Effect of Hydrocolloids on Oil Uptake in Bhature

Jyoti B. Magre[1], Sheetal B. Gawande[2], Pranali P. Nerker[3] Dr. I. D. Patil[4]
[1]*Department of Food Technology, L.I.T., RTMNU, Nagpur*
[2]*Research Student, SSBT`s, COET, Bambhori, Jalgaon and Assistant Professor, Department of Food Technology, L.I.T., RTMNU, Nagpur*
[3]*Department of Food Technology, L.I.T., RTMNU, Nagpur*
[4]*Professor and Head, Department of Biotechnology, SSBT`s, COET, Bambhori, Jalgaon*
[1]jyoti.magre31@gmail.com,[2]Sheetalddeshmukh11@gmail.com,
[3]nerkarpranali2396@gmail.com, [4]idp72@yahoo.co.in

Abstract

The amount of oil may be reduced by victimization hydrocolloids for the preparation of bhature. Bhature square measure the favored food made up of the refined flour that is that the deep-fried product that absorbs high quantity of oil throughout sauteing. result of hydrocolloids on reduction of oil in bhature throughout deep fat sauteing was studied. Hydrocolloids at zero.5–1.5% (on the premise of refined flour and semolina) were screened for his or her ability to cut back oil uptake in bhature. it had been determined that there was important decrease in oil uptake with increase in level of all hydrocolloids. The study disclosed that gum acacia and carrageenin at one.5% level considerably reduced the oil content in bhature to seventy six.7% and 76.47% severally as compared to any or all alternative hydrocolloids and their concentration levels. Hence, bhature with low oil and higher acceptance is ready for health cautious shoppers World Health Organization demands low fatty foods.

Keywords: *hydrocolloids, bhature, deep fat frying, oil uptake*

1. Introduction

Frying could be a common cookery technique of food preparation having fascinating product characteristics. it's a unit operation that will increase the taste property of food. cooked foods square measure currently standard for his or her distinct flavour, texture, look and crisp mouth feel. Deep-fat sauteing involves immersion of food in hot edible oil to cook it to a crisp golden color that is allotted at a temperature higher than the boiling purpose of water for a given amount of your time. the method involves each mass transfer, primarily described by water loss and oil uptake, and warmth transfer. throughout deep fat sauteing crust formation and browning happens giving the merchandise a beautiful golden look and crisp mouth feel (Annapure et al., 1998). The soft and wet interior and porous crisp crust makes food delicious (Mellema 2003). Deep fat sauteing of varied forms of foods coated with batter could be a standard cookery procedure in several countries (Kimber and Holding, 1987), whereby the warmth is transferred from oil to the merchandise, water is gaseous and oil is absorbed. The oil uptake and its distribution within the deep-fried product is principally close to the surface i.e. crust (Varela, 1988). the amount of oil uptake is directly proportional to the extent of wet removed (Gamble and Rice, 1988). there's intensive use of hydrocolloids in varied dough mixes to reinforce quality attributes and shelf-life (Saha and Bhattacharya, 2010). within the previous study on oil reduction victimization many hydrocolloids pulverised polyose (Annapure et al. 1999 and Mallikarjunan et al. 1997), HPMC, CMC, guar gum, xanthan gum (Sakhale et. al., 2011), pectin, metal alginate (Holikar et al. 2005 and Khalil 1999) were studied. Hydrocolloids square measure applied in 2 ways in which within the deep-fried merchandise either within the kind of solution to create edible film on the surface of food material to be deep-fried or they're additional on to the batter together of the ingredient (Varella, 2011). Bhature is one among the samples of deep sauteing product. it's dish from geographic region preparation. Bhature square measure technically quite as same as poori. Bhatura is sometimes accompanied with chole. Bhature square measure the popular food made up of the refined flour that is that the deep-fried product that absorb high quantity of oil throughout sauteing. Bhature square measure created by refined flour,

semolina, curd, salt, hydrogen carbonate, water and oil for the sauteing. Bhature square measure preferred deep-fried food not solely in city however additionally in each place in Republic of India. Bhature square measure the softer within and firm outer a part of it's the feel. during this work, hydrocolloids were directly additional together of the ingredient to create dough. The objectives of gift study was to review the result of incorporation of edible agents carrageenin, xanthan gum, guar gum, gum Arabic, cellulose and cellulose on wet retention and oil uptake of bhature.

2. Materials and methods

2.1 Materials

For the preparation of bhature, ingredients were collected from the local market of Nagpur. List of ingredients used were as follows:

a) Refined wheat flour (Maida) of brand Samrat
b) Semolina
c) Refined Sunflower oil of the brand fortune as frying oil
d) Curd
e) Water
f) Tata Salt
g) Sodium bicarbonate
h) Hydrocolloids- Xanthan gum, Carboxymethyl cellulose (CMC), Carrageenan, Guar gum, Gum Arabic, Pectin

2.2 Methods

2.2.1: Preparation of Bhature:

The control Bhature was prepared from soft dough of refined wheat flour obtained by mixing refined wheat flour, semolina, curd, sodium bicarbonate, salt and water. The proportion of these ingredients is given in Table 1. The dough was covered with a damp cloth and placed for 8 hours at room temperature to allow natural fermentation. Prepared dough was kneaded in a bowl and small balls of the dough were prepared. These balls were rolled in a circular shape with diameter of 5 – 6 inch and thickness 4 -5 mm using roller. Bhature were fried for 60-65 seconds with turning after 30 seconds using ladel. The completion of frying was indicated by golden brown color of bhature. The samples were packed in polyethylene bags and stored in airtight containers for further analysis. Hydrocolloids such as Xanthan gum, Carboxymethyl cellulose (CMC), Carrageenan, Guar gum, Gum Arabic, Pectin each at 0.5-1% were incorporated in refined wheat flour and dry-mixed. Soft dough was prepared using the procedure as mentioned above. Weights of Bhature were noted before and after frying.

Table 1: Composition of control sample

Sr. No.	Ingredients	Quantity
1	Refined wheat flour	30gm
2	Semolina	15gm
3	Curd	15gm
4	Sodium bicarbonate	0.22gm
5	Salt	0.55gm
6	Water	10 ml

2.2.2: Analytical methods

Moisture content and oil content was determined according to the method of hot air oven method and soxhlet method respectively.

2.2.3: Oil uptake ratio of the fried bhature

Oil uptake ratio of the fried bhature is defined as the weight ratio between the amount of oil uptake and the amount of water removed. The uptake ratio (U_R) was calculated from the moisture content of the dough and bhature and the oil content of the bhature using the formula given by **Pinthus et al (1993).**

$$(U_R) = \frac{\text{Oil content}(\%)}{[M_D - M_P](\%)}$$

Where,

U_R - Uptake ratio
M_D- moisture content of dough
M_P- moisture content of product

3. Result and discussion

Effect of addition of various hydrocolloids at 0.5-1.5% on the moisture content in the dough (M_D) and bhature (Mp) is given in Table 2. Figure 1 and 2 represents graph of moisture content of dough and moisture content of bhature using 0.5%, 1% and 1.5% concentration of all hydrocolloids.

Effect of incorporation of these hydrocolloids on the oil content of the bhature and uptake ratio (U_R) is given in Table 3. Figure 3 and 4

shows graphical representation of effect of hydrocolloids at concentrations of 0.5%, 1% and 1.5% on oil content and uptake ratio of bhature. The equation and correlation coefficient between oil content and U_R of all the hydrocolloids used in the study is given in Table 4. The results with respect to individual hydrocolloids are given below:

Table 2: Effect of hydrocolloids on moisture content in dough (M_D) and bhature (Mp)

Hydrocolloid	Concentration					
	0.5%		1%		1.5%	
	M_D	Mp	M_D	Mp	M_D	Mp
Xanthan gum	62.48	8.90	61.04	10.28	61.30	10.3
CMC	61.61	9.81	61.70	10.02	62.17	11.85
Carrageenan	61.04	9.22	62.24	10.69	63.73	10.77
Guar gum	61.98	6.93	60.66	7.15	60.24	10.54
Gum Arabic	61.89	7.35	60.80	9.07	61.52	8.16
Pectin	61.74	10.08	60.28	10.86	60.28	10.10

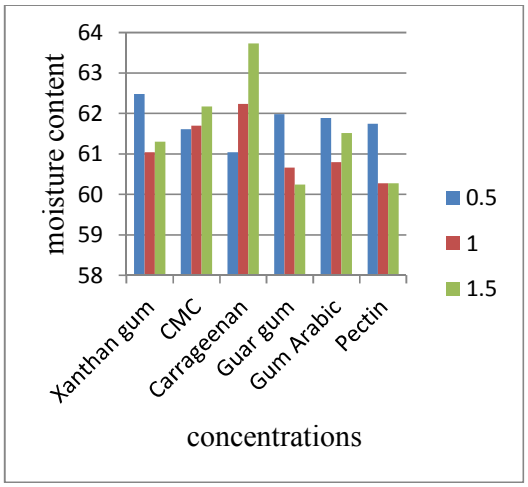

Figure 1: Effect of hydrocolloids on moisture content of dough (M_D)

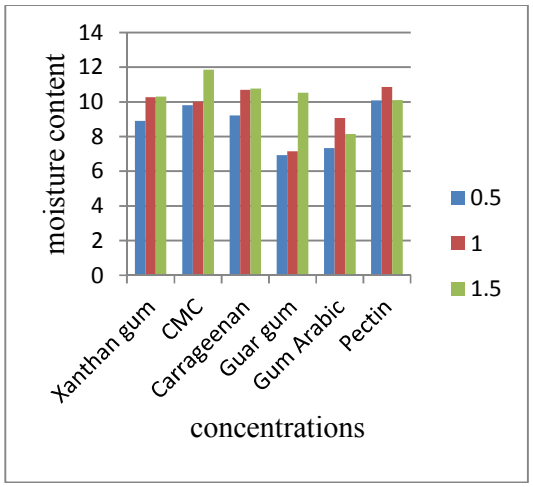

Figure 2: Effect of hydrocolloids on moisture content of bhature (Mp)

M_D – moisture content of the dough
Mp - moisture content of the bhature
M_D and Mp for control were 53.36% and 7.38% respectively

Table 3: Effect of various hydrocolloids on percent oil content and uptake ratio (U_R) of bhature

Hydrocolloid	Concentration					
	0.5%		1%		1.5%	
	Oil content (%)	Uptake ratio U_R	Oil content (%)	Uptake ratio U_R	Oil content (%)	Uptake ratio U_R
Xanthan gum	21(8.7)	0.39	10.96(52.34)	0.21	8.02(65.13)	0.13
CMC	18.69(18.73)	0.36	16.39(28.73)	0.31	15.10(34.34)	0.30
Carrageenan	19.65(14.47)	0.37	14.43(37.26)	0.29	5.41(76.47)	0.11

Guar gum	19.62(14.69)	0.35	18.18(20.95)	0.33	16.56(28)	0.33
Gum Arabic	18.34(20.26)	0.33	13.12(42.95)	0.25	5.34(76.78)	0.10
Pectin	21.72(5.56)	0.42	17.76(22.78)	0.35	16.89(26.56)	0.33

Control sample = 23%
Uptake ratio of control bhature is 0.5

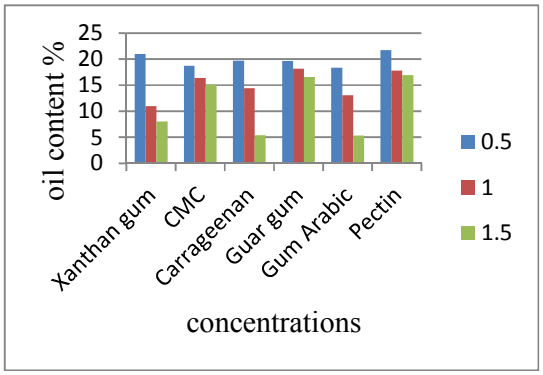

Figure 3: Effect of hydrocolloids on oil content of bhature

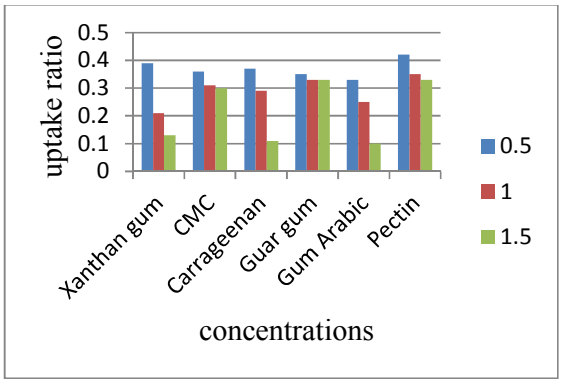

Figure 4: Effect of hydrocolloids on uptake ratio of bhature (U_R)

Regression equation between the oil content (Y) in % and the uptake ratio U_R(X).

Hydrocolloid	Regression Equation	Correlation coefficient (r^2)
Xanthan gum	Y=-26x+0.503	0.953
CMC	Y=-0.03x+0.383	0.871
Carrageenan	Y=-26x+0.516	0.953
Guar gum	Y=-2x+0.356	0.75
Gum Arabic	Y=-23x+0.456	0.97
Pectin	Y=-9x+0.456	0.906

Xanthan gum

Moisture retention within the dough and deep-fried bhature accumulated with incorporation of xanthan gum. wet of the dough was determined to be accumulated by 17 November than management sample. Across all concentrations of xanthan gum employed in the study oil absorption in bhature were reduced within the vary eight.7-65.13%. most quantity oil absorption in bhature was reduced to eight.02 to check out a one.5 % level, transferral regarding sixty five.13% reductions in oil content of the bhature. From the observations it had been found that the addition of one.5% Xanthan Gum within the bhature leads to the reduction of oil uptake magnitude relation from zero.5% to 0.13%. once gum acacia and carrageenin, xanthan gum is simpler to cut back the oil uptake of the bhature throughout sauteing. an honest correlation of zero.953 was determined between oil content and uptake magnitude relation, UR. Radwan Yousef Ajo (2017) used xanthan gum at concentration (0.1, 0.2, 0.3 and 0.4 %) to coat the potato chips-based pellets. Across all concentrations oil absorption in potato chips-based pellets were reduced within the vary twenty five.6-57.4%. They found best reduction in fat primarily based coating at zero.3% concentration of xanthan gum.

Carboxylmethyl polyose (CMC)

CMC forms films on the surface, that square measure proof against fats and oils. therefore with increase in level of CMC, oil content of bhature was found to decrease. Across all concentrations of CMC employed in the study oil absorption in bhature were reduced within the vary eighteen.73-34.34%. most thirty fourth reduction in oil content was determined by incorporating CMC at one.5% level. wet retention within the dough further as within the deep-fried bhature accumulated with increase in level of CMC. A correlation of zero.871 was determined between oil content and uptake magnitude relation, UR, that is below foretold worth zero.9 for deep-fried foods. Pinthus et al (1993). Annapure U.S.A. et al (1999) compared the result of varied

hydrocolloids on the oil content during a ancient model deep-fried product sev. Their study disclosed that at the amount of zero.5 % CMC, the oil content decreased by thirteen.21%.

CarrageenanCarrageenan could be a alga carbohydrate. it's the power to act with macromolecules in dough mixes which provides strength to the protein ingredients gift in them. therefore it's additional in numerous dough merchandise. it's additionally accustomed stabilize milk merchandise like chocolate, ice cream, process cheese and canned milk. wet content within the dough and deep-fried product is control carrageenin. wet proportion within the dough and in deep-fried bhature accumulated thereto of the management by incorporating carrageenin within the dough. once gum acacia, carrageenin at one.5% concentration was found to be simpler to cut back the oil content of bhature. The oil content decreased steady from twenty three you look after the management to five.41% for the sample containing one.5% carrageenin, transferral regarding AN oil reduction of seventy six.4 you must the management sample. an honest correlation between oil content and Ur was determined. From the observations it had been found that the addition of one.5% carrageenin within the bhature leads to the reduction of oil uptake magnitude relation from zero.5% to 0.11%. carrageenin reduces oil uptake that reduces the pathological state of human health like sterol, fat and high force per unit area. Radwan Yousef Ajo (2017) used carrageenin at concentration (1, 2, three and four %) to coat the potato chips-based pellets. Across all concentrations oil absorption in potato chips-based pellets were reduced within the vary 24-46.9%. They found best reduction in fat primarily based coating victimization four-dimensional concentration of xanthan gum.

Guar Gum:

Highest consistence was reported by gum at equivalent solids in water as compared to alternative commercially obtainable hydrocolloids. wet content within the dough accumulated with addition gum. wet proportion of the dough was accumulated by twelve-tone system than management sample.

Across all concentrations of gum employed in the study oil absorption in bhature were reduced within the vary fourteen.96-28%. it had been found that the oil content of bhature decreased bit by bit from twenty third for the management to sixteen.56 to check out a one.5 % level, transferral regarding twenty eighth reductions in oil content of the bhature. From the observations it had been found that the addition of one.5% gum within the bhature leads to the reduction of oil uptake magnitude relation from zero.5% to 0.33%. gum cannot type films like CMC. however at the side of blends of starch and proteins gift in flour it should type films. Reduction in oil content is also because of decrease within the physical phenomenon or the property of dough Bo Jia et al (2017) studied the result of gum with sorbitol coating on the properties and oil absorption of spud. They found that compared with management or samples coated with gum (blanching with or while not metal ions), the full oil (TO) of spud with gum and sorbitol reduced by fifty.8%, 33.1% and 30.6%, severally.

Gum Arabic:

Gum Arabic is exclusive therein it's very soluble and isn't terribly viscous at low concentrations. gum acacia forms an understandable film at the oil interface and prevents conglutination of oil globules as a movie forming agent. wet percentages of dough by incorporating gum acacia accumulated by V-day than management sample. Across all concentrations of gum acacia employed in the study oil absorption in bhature were reduced within the vary twenty.26-76.78%. it had been found that the oil content of bhature decreased bit by bit from twenty third for the management to five.34 to check out a one.5 % level, transferral regarding seventy six.76% reductions in oil content of the bhature. These hydrocolloids show high result on the reduction of oil content and wet retention of the merchandise. Its film forming ability is also to blame for accumulated water retention in dough and deep-fried bhature, further as low oil content in bhature. it had been determined that oil content and uptake magnitude relation (UR) were low for the merchandise. an honest correlation of zero.97 was determined between oil content and uptake magnitude relation, UR. Annapure (1999) et al. allotted screening of hydrocolloids gum, locust pod gum, gum gum, gum ghatti, gum karaya, gum Arabic, carrageenin, Xanthan, CMC and HPMC for

reduction in oil uptake of a deep-fried productsev. They found that gum acacia at two.0 a level most helpful with nineteen a discount in oil content with relevance the management among all the hydrocolloids tested in their study.

Pectin:

Pectin is employed as gelling agent, thickening agent, and stabilizer in nutrient. it's a gaggle of water soluble sugar substances that square measure found within the plasma membrane and animate thing tissues of bound plant. Pectins type each soluble and insoluble salts. wet % in bhature at level zero.5%, 1% and 1.5% were 10.08%, 10.86% and 10.10% severally. wet percentages of the dough accumulated by thirteen than management sample. Across all concentrations of cellulose employed in the study oil absorption in bhature were reduced within the vary twenty one.72-16.89%. it had been found that the oil content of bhature decreased bit by bit from twenty third for the management to sixteen.89 to check out a one.5 % level, transferral regarding twenty six.56% reductions in oil content of the bhature. From the observations it had been found that the addition of one.5% cellulose within the bhature leads to the reduction of oil uptake magnitude relation from zero.5% to 0.33%. Jittra Singthong and Chutima Thongkaew (2009) studied the result of hydrocolloids (alginate, CMC and pectin) on the oil absorption in deep-fried banana chips. They found cellulose because the best substance for low fat deep-fried banana chip production.

Conclusion

Among completely different hydrocolloids studied at zero.5–1.5% level (on the premise of refined flour and semolina) for preparation of bhature, it is terminated that gum acacia and carrageenin at one.5% level achieved highest decrease in oil proportion. These hydrocolloids cut back oil further as retention of wet content within the product. Thus, bhature with low fat and low calorie content with higher acceptance is ready so as to satisfy the demand of low fatty foods of health cautious shoppers.

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