Research Article

Quality Evaluation of the Frying Mediums used in Frying of Traditional Chapli Kabab

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Abstract | The data was collected from three different Chapli Kabab restaurants based in Batkhela Bazar, District Malakand, Khyber Pakhtunkhwa, Pakistan. Samples of fresh and in-use frying mediums (upto five hours) of each Tallow, Ghee and Oil were collected and the whole frying process was properly monitored throughout. All the samples were analyzed for TPM and Acid value at the time of collection with the help of oil testometer DOM-24. A 100 ml of sample from each of the frying mediums was collected and transferred to the Biochemistry Laboratory, University of Malakand for further analysis. The peroxide values (18.073 meq kg^{-1}) were found significantly higher in oil medium, followed by ghee (11.96 meq kg^{-1}) and then tallow (10.507-meq kg^{-1}). Initial value in oil,value of peroxide was recorded as low as (5.05 meq kg^{-1}),which significantly increased to (20.68 meq kg^{-1}) in the 5^{th}hour of frying. In addition, a higher acid value (1.499) recorded in ghee medium followed by oil (1.389) and then tallow (1.250), highest acid value (2.01) in the 5^{th} hour of frying in ghee.Total polar materials (13.166) were higher in ghee medium, which is statistically identical with oil (12.87),whereas minimum (9.661) value was observed in tallow, highest TPM value was recorded in oil during 5^{th} hour of frying which was (19.43). This study can prove helpful for development of new standards of freshness for frying mediums used for frying traditional chapli kabab. This study suggests that the evaluated frying times for acceptable freshness of the frying mediums of traditional chapli kabab especially for frying oil should not be more than 05 hours. Data obtained from this study may be worthwhile in setting food quality regulations for the frying medium used for traditional chapli kabab.

Received | September 02, 2021; **Accepted** | September 27, 2021; **Published** | December 01, 2021
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Citation | Ali, M. and S. Wahab. 2022. Quality evaluation of the frying mediums used in frying of traditional Chapli Kabab. *Sarhad Journal of Agriculture,* 38(1): 199-203.
DOI | https://dx.doi.org/10.17582/journal.sja/2022/38.1.199.203
Keywords | Chapli Kabab, Frying oil, Ghee, Tallow, Monitoring, Quality evaluation

Introduction

Deep frying is a commonly used practice worldwide, producing tons of foods like Snacks Moreira *et al.* (1999), meat/ poultry and their products. Furthermore, it is also a more convenient source of high-energy foods, as well as a fast and convenient way of food preparation Freire *et al.* (2013). Deep-fat frying temperatures can be as low as 130°C to the minimum while 170–190 °C is the most common frying temperature for foods Bouchon (2009) during this process a set of chemical reactions takes place including hydrolysis, polymerization, and oxidation which leads to degradation of the quality of frying medium and involves heat and mass transfer and complex interactions between the material with the frying medium Vitrac *et al.* (2002). Chapli Kebab or Kabab is a traditional Pashtun-style minced kebab, which is normally made from ground meat mostly of beef but can also contain

Table 1: *Effect of frying hours on physicochemical properties of the frying mediums while frying chapli kabab.*

Treatments	Peroxide value (meq kg^{-1})	Acid value (AV)	Total Polar Material	Free fatty acid value	Color Red	Color Yellow
Frying media (T)						
Tallow	10.507± 0.091	1.250± 0.023	9.661± 0.072	1.224 ± 0.085	7.428± 0.102	70.000 ±0.000
Ghee	11.958± 0.092	1.499± 0.030	13.166± 0.173	1.346 ± 0.053	8.017±0.436	63.183 ± 0.150
Oil	18.073± 0.106	1.389± 0.036	12.870± 0.081	1.243 ± 0.034	12.117±0.088	103.000 ± 0.000
Probability	0.000	0.000	0.000	0.000	0.000	0.000
Frying Hours (FH)						
Control	5.05± 0.087	0.74 ± 0.009	3.36 ± 0.041	0.74±0.137	2.06 ± 0.042	22.33 ± 0.272
1st	10.11 ± 0.280	1.17 ± 0.030	6.84 ± 0.046	1.17± 0.045	5.97 ± 0.327	63.33 ± 0.000
2nd	12.96 ± 0.042	1.33 ± 0.019	10.73 ±0.059	1.25± 0.032	8.88 ± 0.217	63.33 ± 0.000
3rd	14.89 ± 0.175	1.39 ± 0.031	13.70 ±0.045	1.39 ± 0.025	11.77 ± 0.274	86.67 ± 0.000
4th	17.40 ± 0.057	1.64 ± 0.041	17.33 ±0.179	1.50 ± 0.022	13.04 ± 0.303	120.00 ± 0.000
5th	20.68 ± 0.137	2.01 ± 0.048	19.43 ±0.283	1.58 ± 0.082	13.42 ± 0.091	116.70 ±0.027
Significance	0.000	0.000	0.000	0.000	0.000	0.000
Interaction						
T x FH	Figure 1	Figure 2	Figure 3	Figure 4	Figure 5	Figure 6

meat from other sources like mutton or chicken with a mix of different kind of spices, chapli kabab is made in shape of a patty. Chapli Kabab is mainly associated Khyber Pakhtunkhwa province of Pakistan, in particular the capital Peshawar the capital of the province Haleem and Smart (2013). Chapli Kabab mostly fried in oil, ghee, or tallow. It is imperative for food control agencies as well as for the food frying operators to evaluate the safety and quality of the frying medium used for frying chapli kabab Weisshaar (2014). Chapli kebab contains several beneficial phenolic compounds, however, frying in the repeatedly used frying medium increases the contents of lipid peroxidation and hence is not safe for health Zeb and Haq (2018).

Food safety is posing an alarming situation in the Khyber-Pakhtunkhwa province of Pakistan due to the miserable conditions of food. This research will help to devise a real-time field mechanism for monitoring frying medium in chapli kabab and other fried foods at the provincial and national levels.

Materials and Methods

Sample collection

Three different frying mediums *i.e* Tallow, Oil, and Ghee being used in the frying of traditional Chapli kabab were collected from three different Chapli kabab restaurants in Batkhela Bazar, District Malakand Khyber-Pakhtunkhwa, Pakistan. Restaurants were selected after a random survey based on the same frying practices and different frying mediums. Fresh and in use frying mediums (upto five hours) of each Tallow, Ghee and Oil were collected. Samples were analyzed for TPM and Acid value on the spot with the help of oil testometer DOM-24 as previously reported by Mlček *et al.* (2015). 100 ml of sample was collected from each of the frying mediums and transferred to the laboratory, Department of Biochemistry University of Malakand for further analysis. Analysis for peroxide value, free fattyacid, and the acid value was done according to the standard method of AOAC (2012). Quality indices showed a significant response among the frying mediums and frying hours (Table 1).

Statistical analysis

All the parameters were determined in triplicates and data was analyzed through CRD design, means were separated through LSD 0.05 (Jan *et al.*, 2009). Interactions were separated through standard dictation in graphs through sigma plot 12.0 software.

Results and Discussion

Peroxide value

In this study, peroxide values (18.073 meq kg^{-1}) were significantly higher in oil medium followed by ghee (11.96 meq kg^{-1}) and then tallow (10.507 meq kg^{-1}). The initial value of peroxide was as low as (5.05 meq kg^{-1}) which gradually increased after each frying hour. Highest The highest (20.68 meq kg^{-1}) value was ob-

served in the 5thhour. Tallow, ghee, and oil linearly increased peroxide value concerning frying hours increasing from initial to 5th hours. A higher response was observed in the oil medium as compared with ghee and tallow (Figure 1) POV is an important biomarker that gives information about the initial stages of oxidation and also indicates the prior reaction products which are produced due to lipid oxidation and hence can be considered as responsible for primary oxidation Debnath *et al*. (2012). However, at elevated temperatures, the hydroperoxide can break down and consequently upon cooling can form secondary oxidation products. Hence, the peroxide value increases with increase in frying time. Results obtained from the current study are in accordance with the results previously reported by Zeb and Haq (2018) for tallow and Chatzilazarou *et al*. (2006) for corn oil and olive oil.

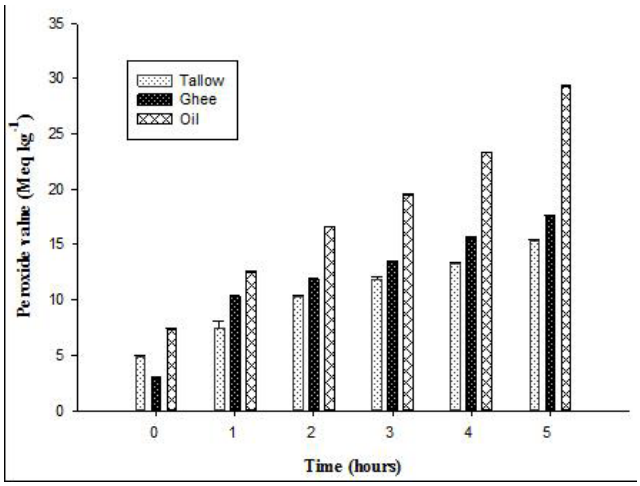

Figure 1: *Peroxide Value as effected by frying hours*.

Acid value

In this study higher acid value AV (1.499) was observed in ghee medium followed by oil (1.389) and then tallow (1.250). Acid value (0.74) was observed initially, gradually with the increase of frying hours with the highest acid value (2.01) observed in ghee in the 5th hour of frying. Acid value in all three mediums increased linearly with respect to frying hours. The higher response in ghee medium noted as compared with oil and tallow (Figure 2) Acid value increases with increase in frying cycles regardless of the type of frying medium as previously reported by Lee *et al*. (2013). Hence, oxidative changes in various culinary fats are hugely affected by factors associated with their chemical composition. As for the small degradation components, it was recorded that simultaneously changing are dependent on the frying time and frying medium type.

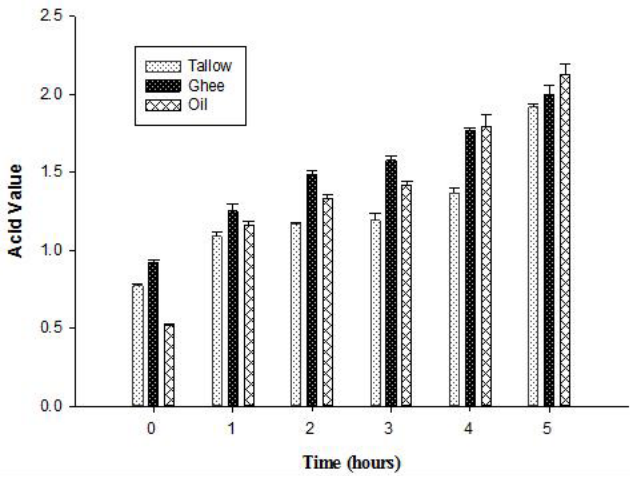

Figure 2: *Acid Value as effected by frying hours.*

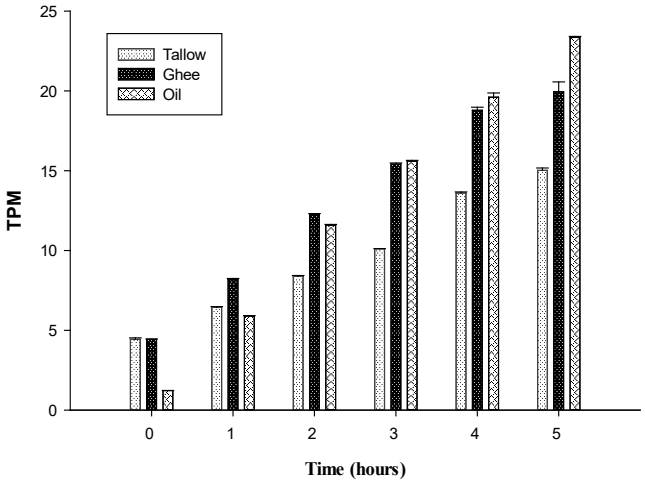

Figure 3: *Total Polar Material as effected by frying hours.*

Total Polar material

Total polar materials (13.166) were higher in ghee medium which is statistically similar with oil (12.87) whereas, a minimum (9.661) value observed in tallow. Initially, TPM was as low as (3.36) which gradually increased with an increase in frying hours. The highest (19.43) value was observed in the 5th hour of frying in Oil. Tallow, Ghee, and oil early increased in total polar material with respect to frying hours increasing from initial to 5th hours. The higher response was observed in ghee medium up to 3 hours of frying which remained at the higher side till 4th and 5th hour (Figure 3). Total polar materials reflect the total level of breakdown products from the frying process. The amount and character of these products are affected by some frying parameters such as fat and food composition, frying conditions (temperature, oxygen exposure, heating time, turnover rate), and the design and material of frying equipment Al-Kahtani (1991). Results obtained from the current study are in accordance with the previously reported results by Mlček *et al*. (2015).

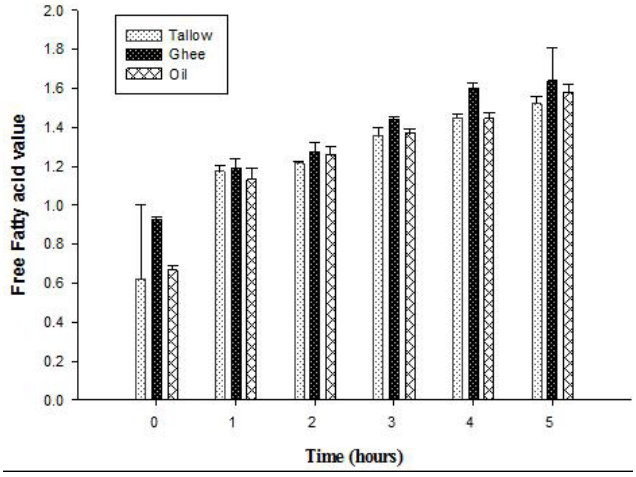

Figure 4: *Free Fatty Acid Value as effected by frying hours.*

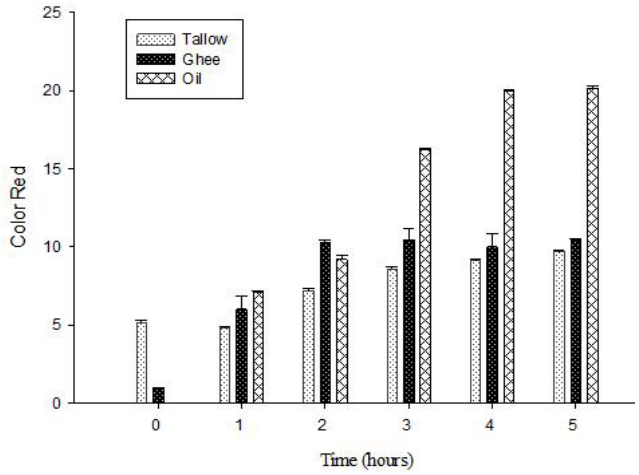

Figure 5: *Color red value as effected by frying hours.*

Free fatty acids

In this study, free fatty acid oxide value (1.346) was higher in ghee medium as compared with oil and tallow. Initially, the free fatty acid value was as low as (0.74), gradually increased with an increase in frying hours. The highest (1.58) value was observed in the 5th hour in oil. FFA values in Tallow, ghee, and oil linearly increased with respect to frying hours from initial to 5th hours. The higher response was observed in the ghee medium with a sharp increase in the first 02 hours and a slight increase in the rest of the hours. Free fatty levels are the most widely used measure of frying oil quality Chen *et al.* (2013). According to Tseng *et al.* (1996) frying oil should be discarded if the FFA levels are above 1%. The increase in FFA could be attributed to oxidation and hydrolysis, which produces FFAs Abdel-Aal and Karara (1986). Results obtained from the current study are in accordance with the results previously reported by Ali *et al.* (2009) for frying medium of chapli kabab.

Color

Color red (12.117) was significantly higher in oil medium followed by ghee (8.017) and then tallow (7.428). Initially, the color red (2.06) value was at the lowest which gradually increased with the increase off frying hours. The highest (13.42) value was observed in the 5th hour in the oil sample. Tallow and ghee linearly increased in color red with respect to frying hours increasing from initial to 5th hours and similar results were also seen for color Yellow for oil, ghee, and tallow with higher values recorded in oil sample as shown in (Figure 5) and (Figure 6). Color results of the frying mediums obtained from this study are in accordance with the results previously reported by Totani *et al.* (2012).

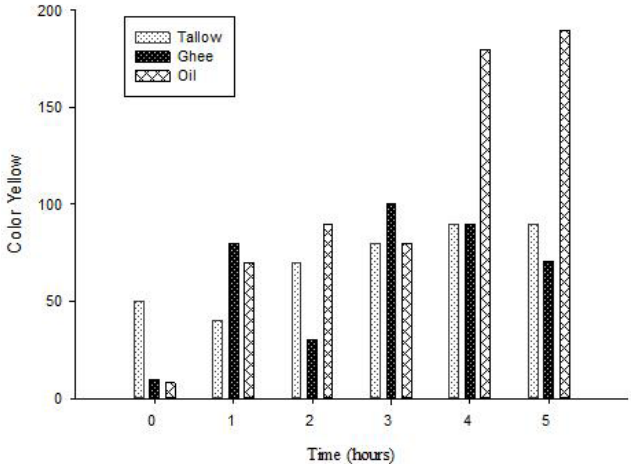

Figure 6: *Color yellow value as effected by frying hours.*

Conclusions and Recommendations

All the three frying mediums used in the frying of traditional chapli kabab showed a significant increase in physicochemical characteristics during continuous five-hour frying time and hence showed an adverse effect on the quality of the frying medium. TPM and Peroxide values increased significantly as both of them can be adopted as a standard factor to determine oxidation of the frying mediums.

It is further suggested that frying mediums especially cooking oil deteriorates significantly in the five-hour frying time and therefore frying medium after continuous five-hour frying time shall be changed for further frying. However, it has been observed during a prior survey in the current study that frying medium was not changed or discarded normally in all traditional chapli kabab shops for less than 12-14 hours.

Novelty Statement

This research study itself is novel, there is no signifi-

cant data available about all three frying mediums of traditional Chapli Kabab in Pakistan as the samples were collected in real time from market and the process was monitored throughout.

Author's Contribution

Murad Ali: PhD scholar, who did research, collected data, analyzed and wrote draft of the manuscript.
Said Wahab: Major Supervisor, who provided technical guidelines in the study throughout.

Conflict of interest
The authors have declared no conflict of interest.

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