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Research Paper

Process development and optimization of process parameters of masala tikki: Kashmiri spices

R.M. Shukla, Aasif Altaf, Naik Ishfaq Ali, , Saqib Rashid, Musaver G. Dug, Inayat Rashid Madiya Manzoor, Rishi Richa* and S. Faisal

College of Agricultural Engineering and Technology, Sher-e-Kashmir University of Agricultural Sciences and Technology, Shalimar, 190 025, Srinagar, Jammu and Kashmir (India)
*e-mail: *rishi.richa24@gmail.com*

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ABSTRACT

The research was conducted to prepare the Masala tikki and reduce the moisture content for enhancing the shelflife. The Kashmiri masala tikki or Werr act as flavoring agents, coloring agents. It is thick spice paste which is mixture of shallot, ginger, and different spices with edible oil. The aim was to standardize & optimize the process parameters of Masala Tikki using drying technology for extending the shell life. There are three independent variables garlic shallot ratio, drying temperature, and masala tikki thickness with three different variables which vary from 15:10 to 15:30, 40 to 60ºC and 0.5 to 1.5 cm respectively. Box Bhenken design - Response surface methodology was used for optimization of process parameters. The composition of garlic-shallot 22:16, drying temperature 60°C and 0.7 cm thickness of masala tikki are the optimized independent parameters and the response values were 39.529% db for final moisture content, 299.99 minutes for drying time, 3.816 for color change, overall acceptability of 7.4 and the optimized shelf life was 46 days. It is used for preparations of different Kashmiri cuisine such as Rajma, Chole, Shahi Paneer, Dham Aloo, Kadhai Chicken, Tandoori Chicken, wazwan.

Key words: Optimization, spice mixture, tikki, flavor, shelflife

Masala Tikki, known as "Werr," in Kashmiri, is a quintessential blend of Kashmiri spices, meticulously ground to perfection. This aromatic spice cake holds a special place in Kashmiri kitchens. standing as a testament to the rich tapestry of Kashmiri cuisine. Crafted from a harmonious mix of cloves, zeera *(Cuminum cyminum)*, red chili powder *(Capsicum annum)*, saunf powder *(Foeniculum vulgare)*, methur (fenugreek seeds) *(Trigonella foenum-graecum)*, a touch of turmeric *(Curcuma longa)*, garam masala, shallot *(Allium cepa var. Aggregatum)*, and ruhann (garlic) *(Allium sativum)*, Masala Tikki caters to those who prefer a flavorful alternative to Hing, despite both possessing significant medicinal properties.

Masala Tikki stimulates appetite and aids digestion by promoting the release of gastric juices, preventing indigestion and acidity. It is rich in phytonutrients, garlic, elevate metabolism and improve organ function *(*Amagase *et al.,* 2001; Alam *et al.,* 2018). Cumin has antioxidants properties (Nadeem & Riaz, 2012), Masala Tikki ingredients combat skin issues and inflammation. With carminative properties, Shallots, being a source of a variety of micronutrients, primarily offer small but useful amounts of vitamin B6 as the major core nutrient *(*Hedges *et al., 2007)*. This Masala Tikki could help to fight for bloating, flatulence, and nausea, ensuring a healthy gastrointestinal tract due to presence different natural spices and herbs. The presence of cloves and cardamom in Masala Tikki aids in combating bad breath (Kochhar *et al.,* 2008; Rajathi *et al.,* 2017). While some individuals, such as those with hyperactivity or ulcers, might need caution due to specific spice sensitivities (Pawar *et al.,* 2011). Statistically observed that majority 50.66% (36% males and 14.66% females) of rural and 46.5% (39.5% males and 7% females) urban respondents of Kashmir use Kashmiri masala tikki (wer) in some foods followed by 32.33% (25.33% males and 7% females) rural and 37.5% (23% males and 14.55 females) urban respondents using kashmiri masala tikki (wer) weekly (Sidiq *et al.,* 2016).

This spice formulation is ready-to-use for culinary preparations help to reduce drudgery of women in the kitchen, chef in restaurant and waza in wedding ceremony. Traditional Tikki preparations often suffer from challenges such as imprecise ingredient proportions, inadequate drying technologies, and lapses in hygiene and food safety protocols. Currently wet masala tikki is available in the market and because of water activity there is chance of microbial growth with storage period while on other hand available market tikki contain good amount of edible oil for enhancing the shelf life of tikki. Hence, drying could help to enhance the shellife of masala tikki and this could help to reduce the amount of oil added in mixture for enhancing the life.

Drying is an integral process, it involves the removal of water or solvents from solids, semi-solids, or liquids through evaporation. It could be a pivotal step in the production of Masala Tikki, ensuring its longevity, quality, and flavor. Thermal drying is an easy and well adopted operation **(**Raidh *et al.,* 2015). Among the myriad drying methods, hot air drying emerges as a transformative technique. This method operates by generating heat throughout the material, leading to faster heating rates and shorter processing times. Notably, regions within the material with higher moisture content absorb more energy, ensuring uniform drying, preserving the spice blends vibrant colors, aromatic profile, and authentic taste (Roy *et al.,* 2016). Furthermore, hot air-drying offers advantages such as space efficiency and remarkable energy conservation, making it an environmentally friendly choice (Krishnamurthy *et al.,* 2008). Challenges such as color variability and lack of stability are commonplace in processed spices, often due to enzymatic browning or non-enzymatic reactions, particularly the Maillard mechanisms (Bouraoui *et al.,* 1994; Feng and Tang, 1998; Prabhanjan *et al.,* 1995). Instead of fossil fuel, oven drying was used to mitigate the environmental issue (Mishra *et al* 2021).

These issues, coupled with the perishable nature of fresh ingredients like garlic and shallot, necessitate exploration into alternative preservation methods. Garlic-Shallot paste, a derivative of these aromatic ingredients, offers a solution. However, its limited shelf life underscores the urgency to explore advanced preservation techniques and develop value-added products, ensuring both flavor integrity and extended usability (Devi *et al.,* 2016). Preserving its essence through advanced drying techniques ensures a delightful culinary experience for enthusiasts worldwide, making it a timeless and wholesome addition to any meal. There is large scope to research in this field regarding drying, packaging and reducing the amount of oil amount. There is also novel drying technology that can also be available for checking the effect of drying technology on nutritional and medicinal value. There is also a scope to improve the packaging of masala tikki as oil get spilled out while transporting at long distance informed by tourist who visited Kashmir. Therefore, keeping all above cited issue in mind, the present work has been undertaken with the following objectives as no such work of drying of masla tikki is done for extending the shelf life was to standardize the process parameters of Masala Tikki and to optimize the process parameters of drying Masala Tikki for extending the shell life.

MATERIALS AND METHODS

The experimental setup and methodologies including data analysis the entire work was carried out in two phases. The first phase involved the standardization of Masala Tikki. Further details regarding the materials, methodologies, and experimental design are elaborated below.

STANDARDIZATION OF THE MASALA TIKKI: In response to spice consumption in Kashmir, a study was conducted. The focus was on preparing ready to use spice mixture for the consumption of spicy foods, junk foods, and dried vegetables. To address this, a Kashmiri spice mix, "Masala Tikki," was meticulously standardized. The standardization process involved precise ratios of Garlic, Shallots, Green Cardamoms, Black Cardamoms, Red Chilli, and other spices. The method included peeling, grinding, and meticulous mixing of these ingredients. Mustard oil was added to achieve consistency and shape.

SAMPLE PREPARATION:

- **(a) Raw Materials:** Fresh raw materials (Garlic and Shallot), spices such as green cardamoms, Black Cardamoms, Red Chilli powder) and Saunf Powder, Coriander Powder and Salt) and mustard oil were carried to the laboratory, which were procured from Shalimar market.
- **(b) Sorting, Peeling and Washing**: Shallots and garlic without any defect and infestation on visual inspection were sorted out by hand picking. The sorted shallots and garlic were peeled and then washed in normal water to remove soil and dust particles.
- **(c) Preparation of Garlic Shallot Paster:** Fresh Garlic and Shallots were chopped, washed to remove mud, and peeled manually. They were then processed in a mixer grinder with Ginger in specific weight ratios.

The resulting paste, combined with 0.01% Sodium chloride for stability, was uniformly ground and stored in a bowl. Mustard oil was added to achieve consistency and shape, the levels of chilli (20g), salt (5g), and oil (3ml) were fixed for taste and texture consistency.

(d) Preparation of spice mixture: Spice seeds, including Green and Black Cardamoms, and Cumin, were extracted from their pods. These seeds were ground into a fine powder using a mixer grinder. The resulting powder was mixed with Red Chilli, Saunf, Coriander, and Salt to create a uniform mixture, which was kept in a separate bowl.

(e) Preparation of Masala Tikki: Masala Tikki was created by blending the spice mix with garlic-shallot paste. 10g of Mustard oil heated to 60°C for removing the pungency from the oil. The garlic-shallot paste was first added, followed by the spice mixture, and mixed thoroughly. The resulting blend was shaped into various thicknesses (0.5, 1.0 & 1.5 cm) in a petri dish. No preservatives or artificial colorings were used. The standardized samples were then subjected to observation in a hot air oven dryer to monitor the drying and other quality characteristics.

Experimental Design: The final experimental runs were decided using Box Behnken Design-Response Surface methodology (as shown in Table 3) using Design Expert (10.0.1) Three independent variables are selected for drying of masla tikki. The ranges of the variables Ginger Shallot ratio (15:10, 15:20, and 15:30), drying temperature (40, 50 and 60°C) and masla tikki thickness (0.5, 1 & 1.5cm) were selected based on literature research and preliminary experiments. The plan consisted of 17 experiments. Following independent variables coded and actual value, constant, independent, and dependent parameters are given in Table 1 and 2.

Table 1: Independent Variables and constant parameters

Independent variables		**Coded levels**		
Name	**code**	**-1**	**0**	**+1**
		Actual levels		
Garlic: Shallot (g)	A	15:10	15:20	15:30
Drying temperature (°C)	B	40	50	60
Masal tikki Thickness (cm)	C	0.5	1.0	1.5
Constant Parameters				
Weight of mixture		50 g		
Packaging bag dimension		18 x 12 cm (about 4.72 in)		

Table 2: Dependent variables

S.no	**Variables**
1.	Final Moisture Content
2.	Drying Time
3.	Sensory evaluation/ overall acceptability
4.	Color change (ΔE)
5.	Shelf life

Experimental Set –up: The laboratory oven dryer (Tosihba India co) was used for experimentation purposes. Oven dryers contain perforated tray inside the drying chamber which is used for holding the sample. The set up was started 10-15 minutes before the placement of sample to achieve desired steady conditions of temperature. Ensuring uniform oven temperature, verified using a thermometer. The temperature of the oven dryer was maintained in such a way to achieve the drying of samples.

Table 3 Experimental design as per BBD code and actual value

Run	A: Mixture Ratio (Ginger: Shallot)	B: Drying Temperature ºC	C: Drying Thickness, cm
1	-1 (15:10)	−1 (40)	0 (1.0)
2	1 (15:30)	0 (50)	−1 (0.5)
3	−1 (15:20)	1 (60)	0 (1.0)
4	0 (15:30)	0 (50)	0 (1.0)
5	0 (15:20)	−1 (40)	−1 (0.5)
6	0 (15:20)	0 (50)	0 (1.0)
7	0 (15:20)	0 (50)	0 (1.0)
8	0 (15:20)	0 (50)	0 (1.0)
9	1 (15:30)	−1 (40)	0 (1.0)
10	0 (15:20)	−1 (40)	1(1.5)
11	1 (25:20)	0 (50)	1(1.5)
12	0 (15:20)	0 (50)	0 (1.0)
13	−1 (15:10)	0 (50)	1 (1.5)
14	1(15:30)	1 (60)	0(1.0)
15	−1 (15:10)	0 (50)	−1 (0.5)
16	0 (15:20)	1 (60)	1(1.5)
17	0 (15:20)	1 (60)	−1 (0.5)

Experimental procedure: Experiments were conducted in the Food Processing Laboratory of the College of Agriculture Engineering and Technology. Fig 1 flow chart of preparation of masala tikki.

Masala Tikki of different Ginger Shallot ratio (15:10, 15:20, and 15:30) at varying thickness (0.5 cm, 1.0 cm, and 1.5 cm) was placed in the pre heated perforated tray of oven at different temperature (40°C, 50°C, and 60°C). The samples were periodically weighed at one-hour intervals, and the moisture content on the dry basis was calculated. Drying continued until consecutive readings indicated consistent moisture content levels.

Laminated polythene bags were used whose dimensions were 18×12cm for storage of tikki samples. Prepared masala tikki were kept inside the polybags and sealed by using sealing machine in departmental lab. (Kyaw, 2012). Sealed and packed masla tikki were stored in refrigerated condition at 4°C.

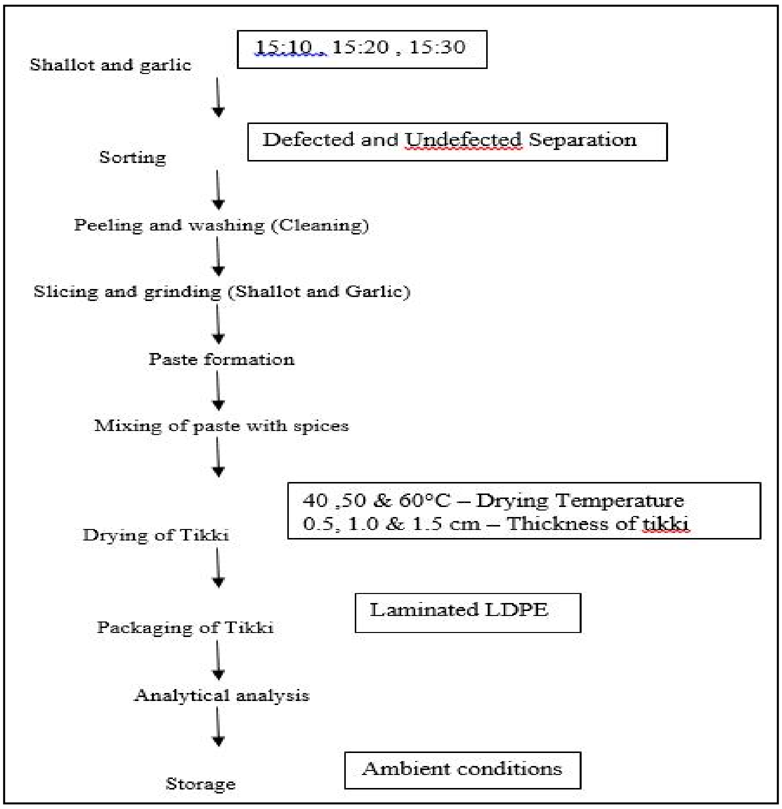
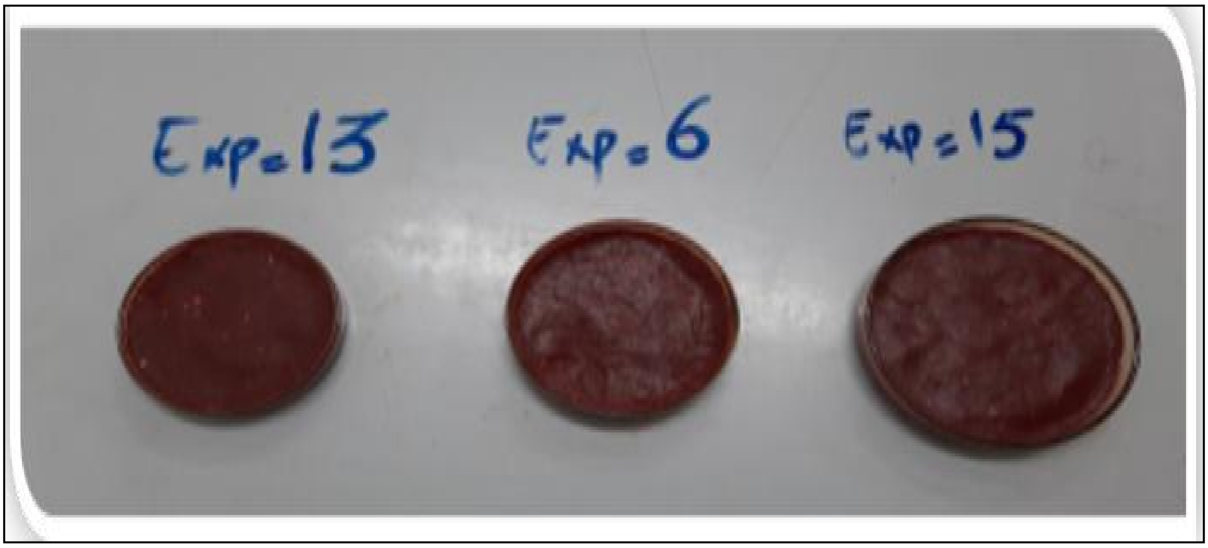


Fig. 1: Flow Chart of Preparation of Masala Tikki



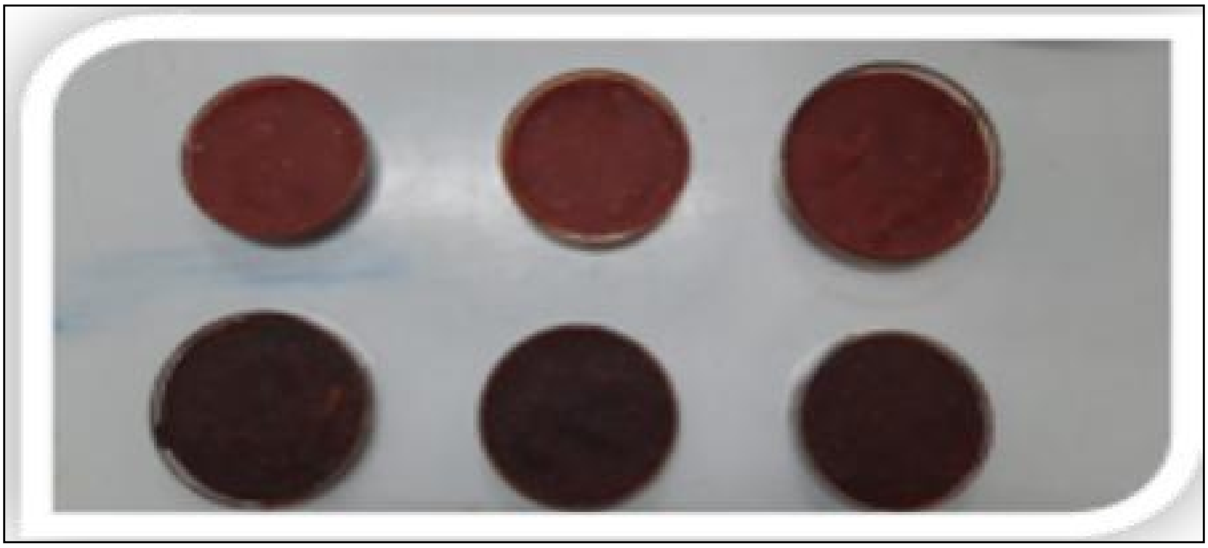


Plate 1: Masala Tikki of different treatments

ANALYTICAL DETERMINATION:

Quality parameters: The quality evaluation of these dried products was carried out based on response variables viz drying time, final moisture content, sensory evaluation, shelf life and color change.

Determination of Moisture Content: Moisture content in Masala Tikki samples was assessed using a digital weighing balance. Moisture content determination followed AOAC (1990) standards. A fresh sample was dried in a hot air oven until a constant weight was achieved. Post-cooling in the desiccators, the sample was re-weighed for the final calculation. The loss in weight was recorded as moisture content (dry basis).

$$MC\ (db)\% = \frac{W_p - W_{dm}}{W_{dm}}$$

where,

W_p= Weight of sample, g

W_{dm}= Weight of dry matter, g

MC= Moisture content (db.) %

Sensory evaluation/Overall Acceptability: Sensory evaluation, including color, flavor, texture, taste, and overall acceptability, was conducted by semi-trained judges employing nine-point hedonic scales *(*Amerine *et al.*, 1965*)*. A panel of 12-15 judges individually assessed samples, with each judge provided a separate product set and fresh water to cleanse their palate between tastings. The paste scores were analyzed for chemical parameters.

Colour change: The color of the dried Masala Tikki samples was assessed in triplicates using a handheld Sucolor reflective colorimeter (precision Calorimeter (SC-10, SUCOLOR)). To ensure accurate measurements, the samples were placed in a dark room, minimizing the influence of other wavelengths on the results *(*Maskan, 2001 and Faisal *et al*, 2018*)*.

$$\Delta E = \sqrt{} (L - L^*)^2 + (a - a^*)^2 + (b - b^*)^2$$

Where,

ΔE is the color change.
L, a and b represent Lightness, Redness and Yellowness.
L*, a* and b* represent final Lightness, Redness and Yellowness.

Shelf Life: Masala tikki samples were tested for quality over a 50-days storage period, with assessments max intervals of 10-days. On basis of this quality assessment storage/ shelf life was determined on visual inspection.

Numerical Optimization Of Variables: Optimization of responses and independent variables was done using Box-Behnken Design by Response Surface Methodology with Design-Expert 10.0.1 software. It was utilized for data analysis and optimization and generating three-dimensional graphs. The impact of independent variables on responses was interpreted using these models. Analysis of variance (ANOVA) was used to examine the statistical significance of the model -terms (Richa *et al,* 2016 and Faisal *et al.,* 2017, Malik *et al.,* 2023).

RESULTS AND DISCUSSION

The effect of independent variables on various response parameters was discussed in this section. ANOVA for each response (drying time, final moisture content, overall acceptability, color change and shelf life) was measured for checking the qualities of dried masala tikki.

Table 4: ANOVA Result for dependent variables

Source	**Drying Time**		**Final Moisture Content**		**Color change**		**Overall acceptability**		**Shelf life**	
	Coefficient	P value %	Coefficient	P value %	Coefficient	P value %	Coefficient	P value %	Coefficient	P value %
Model	336.0	0.0193**	40.40	0.0300**	3.67	0.0008***	7.44	0.0245**	46.20	0.0414**
A	-1.25	0.8181	0.088	0.4987	-0.84	0.0025***	0.11	0.0069***	1.00	0.1172
B	-25.0	-25.0	-0.72	0.0006***	0.38	0.0795**	0.050	0.1365	2.13	0.0068***
C	8.75	0.1397	0.19	0.1702	-0.56	0.0192**	0.013	0.6868	-0.13	0.8297
AB	-5.0	0.5225	0.075	0.6785	-1.73	0.0003***	-0.12	0.0207**	-1.75	0.0628
AC	17.50	0.0506**	0.20	0.2868	1.75	0.0003***	0.100	0.0490**	1.75	0.0628**
BC	5.00	0.5225	-0.12	0.4945	-0.60	0.0527**	-0.025	0.5708	0.50	0.5477
A^2	-14.25	0.0897*	0.100	0.5728	-2.56	0.9922	-0.095	0.0535	-1.35	0.1237
B^2	3.25	0.0897*	-0.025	0.8866	0.79	0.0166	0.030	0.4879	-0.10	0.9005
C^2	-24.25	0.6671	-0.100	0.5728	0.18	0.4907	-0.095	0.0535	-1.60	0.0768
Lack of Fit	*NS*		*NS*		*NS*		*NS*		*NS*	

***, **, * *Significant at 1, 5 and 10 % level of significance respectively*

NS = non-significant, A=Garlic-Shallot mixture ratio, B = Drying Temperature,

C = Thickness of masala tikki

Effect of independent variables on drying time (DT): Experiment 10 (0, -1,1) exhibited the maximum drying time of 360 minutes, whereas experiment 17 (0,1, -1) demonstrated the minimum drying time of 260 minutes. This variance was due to the application of minimum and maximum drying temperatures, respectively. The trend observed indicated that as the thickness of the samples increased, the drying time also increased. This phenomenon can be attributed to the longer route water molecules have to traverse before escaping, resulting in prolonged drying periods. (Prabhanjan *et al.,* 1995). Porous material transport moisture easily as it takes time to collapse the pore. Because of porosity there is possibility that thickness is not effective on drying time. Heat transfer was uniform and effective in thinner stratum, resulting in quick heat perforation of moisture decimation in less time It can attribute to an increase in resultant temperature that improved the heat supply rate to the fish muscles, accelerating water migration inside the masala tikki, therefore drying time was reduced (Richa *et al.,* 2022). Similar result was found by Ali & Rani (2014) time of heating of ginger paste decreased significantly with increasing temperature and decreasing the thickness of ginger paste. Similar observation on the influence of samples thickness on the process time has been reported by Azimi-Nejadian & Hoseini (2019) on microwave power and slices thickness on drying characteristics of potato.

Table 4 shows the effect of independent variable on drying time and the model is significant at 5% level of significance. Also, the interactive effect of mixture ratio and thickness is significant at 5% level of significance on drying time while quadratic term *Garlic-Shallot mixture ratio,* shows 10% level of significance. Fig 2 shows the effect of different variables Garlic-Shallot mixture ratio (A) and temperature (B) on drying time. It is evident from the graph that drying decreases with an increase in drying temperature from 40 to 60 °C. Mixture ratio is effective on drying time.

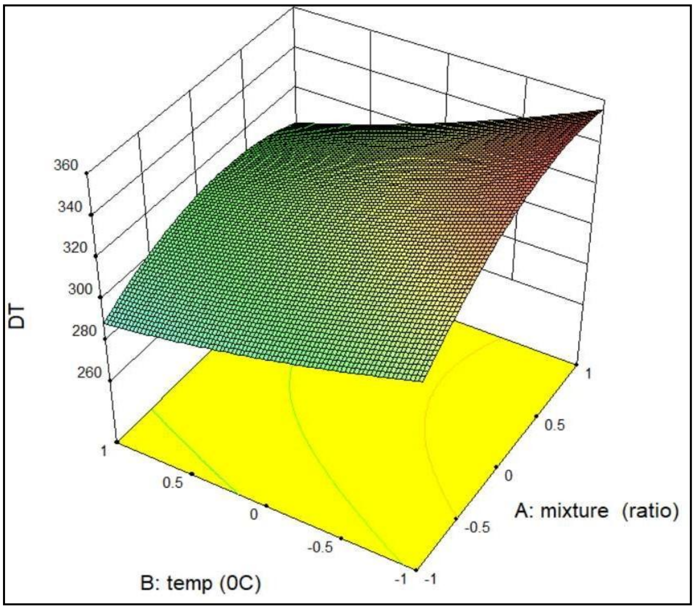


Fig 2: Effect of independent variables on drying time

Effect of independent variables on Final moisture content: The response values of different samples for final moisture content which has been determined analytically are given in table 4. It has been observed maximum final moisture content was in case experiment 10 (0, - 1,1) and minimum moisture content was in case of experiment 17 (0,1, -1) due to a minimum drying temperature and maximum drying temperature applied during drying respectively. Fig 3 shows that with increase in drying temperature final moisture content decreases while with increase in Garlic-Shallot mixture ratio final moisture content increases. The possible reason may be that both garlic and shallot have high moisture content and with increasing mixture ratio, the time of drying was enhanced as a result of higher quantity of water along the extended path for escape water from masla tikki mixture. An enhancement in dryer temperature; increased heat supply rate to the tikki, which accelerate the water migration inside the masala tikki and also sensible heat is high and further heat required for evaporation of water molecules reduced accordingly, whereas latent heat of

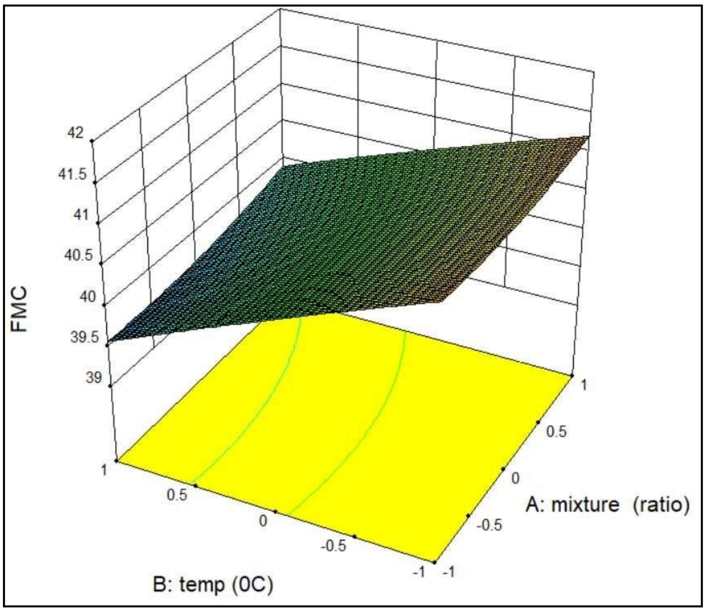


Fig. 3: Effect of independent variables on final moisture content

vaporization remained unaltered (Bellagha *et al.,* 2007). The heating of water inside the cell and facilitates the process of evaporation. Similar finding was observed by Joardder, & Karim. (2023) for apple slice. Table 4 shows that drying temperature has 10% level of significance on final moisture content and also the model is significant at 5% level of significance. It is evident from the graph that final moisture content decreases with an increase in drying temperature from 40 to 60°C.

Effect of independent variables on Color Change: The response values of different samples for color change which has been determined analytically using colorimeter model Precision Calorimeter (SC-10, SUCOLOR). It has been observed maximum color change was in case experiment 3 (-1,1,0) and minimum was in case of experiment 2 (1,0, -1) due to different garlic-shallot mixture ratio and variable drying temperature and thickness respectively. In Table 4 the garlic-shallot mixture ratio significantly impacts color change at a 10% level of significance. Thickness and drying temperature demonstrate 5% significance levels. Additionally, the chosen model exhibits a 1% significance level. Furthermore, interactive effects such as mixture ratio and temperature, mixture ratio and thickness, and temperature and thickness significantly influence drying time at a 1% significance level. It is evident from fig 4 that color change increases with increase in garlic- shallot mixture ratio. A possible reason might be that longer exposure times to surface area required for drying high thickness of masla tikki which cause more color change. Also, drying temperature is effective on color change. The higher the temperature the more the color changes. The high air temperature and the rate of color degradation became faster as a result of the high energy transferred to the food material. It is clearly seen that there are similar results in other studies of oyster mushroom (Engin, 2018), dried ginger paste (Ali & Rani, 2014). Various factors are responsible for the loss of color during processing of food products. These include Maillard and enzymatic browning and process conditions (Ahmed & Shivhare, 2001).

Effect of independent variables on Sensory / Overall acceptability: It has been observed maximum overall acceptability was in case Experiment 9 (1, - 1,0) and minimum overall acceptability was in case of Experiment 1 (-1, -1,0) due to variable mixture ratio. Table 4 demonstrates that the garlic-shallot mixture ratio significantly influences overall acceptability at a 1% significance level. The utilized model also holds significance at a 5% level. Additionally, the combined effects of mixture ratio and temperature, as well as mixture ratio and thickness, significantly impact overall acceptability at a 5% significance level. With the increase in drying temperature overall acceptability increases. A possible reason may be that while drying due to temperature aroma and color get developed which attract the members of sensory panel. Similarly with increase of Garlic-Shallot mixture ratio, overall acceptability/ sensory get increase, as garlic and shallot help to enhance the taste and aroma of masla tikki. Result is close agreement with Seifu et al. (2018) who conducted experiment on drying of onion powder. It is evident from fig 5 overall acceptability decreases with decrease in garlic-shallot mixture ratio.

Effect of independent variables on Shelf life: The shelf life of various samples was observed over 50-days in ambient conditions. Experiment 17 (0, 1,-1) demonstrated the maximum shelf life of 48-days, while experiment 10 (0,-1, 1), involving minimum and maximum drying temperatures, showed the minimum shelf life of 40-days.

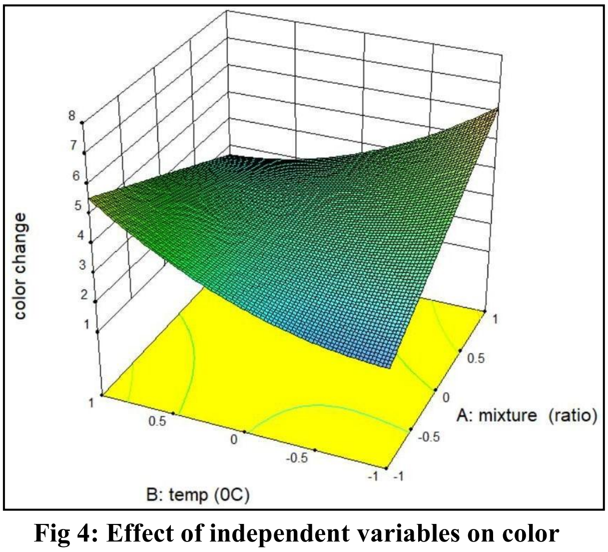


Fig 4: Effect of independent variables on color change

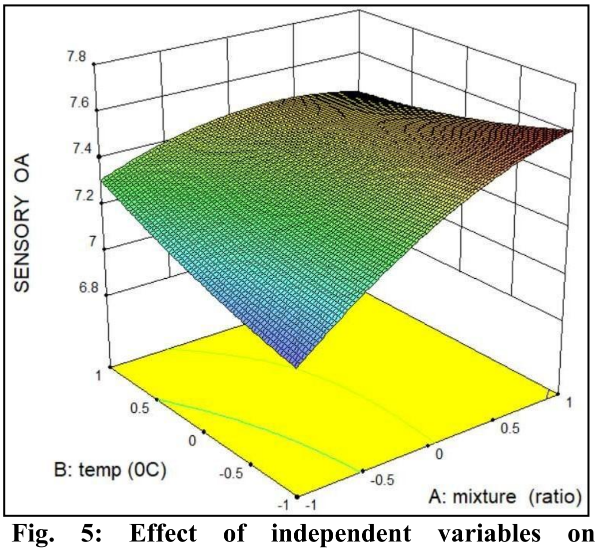


Fig. 5: Effect of independent variables on sensory/overall acceptability

Table 4 indicates that drying temperature significantly influences shelf life at a 1% significance level. The model is significant at a 5% level. Furthermore, the combined effects of mixture ratio and temperature, mixture ratio and thickness, and temperature and thickness significantly impact shelf life at a 5% significance level.

It is evident from Fig 6 that shelf life is maximum in cases where garlic-shallot ratio is at centre value. However, it decreases with increase in mixture ratio also decreases with decrease mixture ratio from centre value. Also, temperature is effective on Shelf life. As drying temperature increases shelf life of product get increase. The possible reason may be that at higher drying temperature more moisture content is reduced, hence due to decrease in water activity there is less chance of microbial growth. Similarly, garlic and shallot both have anti-microbial effect and work as anti-microbial agents, therefore, their combination help to increase the shelf life of product. Similar findings were observed by Ahmed *et al.* (2000) for garlic paste and Pavithra (2014) for spices effect on bacterial growth.

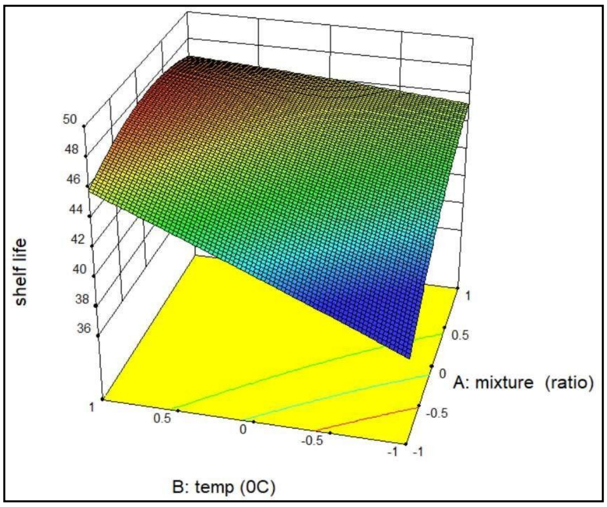


Fig 6 : Effect of independent variables on shelf life

Optimization of Masala Tikki: Optimized value of independent variables obtained by numerical optimization was shown in Table 5 with composition of garlic-shallot 22:16, drying temperature 60°C and 0.7 cm thickness of masala tikki and the response values were 39.529 for final moisture content, 299.99 minutes for drying time, 3.816for colour change, overall acceptability of 7.4 and the optimized shelf life was 46-days.

Table 5 Numerical Optimization Values

Garlic Shallot Ratio	Drying Temperature (°C)	Thickness of masala tikki (cm)	Final Moisture Content (db %)	Drying Time (min)	Shelf Life Days	Sensor Quality	Color Change (ΔE)	Desirability
22:16	60°C	0.706	39.529	299.99	46.060	7.415	3.816	0.823

CONCLUSION

In this study, Masala Tikki, a traditional Kashmiri spice cake known as "Werr," was investigated to standardize the process, optimize drying temperature, and improve the shelf life of product. Experiments were conducted using RSM-BBD design, varying oven temperatures (40°C, 50°C, and 60°C) and tikki thickness (0.5 cm, 1.0 cm, and 1.5 cm). The results showed that moisture content decreased with higher drying temperatures, and drying time was shortest at 60°C. Garlic-shallot mixture ratio significantly affected overall acceptability, with 22:16 being the optimized ratio. Additionally, the combination of mixture ratio, thickness, and temperature influenced drying rate and color change. The study concluded that final moisture content decreased with higher temperatures, with experiment 10 (0,-1,1) exhibiting the minimum moisture due to lower drying temperature. Garlic-shallot ratio, thickness, and temperature influenced drying rate and color change. Shelf life was enhanced by these factors and their combinations. Drying time was affected by garlic-shallot mixture ratio and drying temperature. The optimized parameters were a garlic-shallot ratio of 22:16, drying temperature of 60°C, and thickness of 0.7 cm. These settings resulted in a final moisture content of 39.52%, drying time of 299.99 minutes, color change value of 3.816, overall acceptability score of 7.4, and a shelf life of 46 days. Hence, it is recommended that drying masala tikki and its packaging enhance shelf life and its incorporation in food enhance taste and flavor.

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