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Effect of Corn Oil on the Quality Characteristics of Mayonnaise

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Abstract: Mayonnaise is semi-solid stable emulsion of vegetable oil, egg yolk or whole egg, vinegar or lemon juice, salt seasonings and sugars and dextrose. Oil is used in mayonnaise as energy source and for smooth texture. Mayonnaise was prepared by using different concentrations of corn oil (235, 240, 245, 250 and 255 mL). Firstly all the ingredients were weighed by using the electrical balance. Eggs and vinegar was cooled at 10-13°C. After washing and cleaning. Eggs were deshelled. Spices and eggs were blended for 2 min. Pouring of oil was started drop by drop at first and then remaining oil was added. Packaging was done in already hygienically cleaned bottles. The product was stored under controllable conditions. During the storage period the product was analyzed for moisture, crude protein, total ash, crude fat, and acidity. The sensory evaluation of the product was also made when stored under controlled conditions. The result of the investigation was statistically analyzed and interpreted. The present project was carried out to study the effect of corn oil on the different quality characteristics of mayonnaise. Different concentrations of corn oil were used to prepare mayonnaise samples. The mayonnaise samples were prepared by using 235, 240, 245, 250 and 255 mL of corn oil. These samples were tested for chemical properties like moisture, crude protein, crude fat, total ash, peroxide value and acidity. Among the sensory characteristics it was evaluated for its taste, texture, flavor and overall acceptability during 40 days of storage period. The test was made after 10 days interval up to 40 days. Among chemical characteristics the effect of different oil concentration was non-significant for fat and acidity. While as sensory characteristics were concerned color, flavor, taste, texture and overall acceptability decreased by increasing oil concentration. The last result was shown by the mayonnaise sample prepared by using 235 mL of corn oil. The concentration of 235 mL of corn oil showed good quality attributes especially with respect to its sensory evaluation such as color, taste, texture, flavor and overacceptability of mayonnaise. Mayonnaise prepared by using 235 mL of corn oil also showed good emulsion stability than others.

Key words: Mayonnaise, Physio-chemical properties, corn oil, sensory evaluation

INTRODUCTION

A wide variety of oil is used in the preparation of mayonnaise. The oil used in the mayonnaise and salad dressings provides a base for the rest of the ingredients. These oils are called salad oils and these oils should be refined, bleached, deodorized and winterized. Salad oil should be minimum cloud point of 5.5 h. Cloudiness is undesirable because it also looks bad and contribute waxy mouth feel. The corn oil was used in the preparation of mayonnaise. The prepared mayonnaise was studied for its sensory and physio-chemical properties for the fresh and stored mayonnaise.

Objective of the project:

- To prepare the mayonnaise with standard technique by using corn oil
- To analyze the mayonnaise for consumer acceptability
- To develop the new product without the loss of its acceptability
- To analyze the mayonnaise for its physio-chemical characteristics

- To analyze the mayonnaise for its sensory characteristics
- To analyze the effect of different concentrations of corn oil (235, 240, 245, 250 and 255 mL, respectively)

MATERIALS AND METHODS

For the preparation of the mayonnaise raw material including the refined sugar, common salt, mustard powder, vinegar, refined corn oil, white pepper and eggs were purchased from the local market.

Preparation of the product:

Recipe	
Ingredient	Quantity
Sugar	15 g
Salt	10 g
Vinegar	200 mL
Mustard powder	10 g
White pepper	05 g
Corn oil	235, 240, 245, 250 and 25 mL, respectively
Eggs	02 (In numbers)

Weighing of the ingredient: The entire ingredient was weighed with the help of the electrical balance.

Cooling of the ingredient: Eggs, Corn oil and vinegar was cooled at 10-13°C.

Blending of eggs and spices: Materials were blended for 2-5 min until the mixture was become creamy.

Addition of the vinegar: Vinegar was added and mixture was blended for two minutes.

Pouring of oil: Pouring of oil was done drop by drop at first until mixture become thick then remaining oil was added.

Analysis of the mayonnaise

Phsio-chemical analysis: The Phsio-chemical analysis like moisture, crude protein, crude fat, total ash and acidity was carried out as described in AOAC (1990). Mayonnaise was chemically and physically evaluated after 10,20,30 and 40 days of storage.

Sensory evaluation: Sensory evaluation of mayonnaise was carried out for color, flavor, taste, texture and overall acceptability after 10, 20, 30 and 40 days of storage intervals (Larmond, 1977).

Statistical analysis: The statistical analysis of the data obtained was carried out by using analysis of variance technique as described by Steel *et al.* (1997).

RESULTS AND DISCUSSION

The present project was carried out to study the effect of corn oil on the different quality characteristics of mayonnaise. Different concentrations of corn oil were used to prepare mayonnaise samples. The mayonnaise samples were prepared by using 235, 240, 245, 250 and 255 mL of corn oil. Theses samples were tested for chemical properties like moisture, crude protein, crude fat, total ash, peroxide value and acidity. Among the sensory characteristics it was evaluated for its taste, texture, flavor and overall acceptability during 40 days of storage period. The test was made after 10 days interval up to 40 days. The data about the moisture content in the product (Table 1) showed that there is no increase in the moisture content of the mayonnaise prepared by using different concentration of corn oil with passage of time.

Moisture content: The effect of corn oil on the moisture content of mayonnaise showed the result non-significant ($p>0.05$).

Comparison of treatment					
Treatment	T1	T2	T3	T4	T5
Mean	15.20	15.16	15.20	15.30	15.23

Ash content: The data regarding ash content in the mayonnaise sample indicated that ash content did not increase with the passage of time. The result was non-significant ($p>0.05$).

Comparison of treatment					
Treatment	T1	T2	T3	T4	T5
Mean	2.05	1.97	1.94	2.03	2.02

Fat content: Sensory characteristics of mayonnaise including appearance, texture, flavor and mouth feel was affected by the corn oil concentration. It is concentrated source of calories and contribute to the energy value (Potter and Hotchkiss, 1995). According to US definition and standard of identity for mayonnaise, it must contain 65% fat (Binsted *et al.*, 1971). The statistical result indicated that results were significant ($p<0.05$) for treatment and non-significant for storage:

Comparison of treatment					
Treatment	T1	T2	T3	T4	T5
Mean	62.28	63.74	65.50	66.36	67.82

Protein content: The ANOVA revealed the effect of corn oil and storage intervals on protein content. The result showed that treatment and storage period were all non-significant ($p>0.05$). The result also confirmed the finding of Ockerman (2000) who reported up to 1% of protein in different mayonnaise samples:

Comparison of treatment					
Treatment	T1	T2	T3	T4	T5
Mean	1.09	1.09	1.17	1.15	1.14

Acidity: The data regarding the acidity of the mayonnaise samples showed that acidity increased significantly ($p<0.05$) with the passage of time. After 40 days of storage maximum increase in the acidity was observed.

Comparison of treatment					
Treatment	T1	T2	T3	T4	T5
Mean	0.48	0.50	0.60	0.68	0.74

Sensory characteristics: Color is the important factor that affects aesthetic value of the food product. Mayonnaise, like other food product must in addition have good color. The data showed that the results were significant ($p<0.05$) for color.

Lawson (1995) reported that the appearance of color of the product is of prime importance in consumer acceptance. Booth (1990) suggested that appearance has always been recognized as major appetite stimulating and mouthwatering.

The data regarding the color score of product in Table 11 revealed that color changed during storage of mayonnaise samples. The lowest mean score of 3.76 has obtained by treatment T5 with increasing oil content color of mayonnaise increasingly became unacceptable:

Comparison of treatment

Treatment	T1	T2	T3	T4	T5
Mean	6.16	5.28	4.4	3.78	3.76

Table 1: Effect of different concentration of corn oil on the moisture of mayonnaise

Treatment	Storage (Days)					Mean
	0	10	20	30	40	
T1	15.00	15.00	15.50	15.50	15.0	15.20
T2	15.15	15.20	15.00	15.15	15.3	15.16
T3	15.00	15.30	15.50	15.20	15.0	15.20
T4	15.80	15.40	15.10	15.00	15.3	15.30
T5	15.60	15.40	15.00	15.15	15.0	15.23
Mean	15.30	15.21	15.25	15.33	15.0	

T1: By using 235 mL of corn oil
 T2: By using 240 mL of corn oil
 T3: By using 245 mL of corn oil
 T4: By using 250 mL of corn oil
 T5: By using 255 mL of corn oil

Table 2: Analysis of the variance for the effect of different concentration of corn oil on the moisture of mayonnaise

S.O.V	d.f	S.S	M.S	F-value
Treatments	4	0.07	0.018	0.27
Storage	4	0.10	0.025	0.37
Error	16	1.09	0.068	
Total	24	1.27		

Non-significant

Table 3: Effect of different concentration of corn oil on the ash of mayonnaise

Treatment	Storage (Days)					Mean
	0	10	20	30	40	
T1	2.00	2.10	2.15	2.15	1.85	2.05
T2	1.85	1.85	2.15	1.90	2.10	1.97
T3	1.85	2.00	1.90	2.10	1.85	1.94
T4	1.85	2.15	2.00	2.00	2.15	2.03
T5	2.10	2.00	2.10	1.90	2.00	2.02
Mean	1.91	2.04	2.02	2.02	1.99	

T1: By using 235 mL of corn oil
 T2: By using 240 mL of corn oil
 T3: By using 245 mL of corn oil
 T4: By using 250 mL of corn oil
 T5: By using 255 mL of corn oil

Table 4: Analysis of the variance for the effect of different concentration of corn oil on the ash content of mayonnaise

S.O.V	d.f	S.S	M.S	F-value
Treatments	4	0.04	0.010	0.69
Storage	4	0.05	0.011	0.75
Error	16	0.24	0.015	
Total	24	0.33		

Non-significant

Table 5: Effect of different concentration of corn oil on the fat of mayonnaise

Treatment	Storage (Days)					Mean
	0	10	20	30	40	
T1	63.22	62.12	60.92	63.42	61.72	62.28
T2	64.58	63.48	62.28	65.28	63.08	63.74
T3	65.94	64.48	63.64	66.64	66.44	65.50
T4	67.30	66.20	68.00	65.00	65.80	66.36
T5	68.66	67.56.00	69.36	66.36	67.16	67.82
Mean	65.94	64.64	64.84	65.44	64.74	

T1: By using 235 mL of corn oil
 T2: By using 240 mL of corn oil
 T3: By using 245 mL of corn oil
 T4: By using 250 mL of corn oil
 T5: By using 255 mL of corn oil

Table 6: Analysis of the variance for the effect of different concentration of corn oil on the fat content of mayonnaise

S.O.V	d.f	S.S	M.S	F-value
Treatments	4	72.20	18.050	8.17**
Storage	4	5.34	1.335	0.60**
Error	16	0.24	2.210	
Total	24	112.90		

Highly significant

Table 7: Effect of different concentration of corn oil on the protein of mayonnaise

Treatment	Storage (Days)					Mean
	0	10	20	30	40	
T1	1.00	1.10	1.20	1.15	1.00	1.09
T2	1.00	1.30	1.15	1.00	1.00	1.09
T3	1.15	1.20	1.20	1.20	1.10	1.17
T4	1.20	1.10	1.10	1.15	1.20	1.15
T5	1.15	1.00	1.15	1.20	1.20	1.14
Mean	1.100	1.14	1.16	1.14	1.10	

T1: By using 235 mL of corn oil
 T2: By using 240 mL of corn oil
 T3: By using 245 mL of corn oil
 T4: By using 250 mL of corn oil
 T5: By using 255 mL of corn oil

Table 8: Analysis of the variance for the effect of different concentration of corn oil on the protein content of mayonnaise

S.O.V	d.f	S.S	M.S	F-value
Treatments	4	0.03	0.007	0.78NS
Storage	4	0.01	0.004	0.43NS
Error	16	0.013	0.008	
Total	24	0.18		

Non-significant

Table 9: Effect of different concentration of corn oil on the moisture of mayonnaise

Treatment	Storage (Days)					Mean
	0	10	20	30	40	
T1	0.48	0.45	0.49	0.49	0.50	0.48
T2	0.50	0.49	0.49	0.52	0.52	0.50
T3	0.60	0.58	0.58	0.64	0.64	0.60
T4	0.65	0.68	0.68	0.70	0.70	0.68
T5	0.71	0.67	0.70	0.73	0.74	0.74
Mean	0.60	0.59	0.60	0.63	0.63	

T1: By using 235 mL of corn oil
 T2: By using 240 mL of corn oil
 T3: By using 245 mL of corn oil
 T4: By using 250 mL of corn oil
 T5: By using 255 mL of corn oil

Table 10: Analysis of the variance for the effect of different concentration of corn oil on the acidity of mayonnaise

S.O.V	d.f	S.S	M.S	F-value
Treatments	4	0.21	0.053	356.07
Storage	4	0.01	0.002	12.17
Error	16	0.00	0.00	
Total	24			

Highly significant

Flavor: Baur (1995) reported that flavor of product is considered the prime determinant in its acceptance. The flavor of oil and fat products are generally ascribed to the component of fatty acids. The result showed that the flavor value significantly increased ($p < 0.05$).

Table 11: Effect of different concentration of corn oil on the moisture of mayonnaise

Treatment	Storage (Days)					Mean
	0	10	20	30	40	
T1	8.1	7.1	6.2	5.2	4.2	6.16
T2	7.3	6.2	5.4	4.3	3.2	5.28
T3	6.1	5.2	4.3	3.2	3.2	4.4
T4	5.2	4.1	3.3	3.2	3.1	3.78
T5	5.3	4.1	3.2	3.1	3.1	3.76
Mean	6.4	5.34	4.48	3.1	3.36	

T1: By using 235 mL of corn oil
 T2: By using 240 mL of corn oil
 T3: By using 245 mL of corn oil
 T4: By using 250 mL of corn oil
 T5: By using 255 mL of corn oil

Table 12: Analysis of the variance for the effect of different concentration of corn oil on the color of mayonnaise

S.O.V	d.f	S.S	M.S	F-value
Treatments	4	21.43	5.356	27.41
Storage	4	29.75	7.438	38.07
Error	16	3.13	0.195	
Total	24			

Highly significant

Table 13: Effect of different concentration of corn oil on the flavor of mayonnaise

Treatment	Storage (Days)					Mean
	0	10	20	30	40	
T1	1.2	8.3	7.2	6.1	5.1	7.8
T2	8.1	7.2	6.3	5.2	4.3	6.22
T3	7.3	6.1	5.4	4.2	3.3	5.26
T4	6.2	5.4	4.3	3.4	2.4	4.28
T5	5.4	4.5	3.4	2.3	2.2	3.56
Mean	7.24	6.24	5.32	4.24	3.46	

T1: By using 235 mL of corn oil
 T2: By using 240 mL of corn oil
 T3: By using 245 mL of corn oil
 T4: By using 250 mL of corn oil
 T5: By using 255 mL of corn oil

Table 14: Analysis of the variance for the effect of different concentration of corn oil on the Ash content of mayonnaise

S.O.V	d.f	S.S	M.S	F-value
Treatments	4	42.25	10.563	322.53
Storage	4	45.78	11.446	349.50
Error	16	0.52	0.033	
Total	24	88.56		

Highly significant

Table 15: Effect of different concentration of corn oil on the taste of mayonnaise

Treatment	Storage (Days)					Mean
	0	10	20	30	40	
T1	9.3	8.1	8.1	7.2	6.3	7.80
T2	9.2	7.4	7.3	6.4	6.1	6.88
T3	8.3	7.5	7.4	6.5	6.1	7.16
T4	7.5	7.3	6.2	6.1	5.4	8.50
T5	7.2	7.1	6.3	5.5	4.5	6.12
Mean	7.90	7.48	7.06	6.34	5.68	

T1: By using 235 mL of corn oil
 T2: By using 240 mL of corn oil
 T3: By using 245 mL of corn oil
 T4: By using 250 mL of corn oil
 T5: By using 255 mL of corn oil

Table 16: Analysis of the variance for the effect of different concentration of corn oil on the taste of mayonnaise

S.O.V	d.f	S.S	M.S	F-value
Treatments	4	8.23	2.058	17.24
Storage	4	15.82	3.955	33.13
Error	16	1.91	0.119	
Total	24			

Highly significant

Table 17: Effect of different concentration of corn oil on the texture of mayonnaise

Treatment	Storage (Days)					Mean
	0	10	20	30	40	
T1	9.4	9.3	8.5	8.1	7.4	8.54
T2	9.2	8.2	7.3	7.2	7.2	7.82
T3	7.5	7.2	6.4	6.1	5.5	6.54
T4	7.3	7.1	5.2	6.1	5.2	6.38
T5	6.4	6.1	5.4	5.2	5.1	5.64
Mean	7.96	7.58	6.76	6.54	6.08	

T1: By using 235 mL of corn oil
 T2: By using 240 mL of corn oil
 T3: By using 245 mL of corn oil
 T4: By using 250 mL of corn oil
 T5: By using 255 mL of corn oil

Table 18: Analysis of the variance for the effect of different concentration of corn oil on the Ash content of mayonnaise

S.O.V	d.f	S.S	M.S	F-value
Treatments	4	27.44	6.86	123.28
Storage	4	11.86	2.965	53.29
Error	16	0.89	0.056	
Total	24			

Highly significant

Table 19: Effect of different concentration of corn oil on the overall acceptability of mayonnaise

Treatment	Storage (Days)					Mean
	0	10	20	30	40	
T1	9.2	8.4	7.3	7.1	6.3	7.66
T2	8.3	8.1	7.2	7.2	6.1	7.38
T3	8.1	7.4	7.1	5.4	5.5	6.90
T4	7.3	7.1	6.3	5.2	5.1	6.20
T5	6.4	6.1	5.3	5.1	4.5	5.44
Mean	7.86	7.42	6.60	6.20	5.50	

T1: By using 235 mL of corn oil
 T2: By using 240 mL of corn oil
 T3: By using 245 mL of corn oil
 T4: By using 250 mL of corn oil
 T5: By using 255 mL of corn oil

Table 20: Analysis of the variance for the effect of different concentration of corn oil on the overall acceptability content of mayonnaise

S.O.V	d.f	S.S	M.S	F-value
Treatments	4	16.30	4.075	58.3
Storage	4	17.81	4.453	63.71
Error	16	1.12	0.070	
Total	24			

Non-significant

Comparison of treatment

Treatment	T1	T2	T3	T4	T5
Mean	7.80	6.22	5.26	4.28	3.56

Taste: The ANOVA revealed the effect of treatments and storage intervals on the taste of the product Table 16. The taste of mayonnaise showed the result highly significant ($p < 0.05$).

Comparison of treatment

Treatment	T1	T2	T3	T4	T5
Mean	7.80	6.88	7.16	8.50	6.12

Texture: The ANOVA revealed the results showed that the storage intervals treatments were highly significant ($p < 0.05$) Table 18.

Booth (1990) suggested that precautions needed to be taken according to nature of food stuff concerned to avoid or minimize textural changes in foods:

Comparison of treatment

Treatment	T1	T2	T3	T4	T5
Mean	8.54	7.82	6.51	6.38	5.64

Overall acceptability: Results of the sensory assessment are presented in Table 19. The judges observes a decline in overall acceptability mayonnaise during storage by giving low score. The decrease in overall acceptability of mayonnaise during storage might be due to change in color, taste and flavor of mayonnaise samples. However overall acceptability of T1 was better than all other treatments. The ANOVA revealed that the storage interval treatments were highly significant ($p < 0.05$) and overall acceptability decreased with storage time.

Comparison of treatment

Treatment	T1	T2	T3	T4	T5
Mean	7.66	7.38	6.90	6.20	5.44

Conclusion: The present project was carried out to study the effect of corn oil on the different quality characteristics of mayonnaise. Different concentrations of corn oil were used to prepare mayonnaise samples. The mayonnaise samples were prepared by using 235, 240, 245, 250 and 255 mL of corn oil. These samples were tested for chemical properties like moisture, crude protein, crude fat, total ash, peroxide value and acidity. Among the sensory characteristics it was evaluated for its taste, texture, flavor and overall acceptability during 40 days of storage period. The test was made after 10 days interval up to 40 days. Among chemical

characteristics the effect of different oil concentration was non-significant for fat and acidity. While as sensory characteristics were concerned color, flavor, taste, texture and overall acceptability decreased by increasing oil concentration. The last result was shown by the mayonnaise sample prepared by using 235 mL of corn oil. The concentration of 235 mL of corn oil showed good quality attributes especially with respect to its sensory evaluation such as color, taste, texture, flavor and overacceptability of mayonnaise. Mayonnaise prepared by using 235 mL of corn oil also showed good emulsion stability than others.

REFERENCES

- AOAC, 1990. Official Methods of Analysis. 15th Ed. Association of Official Analytical Chemists, Inc., Virginia, USA, pp.: 770-771.
- Baur, F.J., 1995. Nutritional aspects of oils and fats (Chapter 13) technology, utilization, and nutrition. Chapman & Hall Publishers International Thomson Publishing Co. New York, U.S.A., pp: 203-280.
- Binsted, R., J.D. Devey and J.C. Dakin, 1971. Pickles and sauce making. 3rd edn, Food Trade Press Ltd., London.
- Booth, R.G., 1990. Snack food. Van Nostrand Reinhold, Publishers 1st edition. New York. U.S.A.
- Larmond, E., 1977. Laboratory methods of sensory evaluation of foods. Publication 1673. Dep't of Agriculture. Ottawa, Canada.
- Lawson, H., 1995. Food oils and Fat Technology utilization and Nutrition. Chapman and Hall International Thomson Publishing Co. New York, U.S.A.
- Ockerman, H.W. and C.L. Hansen, 2000. Sausage containers. In: Animal by-product processing and utilization. CRC Press, Boca Raton, pp: 285-323.
- Potter, N.N. and J.H. Hotchkiss, 1995. Food Science 5th edition; Chapman and Hall Publishers, New York.
- Steel, R.G.D., J.H. Torrie and D.A. Dickey, 1997. Principles and procedures of statistics: A biometrical approach. 3rd ed. McGraw-Hill, New York, USA., pp: 356.