



Unveiling Consumers' Perception Towards Duck Egg and Its Culinary Preparations in Odisha State

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Duck rearing is being practised by the farmers in the coastal states as well as other states of the country having large water bodies like ponds, lakes, rivers, canals, etc. Ducks have many advantages over chicken, as they are adapted to various environmental conditions compared to chicken, require less elaborate housing and prosper in marshy and wetlands where other livestock cannot. They are hardy and susceptible to fewer diseases than chicken. They can scavenge on their own and require less manpower to take care of them. Duck can be easily integrated with other agriculture farming and thus is suitable as a component in integrated farming. They also produce larger eggs than the chicken and lay early in the morning. Duck meat and egg is an important source of protein and iron (Tai and Tai, 2001). The quality parameters of duck eggs are reported in various literature and are deemed to be of high quality in studies reported by Padhi *et al.* (2021), Padhi *et al.* (2022) and Padhi *et al.* (2023). Rhodes *et al.* (1960) reported that certain qualities appear to favour duck eggs over chicken eggs, these include greater stability to storage deterioration, less evident chalaza, reduced darkening around the yolk of hard-boiled eggs and reduction in volatile sulfide. Duck eggs have a great potential economic value as they are rich in omega-3 fatty acids (Sinanoglou *et al.*, 2011). Omega-3 fatty acid supplements are beneficial in improving the appetite, weight, and quality of life in individuals with advanced-stage cancer and cachexia (Colomer *et al.*, 2007). While ducks offer various advantages over chickens, and their eggs are nutritious, the demand for duck eggs in Odisha is generally lower than that for chicken eggs. In some pockets, there is an exception, but overall, consumers in the region are often uninterested in purchasing or consuming duck eggs at a higher price compared to chicken eggs. Even with lower duck egg prices consumers are reluctant to purchase the eggs. Furthermore, even though ducks have been raised in the country for many years, there is limited information available regarding their use as food, despite the fact that their eggs have been utilized

for consumption. Rhodes *et al.* (1960) reported that certain qualities appear unfavourable to duck eggs and these are firm white, the tough shell membrane and the prejudice encountered concerning the use of duck eggs for food. They suggested investigations which should include a detailed consumer acceptance study. Bose and Mahadevan (1956) stated that duck eggs could be substituted successfully for chicken eggs when they are hard-boiled, fried, poached, or scrambled. However, recent studies are limited on these aspects. With this perspective in mind, the current study aimed to explore consumers perception toward duck eggs, identify any negative attributes associated with them, and understand the culinary preferences of those who purchase and consume these eggs.

The present study was conducted with a survey of consumers visiting the Regional Centre of ICAR-Central Avian Research Institute, presently known as Regional Station, ICAR-Directorate of Poultry Research, Bhubaneswar, Odisha sale counter to purchase duck eggs for table purposes. A structured directional interview schedule was prepared and the consumers were asked the following questions; Does he or she like duck eggs for consumption more than chicken eggs? If he or she is purchasing duck eggs for consumption, what are the attributes he or she perceives that deter him or her from consuming more duck eggs than chicken? The feedback answers of the consumer or purchaser for the specific question were recorded. Even many consumers replied with more than one attribute and the same was recorded. It is to mention here, that the duck egg price at the station counter is always less than the market price of chicken eggs. Further, to know what dishes/culinary the consumers are preparing out of duck eggs for consumption, they were also surveyed as this will help to know the consumer's preference for dish/culinary of duck eggs. The consumer (he or she) was asked about the dishes/culinary they like to prepare from duck eggs for consumption. Many consumers prepared more than one dish out of duck eggs for consumption so the same

was recorded for each consumer. The data thus collected were analyzed for frequencies, and percentages were calculated based on the total number of respondents. Consequently, in some questions, the total percentage may exceed 100, as several consumers provided answers involving different combinations. Percentage and frequencies for different combinations of attributes and dishes were calculated to know the best combination of dishes the consumer prefers to consume. The data were analyzed using standard statistical methods to calculate descriptive statistics such as frequencies and percentages as per Snedecor and Cochran (1994).

The perception and or feeling of the consumer consuming duck eggs are presented in Table 1. From a perusal of the results, it was observed that out of the total consumers purchasing duck eggs, 25.53 % of them informed that duck eggs taste good and have no negative attributes compared to chicken. Perhaps they are the regular consumers of duck eggs and they prefer and are well adapted to the duck egg culinary for consumption. The remaining people have some negative perceptions of duck eggs and their consumption as they purchase the duck eggs out of curiosity to taste duck eggs or due to the lower price of duck eggs and or larger size of eggs. Many consumers are also repeatedly visiting the centre to purchase duck eggs though they have some negative perceptions of consuming duck eggs. The maximum number of consumers (42.90%) informed about the fishy odour/ smell of duck eggs during consumption. In our country, many consumers and in many pockets like the fishy smell of duck culinary or preparation, but in this study the fishy odour was informed by many consumers that deter them from consuming it compared to chicken eggs. Studies have shown that the fishy odour

of duck eggs was stronger than that of chicken eggs and it is due to the presence of trimethylamine (TMA). It is also reported that fishy odour perception ability was affected by the gender and region of the evaluators (Li *et al.*, 2019). This is in agreement with the findings that many consumers reported the fishy odour of duck eggs and it is also true that in many parts and pockets of the country, the perception of fishy odour also varies. This coincides with the case of 25% of the consumers, who did not report any fishy odour in duck eggs. In India, Jalaludeen and Churchil (2006) reported that duck eggs have a stronger flavour than chicken eggs which can be compensated by the use of onions, peppers, mushrooms and cheese. This is in agreement with the fishy odor as reported by many consumers in the present study.

More than 35% of the respondents informed that duck eggs are less tasty compared to chicken eggs. This is as per their perception. It may be because the consumers are more associated with chicken eggs though they have developed some affinity to duck eggs and the taste variation needs to be further studied. Since the availability of duck eggs in the market is less compared to chicken eggs the adaptability to duck eggs taste may not be there. Another negative attribute as informed by the consumers was the hardness of boiled eggs during consumption compared to chicken eggs. This may be due to the bigger size of the duck eggs and it contains more outer and inner albumen compared to chicken eggs thus giving more hardness to the boiled egg. Chicken eggs are smaller and the thick and thin albumen are less compared to duck eggs and thus are less hard than duck eggs. Besides, the consumers also reported an increase in body temperature or warming of the body after consumption of duck eggs as a negative

Table 1. Perception of consumers regarding different attributes of duck eggs (n=2832)

Sl. No.	Attributes of duck eggs	Frequency	%
1	Good taste or no negative attributes (G)	723	25.53
1	Fishy odor (F)	1215	42.90
2	Less tasty compared to chicken egg(L)	1013	35.77
3	Hardness of boiledegg during consumption compared to chicken eggs (H)	1018	35.95
4	Body temperature increases after consumption or warming of body after consumption (W)	809	28.57

attribute. This may be mostly due to the larger size of duck eggs than chicken. Further, a duck egg contains more nutrients both with respect to albumen content and yolk content. The larger yolk in a duck egg also contains more fat than the chicken eggs. This may be the reason for the warming of the body after consumption of duck eggs. But this may be considered as a positive attribute if the consumption is during the winters. However, consumer perceptions of these four attributes make sometimes duck eggs more unpopular than chicken eggs. The consumers should be informed about the good qualities of the duck eggs so that their perception will change thereby increasing the popularity of duck eggs among the consumers. The above negative attributes as informed were reported by the consumers in single or in different combinations and many consumers informed more than one or two negative attributes of duck eggs than only one negative attribute and the same are summarized in Table 2. As discussed earlier after keeping aside 25.53% of the total consumers who

have no negative perception of duck eggs, the negative attribute having the highest % was fishy odour (12.22%); indicating 12.22% of the consumers reported only one negative attribute of duck eggs *i.e.*, fishy odour (F). As discussed, fishy odour perception of the consumers varies according to gender and region of consumers and is due to the presence of TMA (Li *et al.*, 2019). Other single attributes like less tasty than chicken egg (L), hardness of egg during consumption (H) and warming of body after consumption (W) are informed by a very low number of consumers and the total of the three was only 7.56%. The respondents informing two negative attributes in combination revealed that F and L, F and H, H and W and L and W, L and H were higher and the total % of two negative attributes in combination was 41.71%. This indicated that more than two negative attributes were informed by the majority of the consumers. Among the six combinations of two attributes, combination F + W was less than other combinations. The three attributes combination varies from 2.47 to 4.20% and

Table 2. Attributes as informed by the consumers for duck eggs in single and different combinations (n=2832)

Sl. No.	Attributes or attributes combination	Frequency	%
1	G	723	25.53
2	F	346	12.22
3	L	105	3.71
4	H	69	2.44
5	W	40	1.41
6	F + L	239	8.44
7	H + W	207	7.31
8	F + H	243	8.58
9	L + W	182	6.43
10	F + W	101	3.57
11	L + H	209	7.38
12	F + L + H	83	2.93
13	F + L + W	70	2.47
14	L + H + W	119	4.20
15	F + H + W	80	2.83
16	F + L + H + W	6	0.21

G= Good taste or no negative attributes, F= Fishy odour, L=Less tasty compared to chicken egg, H= Hardness of egg during consumption compared to chicken eggs, W= Body temperature increases after consumption or warming of body after consumption by consumer

the total of three negative attributes as informed by the consumers was 12.43%. Consumers who informed all four attributes of the duck eggs were very less and only 0.21%. This indicates that the majority of the consumers informed two negative attributes followed by single attributes, combination of three attributes and then all four negative attributes. Rhodes *et al.* (1960) reported that duck and chicken scrambled eggs both have good flavour. They also informed that the shell appearance of duck eggs is less pleasing than chicken eggs and some individuals refuse to consume duck eggs. However, in the present study, many consumers reported the perception of fishy odour. The results suggest that a considerable number of consumers who purchase duck eggs hold negative perceptions and feelings towards them. Addressing these concerns is crucial and can be achieved through various methods such as research, education, and raising awareness about the positive qualities of duck eggs. By informing consumers about the nutritional benefits and other positive aspects, there is a potential to increase consumption, subsequently driving up demand. This, in turn, could lead to higher remunerative prices for farmers, ultimately fostering an increase in duck production in the country.

The consumers or purchasers of duck eggs visiting the centre were also asked about the dishes/culinary they prepare for consumption and the dishes/culinary informed were omelette (Om), Bhujia or scrambled egg (Bh), Boiled egg (Bo) and Egg curry (Cu). The responses of the consumers are presented in Table 3. It was observed that 64.8 % of the total consumers like to consume duck eggs as scrambled eggs whereas 60.88% informed that they also consume duck eggs as egg curry. Boiled eggs and omelettes were also consumed by more than 50% of the consumers from duck eggs.

The results revealed four types of dishes or culinary preparations made from duck eggs, and it was observed that a majority of consumers prefer to enjoy either one or a variety of dishes made from duck eggs. The consumption patterns of different dishes or dish combinations are presented in Table 4. From a perusal of the data, it is evident that the duck eggs as single dishes are not reported by many and the number

of such respondents is less than 1%. This indicated the versatility of the duck eggs as it is consumed in different dishes/culinary preparations rather than one particular dish. Bo + Cu as dishes were consumed by more than 23% of the people followed by Om + Bh. Most of the consumers consume duck eggs in two dishes followed by three dishes, all four dishes and a single dish. This study unveiled that the culinary preparations made by consumers using duck eggs closely resemble those made with chicken eggs, and there are no distinct, special dishes specifically associated with duck eggs. Moreover, instead of sticking to a single dish, consumers tend to consume duck eggs in the form of preparations comprising two or three different dishes.

Only a single preparation or all four preparations was reported by a very small number of the respondents. Bose and Mahadevan (1956) reported that duck eggs can substitute chicken eggs when they are hard-boiled, fried, poached or scrambled. The present findings are in agreement with the study and instead of poached eggs they are consumed as omelettes and for egg curry the boiled eggs are fried in oil and then used for preparation of egg curry in Odisha. Preserved duck egg, also known as pidan, century egg, hundred-year egg, thousand-year egg, or thousand-year-old egg, is a unique Chinese delicacy used in many traditional dishes. Preserved eggs are highly popular in China and some other Southeast Asian countries, such as Thailand and Malaysia. In China, about 1.5 million tons of fresh duck eggs are processed into preserved eggs every year (Zhao *et al.*, 2014). These preserved egg preparations are not being prepared in India and need to be tried and consumers may be given an option to consume the preserved duck eggs. Jalaludeen and Churchil (2006) reported that a duck egg is best for the preparation of scrambled eggs. They also reported about the duck egg dishes like boiled eggs, stuffed egg or devilled eggs, coddled eggs, roasted eggs, egg omelettes and poached eggs. In the present study, the highest number of consumers reported a preference for scrambled eggs, while preparations such as boiled eggs and egg omelettes also emerged as popular dishes among consumers who consume duck eggs in Odisha.

Ducks are popular in coastal states as well as

Table 3. Preparation of different dishes for consumption out of duck eggs as informed by the consumers (n=2597)

Sl. No.	Dishes prepared from duck eggs	Frequency	%
1	Omelette (Om)	1328	51.14
2	Bhujia or scrambled egg (Bh)	1683	64.81
3	Boiled egg (Bo)	1483	57.10
4	Egg curry (Cu)	1581	60.88

Table 4. Preparation of different dishes and dish combinations for consumption of duck eggs as informed by the consumer (n=2597)

Sl. No.	Dishes or dish combination	Frequency	%
1	Only Omelette (Om)	7	0.27
2	Only Bhujia (Bh)	2	0.08
3	Only Boiled egg (Bo)	15	0.58
4	Only Egg curry (Cu)	10	0.39
5	Om + Bh	507	19.51
6	Om + Bo	104	4.00
7	Om + Cu	46	1.77
8	Bh + Bo	195	7.51
9	Bh + Cu	182	7.01
10	Bo + Cu	622	23.95
11	Om + Bh + Cu	358	13.79
12	Om + Bo + Cu	110	4.24
13	Om + Bo + Bh	184	7.09
14	Bh + Bo + Cu	137	5.28
15	All items	116	4.47

in other states having large water bodies like lakes, ponds, river canals, water reservoirs, etc. Duck eggs are consumed by consumers and they have some negative attributes in comparison to chicken eggs. About 25% of consumers express a liking for duck eggs. However, among other consumers who consume duck eggs, some reported negative feed back such as a fishy odor, lesser taste compared to chicken eggs, hardness of boiled eggs during consumption, and a warming up of the body after consumption. Consumers commonly prepare dishes such as omelettes, scrambled eggs, boiled eggs and egg curry when incorporating duck eggs into their meals. A noteworthy finding is that many consumers enjoy more than one dish or culinary preparation using duck eggs. Our study emphasizes the importance of educating

consumers about the positive qualities of duck eggs to enhance their consumption. Additionally, addressing the negative attributes reported by consumers will require further detailed investigation to mitigate the issues. Exploring the potential for creating other exotic products from duck eggs and testing their suitability in our country could be beneficial. This approach will not only enhance duck production but also boost consumption, ultimately ensuring remunerative prices to the farmers from duck farming.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

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