SUMMARY AND CONCLUSION

Keeping the health consciousness of consumers, the food industry is gearing up to bring low fat and high vitamin A products in the market with this in view, the present study was made with an attempt to manufacture low fat and high vitamin A frozen yoghurt. With the following objectives:

2. To evaluate the organoleptic quality of low fat frozen yogurt with carrot pulp.
3. To evaluate the microbial analysis of low fat frozen yogurt with carrot pulp.
4. To estimate the cost of prepared of low fat frozen yogurt with carrot pulp.

The different treatment combinations used in the experiment were represented as follows:

\( T_1S_1F_1 \) – Low fat frozen yogurt prepared by using 2 percent carrot pulp, 0.3 percent stabilizer and 0.5 percent fat (4:0.6:1), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

\( T_1S_1F_2 \) – Low fat frozen yogurt prepared by using 2 percent carrot pulp, 0.3 percent stabilizer and 1.5 percent fat (4:0.6:3), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

\( T_1S_1F_3 \) – Low fat frozen yogurt prepared by using 2 percent carrot pulp, 0.3 percent stabilizer and 3 percent fat (4:0.6:6), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

\( T_1S_2F_1 \) – Low fat frozen yogurt prepared by using 2 percent carrot pulp, 0.4 percent stabilizer and 0.5 percent fat (4:0.8:1), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

\( T_1S_2F_2 \) – Low fat frozen yogurt prepared by using 2 percent carrot pulp, 0.4 percent stabilizer and 1.5 percent fat (4:0.8:3), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

\( T_1S_2F_3 \) – Low fat frozen yogurt prepared by using 2 percent carrot pulp, 0.4 percent stabilizer and 3 percent fat (4:0.8:6), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

\( T_1S_3F_1 \) – Low fat frozen yogurt prepared by using 2 percent carrot pulp, 0.5 percent stabilizer and 0.5 percent fat (4:1:1), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.
**T₁S₂F₂** – Low fat frozen yogurt prepared by using 2 percent carrot pulp, 0.5 percent stabilizer and 1.5 percent fat (4:1:3), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

**T₁S₂F₃** – Low fat frozen yogurt prepared by using 2 percent carrot pulp, 0.5 percent stabilizer and 3 percent fat (4:1:6), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

**T₂S₁F₁** – Low fat frozen yogurt prepared by using 3 percent carrot pulp, 0.3 percent stabilizer and 0.5 percent fat (6:0.6:1), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

**T₂S₁F₂** – Low fat frozen yogurt prepared by using 3 percent carrot pulp, 0.3 percent stabilizer and 1.5 percent fat (6:0.6:3), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

**T₂S₁F₃** – Low fat frozen yogurt prepared by using 3 percent carrot pulp, 0.3 percent stabilizer and 3 percent fat (6:0.6:6), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

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**T₂S₁F₁** – Low fat frozen yogurt prepared by using 4 percent carrot pulp, 0.3 percent stabilizer and 0.5 percent fat (8:0.6:1), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

**T₂S₁F₂** – Low fat frozen yogurt prepared by using 4 percent carrot pulp, 0.3 percent stabilizer and 1.5 percent fat (8:0.6:3), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

**T₂S₁F₃** – Low fat frozen yogurt prepared by using 4 percent carrot pulp, 0.5 percent stabilizer and 0.5 percent fat (8:1:1), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

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**T₂S₃F₂** – Low fat frozen yogurt prepared by using 4 percent carrot pulp, 0.5 percent stabilizer and 1.5 percent fat (8:1:3), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

**T₂S₃F₃** – Low fat frozen yogurt prepared by using 4 percent carrot pulp, 0.5 percent stabilizer and 3 percent fat (8:1:6), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.
T_4S_1F_1 – Low fat frozen yogurt prepared by using 5 percent carrot pulp, 0.3 percent stabilizer and 0.5 percent fat (10:0.6:1), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

T_4S_1F_2 – Low fat frozen yogurt prepared by using 5 percent carrot pulp, 0.3 percent stabilizer and 1.5 percent fat (10:0.6:3), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

T_4S_1F_3 – Low fat frozen yogurt prepared by using 5 percent carrot pulp, 0.3 percent stabilizer and 3 percent fat (10:0.6:6), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

T_4S_2F_1 – Low fat frozen yogurt prepared by using 5 percent carrot pulp, 0.4 percent stabilizer and 0.5 percent fat (10:0.8:1), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

T_4S_2F_2 – Low fat frozen yogurt prepared by using 5 percent carrot pulp, 0.4 percent stabilizer and 1.5 percent fat (10:0.8:3), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

T_4S_2F_3 – Low fat frozen yogurt prepared by using 5 percent carrot pulp, 0.4 percent stabilizer and 3 percent fat (10:0.8:6), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

T_4S_3F_1 – Low fat frozen yogurt prepared by using 5 percent carrot pulp, 0.5 percent stabilizer and 0.5 percent fat (10:1:1), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

T_4S_3F_2 – Low fat frozen yogurt prepared by using 5 percent carrot pulp, 0.5 percent stabilizer and 1.5 percent fat (10:1:3), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

T_4S_3F_3 Low fat frozen yogurt prepared by using 5 percent carrot pulp, 0.5 percent stabilizer and 3 percent fat (10:1:6), 12 percent SNF, with addition of 12 percent sugar and 2 percent of yoghurt starter culture.

The experimental trials were replicated three times and in each replication the products were tested for acidity, pH, total solids, overrun, moisture, ash, protein, total carbohydrate, total carotene, calcium, yeast and mould count and presumptive coliform and organoleptic tests.
(flavour and taste, body and texture, colour and appearance and overall acceptability). A panel of five judges evaluated the low-fat frozen yoghurt with carrot pulp by using score card (9 point hedonic scale) for organoleptic properties. The obtained data were statistically analyzed using 4x3x3 factorial design and critical difference technique and the results.

**Moisture content in low-fat frozen carrot yoghurt**

The highest mean moisture content was recorded in T₄S₂F₁ (81.6) followed by T₁S₁F₁ (78.2), T₁S₁F₂ (77.2), T₁S₁F₃ (75.5), T₁S₂F₁ (78.7), T₁S₂F₂ (77.3), T₁S₂F₃ (75.6), T₁S₃F₁ (77.98), T₁S₃F₂ (77.0), T₂S₁F₁ (79.2), T₂S₁F₂ (77.84), T₂S₁F₃ (76.3), T₂S₂F₁ (79.0), T₂S₂F₂ (78.4), T₂S₂F₃ (76.8), T₂S₃F₁ (79.3), T₂S₃F₂ (78.0), T₂S₃F₃ (76.8), T₃S₁F₁ (81.05), T₃S₁F₂ (79.5), T₃S₁F₃ (78.2), T₃S₂F₁ (80.4), T₃S₂F₂ (79.4), T₃S₂F₃ (77.9), T₃S₃F₁ (80.6), T₃S₃F₂ (80.19), T₃S₃F₃ (77.97), T₄S₁F₁ (81.7), T₄S₁F₂ (80.4), T₄S₁F₃ (79.4), T₄S₂F₂ (80.8), T₄S₂F₃ (78.7), T₄S₃F₁ (80.9), T₄S₃F₂ (80.4) and T₄S₃F₃ (78.5). The lowest total moisture content of 75.0 percent was recorded for T₁S₁F₃. Moisture content of low-fat frozen carrot yoghurt differed significantly in most of the treatment combinations.

On comparing the average moisture content for different levels of carrot pulp against critical different value, significant difference was observed between the mean values of T₁-T₂ (0.95), T₁-T₃ (2.38), T₁-T₄ (3.14), T₂-T₃ (1.43), T₂-T₄ (2.19), and T₃-T₄ (0.76). The average value of T₄ (80.2) was highest and it differs significantly from all other levels of carrot pulp. So it can be regarded as best.

On comparing the average moisture content for different levels of fat against critical different value, significant difference was observed between the mean values of F₁-F₂ (0.99), F₁-F₃ (2.58) and F₂-F₃ (1.58). The average value of F₁ (79.86) was highest and it differs significantly from all other levels of fat. In terms of stabilizer there is no significant difference between treatment combinations.

**Fat content in low-fat frozen carrot yoghurt**

The highest average score for fat content of low fat frozen yoghurt was recorded in T₁S₁F₃ (2.60) followed by T₁S₁F₁ (0.43), T₁S₁F₂ (1.3), T₁S₂F₁ (0.41), T₁S₂F₂ (1.23), T₁S₂F₃ (2.56), T₁S₃F₁ (0.42), T₁S₃F₂ (1.22), T₁S₃F₃ (2.45), T₂S₁F₁ (0.42), T₂S₁F₂ (1.23), T₂S₁F₃ (2.55), T₂S₂F₁ (0.41), T₂S₂F₂ (1.2), T₂S₂F₃ (2.54), T₂S₃F₁ (1.1), T₂S₃F₂ (2.58), T₂S₃F₃ (0.43), T₃S₁F₂ (1.32), T₃S₁F₃ (2.52), T₃S₂F₁ (0.44), T₃S₂F₂ (1.32), T₃S₂F₃ (2.53), T₃S₃F₁ (0.42), T₃S₃F₂ (1.33), T₃S₃F₃ (2.57), T₄S₁F₁ (0.43), T₄S₁F₂ (1.32), T₄S₁F₃ (2.6), T₄S₂F₁ (0.41), T₄S₂F₂ (1.28), T₄S₂F₃ (2.53), T₄S₃F₁ (0.46), T₄S₃F₂ (1.32) and T₄S₃F₃ (2.6). The lowest fat content of 0.39 percent was recorded for T₂S₁F₁. Fat content of low-fat frozen carrot yoghurt differed significantly in most of the treatment combinations.

The fat content of product as carrot pulp no significant difference was found between treatment combinations.
On comparing the fat content for different levels of fat against critical different value, significant difference was observed between the mean values of F₁-F₂ (0.83), F₁-F₃ (2.11) and F₂-F₃ (1.28). The average value of F₃ (2.53) was highest and it differs significantly from all other levels of fat. So it can be regarded as best. In terms of fat and stabilizer there is no significant difference between treatment combinations.

Protein content in low-fat frozen carrot yoghurt

The highest mean protein content was recorded in T₁S₁F₂ (4.29) followed by T₁S₁F₁ (4.20), T₁S₁F₃ (4.23), T₁S₂F₁ (4.22), T₁S₂F₂ (4.26), T₁S₂F₃ (4.26), T₁S₃F₁ (4.22), T₁S₃F₂ (4.26), T₁S₃F₃ (4.26), T₂S₁F₁ (3.96), T₂S₁F₂ (3.91), T₂S₁F₃ (3.95), T₂S₂F₁ (3.99), T₂S₂F₂ (3.94), T₂S₂F₃ (3.98), T₂S₃F₁ (3.95), T₂S₃F₂ (3.97), T₂S₃F₃ (3.96), T₃S₁F₁ (3.29), T₃S₁F₂ (3.29), T₃S₁F₃ (3.29), T₃S₂F₁ (3.28), T₃S₂F₂ (3.28), T₃S₂F₃ (3.28), T₃S₃F₁ (3.28), T₃S₃F₂ (3.28), T₃S₃F₃ (2.91), T₄S₁F₁ (2.95), T₄S₁F₂ (2.92), T₄S₁F₃ (2.94), T₄S₂F₁ (2.91), T₄S₂F₂ (2.91), T₄S₂F₃ (2.99), T₄S₃F₂ (2.97) and T₄S₃F₃ (2.96). The lowest protein content of 2.89 percent was recorded for T₄S₁F₁. Protein content of low-fat frozen carrot yoghurt differed significantly in most of the treatment combinations.

On comparing the protein content for different levels of carrot against critical different value, significant difference was observed between the mean values of T₁-T₂ (0.33), T₁-T₃ (0.99), T₁-T₄ (1.4), T₂-T₃ (0.66), T₂-T₄ (1.07), and T₃-T₄ (0.409). The average value of T₁ (4.28) was highest and it differs significantly from all other levels of carrot pulp. So it can be regarded as best. In terms of fat and stabilizer there is no significant difference between treatment combinations.

Carbohydrate content in low-fat frozen carrot yoghurt

The highest average score for carbohydrate content of low fat frozen yoghurt was recorded in T₁S₁F₃ (16.96) followed by T₁S₁F₁ (16.25), T₁S₁F₂ (16.62), T₁S₁F₃ (16.04), T₁S₂F₁ (16.54), T₁S₂F₃ (16.86), T₁S₃F₁ (16.74), T₁S₃F₂ (16.83), T₁S₃F₃ (16.67), T₂S₁F₁ (15.35), T₂S₁F₂ (15.93), T₂S₁F₃ (15.98), T₂S₂F₁ (15.52), T₂S₂F₂ (15.31), T₂S₂F₃ (15.12), T₂S₃F₁ (15.26), T₂S₃F₂ (15.26), T₂S₃F₃ (15.74), T₃S₁F₁ (14.48), T₃S₁F₂ (14.89), T₃S₁F₃ (14.65), T₃S₂F₁ (14.99), T₃S₂F₂ (14.81), T₃S₂F₃ (14.97), T₃S₃F₁ (14.5), T₃S₃F₂ (14.02), T₃S₃F₃ (14.99), T₄S₁F₁ (13.28), T₄S₁F₂ (13.62), T₄S₁F₃ (13.35), T₄S₂F₂ (13.21), T₄S₂F₃ (13.89), T₄S₃F₁ (13.99), T₄S₃F₂ (13.47) and T₄S₃F₃ (13.98). The lowest total carbohydrate content of 13.15 percent was recorded for T₄S₁F₃. Carbohydrate content of low-fat frozen carrot yoghurt differed significantly in most of the treatment combinations.

On comparing the carbohydrate content for different levels of carrot against critical different value, significant difference was observed between the mean values of T₁-T₂ (1.05), T₁-T₃ (2.03), T₁-T₄ (3.09), T₂-T₃ (0.98), T₂-T₄ (1.98), and T₃-T₄ (0.1). The average value of T₁ (16.52) was highest and it differs significantly from all other levels of carrot pulp. So it can be regarded as best. In terms of fat and stabilizer there is no significant difference between treatment combinations.
Ash content in low-fat frozen carrot yoghurt

The highest average score for ash content of low fat frozen yoghurt was recorded in T₄S₂F₃ (1.97) followed by T₁S₁F₂ (0.65), T₁S₁F₃ (0.68), T₁S₂F₁ (0.63), T₁S₂F₂ (0.67), T₁S₂F₃ (0.72), T₃S₃F₁ (0.64), T₃S₃F₂ (0.66), T₃S₃F₃ (0.72), T₂S₁F₁ (1.07), T₂S₁F₂ (1.09), T₂S₁F₃ (1.22), T₂S₂F₁ (1.08), T₂S₂F₂ (1.15), T₂S₂F₃ (1.26), T₂S₃F₁ (1.1), T₂S₃F₂ (1.19), T₂S₃F₃ (1.29), T₃S₁F₁ (0.80), T₃S₁F₂ (1.0), T₃S₁F₃ (1.34), T₃S₂F₁ (0.89), T₃S₂F₂ (1.18), T₃S₂F₃ (1.32), T₃S₃F₁ (1.2), T₃S₃F₂ (1.19), T₃S₃F₃ (1.46), T₄S₁F₁ (1.70), T₄S₁F₂ (1.75), T₄S₁F₃ (1.90), T₄S₂F₁ (1.72), T₄S₂F₂ (1.77), T₄S₃F₁ (1.66), T₄S₃F₂ (1.84) and T₄S₃F₃ (1.96). The lowest total ash content of 0.62 percent was recorded for T₁S₁F₁. Ash content of low-fat frozen carrot yoghurt differed significantly in most of the treatment combinations.

On comparing the ash content for different levels of carrot against critical different value, significant difference was observed between the mean values of T₁-T₂ (0.52), T₁-T₃ (0.52), T₁-T₄ (1.16), T₂-T₄ (0.64), and T₃-T₄ (0.64). The average value of T₄ (1.74) was highest and it differs significantly from all other levels of carrot pulp. So it can be regarded as best.

On comparing the ash content for different levels of fat against critical different value, significant difference was observed between the mean values of F₁-F₂ (0.08), F₁-F₃ (0.21) and F₂-F₃ (0.13). The average value of F₃ (1.3) was highest and it differs significantly from all other levels of fat. So it can be regarded as best.

On comparing the ash content for different levels of stabilizer against critical different value, significant difference was observed between the mean values of S₁-S₃ (0.07) and S₂-S₃ (0.07). The average value of S₃ (1.23) was highest and it differs significantly from all other levels of fat. So it can be regarded as best.

Total carotene content in low-fat frozen carrot yoghurt

The highest average score for total carotene content of low fat frozen yoghurt was recorded in T₄S₃F₃ (312) followed by T₁S₁F₂ (217), T₁S₁F₃ (220), T₁S₂F₁ (214), T₁S₂F₂ (218), T₁S₂F₃ (219), T₁S₃F₁ (216), T₁S₃F₂ (216), T₁S₃F₃ (220), T₂S₁F₁ (238), T₂S₁F₂ (244), T₂S₁F₃ (247), T₂S₂F₁ (240), T₂S₂F₂ (246), T₂S₂F₃ (249), T₂S₃F₁ (242), T₂S₃F₂ (245), T₂S₃F₃ (250), T₃S₁F₁ (252), T₃S₁F₂ (260), T₃S₁F₃ (270), T₃S₂F₁ (254), T₃S₂F₂ (263), T₃S₂F₃ (273), T₃S₃F₁ (255), T₃S₃F₂ (264), T₃S₃F₃ (276), T₄S₁F₁ (302), T₄S₁F₂ (306), T₄S₁F₃ (309), T₄S₂F₁ (304), T₄S₂F₂ (308), T₄S₂F₃ (310), T₄S₃F₁ (304) and T₄S₃F₂ (309). The lowest total carotene content of 214 µg was recorded for T₁S₁F₁. Carotene content of low-fat frozen carrot yoghurt differed significantly in most of the treatment combinations.

On comparing the total carotene content for different levels of carrot against critical different value, significant difference was observed between the mean values of T₁-T₂ (27.96), T₁-T₃ (46.33), T₁-T₄ (90), T₂-T₃ (18.36), T₂-T₄ (62.04) and T₃-T₄ (43.67). The average value of T₄
(306.96) was highest and it differs significantly from all other levels of carrot pulp. So it can be regarded as best.

On comparing the total carotene content for different levels of fat against critical different value, significant difference was observed between the mean values of F1-F2 (4.94), F1-F3 (10.16) and F2-F3 (5.22). The average value of F3 (263.16) was highest and it differs significantly from all other levels of fat. So it can be regarded as best.

On comparing the total carotene content for different levels of stabilizer against critical different value, significant difference was observed between the mean values of S1-S2 (1.67) and S1-S3 (2.78). The average value of S3 (259.33) was highest and it differs significantly from all other levels of stabilizer. So it can be regarded as best.

**Calcium content in low-fat frozen carrot yoghurt**

The highest average scores for calcium content of low fat frozen yoghurt was recorded in T3S3F3 (180) followed by T1S1F1 (165), T1S1F2 (160), T1S1F3 (150), T1S2F1 (160), T1S2F2 (165), T1S2F3 (180), T1S3F1 (160), T1S3F2 (170), T1S3F3 (150), T2S1F1 (160), T2S1F2 (180), T2S1F3 (170), T2S2F1 (150), T2S2F2 (170), T2S2F3 (140), T2S3F2 (180), T2S3F3 (160), T3S1F1 (150), T3S1F2 (170), T3S2F1 (160), T3S2F2 (130), T3S2F3 (140), T3S3F1 (140), T3S3F2 (160), T4S1F1 (170), T4S1F2 (130), T4S1F3 (170), T4S2F1 (150), T4S2F2 (150), T4S2F3 (160), T4S3F1 (140), T4S3F2 (140) and T4S3F3 (170). The lowest calcium content of 130 mg was recorded for T2S3F1. Calcium content of low-fat frozen carrot yoghurt differed significantly in most of the treatment combinations.

On comparing the calcium content for different levels of carrot against critical different value, significant difference was observed between the mean values of T1-T2 (2.96), T1-T3 (49.44), T1-T4 (61.85), T2-T3 (46.48) and T2-T4 (58.89). The average value of T4 (331.85) was highest and it differs significantly from all other levels of carrot pulp. So it can be regarded as best.

On comparing the calcium content for different levels of fat against critical different value, significant difference was observed between the mean values of F1-F3 (35) and F2-F3 (24.72). The average value of F3 (318.47) was highest and it differs significantly from all other levels of fat. So it can be regarded as best. In terms of stabilizer there is no significant difference between treatment combinations.

**pH content in low-fat frozen carrot yoghurt**

The highest average scores for pH of low fat frozen yoghurt was recorded in T3S2F2 (5.2) followed by T1S1F1 (4.7), T1S1F2 (4.4), T1S1F3 (4.7), T1S2F1 (4.46), T1S2F2 (4.8), T1S2F3 (4.5), T1S3F1 (4.8), T1S3F2 (4.9), T1S3F3 (4.38), T2S1F1 (4.66), T2S1F2 (4.8), T2S1F3 (4.7), T2S2F1 (4.9), T2S2F2 (5.1), T2S2F3 (4.42), T2S3F1 (4.8), T2S3F2 (4.82), T3S3F1 (4.6), T3S3F2 (4.46), T3S1F1 (4.8), T3S1F2 (4.8), T3S1F3 (4.42), T3S2F1 (4.7), T3S2F2 (4.45), T3S2F3 (4.6), T3S2F4 (4.7), T4S1F1 (4.4), T4S1F2.
(4.7), T₄S₁F₃ (4.5), T₄S₂F₁ (4.5), T₄S₂F₂ (4.8), T₄S₂F₃ (4.55), T₄S₃F₁ (4.5), T₄S₃F₂ (4.7) and T₄S₃F₃ (4.8). The lowest total pH content of 4.31 percent was recorded for T₃S₂F₂. The pH content of low-fat frozen carrot yoghurt differed significantly in most of the treatment combinations.

On comparing the pH content for different levels of carrot against critical different value, significant difference was observed between the mean values of T₁-T₂ (0.127) and T₁-T₃ (0.117). The average value of T₂ (4.69) was highest and it differs significantly from all other levels of carrot pulp. So it can be regarded as best.

On comparing the pH content for different levels of fat against critical different value, significant difference was observed between the mean values of F₁-F₂ (0.13), F₁-F₃ (0.22) and F₂-F₃ (1.57). The average value of F₂ (4.74) was highest and it differs significantly from all other levels of fat. So it can be regarded as best. In terms of stabilizer there is no significant difference between treatment combinations.

**Acidity content in low-fat frozen carrot yoghurt**

The highest average scores for acidity of low fat frozen yoghurt was recorded in T₄S₃F₃ (0.198) followed by T₁S₁F₁ (0.16), T₁S₁F₂ (0.12), T₁S₁F₃ (0.17), T₁S₂F₂ (0.13), T₁S₂F₃ (0.19), T₁S₃F₁ (0.15), T₁S₃F₂ (0.15), T₁S₃F₃ (0.11), T₂S₁F₁ (0.12), T₂S₁F₂ (0.133), T₂S₁F₃ (0.13), T₂S₂F₁ (0.13), T₂S₂F₂ (0.171), T₂S₂F₃ (0.144), T₂S₃F₁ (0.14), T₂S₃F₂ (0.182), T₂S₃F₃ (0.15), T₃S₁F₁ (0.163), T₃S₁F₂ (0.17), T₃S₁F₃ (0.16), T₃S₂F₁ (0.168), T₃S₂F₂ (0.162), T₃S₂F₃ (0.156), T₃S₃F₁ (0.15), T₃S₃F₂ (0.19), T₃S₃F₃ (0.166), T₄S₁F₁ (0.154), T₄S₁F₂ (0.18), T₄S₁F₃ (0.19), T₄S₂F₁ (0.13), T₄S₂F₂ (0.19), T₄S₂F₃ (0.17), T₄S₃F₁ (0.19) and T₄S₃F₂ (0.13). The lowest total acidity content of 0.12 percent was recorded for T₁S₂F₁.

On comparing the acidity content for different levels of carrot against critical different value, significant difference was observed between the mean values of T₁-T₃ (0.012), T₁-T₄ (0.01), T₂-T₃ (0.011) and T₂-T₄ (0.013). The average value of T₄ (0.162) was highest and it differs significantly from all other levels of carrot pulp. So it can be regarded as best. In terms of fat and stabilizer there is no significant difference between treatment combinations.

**Total solid content in low-fat frozen carrot yoghurt**

The highest average scores for total solids of low fat frozen yoghurt was recorded in T₄S₃F₃ (32.4) followed by T₁S₁F₂ (27.8), T₁S₁F₃ (29.2), T₁S₂F₁ (26.8), T₁S₂F₂ (27.8), T₁S₂F₃ (29.3), T₁S₃F₁ (26.9), T₁S₃F₂ (28.1), T₁S₃F₃ (29.6), T₂S₁F₁ (27.7), T₂S₁F₂ (28.7), T₂S₁F₃ (30.2), T₂S₂F₁ (27.6), T₂S₂F₂ (28.7), T₂S₂F₃ (30.6), T₂S₃F₁ (28.7), T₂S₃F₂ (28.8), T₂S₃F₃ (30.6), T₃S₁F₁ (28.7), T₃S₁F₂ (29.7), T₃S₁F₃ (31.1), T₃S₂F₁ (28.7), T₃S₂F₂ (29.8), T₃S₂F₃ (31.3), T₃S₃F₁ (28.9), T₃S₃F₂ (29.8), T₃S₃F₃ (31.2), T₄S₁F₁ (29.7), T₄S₁F₂ (30.6), T₄S₁F₃ (32.1), T₄S₂F₁ (29.8), T₄S₂F₂ (30.8), T₄S₂F₃ (32.4), T₄S₃F₁ (29.8) and T₄S₃F₂ (30.9). The lowest total solid content of 26.7 percent was
recorded for T₁S₁F₁. Total Solid content of low-fat frozen carrot yoghurt differed significantly in most of the treatment combinations.

On comparing the total solid content for different levels of carrot against critical different value, significant difference was observed between the mean values of T₁-T₂ (0.97), T₁-T₃ (1.87), T₁-T₄ (2.9), T₂-T₃ (0.9), T₂-T₄ (1.93) and T₃-T₄ (1.03). The average value of T₄ (30.98) was highest and it differs significantly from all other levels of carrot pulp. So it can be regarded as best.

On comparing the total solid content for different levels of fat against critical different value, significant difference was observed between the mean values of F₁-F₂ (0.97), F₁-F₃ (2.52) and F₂-F₃ (1.55). The average value of F₃ (30.87) was highest and it differs significantly from all other levels of fat. So it can be regarded as best.

On comparing the total solid content for different levels of stabilizer against critical different value, significant difference was observed between the mean values of S₂-S₁ (0.72). The average value of S₃ (29.62) was highest and it differs significantly from all other levels of stabilizer. So it can be regarded as best.

**Overrun content in low-fat frozen carrot yoghurt**

The overrun obtained by different treatments for low fat frozen yoghurt was recorded in T₂S₁F₁ (70.32) followed by T₁S₁F₂ (70.26), T₁S₁F₃ (70.25), T₁S₂F₂ (70.27), T₁S₂F₃ (70.29), T₁S₃F₁ (70.26), T₁S₃F₂ (70.30), T₁S₃F₃ (70.30), T₂S₁F₂ (70.30), T₂S₁F₃ (70.27), T₂S₂F₁ (70.27), T₂S₂F₂ (70.27), T₂S₂F₃ (70.26), T₂S₃F₁ (70.30), T₂S₃F₂ (70.29), T₂S₃F₃ (70.24), T₃S₁F₁ (70.32), T₃S₁F₂ (70.28), T₃S₁F₃ (70.28), T₃S₂F₁ (70.31), T₃S₂F₂ (70.26), T₃S₂F₃ (70.29), T₃S₃F₁ (70.28), T₃S₃F₂ (70.29), T₃S₃F₃ (70.30), T₄S₁F₁ (70.26), T₄S₁F₂ (70.31), T₄S₁F₃ (70.28), T₄S₂F₂ (70.28), T₄S₂F₃ (70.28), T₄S₃F₁ (70.28), T₄S₃F₂ (70.30) and T₄S₃F₃ (70.29). The lowest overrun content of 70.21 percent was recorded for T₂S₁F₁. There was non-significant different between treatments combinations in carrot pulp as well as fat and stabilizer in low fat frozen yoghurt with carrot pulp.

**Flavour and taste content in low-fat frozen carrot yoghurt**

The highest average scores for flavour and taste of low fat frozen yoghurt was recorded in T₃S₃F₃ (8.7) and T₄S₃F₃ (8.6) followed by T₁S₁F₁ (6.7), T₁S₁F₂ (6.6), T₁S₁F₃ (6.6), T₁S₂F₁ (6.7), T₁S₂F₂ (6.7), T₁S₂F₃ (6.8), T₁S₃F₁ (6.9), T₁S₃F₂ (6.9), T₁S₃F₃ (7.2), T₂S₁F₁ (7.0), T₂S₁F₂ (6.8), T₂S₁F₃ (7.1), T₂S₂F₁ (7.0), T₂S₂F₂ (6.9), T₂S₂F₃ (7.1), T₂S₃F₁ (7.5), T₂S₃F₂ (7.7), T₂S₃F₃ (7.4), T₃S₁F₁ (7.2), T₃S₁F₂ (7.4), T₃S₁F₃ (7.6), T₃S₂F₁ (7.6), T₃S₂F₂ (7.5), T₃S₂F₃ (7.6), T₃S₃F₁ (7.9), T₃S₃F₂ (8.3), T₄S₁F₁ (7.2), T₄S₁F₂ (7.4), T₄S₁F₃ (7.7), T₄S₂F₁ (7.3), T₄S₂F₂ (7.6), T₄S₂F₃ (7.7), T₄S₃F₁ (8.2) and T₄S₃F₂ (8.0). The difference was found to be significant in most of the treatment combinations.
On comparing the flavour and taste score for different levels of carrot against critical different value, significant difference was observed between the mean values of T1-T2 (0.29), T1-T3 (0.92), T1-T4 (0.79), T2-T3 (0.63) and T2-T4 (0.5). The average value of T3 (7.74) was highest and it differs significantly from all other levels of carrot. So it can be regarded as best.

On comparing the flavour and taste score for different levels of stabilizer against critical different value, significant difference was observed between the mean values of S1-S3 (0.58) and S2-S3 (0.5). The average value of S3 (7.68) was highest and it differs significantly from all other levels of stabilizer. So it can be regarded as best. In terms of fat there is no significant difference between treatment combinations.

**Body and texture content in low-fat frozen carrot yoghurt**

The highest average scores for body and texture of low fat frozen yoghurt was recorded in T3S1F3 (8.3) and T3S3F3 (8.2) followed by T1S1F1 (6.3), T1S1F2 (6.2), T1S1F3 (6.3), T1S2F1 (6.6), T1S2F2 (6.7), T1S2F3 (6.8), T1S3F1 (7.2), T1S3F2 (7.8), T1S3F3 (7.8), T2S1F1 (6.2), T2S1F2 (6.4), T2S1F3 (6.6), T2S2F1 (6.7), T2S2F2 (6.6), T2S2F3 (6.8), T2S3F1 (7.7), T2S3F2 (7.6), T2S3F3 (7.8), T3S1F1 (6.5), T3S1F2 (6.4), T3S1F3 (6.6), T3S2F1 (6.8), T3S2F2 (6.7), T3S2F3 (6.9), T3S3F1 (8.0), T3S3F2 (7.8), T3S3F3 (6.3), T3S3F3 (6.5), T4S1F3 (6.7), T4S2F1 (7.1), T4S2F2 (7.4), T4S2F3 (7.5), T4S3F1 (7.9) and T4S3F2 (7.9). The difference was found to be significant in most of the treatment combinations.

On comparing the body and texture score for different levels of carrot against critical different value, significant difference was observed between the mean values of T1-T3 (0.18), T1-T4 (0.37), T2-T3 (0.13), T2-T4 (0.32) and T3-T4 (0.19). The average value of T4 (7.24) was highest and it differs significantly from all other levels of carrot pul. So it can be regarded as best.

On comparing the body and texture score for different levels of fat against critical different value, significant difference was observed between the mean values of F1-F3 (0.17). The average value of F3 (7.11) was highest and it differs significantly from all other levels of fat. So it can be regarded as best.

On comparing the body and texture score for different levels of stabilizer against critical different value, significant difference was observed between the mean values of S1-S2 (0.47), S1-S3 (1.44) and S2-S3 (0.94). The average value of S3 (7.8) was highest and it differs significantly from all other levels of stabilizer. So it can be regarded as best.

**Colour and appearance content in low-fat frozen carrot yoghurt**

The highest average scores for colour and appearance of low fat frozen yoghurt was recorded in T3S2F3 (8.7) and T3S3F3 (8.9) followed by T1S1F1 (6.4), T1S1F2 (6.5), T1S1F3 (6.4), T1S2F1 (6.2), T1S2F2 (6.6), T1S2F3 (6.7), T1S3F1 (6.9), T1S3F2 (6.8), T1S3F3 (7.0), T2S1F1 (6.7), T2S1F2 (7.2), T2S1F3 (6.9), T2S2F1 (6.9), T2S2F2 (6.9), T2S2F3 (7.2), T2S3F1 (7.2), T2S3F2 (7.6), T2S3F3 (7.7),
T₃S₁F₁ (7.2), T₃S₁F₂ (7.5), T₃S₁F₃ (7.7), T₃S₂F₁ (8.1), T₃S₂F₂ (7.9), T₃S₂F₃ (8.5), T₃S₃F₁ (8.5), T₃S₃F₂ (8.6), T₄S₁F₁ (7.2), T₄S₁F₂ (7.4), T₄S₁F₃ (7.7), T₄S₂F₁ (7.3), T₄S₂F₂ (7.6), T₄S₂F₃ (7.9), T₄S₃F₁ (8.7) and T₄S₃F₂ (8.7). The difference was found to be significant in most of the treatment combinations.

On comparing the colour and appearance score for different levels of carrot against critical different value, significant difference was observed between the mean values of T₁-T₂ (0.49), T₁-T₃ (1.41), T₁-T₄ (1.43), T₂-T₃ (0.92) and T₂-T₄ (0.94). The average value of T₄ (8.1) was highest and it differs significantly from all other levels of carrot pulp. So it can be regarded as best.

On comparing the colour and appearance score for different levels of fat against critical different value, significant difference was observed between the mean values of F₁-F₂ (0.13) and F₁-F₃ (0.24). The average value of F₃ (7.62) was highest and it differs significantly from all other levels of fat. So it can be regarded as best.

On comparing the colour and appearance score for different levels of stabilizer against critical different value, significant difference was observed between the mean values of S₁-S₂ (0.38), S₁-S₃ (0.91) and S₂-S₃ (0.536). The average value of S₃ (7.98) was highest and it differs significantly from all other levels of stabilizer. So it can be regarded as best.

**Overall acceptability content in low-fat frozen carrot yoghurt**

The highest average scores for overall acceptability of low fat frozen yoghurt was recorded in T₃S₃F₃ (8.57) and T₄S₃F₃ (8.56) followed by T₁S₁F₁ (6.46), T₁S₁F₂ (6.43), T₁S₁F₃ (6.43), T₁S₂F₁ (6.5), T₁S₂F₂ (6.66), T₁S₂F₃ (6.76), T₁S₃F₁ (7.0), T₁S₃F₂ (7.16), T₁S₃F₃ (7.33), T₂S₁F₁ (6.63), T₂S₁F₂ (6.8), T₂S₁F₃ (6.86), T₂S₂F₁ (6.86), T₂S₂F₂ (6.8), T₂S₂F₃ (7.03), T₂S₃F₁ (6.46), T₂S₃F₂ (7.63), T₂S₃F₃ (7.63), T₃S₁F₁ (6.96), T₃S₁F₂ (7.1), T₃S₁F₃ (7.3), T₃S₂F₁ (7.5), T₃S₂F₂ (7.36), T₃S₂F₃ (7.66), T₃S₃F₁ (8.13), T₃S₃F₂ (8.23), T₄S₁F₁ (6.9), T₄S₁F₂ (7.1), T₄S₁F₃ (7.36), T₄S₂F₁ (7.23), T₄S₂F₂ (7.53), T₄S₃F₂ (7.7), T₄S₃F₁ (8.26) and T₄S₃F₂ (8.2). The difference was found to be significant in most of the treatment combinations.

On comparing the overall acceptability score for different levels of carrot against critical different value, significant difference was observed between the mean values of T₁-T₃ (1.01), T₁-T₄ (0.94), T₂-T₃ (0.67) and T₂-T₄ (0.60). The average value of T₃ (7.72) was highest and it differs significantly from all other levels of carrot pulp. So it can be regarded as best.

On comparing the overall acceptability score for different levels of stabilizer against critical different value, significant difference was observed between the mean values of S₁-S₃ (0.98) and S₂-S₃ (0.7). The average value of S₃ (7.82) was highest and it differs significantly from all other levels of stabilizer. So it can be regarded as best. In terms of fat there is no significant difference between treatment combinations.
Yeast and mould count in low-fat frozen carrot yoghurt

The highest average count for yeast and mould of low fat frozen yoghurt was recorded in T₃S₃F₂ (14) followed by T₁S₁F₁ (11), T₁S₁F₂ (12), T₁S₁F₃ (8), T₁S₂F₁ (9), T₁S₂F₂ (10), T₁S₂F₃ (7), T₁S₃F₁ (12), T₂S₃F₃ (12), T₂S₁F₁ (9), T₂S₁F₂ (11), T₂S₁F₃ (8), T₂S₂F₁ (7), T₂S₂F₂ (8), T₂S₂F₃ (7), T₂S₃F₁ (7), T₂S₃F₂ (7), T₃S₃F₃ (8), T₃S₁F₁ (7), T₃S₁F₂ (7), T₃S₁F₃ (9), T₃S₂F₁ (6), T₃S₂F₂ (6), T₃S₂F₃ (8), T₃S₃F₁ (5), T₃S₃F₂ (5), T₄S₁F₁ (9), T₄S₁F₂ (7), T₄S₁F₃ (8), T₄S₂F₁ (8), T₄S₂F₂ (7), T₄S₂F₃ (7), T₄S₃F₁ (5), T₄S₃F₂ (6) and T₄S₃F₃ (5). The lowest yeast and mould count of 4 percent was recorded for T₃S₃F₃. The difference was found to be significant in most of the treatment combinations.

On comparing the yeast and mould count for different levels of carrot against critical different value, significant difference was observed between the mean values of T₁-T₂ (2.55), T₁-T₃ (4.22), T₁-T₄ (3.81), T₂-T₃ (1.67) and T₃-T₄ (1.26). The average value of T₄ (6.7) was lowest and it differs significantly from all other levels of carrot pulp. So it can be regarded as best.

On comparing the yeast and mould count for different levels of stabilizer against critical different value, significant difference was observed between the mean values of S₁-S₂ (0.97), S₁-S₃ (1.33) and S₂-S₃ (0.35). The average value of S₃ (7.3) was lowest and it differs significantly from all other levels of stabilizer. So it can be regarded as best. In terms of fat there is no significant difference between treatment combinations.

Coliform count in low-fat frozen carrot yoghurt

All the treatments were subjected to coliform test and it is found to be negative coliform test. This indicated that the yoghurt treatments were free from gas producing organisms. This was possible due to strict due to sanitary condition observed during each step of manufacture.

Cost of the product

The average cost of production, one litre of low-fat frozen yoghurt with carrot pulp i.e. T₁S₁F₂ (51.88), T₁S₁F₃ (59.88), T₁S₂F₁ (44.05), T₁S₂F₂ (52.05), T₁S₂F₃ (60.05), T₁S₁F₁ (44.22), T₁S₃F₂ (52.22), T₁S₃F₃ (60.22), T₂S₁F₁ (44.28), T₂S₁F₂ (52.28), T₂S₁F₃ (60.28), T₂S₂F₁ (44.45), T₂S₂F₂ (52.45), T₂S₂F₃ (60.45), T₃S₁F₁ (44.62), T₃S₁F₂ (52.62), T₃S₁F₃ (60.62), T₃S₂F₁ (44.68), T₃S₂F₂ (52.68), T₃S₂F₃ (60.68), T₃S₃F₁ (44.85), T₃S₃F₂ (52.85), T₃S₃F₃ (60.85), T₄S₁F₁ (45.02), T₄S₁F₂ (53.02), T₄S₁F₃ (61.02), T₄S₂F₁ (53.08), T₄S₂F₂ (53.08), T₄S₂F₃ (61.08), T₄S₃F₁ (45.25), T₄S₃F₂ (53.25), T₄S₃F₃ (61.25), T₄S₄F₁ (45.42), T₄S₄F₂ (53.42) and T₄S₄F₃ (61.42). The cost of production (Rs/lt.) of low-fat frozen yoghurt sample T₁S₁F₁ (43.88) was much less than other samples.

Energy value of low-fat frozen carrot yoghurt

The maximum Energy value of low-fat frozen yoghurt sample 146 kcal/100 g was recorded in T₁S₁F₃ followed by T₁S₁F₁ (127), T₁S₁F₂ (134), T₁S₂F₁ (120), T₁S₂F₂ (127), T₁S₂F₃ (139), T₁S₃F₁
and T3. The lowest energy value of Low-fat frozen yoghurt incorporated with carrot pulp of 78 kcal/100g was recorded for T4S3F1.

CONCLUSION

It is concluded that the low-fat frozen yoghurt containing 3% fat, 0.5% stabilizer and 4% carrot pulp (T3S3F3) and 2% carrot pulp, 0.5% Stabilizer, 1.5% fat (T4S3F3) was high as comparable with other treatments in organoleptic and nutritional characteristics. T3S3F3 and T4S3F3 showed significant difference in organoleptic characteristics (flavour and taste, body and texture, colour and appearance & overall acceptability) and nutritional characteristics (protein, carotene, calcium, pH, acidity, total solids and overrun). When the highest amount of fat, stabilizer and carrot were added. It is quite obvious from the results that the total solids percent significantly increased with the increase in fat, stabilizer and carrot pulp. The energy wise low-fat frozen yoghurt treatment combinations were more acceptable as compared to high-fat frozen yoghurt. Fat, protein and carbohydrate decreased with increasing levels of carrot pulp due to its high moisture content. The low coliform and yeast and mould count indicated that there was no post processing contamination and this probiotic product could be manufactured without having contamination problems and can be stored at room temperature for extended period of time. The cost of low fat frozen yoghurt incorporated with carrot pulp is 61.42 Rs/lt. Its cost is low and this may be available in the market for the consumers at reasonable prices. The quality of sample T3S3F3 (3% fat, 0.5% stabilizer and 4% carrot pulp) and T4S3F3 (2% carrot pulp, 0.5% Stabilizer, 1.5% fat), is very well comparable to that of the other treatments.

RECOMMENDATIONS:

By incorporating different proportions of carrot pulp and different fat percent, various acceptable products like frozen yoghurt and other desserts may be prepared, which have significantly low fat and high vitamin A content and may be recommended for inclusion in dies to benefit all age groups as well as patients of vitamin A deficiency disease and gastrointestinal tract problems. It can be helpful from the therapeutic point of view for the people suffering from diseases like cardiovascular diseases, cancer, hypercholesterolemia, lactose intolerance, indigestion etc.