Int.J.Curr.Microbiol.App.Sci (2020) *9*(4): 1030-1039

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 9 Number 4 (2020)**
Journal homepage: http://www.ijcmas.com

Case Study https://doi.org/10.20546/ijcmas.2020.904.122

Performance Evaluation and Cost Estimation of Papad Making Process with Papad Press Machine & Prepared Papad Compared with the Commercial Market Sample

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Keywords

Black gram, Green gram, Papad making process, Traditional process, Papad press machine, Cost estimation, Commercial market Papad

Article Info

Accepted:
10 March 2020
Available Online:
10 April 2020

A B S T R A C T

India is the center of diverse food cultures comprising more than 1000 major and minor ethnic fermented and no fermented foods. One of the key players in ethnic foods which have been locally and globally marketed is papad. Papad, a low moisture traditional Indian savory food item is consumed either after frying or roasting. It is being manufactured on cottage or home scale and has been in a great demand in India and abroad. Traditionally, circular in shape, made from dough of powdered pulses (black gram, green gram), spices, common salt, edible oil, papad khar, containing sodium carbonate or sodium bicarbonate and calcium propionate. Conventionally papads making method involves preparation of dough using urid, spices, common salt, papad khar, edible oil etc. with required quality of water, beating of dough tip soft, making dough rounds (ball) rolling into circular disc, using rolling pins (roller manually). The rolled papad (circular dough disc) are dried under shade to a moisture content of 13 to 14 per cent (w.b.). Traditional method of rolling with pins (roller) is a very tedious and time consuming; hence yield of papad was also very low. Keeping the aforesaid view, the hand operated papad press available in the department of P.H.T. at C.A.E., Pusa, Bihar was planned to evaluate the Papad making prcess . This machine is faster, simple in operation and very efficient; its capacity is 150 papads per hour. Since it is very easy to operate, so ladies can also operate without any difficulty. Its production is four times greater than old system and it requires no power. Thus, the machine (hand papad press) can be used efficiently for the production of papads by village women and can generate income as well as employment to many unemployed youth at village level.

Introduction

Among the traditional savoury food, 'Papad' also known as Appalam, papadam, is a popular tasty food item in Indian dietary science times immemorial and is in great demand always because most of the people like papads as one of the items in the daily

lunch and dinner menu to make the food tastier. It is a low moisture food consumed either after frying or roasting or as an adjunct with vegetable soups and curries. Snack foods, ready to eat foods, convenient foods etc. are in a great demand as a part of diet both in developing and developed countries.

There has been a growing demand of this important class of savoury product (papad) in India and abroad. Reported data reveals that during 1976-80, papads worth about RS.221.8 lakh were exported from India (Pruthi *et al.*, 1984). The demand for Indian papades increased further, leading an export of 3343 tonnes papads worth Rs 49 millions in 1986-86.During1988-89 papads of worth Rs. 64 millions were exported (Kulkarni et at 1996).

Conventionally papads making methods involves (a) preparation of dough by mixing pulse flours (Urid), spices, common salt, papad khar, edible oil, etc. with required quantity of water (b) beating of dough to softer (c) making dough rounds (balls) (d) rolling into circular disc using rolling pins (rollers) manually. The quantity of water to be added for the preparation and thus initial moisture content of papad dough varies from 55 to 65 percent (w.b.).

The proximate composition of different spicy papads available commercially has a wide variation (Pruthi *et al.*, 1984 and kulkarni *et al.*, 1996). Papads are rolled manually by woman at cottage or home level to a mean diameter and mean thickness of 15.8 to 18.6 cm and 0.72 to 1.27 mm, respectively for north Indian papads. The mean diameter of south Indian papads varies from 6.5 to 8 cm.

The rolled papads (circular dough disc) are dired under sun or shade to a moisture content of 13 to 14 per cent (w.b.). Final moisture content of the dried papad is the most important factor to keep the product in good condition during storage.

Care should be taken while drying the papad, the papads should neither be over – dried nor damp moisture content may lead spoilage in quality during storage. If under dried, fungal attack occurs during storage. Papads are generally packed in polythene bags and could be stored for 4 month safely at room temperature.

Keeping the above view the hand operated papads press available in the department of post Harvest Technology at C.A.E., Pusa, as planned to evaluate for making papads. The machine is faster, simple in operation and very efficient. A cost economics analysis of the machine (hand press for papads) can be used efficiently for the production of papads by village woman and can generate income as well as employment to many unemployed youth.

This will also provide good quality papads to the local/rural or urban people at low cost as compared to commercial papads. This project is also taken up to optimize the proper preposition of mung dal flour with urid to obtain a suitable blend acceptable organoleptically. This will give a new variety of papads over the traditional urid papads improving its taste and quality. Therefore a main objective for the planned project work was taken as a:

Performance evaluation and cost estimation of papad making process with papad press machine & prepared papad compared with the commercial market sample

Materials and Methods

In order to describe the method and experimental set up the details are given in following sub –heads

Independent variables

Different prepositions of Urid –Moong dal flour -5 levels.

(1) 100 per cent Urid without Moong (100:o)
(2) 60 per cent Urid + 40 per cent moong (60:40)
(3) 50 per cent Urid +50 per cent moong (50:50)
(4) 40 per cent Urid +60 per cent moong (40:60)
(5) Moong (0: 100)

Machine parameters were fixed as per the recommendation of the manufacturer.

Dependent variables

Physical characteristics (diameter, thickness, moisture content and weight)

Sensory or Organoleptic characteristics (Texture, Colour, Flavour, Appearance, Taste, Overall acceptability)

Hand papad press machine available at P .H T. Department, College of Agril. Engg, Pusa, Bihar was used to press the papads during experimentation. The press is based on the design of CFTI, Mysore and manufactured by A.M Engineering, Patna (Bihar). The systematic diagram of the machine is shown in Fig. 1. It consists of rectangular plat –from, lower disc, upper movable disc, lever assembly and a handle. The machine is simple in operation.

Some of the specific futures of the machine

The specific features of the hand papad press as per the manufacture recommendations are listed as below:

Production per hour per machine
Diameter up to 8" – 150 Nos.
South Indian papads 450 to 600 nos.
Production four times than old system
Very easy to operate
Ladies can operate conveniently
No need of power
Income Rs. 125/per day on a set of two machine
One person operate one machine
Need nominal investment
Papads manufactured on these machines are round
Papads of desired thickness can be made

The quantity of different ingredients used to prepare each 250 g sample of both the dal Urid and Moong flours is listed as follows

Blends of urid and moong : The prepositions of Urid and Moong Dal flour were 100:0, 60:40, 50:50, 40:60 and 0:100, respectively.

Black pepper : 6.25g
Iodized salt : 13.75g
Hing [Asfoetida] : 0.5g
Mustard oil : 10 g
Sodium bicarbonate (meetha soda) :12.5 g

Method of preparation of papad

Number of steps involved in preparation of papads

Mixing all above mentioned ingredients and beating the dough properly

All the ingredients mentioned above are weighted using electronic balance with an accuracy of 0.001 g. These ingredients were mixed together in a steel bowl by hand. The boiled and cooled water of 112.5 g (approximately 113 ml) was mixed to each sample to prepare the papad dough. The Hing was dissolve in hot water for 24 hour before dought making in a separate utensil to provide uniform mixing. Prepared dough was kept for an hour for obtaining moisture equilibrium.

After this the beating of dough using flat iron beater was done manually. The oil was added during beating. Beating time ranged from 20 to 30 minutes to obtain proper elasticity and softness of the dough. The dough should neither be sticky to adhere on polythene sheets nor be too hard to press into desirable diameter and thickness.

Making dough rounds balls

The prepared dough was rolled by hand to convert it into a cylinder of about 20 cm long and 2.5 to 2.6 cm in diameter. Care was taken to cut the balls (rounds) out of this cylinder, so that the size and weight of each ball may turn out to be same. The weight of a dough round was varied from 12.8 to 13.0 g.

Pressing dough rounds balls into papad and drying

The hand papad press machine was used to press the balls (rounds) into papads. First of all, the 20 pairs of thick processing polythene sheets (8" x 8") were lubricated slightly (only from inside) using mustard oil. The dough balls were kept in between each pair of the polyethylene sheets just in the centre. Then, this polyethylene sheet carrying a dough ball kept on the lower pressing disc of the hand papad press machine. Then, the handle was pushed down for 5 to 6 seconds to press the dough ball into papad. The prepared papad within the pair of polythene sheets was then removed from lower pressing disc and the upper sheet was removed easily leaving the surface of papad exposed to atmosphere for drying. The papad was allowed to dry upto 14.0 to 15.0 per cent moisture content. The drying time ranged from 5 to 6 hrs.

Physical and sensory quality of papad

Physical characteristics viz. Demeter, thickness, moisture content and weight of row papads were measured. The organoleptic quality of fried papads of each sample was also evaluated using 9 point hedonic scale. The details of the methods are given blow**.**

Physical characteristics of raw papad

The moisture content (per cent, d.b.) of raw dried papad were determined using standard air oven drying method at 102^0C for 24 hr. The diameter of 5 papad randomly selected from each lot (blend) was measured by ruler accurately in cm. The thickness was measured with the help of screw gauge in mm. For measurement of the weight the electronic balance was used.

Frying of papads

Dired papads were deep fried in mustered oil (in a metal Kadai) at approximately 185^0 for 20-30 seconds. Immediately after frying, papads were taken to quality assessment. Three replications for each blend were tired.

Organoleptic evaluation

Fried papad were evaluated by semi-trained panelists for colour, flavor, appearance, taste and overall acceptability, using a nine point Hedonic scale. The quality of prepared fried papads was also compared with the commercial market sample. The average score given by panelists were tabulated and frequency distribution histograms were drown for each blends along with market sample (spicy urid papad of Lijat brand).

Various result obtained during testing the hand papad press machine for different blends of Black and Green gram pulses flour for preparing papads. The assessment of quality parameters as resulted after organoleptic evaluation of fired papads are also presented in tabe.1. The result is being presented by frequency distribution histograms and suitable

tables as per the need and ease of discussion. The details of various result and pertaining discussion are given in following sub-sections:

Physical characteristics of row papads

Some of the physical characteristics of prepared raw papads using different blends of urid and moong dal flour were determined using standard methods as described in table 1. (Five replications for thickness, diameter and weight were taken), whereas, three republications to determined moisture content (per cent d.b.) were recorded. Table 1 shows the average values of physical characteristics with their standard deviations in parentheses. As it clear from the table that effect of blending moong dal flour with urid has not affected the physical properties significantly. The range with variation of average thickness was between 0.64 to 0.7 mm which was slightly more than commercial sample (0.51 mm) but it was within the limit of the ISI standards for papads.

The diameter of spicy commercial papads usually made of urid available in the grocery shops of Indian market have wide variation (pruthi et al 1984 and kulkarni, et al 1996) . The ISI standard (1972) for the diameter of raw papads recommends a range of 5- 23 cm, which show that wide variation in the diameter of papads are acceptable by people depending upon their taste, need and occasions. From table 1, it is clear that the diameter of prepared papads was ranged between 17.02 to 16.4 cm, which is more than the purchased market sample (15.1cm) . The addition of moong with blend or the per cent increase in the moong resulted in the slight decrease in the diameter of the papads . Thickness of papads also decreased minutely with the per cent of moong dal flour in the blend . Urid dal has binding property which helps in the preparation of soft and elastic dough, increasing the papad rolling properties which results is bigger and thinner papads . Due to this reason when the percentage of moong dal flour was increased in the blend,it produced smaller and thicker papads.

Oraganoleptic evaluations of fried papads

Prepared papads were fired in mustard oil as frying medium and evaluated using five - point hedonic scale. The average scores for different quality attributes of fried papads are calculated and tabulated in table 2.

The frequency distribution histograms for the texture of different blends of urid-moong dal flour along with market sample (Spicy urid papad) are plotted in Fig. 2. The prepared urid Papad without moong [S_1] has an average score of 8.44 which was found at par with the market sample as for as texture was concerned. The percentage of mung dal flour with urid caused a decreased in the taxure which is clearly indicated by the average scores for the samples in organoleptic

Colour of fried papads

Form the table 2, it is clear that the blending of mung dal flour with urid resulted in the decrease in the average score from 8.5. to 7.11. The colour of the papads prepared with 100 per cent urid was found similar to that of the market sample, indicating that the quality of ingredients and process of papad making was as per the standard with the commercial method. Dark yellow, yellow radish etc. were some of the remarks given by panelists to judge the colour of papads . The yellowness or darkening of prepared papads was observed to be increased with increase in the level of moong dal flour in the blend.

Flavour and appearance

Table 2 shown the average score, given by panalists during organoleptic evaluation for flavor were 8.2 and 8.1 for 100 percent urid and 60percent urid pus 40 percent moong, respectively, which were almost similar to the flavor of market sample (with 8.3 as average score) . The lowest score was slightly lower than the 100%moong dal flour for flavor in sensory evaluation .

Taste of fried papad

The taste is the important quality parameter as per the organoleptic evaluation in concerned. The average scores given by judges to fried papads prepared from different blends of urid-mung dal flour for taste are plotted in Fig. 3 and Table 2. The highest average score for taste was given to S_1 (100 % urid dal) as 8.8 which was found to be better than the market sample (8.6). The average score for the different samples were 8.1 for S_2 and S_3 and 7.8 for S_5 and 7.5 for S_3. These values indicate that the belding mung dal with urid dal was acceptable as for as taste is concerned, and all these samples except 100 percent moong was liked very much by the judge

Overall acceptability of prepared papads

The organoleptic evaluation tabulated in table 2, shows that all the samples were well acceptable by judges. The average score obtained by papads made out of different blends of mung were 8.1, 8.0, 7.4 and 7.1 for 40 per cent, 60 per cent, 100 pre cent and 50 pre cent mung dal in the blend, respectively. Papad with 50 precent blend were also found acceptable showing an average score of 7.1 which means that the product was liked by judges and can recommended.

Cost economics of papad making with hand papad press

Papad making is not an organised industry in our country but they are made by cottage or home industries. Rolling of papad is usually completed by roller (roller pin) which is made of wood by village women. Some ladies prepare (roll) papad for their home consumption only. As it is a very slow and tedious job, the resulted papads are sometimes not so good quality. The size and shape is also not uniform.

The hand operated Papad press will not only result in uniformity of Papads but also may help in income generation of the rural or village women. It will also provide employment to villagers. Keeping this in view, a cost economics of papad making with this Hand operated Papad machine was carried out before recommending it for entrepreneurship development. The details of the cost analysis of the operation with the machine are summerised in following steps:

Assumptions

Following assumption were made to calculated interest, Depreciation, salvage value etc:

As the machine is very simple and requires only 1 m x 1 m space, no building etc in needed

Life of the hand papad press (L): 5 years
Salvage value: 10% of the cost of machine
Interest rate : 12% an average investment
Hand papad press requires no repairs and maintenance cost if handle properly and if the discs are lubricated as per the instructions.
No. of working hours per year @ 8 hr. Per day (H): 2400hr.

The actual working days per year considered as 300 only. 65 days were excluded for heavy rainy season or causally etc.

Fixed cost

Initial cost of Hand papad press(C) : Rs. 3200.00

Cost of stainless steel bowls, trays and 2 big Polyethylene (for spreading papad) : Rs. 900.00

Cost of thick processing polyethylene sheets for pressing papad : Rs. 100.00

Total Fixed Cost : Rs. 4200.00

Salvage value (10% of the initial cost) S = 32000x 10/100= 320

Depreciation (D)

$$D = \frac{(C - S)}{LXH} = \frac{(3200 - 320)}{5X2400} = 0.24\ Rs/hr$$

Interest on capital investment (I)

$$I = \frac{(C + S)}{2} X \frac{i}{H} = \frac{(3200 + 1000 + 320)}{2} X \frac{0.12}{2400} = 0.113 Rs/hr$$

Total fixed cost= Depreciation + interest=0.24+0.113=0.353 Rs./hr.

Table.1 Physical characteristic of raw papads prepared with different blends of Black grams and green grams

Sample	Thickness (mm)	Average weight (g)	Moisture content (%d.b.)	Diameter (cm)
100% U + 0% M	O.64 (0.7)	11.94 (1.159)	14.05 (0.112)	17.02 (1.18)
60% U + 40 % M	0.67 (0.06)	11.96 (1.123)	14.02 (0.45)	17.07 (0.625)
50% U + 50 % M	0.67 (0.83)	12.28 (0.69)	14.01 (0.30)	16.37 (1.33)
40% U + 60 % M	0.067 (0.44)	12.16 (0.85)	13.95 (0.15)	17.07 (1.31)
0% U + 100 % M	0.7 (0.65)	11.92 (0.46)	14.01 (0.08)	16.4 (0.90)
Market Sample	0.51 (0.017)	12.39 (0.026)	14.04 (0.047)	15.1 (0.136)
ISI Standard	0.5-1.2	15-23	12-15	5-23

Table.2 Average score given by panelists to different samples of fried papads for organoleptic evaluation

Sample	Texture	Colour	Flavour	Apperance	Taste	Overall acceptability
100% U + 0% M	8.44	8.50	8.20	8.44	8.80	8.50
60% U + 40 % M	8.11	8.22	8.11	7.80	8.12	8.10
50% U + 50 % M	7.70	7.55	7.66	7.40	7.50	7.10
40% U + 60 % M	7.40	7.78	7.44	8.22	8.10	8.0
0% U + 100 % M	7.20	7.11	7.55	7.22	7.80	7.40
Market Sample	8.60	8.50	8.31	8.50	8.60	8.60

S.N.	Ingredients	Quality	Cost (Rs.)
1.	**Urid dal**	**6kg**	**180.00**
2.	**moong dal**	**4kg**	**112.00**
3.	**Kali mirch(Black pepper)**	**250g**	**80.00**
4.	**Hing**	**20g**	**36.00**
5.	**Salt**	**550g**	**3.30**
6.	**Sodium bicarbonate(Meetha soda)**	**10g**	**10.00**
7.	**Calcium propionate**	**10g**	**10.00**
8.	**Mustard oil**	**400g**	**52.00**
	Total		**Rs.483.30/day or Rs. 60.4/hr**

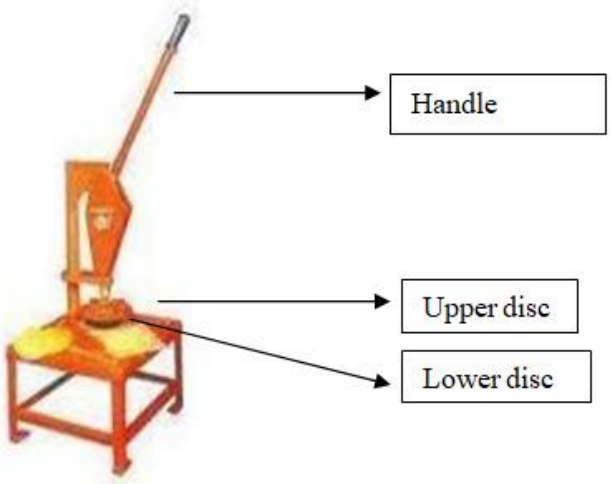

Fig.1 Hand press papad machine

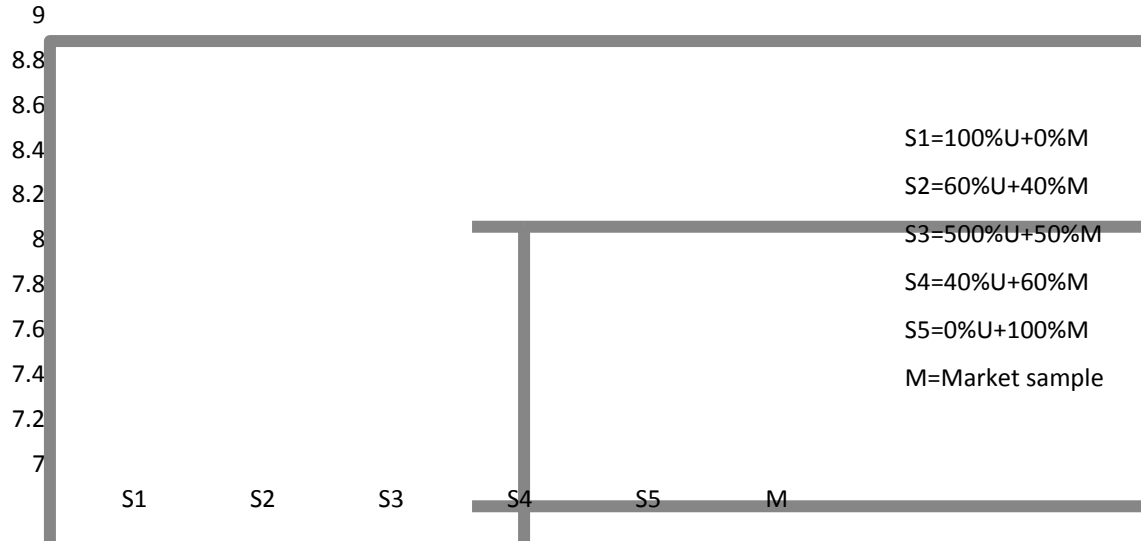

Fig.2 Frequency distribution histogram showing the variation in texture for different samples

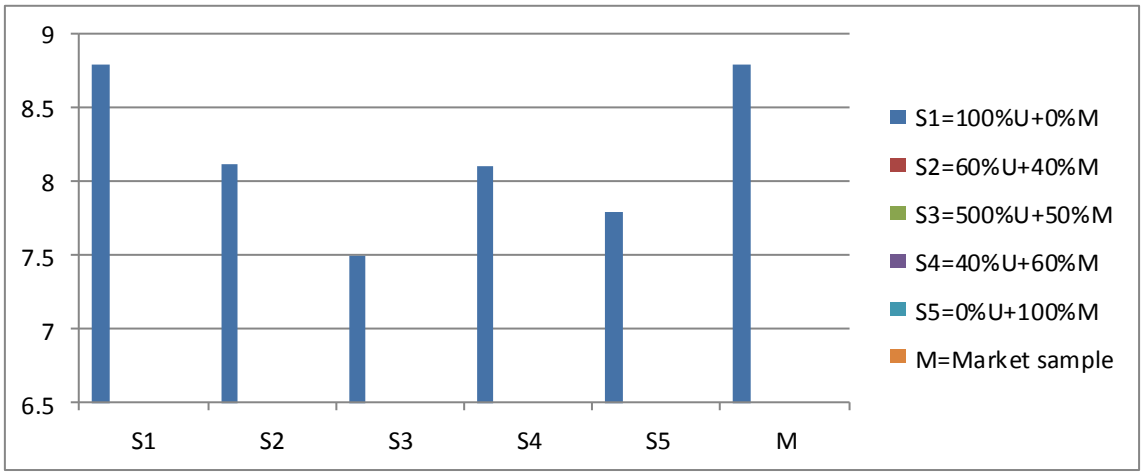

Fig.3 Frequency distribution histogram showing the variation in colour for different samples

Variable cost

Cost of materials/ingredients for papads using 60 per cent urid + 40 per cent
Moong dal flour Blend (Based on 10 kg of blend per day)

Labor required only one (1) labor charge = 5.6 Rs/hr @45 per day
200 Gauge polyethylene bags for packaging of papads
(Max. of 50 packets are needed per day) =5.6 Rs/hr

Total variable cost =
RS.60.4+5.6+18.0=Rs.74.0/hr

Total cost/hr (T) = Fixed cost + variable cost =0.35+74.0=74.35 Rs/hr ≈74.4 Rs/hr

The present study revealed that if the machine is operated 8hr. / day, approximately 12.5kg Papads (1200no.) are prepared, having a diameter of approximately 20 (cm).

If 250g packets are prepared for sale the no. of packets /day =50 packets.

If entrepreneur/village women/home scale industry people sells the papad @ Rs. 18 per packet of 250g. (as the market price of commercial urid papad is Rs 22 for same weight). The sale price (F) for 50 packet = Rs 900.00/ Day or = 900.00/8=Rs112.50/hr. F=11.25.

Total profit= Total sale price (F) - Total invest cost (T) = 112.5-74.4= Rs 38/hr.

Profit/day = 38X 8=304 Rs/day

Annual profit (2400hr) =38×2400=Rs.91200.

If an entrepreneurs or cottage industry or a village women utilize the hand Papad press for making papad he or she may earn a total nprofit of Rs.91200/annum.

If other family members co-operate and help in the process they don't have to pay for a labour thus increasing their income or profit.

References

Ahlawat, S.S., Berswal, I.S., Sahu, J. and Pathak, V. 1997. Studies on chicken meat blended papads. Indian journal of poultry Science. Vol. 32 (2), pp. 142-147.

Berwal, J.S., Dhanda, J.S. and Berwal, R.K. 1996 Studies on rice and turkey meat blend papads. J. food science and Tech. Vol. 33 (3), pp. 237 – 239.

Del Angel, A.R. and sotelo, A. 1982. Nutritive value of mixture using chickpeas with weat, triticale, normal and opaque – 2 –corns. J. Nutr. Vol. 112, pp. 1474-1480..

Kulkarni, S.G., Manan, J.k., Kishoral, M.D. and Shukla, I.C. 1996. Physico-chemical characteristics of commerical spiced papads. J. Food Science and Tech, Vol. 33(5).

Manan, J.K., Kulkarni, S.G., Agrawal, M.D. sukla, I.C. 1996. Survey of manufacture units. Method of preparation, packing and storage behaviour of papads manufacturing in Uttar Pradesh. Beverage and Food World. VOL.23 (5), pp.19-21.

Sexna, A.K., Manan, J.K., Kulkarni, S.g. and Shukla, J.C. 1996. Papad (a food adjunct) industry in India. A resume Indian Food Packer. Vol. 50 (6), pp. 102-111.

Sing, Narpinder; Bajwa, Usha and sekon, K.s. 1996. Pasting and papad quality of rice, wheat and mung flour blends. J. Food Science and Tech. Vol. 33 (3), pp 224-228.

Valencia, M.., Troncoso, R. and Higuera,I. 1988. Linear Programming formulation and Biological evaluation of chickpea based in fact foods. Cereal Chem. Vol.65, pp.101-104.

How to cite this article:

Meera Kumari, Kumari Shipra and Brijesh Kumar. 2020. Performance Evaluation and Cost Estimation of Papad Making Process with Papad Press Machine & Prepared Papad Compared with the Commercial Market Sample. *Int.J.Curr.Microbiol.App.Sci.* 9(04): 1030-1039.
doi: https://doi.org/10.20546/ijcmas.2020.904.122