DEVELOPMENT AND EVALUATION OF JAPANESE QUAIL EGG PICKLE PRODUCT TO ENSURE FOOD AND NUTRITION SECURITY

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ABSTRACT

The aim of the present study was to standardize and evaluate and acceptance of Japanese quail egg pickle. A simple, cost-effective and efficient technology need to be developed for pickling of Japanese quail eggs for storage at ambient temperature and marketing it in a ready-to-eat form for at least 6 months. Results on sensory evaluation revealed that highly acceptable nutrient rich Japanese quail egg pickle prepared by soaking in citric acid solution was superior than those made from other trials and recorded highest sensory score of 8.0. Storage study showed that the pickles stored in both food grade pouches and glass bottles could be stored up to six months. Training programmes were organized to demonstrate Japanese quail egg pickle production among farmers, farm women and SHG women. Feedback of the farmers and SHG showed that the Japanese quail egg pickles was tasty and can be used as side dish for any food item, easy to prepare and market. A case study on a successful entrepreneur showed that Japanese quail egg pickle had a good demand among the people suffering from respiratory problems. The pickle was sold as 200g bottle with a profit margin of 40 per cent. Developed Japanese quail egg pickles are also sold in 200 g bottle at the KVK Rural mart with FSSAI license and labeling.

Key words: Citric acid, Egg pickling, Japanese quail egg, Shelf life, Nutritional quality

INTRODUCTION

The eggs have been documented as one of the best sources of high-quality protein which contains all essential amino acids for human diet throughout the world. The high protein content of egg makes it an excellent potential protein source for food industry applications. In addition to high-quality proteins, the egg is also a good source of valuable vitamins, minerals, and growth factors. (Genchev, 2008). Poultry products mainly eggs contribute greatly to the achievement of the nutritional adequacy of the public; the egg is a food that is very good for children who are growing because it contains nutrients such as a complete protein, fat, vitamins and minerals that are easy to digest. Japanese quail products have gained popularity in the last few years by

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consumers. Japanese quail scientifically called as *Coturnix coturnix japonica* is the smallest avian species for meat and egg purpose.

Japanese quail was first domesticated in Japan as a source of both egg and meat, and it spread all over the world (Mizutani, 2003). Japanese quail is one of the most promising sources of livelihood to accomplish the demand for high protein egg with positive health benefits. The nutritional value of Japanese quail eggs is 12.8% protein and 11.5% fat, which is not less than the nutritional value of chicken eggs. Japanese quail egg is believed to have medicinal properties apart from its nutritional treasure and is a more appropriate choices for the nutritional security of the rural and urban poor who have limited access to other sources of dietary components. (Tunsaringkaran, *et al.,* 2013)

Many people especially in Asian countries consume Japanese quail eggs as reported by earlier studies that Japanese quail eggs are packed with vitamins and minerals even with their small size, their nutritional value is three to four times greater than chicken eggs. Regular consumption of Japanese quail eggs helps fight against many diseases which is a natural combatant against digestive tract disorders such as stomach ulcers. Japanese quail eggs strengthen the immune system, promote memory health, increase brain activity and stabilize the nervous system. They help with anemia by increasing the level of hemoglobin in the body while removing toxins and heavy metals (Kovacs-Nolan *et al*., 2005). The nutritional value of Japanese quail eggs is much higher than those of other eggs with rich antioxidants, minerals, and vitamins. They give us a lot of nutrition than do other foods (Lalwani, 2011). A simple, cost-effective and efficient technology needs to be developed for pickling of Japanese quail eggs for storage at ambient temperature and marketing it in a ready-to-eat form for at least 6 months. Low moisture and reduced pH are the two major factors contributing to shelf stability of the pickles. Pickling also helps in improving desirable characteristics like taste and flavor along with preservative effect (Das *et al.,* 2007). Sensory attributes are one of the most important factors which control the consumers' acceptance and preference of food products and their purchase intent. The overall quality of any food product is related to several sensory attributes like appearance, texture and flavor (Girdhari and Siddapa, 2014). Texture is also one of the most important sensorial quantitative characteristics of pickle and its effect on product acceptance by the buyer is crucial (Khaskheli *et al.*, 2015). The present study was undertaken to prepare Japanese quail egg pickle by use of different preservatives, to observe shelf life and also to assess the overall acceptability of pickle by sensory evaluation and transforming of the technology to SHG women so as to start an entrepreneurship.

MATERIALS AND METHODS

Processing of raw ingredients

Japanese quail eggs were procured from Post Graduate Research Institute of Animal Sciences, Kattupakkam and

other ingredients such as spices, ginger, garlic, green chillies, curry leaves, oil, chili powder, salt and class II preservative (sodium benzoate) were purchased from the local market. The Japanese quail eggs were boiled, shell removed and pricked using sterile needle and soaked in three different media (Table 1). Ginger and garlic were cleaned and ground into paste without addition of water. Green chillies and curry leaves were cleaned and ground coarsely. Cumin seed, asofoedita and mustard was roast, powdered and kept aside. Coriander, cloves, cinnamon, cardamom, aniseeds, black pepper and fennel seeds were roasted and powdered. All the paste and powders were mixed and fried in vegetable oil. To the boiled and soaked Japanese quail eggs, the fried mixture was added. Salt, chili powder and turmeric powder was added and the whole content was fried for five minutes. Finally, food grade preservatives were added to the pickle and packed in sterile bottles and stored in cool dry place.

Experimental Design

Japanese quail egg pickle was prepared in three different medias as per the composition given in the Table 1 and pictures of the method of preparation is presented in Fig.

Sensory evaluation and acceptability test of the pickle

Sensory attributes of foods are important indicators of acceptability and sustainability of processed foods in the ever-growing processed food market. The consumer acceptability of developed Japanese quail egg pickles was evaluated for organoleptic quality attributes by ranking the responses using a 9-point ranking test method. The 40 panelists were selected from women entrepreneur of Maraimalai Nagar, Kancheepuram District, Tamil Nadu. Panelists were asked to give scores for characteristic colour, flavour, texture, taste and overall acceptability of the developed

Table 1. Ingredient composition of pickle medium

Trial	Treatment
I	Boiled Japanese quail egg +2 per cent salt + spice masala + 2 percent class II preservative and store in sterilized glass bottle and food grade pouches
II	Boiled Japanese quail egg + 10 per cent vinegar(acetic acid) + spice masala + 2 percent class II preservative and store in sterilized glass bottle food grade pouches
III	Boiled Japanese quail egg + 2 per cent citric acid + spice masala + 2 percent class II preservative and store in sterilized glass bottle food grade pouches

Table 2. Mean(±SD) score for sensory attributes of Japanese quail egg pickle

Trials	Sensory attributes				
	Colour	Flavour	Texture	Taste	Overall acceptability
Trial I	7.3±0.10	7.2±0.51	7.2±0.51	7.2±0.51	7.0±0.14
Trial II	7.0±0.14	6.4±0.13	7.4±0.15	6.8±0.43	6.6±0.45
Trial III	7.5±0.15	7.6±0.27	7.6±0.16	7.8±0.35	8.0±0. 65

Japanese quail egg pickle. The scale was arranged such that 9 = like extremely, 8 = like very much, 7 = like moderately, 6 = like slightly, 5 = neither like or dislike, 4 = dislike slightly, 3 = dislike moderately, 2 = dislike very much, 1 = dislike extremely.

Shelf-life study for the developed product

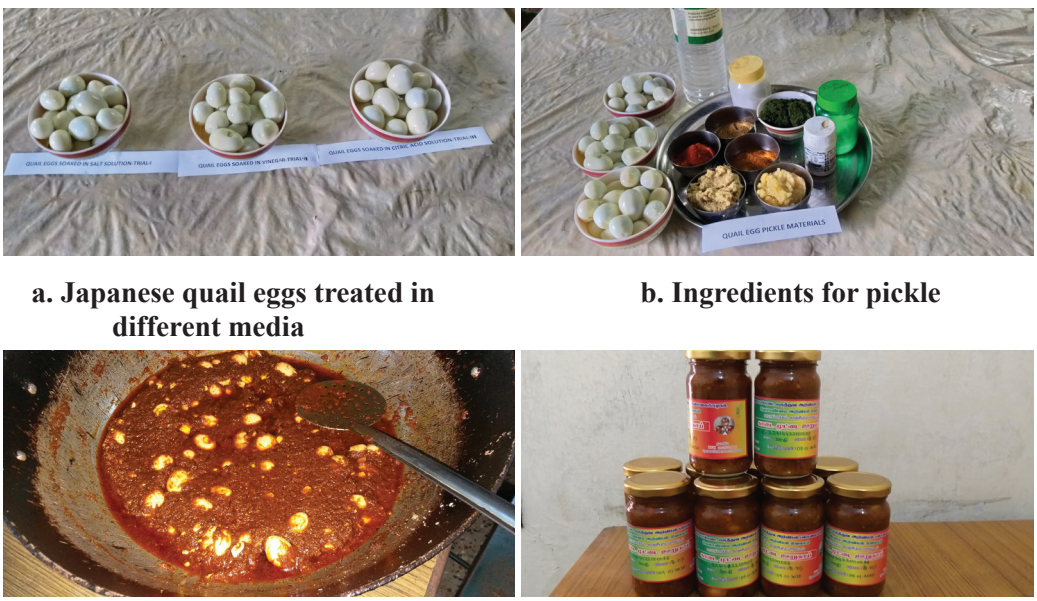
The storage study was carried out to assess the shelf life of the prepared product. The product was also checked for quality and packed in food grade flexible pouches. Low density polyethylene package was used with two thicknesses (300 and 400 gauges) and glass bottles and stored in room temperature. The experiment was conducted for a period of six months. Observation was recorded at the end of every month for the period of up to 6month in order to see any change in colour, flavor, texture and appearance.

Technology transfer and marketing of the product

Training programmes were organized to demonstrate Japanese quail egg pickle production among farmers and SHG women. Technologies such as production, packaging, labeling, licensing and marketing of the product were transferred to the trainees.

RESULTS AND DISCUSSION

Results on sensory evaluation revealed that highly acceptable nutrient rich Japanese quail egg pickle prepared by soaking in citric acid solution was superior than those made from other trials and recorded highest sensory score of 8.0, followed by soaked in salt solution. So, this indicated that color, flavour, texture, taste of Trial III is more acceptable than the others. Trial II recorded



a. Japanese quail eggs treated in different media

b. Ingredients for pickle

c. Prepared Japanese quail egg pickle

d. Final product

Fig. Treatment of Japanese quail egg in different Medias for pickle

less taste and other attributes because of the vinegar flavor. Pickled Japanese quail eggs are an acceptable market product and the results were on par with results of Bayomy *et al.* (2017). Table 2 gives the mean score for sensory attributes of the Japanese quail egg pickle.

Storage and shelf stability of Japanese quail egg pickle

Packaging of food products is necessary to prevent contamination and damage during transport and storage. Packaging materials provides clarity as well as protection against insect and moisture. Low density polyethylene bags are often used for packaging of food products. The developed product can be stored up to six months without any deterioration in different flexible pouches under ambient storage conditions

Three different samples of Japanese quail egg pickles were stored at room temperature of 30°to 32° C from one to six months. The effects of storage time on physical properties such as colour, flavour and texture of the pickles were studied. The developed Japanese quail egg pickles were in good condition even after 6 months. There was no change in colour, flavor and texture in T-III and T-I, whereas in T-II slight vinegar flavor was present but do not find any deterioration in all three samples. The covering of oil as well as proper concentration of salt helped to prevent microbial contamination and vinegar and acetic acid helped to maintain the proper *pH* of the pickle concentration of salt and class II preservative were added which helped to extend the shelf life even after six months.

CONCLUSION

Japanese quail egg pickle prepared by soaking in citric acid showed highest sensory score of 8.0 with all sensory properties. Storage study showed that the pickles packed in both food grade pouches and glass bottles could be stored up to six months and renders good market potential. The developed Japanese quail egg pickles were sold through KVK Rural mart in 200g labelled bottles with a profit margin of 40 per cent with *FSSAI* license. This product can be scaled up to the SHG women and entrepreneurs by transferring the technology through training programmes and demonstrations. The development of products like pickles can be used as an alternative to store the eggs for long duration through processing and thereby increasing the profit and consumer acceptability. Nutrient rich Japanese quail egg product can be more appropriate choices for the nutritional security of the malnourished poor who have limited access to other sources of dietary components.

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