.1 per cent Ashwagandha; 0.3 per cent Turmeric; 2.5 per cent Betel vine; 1.1 per cent Tulsi in quarg cheese. The product was evaluated for sensory by five semi-trained panel of judges using quarg cheese score card. The present work will be a decide the suitable levels of herbs in quarg cheese.

Key words: Ashwagandha, Betelvine, Quarg cheese, Sensory, Tulsi, Turmeric.

INTRODUCTION

India is reckoned as a major threat in the dairying world by the rest of the world due to its immense potentiality, it is documented as the biggest and fastest growing market in the milk and milk products' world. Milk production during 2019-20 and 2020-21 is 198.40 million tonnes and 209.96 million tonnes respectively showing an annual growth of 5.80%. The per capita availability of milk is around 427 grams per day in 2020-21 (Annual Report, 2020-21).

Cheese may be defined as curd of milk separated from whey and pressed in solid mass there has been steady increasing in consumption of cheese in most country worldwide. There are more than 2000 varieties of cheese, although many have little difference in flavour from extremely mild to very sharp and in texture from semi solid to almost stone hard. The most popular variety of cheese is cheddar, mozzarella, feta, cottage and quarg cheese.

'Quarg' the proper german name is speisquarg, is the natural unripened, fresh cheese produced on large scale in Germany and is very popular there. It is essentially milk protein paste manufactured by proper bacterial culture with small amount of rennet addition for better separation of the protein coagulum from the whey and better yield.

Herbs are plants or parts, mostly leaves and seeds, that are used for that their taste, flavour, aroma and imparting color in food products or for medicinal and functional properties.

Ashwagandha is referred to as Indian ginseng or winter cherry. One of the most esteemed medicinal plant used in Indian Ayurveda since centuries. It is considered to be a vitalizer, adaptagen, facilitating the ability to withstand stressors and has antioxidant properties.

Turmeric is widely used as a spice, preservative, coloring matter and has wide range of medicinal and pharmacological applications.

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Basil is commonly known as *Tulsi.* Since ancient times, this plant is known for its medicinal properties. The aqueous extract of leaves of *Ocimum sanctum* showed significant reduction in blood sugar level in both normal and alloxan induced diabetic rats.

Piper betel Linn. (Piperaceae) is a natural herb which is valued for its medicinal and therapeutic properties. Its leaves are widely used as masticatory by the Asian people.

MATERIALS AND METHODS

Fresh cow milk was obtained from Research cum development project on cattle, M.P.K.V. Rahuri. The cheese culture (NCDC-149) was procured from National Collection of Dairy Culture, Dairy Microbiology Division, NDRI, Karnal (Haryana). Microbial 'Meito' rennet was purchased from CHR Hansen Ltd. Mumbai to make the firm and desirable Quarg cheese. Herbs was procured, Betel leaves and tulsi leaves as a source of natural herb from All India Coordinated Project on Medicinal and Aromatic Plants and Beetle Vine Research, MPKV Rahuri, Dist. Ahmednagar. Ashwagandha and Turmeric powder purchased from local market of Rahuri.

Technology of herbal quarg cheese

The quarg cheese was prepared by using technology developed at NDRI, Karnal , prescribed by Gahane (2008) with some minor modifications. Manufacture of herbal quarg cheeseis presented in Flow chart 1.

Treatments details

To levels of herbs (Betel vine, Ashwagandha, Turmeric and Tulsi) by using in the form of powder or extract.

On the basis of sensory evaluation the one level of Betel vine, Ashwagandha, Turmeric and Tulsi was finalized for the experimental trials as follow (Fig 1).

	Per cent of Herbs							
Treatment	T_0	T_1	T_2	T_3	T_4	T_5	T_6	T_7
Ashwagandha	0.0	0.3	0.5	0.7	0.9	1.1	1.3	1.5
Turmeric	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7
Betel vinE	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5
Tulsi	0.0	0.3	0.5	0.7	0.9	1.1	1.3	1.5

Sensory evaluation

The quarg cheese was evaluated sensorily by semi-trained panel of five judges from Department of Animal Husbandry and Dairy Science, Post Graduate Institute, MPKV, Rahuri using quarg cheese score card, total score 100 (Kadiya *et al.*, 2014).

Statistical analysis

The data obtained from trials of final treatment replicated four times was analyzed by completely randomized design (CRD) method by (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION

Initially trials were conducted using different level of herbs in order to achieve good sensory attributes in the product. Therefore, from the basket of available different herbs *viz.* Ashwagandha, Turmeric, Betel vine and Tulsi were selected for the study.

Effect of addition of Ashwagandha Powder in Quarg cheese in sensory evaluation

Different level of Ashwagandha powder was studied analyzed for sensory attributes, the results obtained is depicted in following Table 1 and discussed below.

Flavour

The flavour score was ranged from 44.00 to 48.50. It was noticed that treatment T_5 (1.1% Ashwagandha powder) scored highest flavour score (48.50). It was clear from the Table 1 that increases in per cent the level of Ashwagandha powder decreases flavour score slightly up to optimum level and experienced characteristic mild acidic quarg cheese flavour, light pungency of Ashwagandha powder appears mid-late with slightly hot, distinctive bittersweet taste. Therefore the judges evaluated higher score T_5 (48.50).

Oraon and Prajapati *et al.* (2017) concluded that Ashwagandha powder was incorporating at the rate of 0 to 0.7% by weight of chakka in the manufacturing of shrikhand , it is prepared using 0.5% Ashwagandha powder was superior in terms of organoleptic characteristics as compared to experimental shrikhand containing 0.3 and 0.7 powder and control shrikhand.

Body and texture

The body and texture score offered to the treatment by the judges was increasing in slower rate up to some limit but less than T_6. The highest score offered to T_6 (34.66) followed by T_4 and T_5 (34.16) where as the lowest score recorded to T_7 (31.66) with acceptable sense. It was observed that raising the level of Ashwagandha powder to 1.1 per cent cause increase in score of body and texture of quarg cheese.

Pal (2019) observed that the level of Ashwagandha powder increases in shrikhand there was significant ($p<0.05$) decreased in the sensory score of Ashwagandha.

Colour and appearance

It was found significant ($p<0.05$) difference between treatments for colour and appearance. The highest score



Fig 1: Different variants of herbal quarg cheese.

was offered to T_5 (14.83) as well as lowest score was rated to other treatment.

The addition of Ashwagandha powder in quarg cheese shows that colour tends towards slightly creamy white which was accepted by the judges.

Overall acceptance

The highest score for overall resultant quarg cheese. acceptability was recorded to T_5 treatment (97.49) followed by T_6 (94.16). In accordance with the result obtained, the treatment T_5 after T_4 was found to provide best sensory characteristics in the resultant quarg cheese.

Effect of addition of turmeric powder in quarg cheese in sensory analysis

Different level of turmeric was studied analyzed for sensory attributes, the results obtained is depicted in following Table 2 and discussed below.

Flavour

It was revealed that the flavour score was increased with increasing rate of turmeric powder from T_1 to T_3 (44.84 to 46.50) as compared to control (44.51) and sharply decline at T_4 to T_7 (45.83 to 39.33). The highest score was recorded for quarg cheese containing 0.3% turmeric powder T_3 (46.50) whereas the lowest score was recorded for cheese containing 0.7% turmeric powder T_7 (39.33), this sharply decrease in flavour score because of the high turmeric Powder concentration release more volatile Ar-turmerone and α- and β-turmerone compound by Turmeric powder imparting strong turmeric powder like flavour associated with earthy and bitter.

The treatment T_3 (46.50) rated higher score by the judges concluding optimum level of turmeric powder for preparation of quarg cheese.

Fresh cow Milk
↓
Standardization (4% Fat)
↓
Pasteurization (85°C/15 min.)
↓
Cooling (30-37°C)
↓
Inoculation of starter culture @ 1 %
↓
Renneting (250 mg/100 lit. of milk)
↓
Incubation (12-16 hrs. for 37°C, pH 4.9-5.0)
↓
Cutting and Stirring
↓
Cooking/Heating (1 hour for 65°C)
↓
Cooling at room temp.
↓
Whey off
↓
Mixing (Herbs)
↓
Quarg cheese
↓
Packaging and Storage (4±1°C)

Flow Chart 1: Procedure of prepration of herbal quarg cheese.

Shweta Buch *et al.,* (2014) observed that the flavour score declined slightly on addition of turmeric at 0.2% by weight of expected yield of paneer and improved on addition of 0.4% by weight of expected yield of paneer.

Body and texture

The highest score was rated to T_3 (33.83) where as lowest score was recorded to other treatment T_7 (30.50). This decreasing trend of score for body and texture might be due to turmeric powder and slight increasing in solidity and decline in softness, smoothness and spreadability as compared to control treatment.

Laith *et al.* (2019) resulted that indicated adding a Turmeric powder to the milk processed into cheese did not affect the colour, texture and bitterness attributes of the cheese samples.

Colour and appearance

The highest score for colour and appearance was rated to T_3 (13.33) followed by T_4 (13.16) and lowest score rated to T_7 (9.66). It was observed that score for colour and appearance goes to decrease with increasing order by addition of Turmeric powder and sharply decrease at T_7.

Manoharan *et al.,* (2012) resulted that the sensory evaluation of curcumin (turmeric) powder as natural color for butterscotch flavor ice -cream, turmeric is a bright yellow colorant produced from the roots of the herb *curcuma longa*, with pigments including curcuminoides, curcumin and related compounds responsible for the yellow color.

Overall acceptance

The score was decreased with increasing rate up to T_3 (93.66) as compared to control sample (89.17) where, as sharply decline at T_7 (79.49). The highest score for overall acceptability was recorded to T_3 (93.66) followed by T_2 (91.76). In accordance with the result obtained, the treatment T_3 after T_2 treatment was found to provide best sensory characteristics in the resultant quarg cheese and therefore this was selected for further investigation.

Hosney *et al.* (2011) reported that karish cheese with curcumin gave the highest score comparing with karish cheese (control) during storage period.

Table 1: Effect of ashwagandha powder level on the sensory quality of quarg type cheese.

Rate of addition	Sensory attributes			
	Flavour	Body and texture	Colour and appearance	Overall acceptance
T_0	44.50^{f}	33.00^{de}	12.33^{de}	89.83^{f}
T_1	44.83^{def}	33.33^{cd}	12.50^{de}	90.66^{ef}
T_2	45.33^{de}	33.66^{bc}	12.83^{cd}	91.79^{de}
T_3	45.50^{d}	33.66^{bc}	13.33^{bc}	92.49^{d}
T_4	45.83^{c}	34.16^{ab}	13.83^{b}	93.82^{bc}
T_5	48.50^{a}	34.16^{ab}	14.83^{a}	97.49^{a}
T_6	47.50^{b}	34.66^{a}	12.00^{e}	94.16^{b}
T_7	44.00^{f}	31.66e	10.83^{f}	86.46^{g}
SE±	0.2887	0.1992	0.2440	0.4040
CD (P≤0.05)	0.8756	0.6042	0.7400	1.2111

Significant at P≤0.05; NS- Non significant at P≥0.05

Table 2. Effect of turmeric powder level on the sensory quality of quarg cheese.

Rate of addition	Sensory attributes			
	Flavour	Body and texture	Colour and appearance	Overall acceptance
T_0	44.51^{cd}	32.66^{bc}	12.00^{cd}	89.17^{d}
T_1	44.84^{bc}	32.83^{bc}	12.66^{bc}	90.33^{cd}
T_2	45.60^{abc}	33.16^{ab}	13.00^{ab}	91.76^{b}
T_3	46.50^{a}	33.83^{a}	13.33^{a}	93.66^{a}
T_4	45.83^{ab}	32.16^{cd}	13.16^{ab}	91.15^{bc}
T_5	44.83^{bc}	31.33^{de}	13.10^{ab}	89.26^{d}
T_6	43.33^{d}	31.16^{e}	11.66^{d}	86.15^{e}
T_7	39.33^{e}	30.50^{e}	09.66^{e}	79.49^{f}
SE±	0.4131	0.2746	0.2440	0.4249
CD(P≤0.05)	1.2529	0.8329	0.7400	1.2739

Significant at P≤0.05; NS- Non significant at P≥0.05.

Effect of addition of Betel vine extract in quarg cheese in sensory evaluation

Different level of Betel vine were studied and analyzed for sensory attributes, the results obtained is depicted in following Table 3 and discussed below:

Flavour

The flavour score offered by the judges was ranged from 40.83 to 44.66. In the sensory evaluation flavour score was slowly increasing by the increase level of Betel vine extract from control treatment (40.83) up to T_5 (44.66) and decreased at T_7 (43.33). The higher flavour score was offered to T_5 (44.66) and lowest score was offered to T_0 (40.83). Thus, treatment T_5 (2.5%) rated higher score by the judges concluding optimum level of Betel vine extract for the flavour of quarg cheese when used in an ideal amount with the right complementary flavour.

Satyal *et al.* (2012) reported that the flavour score of ghee was significantly influenced by the levels Piper betel leaves. As Piper betel leaves level increased from 1.0 per cent 1.5 per cent flavor of the product increased, however Piper betel leaves level beyond 1.5 per cent, the flavor score of the product declined.

Kubade *et al.* (2020) concluded that the higher level of piper betel leaves incorporation resulted in slightly strong and astringent flavour of piper betel leaves. The flavour score of ghee was significantly influenced by the levels of piper betel leaves.

Body and texture

The highest score was rated to T_0 (34.33) where, as lowest score was recorded to T_7 (31.66). This decreasing trend of score for body and texture might be due to slight increasing in spreadability and decline in softness, smoothness as compared to control treatment.

Patel and Rajorhia (1979) noticed that when betel (Piper betel) and curry (Murrayakoeniji) leaves were added to butter during clarification in to ghee, the samples of ghee treated with betel leaves and curry leaves were appreciated for slightly higher intensity of their color.

Colour and appearance

It was revealed that the score was ranged from 12.00 to 14.33 and found the significant difference between treatments. The highest score for colour and appearance was rated to control (14.33) and T_1 (14.16).

Kamble *et al.* (2019) who found that the colour and appearance score of Piper betel flavoured milk ranged from 7.5 to 8.6. The maximum score was obtained for formulation, which had 5 per cent Piper betel leaves extract and 10 per cent sugar.

Overall acceptance

The score was increased from T_1 to T_5 (90.32 to 91.15) as compared to control (89.32) where as sharply decline at T_6 (88.81). The highest score for overall acceptability was recorded to T_5 (92.15). In accordance with the result obtained, the treatment T_5 (92.15) was found to provide best sensory characteristics in the resultant quarg cheese and therefore, this was selected for further investigation.

Loliger and Schmied (1971) found that addition of aquous extract of betel leaves did not have any appreciable effect on overall acceptability of dahi samples though phenolic compound was present in betel leaves.

Effect of addition of Tulsi extract in Quarg cheese in sensory analysis

Different level of Tulsi extract and analyzed for sensory attributes, the results obtained is depicted in following Table 4 and discussed below:

Flavour

It was revealed that the flavour score was increasing from T_1 to T_5 (43.16 to 44.83) as compared to control (42.83) and sharply decline at T_6 (43.83). The result obtained for quarg cheese added with Tulsi extract in relation to flavour shows significant ($p<0.05$) difference in the treatment. The flavour score offered by the judges was ranged from 42.83 to 44.83. The highest score was recorded for quarg cheese containing 1.1% (44.83) Tulsi extract (T_5) where as the lowest score was recorded for cheese containing 42.83 (T_0).

Table 3: Effect of betel vine extract level on the sensory quality of quarg cheese.

Rate of addition	Sensory attributes			
	Flavour	Body and texture	Colour and appearance	Overall acceptance
T_0	40.83^{e}	34.33^{a}	14.33^{a}	89.32^{bc}
T_1	42.50^{de}	33.83^{ab}	14.16^{ab}	90.32^{b}
T_2	42.83^{cde}	33.66^{bc}	14.00^{abc}	90.49^{ab}
T_3	43.16^{bc}	33.50^{bcd}	13.66^{abcd}	90.49^{ab}
T_4	43.83^{bcd}	33.33^{cd}	13.50^{bcd}	90.66^{ab}
T_5	44.66^{a}	33.16d	13.33^{cd}	91.15^{a}
T_6	43.50^{bc}	32.33^{e}	12.98^{d}	88.81^{c}
T_7	43.33^{bcd}	31.66^{e}	12.00^{e}	86.99^{d}
SE±	0.3086	0.1559	0.2271	0.2271
CD($P\leq0.05$)	0.9361	0.4674	0.6889	0.6889

Significant at $P\leq0.05$; NS- Non significant at $P\geq0.05$.

Table 4: Effect of tulsi extract level on the sensory quality of quarg cheese.

Rate of addition	Sensory attributes			
	Flavour	Body and texture	Colour and appearance	Overall acceptance
T_0	42.83^{e}	31.83^{f}	14.33^{a}	88.99^{d}
T_1	43.16^{d}	32.16^{ef}	13.66^{ab}	88.98^{d}
T_2	43.50^{cd}	32.50^{ef}	13.50^{abc}	89.50^{bcd}
T_3	43.83^{bc}	33.42^{cde}	13.33^{abc}	90.58^{abcd}
T_4	44.16^{b}	33.83^{abcd}	13.16^{bc}	91.15^{ab}
T_5	44.83^{a}	34.66^{a}	13.10^{bc}	92.59^{a}
T_6	43.83^{bc}	34.50^{ab}	12.83^{bc}	91.13^{abc}
T_7	43.66^{bcd}	34.16^{abc}	12.50^{c}	90.32^{bcd}
SEm±	0.1992	0.3212	0.3780	0.6897
CD (P≤0.05)	0.6042	0.9743	1.1464	2.069

Significant at P≤0.05; NS- Non significant at P≥0.05.

Palthur (2014) reported that the Tulsi flavored herbal milk has improved sensory attributes and overall acceptability, enhanced keeping quality with good antioxidant properties when compared with normal milk.

Body and texture

The changes in score for body and texture are presented in Table 4. and it was observed that the score was ranged from 31.83 to 34.66.

The highest score was rated to T_5 (34.66) where as lowest score was recorded to T_0 and T_7 (31.83 and 34.16). This decreasing trend of score for body and texture might be due to slight increasing in spreadability and decline in softness, smoothness as compared to control treatment.

Colour and appearance

The changes in score for colour and appearance are presented in table no.4 and it was revealed that the score was ranged from 12.50 to 14.33 and found the significant difference between treatments. The highest score for colour and appearance was rated to control treatment (14.33) followed by T_1 (13.66) and lowest was rated T_7 (12.50). High amount of tulsi extract and sharply decrease sensory score at T_7 (12.50).

Kumar *et al.* (2013) observed that highest score of color and appearance at 3.0% level of tulsi extract; the level of Tulsi extract increases decreases the colour and appearance score of ice cream sample.

Overall acceptance

The score was increased from T_2 to T_6 (89.50 to 92.59) as compared to control (88.99) where as sharply decline at T_7 (90.32). The highest score for overall acceptability was recorded to T_5 (92.59). In accordance with the result obtained, the treatment T_5 (92.59) was found to provide best sensory characteristics in the resultant quarg cheese and therefore this was selected for further investigation.

Trivedi *et al.* (2014) recommended incorporating Tulsi juice @ 6 % and freeze dried Tulsi juice @ 1% by weight of ice-cream mix in the preparation of Tulsi flavoured herbal ice-cream.

CONCLUSION

Good quality quarg cheese with mild acidic flavor, smooth and creamy texture can be made by addition of herbs such as ashwagandha (1.1%), turmeric (0.3%), betel vine (2.5%) and Tulsi (1.1%).

Conflict of interest

All authors decalre that they have no conflict of interest.

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