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International
Journal
Of Modern Engineering Research (IJMER)

Research on the development and market application of mixed fruit and vegetable milk products

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ABSTRACT:*Due to changes in diet structure and living habits, more and more young people, especially young students, have bad living habits of skipping breakfast and partial eating, which brings very serious problems to the health of young people and children. Therefore, we selected local blueberries, apples, plums, melons and other fruits through deep processing of fruit juice and some high nutritional value, good taste of vegetable juice (bell pepper, carrot, cucumber, tomato, broccoli, etc.) through the matching and mixing process, to prepare a series of good taste, comprehensive nutritional value of fruit and vegetable milk drinks. And the sensory identification of the product was carried out. At the same time, the market application of mixed fruit and vegetable milk was analyzed. The results of this study will provide some basis for the promotion of fruit and vegetable milk.*

KEY WARDS: *fruit and vegetable milk products,manufacturing procedure, market application*

Date of Submission: 26-05-2025 Date of acceptance: 07-06-2025

I. INTRODUCTION

Due to changes in dietary habits and lifestyles, an increasing number of young people, particularly adolescent students, have developed unhealthy habits such as skipping breakfast and picky eating, which pose serious health risks to their physical well-being[1-9]. The nutritional value of milk is the most comprehensive of all foods [10-14]. (1) The most abundant in milk is lactose, which makes calcium easily absorbed. (2) Milk contains good quality proteins, including casein, small amounts of whey protein, and immunoglobulin, which has a biological value of 85. Milk contains all the amino acids needed for human growth and development, which is unmatched by other foods. (3) Milk has a reasonable ratio of protein to calories, which ensures that the drinker does not consume "pure" calories. (4) The calcium content in milk is easily absorbed, (5) In addition, the combination of phosphorus, potassium, magnesium and other substances is also very reasonable. Therefore, it is necessary to use milk as a food to improve and supplement the nutrition of teenagers However, on the one hand, only drinking milk, people can' t get comprehensive nutrition, on the other hand, milk is not accepted by some people who do not like the taste of milk. Therefore, we selected local blueberries, apples, plums, melons and other fruits through deep processing of fruit juice and some high nutritional value, good taste of vegetable juice (bell pepper, carrot, cucumber, tomato, broccoli, etc.) through the matching and mixing process, to prepare a series of good taste, comprehensive nutritional value of fruit and vegetable milk drinks. We hope this product can help the health of young friends. This paper focuses on "How to develop a mixed fruit and vegetable milk product that meets the needs of student consumer groups?" And "How to bring mixed fruit and vegetable milk products to market and succeed?" The purpose of this paper is to prepare a series of fruit and vegetable milk drinks with good taste and comprehensive nutritional value for the health of teenagers. The development of mixed fruit and vegetable milk products conforms to the current trend of healthy diet and has broad market prospects. Guided by market demand and driven by scientific and technological innovation, this study will develop mixed fruit and vegetable milk products that meet the needs of student consumer groups and contribute to promoting the development of the health beverage industry.

II. MATERIAL AND METHODS

1.1 Materials

bell pepper, carrot, tomato, broccoli, cucumber, blueberry, plum, apple, cantaloupe and other seasonal vegetables and fruits; Xanthan gum, sodium carboxymethyl cellulose, citric acid, lysozyme, glucose oxidase, carotene, VC, niacin, glutathione, maltose, poly fructose, white granulated sugar are food grade; fresh milk, food grade liquid nitrogen. The experimental water are potable pure water.

1.2 instruments

Homogenizer, acidity meter, juicer, sugar meter

1.3 Vegetable juice and fruit juice extraction method

All fresh vegetables (soaked in light salt water for 30 min, boil water for 1-2 min, dried and chopped) and fruits (soaked in light salt water for 30 min, dried and chopped), cold pressed fresh juice according to low temperature (4 ℃), 100 mesh sieved, low temperature storage at 4 ℃ to ensure freshness.

III. RESULTS AND ANALYSIS

3.1 Production technology of mixed fruit and vegetable milk

Table 1 Formula 1 of a mixed fruit and vegetable juice

Number	Name (Cold juicing)	Additive amount(mL)
1	bell pepper	0.5 mL
2	carrot	5 mL
3	tomato	2.5 mL
4	broccoli	0.5 mL
5	cucumber	2 mL
6	blueberry	4 mL
7	plum	5 mL
8	apple	5 mL
9	muskmelon	5 mL
10	xanthan gum	0.2 mL
11	sodium carboxymethyl cellulose（1%）	0.2 mL
12	citric acid（50%）	0.4 mL
13	lysozyme	10 mg
14	glucose oxidase	10 mg
15	carotene	200 mg
16	ascorbic acid	200 mg
17	nicotinic acid	200 mg
18	GSH	200 mg
19	maltose	5 mL
20	levulose（70%）	5 mL
21	granulated sugar （40%）	4 mL
22	fresh milk	45 mL
23	potable water	make up to 100 mL

Table 3 Formula 2 of a mixed fruit and vegetable juice

Number	Name (Cold juicing)	Additive amount(mL)
1	bell pepper	0.5 mL
2	carrot	6 mL
3	tomato	3 mL
4	broccoli	0.6 mL
5	cucumber	2.5 mL
6	blueberry	5 mL
7	plum	6 mL
8	apple	6.5 mL
9	muskmelon	7 mL
10	xanthan gum	0.2 mL
11	sodium carboxymethyl cellulose（1%）	0.2 mL
12	citric acid（50%）	0.2 mL
13	lysozyme	10 mg
14	glucose oxidase	10 mg
15	carotene	200 mg
16	ascorbic acid	200 mg
17	nicotinic acid	200 mg
18	GSH	200 mg
19	maltose	3 mL
20	levulose（70%）	4 mL
21	granulated sugar （ 40%）	5 mL
22	fresh milk	45 mL
23	potable water	make up to 100 mL

Figure 1 Formula 1 product

Table 2 pH measurement of Formula 1 productsTable 4 pH measurement of Formula 2 products

time（h）	pH
0	5.51
2	5.66
4	5.65
6	5.65
22	5.64
27	5.60

time（h）	pH
0	5.40
2	5.49
4	5.43
6	5.48
22	5.49
27	5.45

According to the formula in Table 1, after mixing and filling at low temperature, an appropriate amount of food-grade liquid nitrogen was dropped and sealed under aseptic conditions, thus the whole preparation process of mixed fruit and vegetable milk has been completed. This product was light pink, as shown in Figure 1, and had a vegetable and fruit fragrance, sweet and sour taste. The pH stability results of the mixed fruit and vegetable juice milk drink prepared according to formula 1 were shown in Table 2. From 0-27 hours, the pH was stable in the range of 5.51-5.66, indicating that the pH was stable.

Similarly, after the formula in Table 3 was mixed and filled at low temperature, an appropriate amount of food-grade liquid nitrogen was dropped and sealed under aseptic conditions, thus completing the whole preparation process of mixed fruit and vegetable milk. This product was light pink, with vegetable and fruit fragrance, sweet and sour taste. The pH stability results of the mixed fruit and vegetable juice milk drink prepared according to formula 2 were shown in Table 4. From 0-27 hours, the pH was stable in the range of 5.40-5.49, indicating that the pH was stable. These two formulations show that the stability of the product was very good.

After many attempts, the ratio of raw materials was finally determined as shown in Table 5. The taste of the products obtained can satisfy the taste of most people. According to the above formula, the sugar content measured by the sugar meter is basically in the range of 8-12%, and the sugar content in this range will not be harmful to the gastrointestinal tract because of too low acidity, nor will it have an adverse effect on the teeth and blood sugar because of too high sugar content [15-18]。

Table 5 Formula of a mixed fruit and vegetable juice (total volume 100 mL)

Number	Name (Cold juicing)	Additive amount(mL)
1	bell pepper	0.3-0.6 mL
2	carrot	3-6 mL
3	tomato	1-3 mL
4	broccoli	0.3-0.6 mL
5	cucumber	1-2.5 mL
6	blueberry	2-5 mL
7	plum	3-6 mL
8	apple	3-8 mL
9	muskmelon	3-7 mL
10	xanthan gum	0.1-0.3 mL
11	sodium carboxymethyl cellulose（1%）	0.1-0.3 mL
12	citric acid（50%）	0.2-0.4 mL
13	lysozyme	5-10 mg
14	glucose oxidase	5-10 mg
15	carotene	200 mg
16	ascorbic acid	200 mg
17	nicotinic acid	200 mg
18	GSH	200 mg
19	maltose	3-6 mL
20	levulose（70%）	3-6 mL
21	granulated sugar（40%）	3-5 mL
22	fresh milk	45 mL
23	potable water	make up to 100 mL

3.2. Market survey of mixed fruit and vegetable milk

3.2.1 Consumer awareness survey on mixed fruit and vegetable map products

Table 6 Consumers' cognition and attitude towards mixed fruit and vegetable milk products

Type	Option	Frequency	Percentage
Have you ever heard of mixed fruit and vegetable milk products	yes	800	80%
	no	200	20%
Whether to buy mixed fruit and vegetable milk products regularly	yes	300	30%
	no	700	70%
It is believed that mixed fruit and vegetable milk products are healthier than ordinary drinks	yes	700	70%
	no	300	30%
Are you willing to try buying mixed fruit and vegetable milk products	yes	600	60%
	no	400	40%

3.2.2 Investigation on buying intention of mixed fruit and vegetable milk by different gender consumers

Differences in purchasing intention of mixed fruit and vegetable milk products among different genders: Chi-square test was adopted, and the results showed that there were significant differences in purchasing intention of mixed fruit and vegetable milk products among college students of different genders（χ^2=10.23, $p<0.05$）,shown in Table 7.Girls are more likely than boys to buy mixed fruit and vegetable milk products.

Table 7 Purchasing intention of mixed fruit, vegetable and milk products of different genders

sex	Be willing to buy	Unwilling to buy	total
male	140	160	300
female	180	120	300
total	320	280	600

The target consumer group has a certain awareness of mixed fruit and vegetable milk products, but the purchase rate is low, which indicates that there is still a lot of room for development of mixed fruit and vegetable milk products in the market. Consumers have high requirements for the taste and nutritional value of mixed fruit and vegetable milk products, strawberry and carrot flavor is the most popular taste, vitamin C, dietary fiber and protein are the most concerned nutrients. The price of mixed fruit and vegetable milk products is an important factor affecting consumers' willingness to buy, and the price range of 5-10 yuan/bottle is most easily accepted by consumers.

According to the above survey, the sales volume of the mixed fruit and vegetable milk product developed by our research group increased steadily after it was launched, and the consumer evaluation was good, which indicated that the product had a good market prospect.

IV. CONCLUSIONS AND RECOMMENDATIONS

（1）At present, there are few dairy drinks on the market with mixed fruits and vegetables ；（2）This product is not only upgraded in taste to be more suitable for teenagers ；（3）And in nutrition, this product pursues comprehensive nutritional needs ；（4）Raw materials selection and process are natural and non-toxic. The results show that the product has broad market prospects, can meet the consumer's demand for healthy and delicious drinks, and promote the growth and healthy growth of teenagers. On the basis of market research, we know that this product has certain promotion value.

ACKNOWLEDGEMENT

This work was financially supported by the Dalian university 2024 college student innovation and entrepreneurship training project (Innovation Training Project, Provincial project,) No. S202411258003X.

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