Formula Optimization and Characterization of Jam based on Carica Fruit (*Carica pubescens,* L)

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ABSTRACT

Carica fruit is a geographical indication product from the highland region of Dieng, Central Java, Indonesia. Carica fruit can only be consumed after going through processing. One of the products that have been developed by SME's was Carica cocktail which is made from unripe fruit. Currently, the use of over-ripe fruit and byproduct from cocktails processing (pulp) has not been carried out. Over-ripe fruit and pulp have a strong flavor but the texture was mushy so it taint quickly when stored.

This research were aimed to : 1) optimizing the proportion of main ingredients that consisting of sugar and non-sugar to produce jam which has a response of intensity score of preferency, spread ability, taste, adhesiveness, and springiness using the surface response methodhology; 2) examine the sensory characteristics of product with optimum formula with quantitative descriptive analysis using 10 trained panelists; 3) examine the physicochemical characteristics of the product with optimum formula. The basic formula consists of the main ingredients, i.e. sugar and non-sugar (mixture of carica puree, carica pulp, and chayote puree in ratio: 46.67%: 20%: 33.33%). Food additives used were gelatin (0.04%), pectin (0.02%), citric acid (0.07%), synthetic vanilla powder (0.03%). In the formula optimization using software of design expert V.10 (for trial) obtained 14 treatment combinations with lower and upper limits for the sugar proportion of 20% and 40%, while non-sugar was 60% and 80%, respectively.

The results showed that: 1) Formula consisting of sugar 28.46%, carica puree 33.34%, carica pulp 14.31%, and chayote puree 23.82% produced jam which had an actual score (range 1-9) i.e. overall acceptibility 6.58 (rather like to like), spread ability 6.90 (easy to spread), taste 6.70 (rather like to like), adhesiveness 6.64 (rather sticky), and 6.38 (rather chewy). The product with optimum formula has more sticky, chewy and fibrous texture and mouthfeel and had higher hedonic acceptibility (from the appearance, color, texture, aroma and taste attributes) compared to control (which was made from 100% carica puree and 100% chayote puree); 3) The product with optimum formula has 52.13% wb water, 1.20% db ash, 1.73% db protein, 1.08% db fat, 43.86% db carbohydrate by different, 191.76 Kcal / 100 g energy, 15.76% db dietary fiber, 31.52 mg / 100g vitamin C, color brightness intensity (L) 30.79, green color intensity (a) -0.45, yellow color intensity (b) 12.47, respectively. Total sugar content and water activity of optimum product is still slightly high, i.e. 35.78% wb and 0.84, respectively.

Keywords: *Carica pubescens,* L, jam, formula optimization, quantitative descriptive analysis, physicochemical properties.

BACKGROUND

Carica fruit is a geographical indication product from the highland region of Dieng, Central Java, Indonesia. It rich in Vit C, K, flavonoid, antioxidant, dietary fiber. It can only be consumed after processing. One of the processed carica is cocktails which is made from unripe fruit. The use of over-ripe fruit and byproduct from cocktails processing (pulp) has not been carried out. It have a strong flavor, soft texture, and become taint quickly when stored. A mixture of over-ripe carica fruit and its pulp can be used in jam production. The substitution of carica jam with chayote can reduce production costs. Chayote is rich in pectin and tasteless . Its suitable to be used as a substitute of carica fruit in jam production. In its application by SMEs, the carica jam formula must be optimized.

This research were aimed to : 1) optimizing the proportion of the main ingredients in carica jam production using the surface response methodology (RSM); 2) Examine the sensory characteristics of carica jam with quantitative descriptive analysis; 3) Examine the physicochemical characteristics of carica jam.

MATERIALS AND METHODS

Materials

Carica fruit and Chayote was obtained from Wonosobo district. Other ingrediens (gelatin, pectin, sucrose, citric acid, synthetic vanilla) were obtained from CV. Nuru Jaya Surabaya.

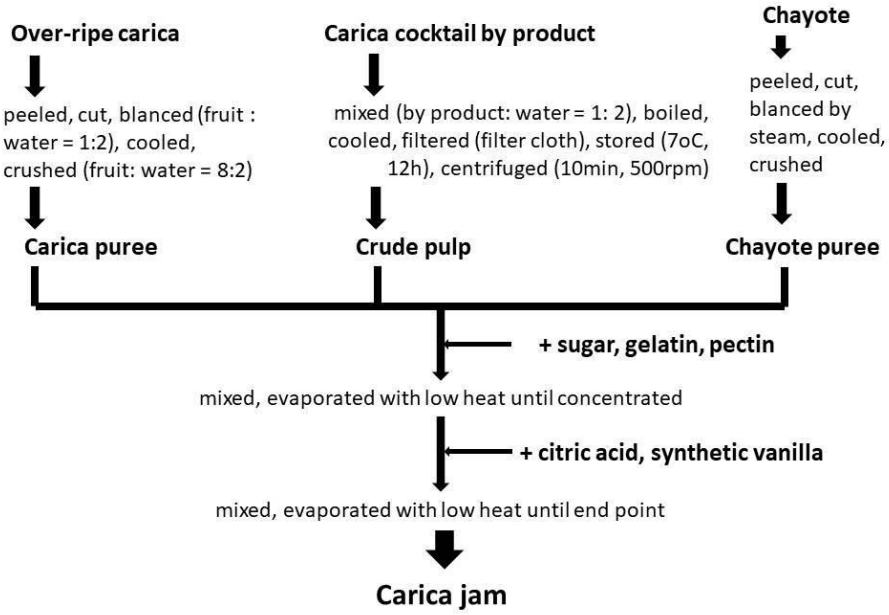
Method

The stages of this research were : 1) Determination of basic formula and process; 2) Recruitment of trained panelists; 3) Formula optimization (intensity and hedonic rating test); 4) Quantitative Desriptive Analysis and hedonic ranking test of products with optimum formula; 5) Physicochemical analysis of product with optimum formula.

The basic formula consists of the main and supporting ingredients. The percentage of supporting ingredients was calculated based on the total of the main ingredients used. The main ingredients used were sugar and non-sugar (mixture of carica puree, carica pulp, and chayote puree in ratio: 46.67%: 20%: 33.33%). Food additives used were gelatin (0.04%), pectin (0.02%), citric acid (0.07%), synthetic vanilla powder (0.03%) (Table 1). The procedure of carica jam making shown at Picture 1.

Table 1. Basic formula of carica jam

Type of ingredient	Name of ingredient	Basic value (%)
Main ingredients	Sugar	20-40
	Non-sugar :	60-80
	Carica puree	46.67
	Carica pulp	20
	Chayote puree	33,33
Suporting ingredients	Gelatin	0,04
	Pectin	0,02
	Citric acid	0,07
	Synthetic vanilla	0,03



Picture 1. The carica jam production

The stages of recruitment of trained panelists i.e. : 1) Selection of panelists : a) filling out the questionnaire, acuity test through : i) introduction test of primary aroma and taste, intensity test of primary taste; ii) sensitivity test (taste, texture, color, and aroma); 2) Panelist training: a) Introduction of the sensory quality attributes of jam (research and market products); b) Training of rating and ranking test (3x) of carica jam using hedonic scale 1-9; c) Determination of the quality attributes of carica jam (by focus group discussion); d) Training of rating test of carica jam using 15cm of unstructured scale (3x).

In the formula optimization using Response surface methodology (RSM) with Design expert V.7 software (for trial). The experimental design is central composite. The stages in the formula optimization i.e. : 1) Determination of the upper and lower limits; 2) Making products with treatments result from RSM recommendations; 3) Measurement of responses; 4) Verification and validation. There are 2 treatment optimized i.e. sugar proportion and non-sugar proportion. The lower and upper limits for the sugar proportion of 20% and 40%, while non-sugar was 60% and 80%, respectively (Table 2). With 2 replications for obtained 14 treatment combinations.

Table 2. The upper and lower limits in formula optimization

Treatment	Unit	-alpha	- Level	+ Level	+alpha
Carica proportion	%	60	62.93	77.07	80
Sugar proportion	%	20	22.93	37.07	40

RESULTS AND DISCUSSION

The following are data from 14 formula variations recommended by Design expert software.

Table 3. Formula variations

Formula	*Carica puree* (%)	*Chayote puree* (%)	Carica pulp (%)	Sucrose(%)	Total (%)
1	30.46	13.06	26.48	30	100
2	22.3	9.56	31.07	37.07	100
3	38.62	16.55	21.9	22.93	100
4	30.46	13.06	26.48	30	100
5	22.3	9.56	45.21	22.93	100
6	30.46	13.06	26.48	30	100
7	38.62	16.55	7.76	37.07	100
8	30.46	13.06	26.48	30	100
9	30.46	13.06	26.48	30	100
10	30.46	13.06	16.48	40	100
11	18.92	8.11	42.97	30	100
12	42	18	10	30	100
13	30.46	13.06	26.48	30	100
14	30.46	13.06	36.48	20	100

The following are the results of measurements of the responses of each formula

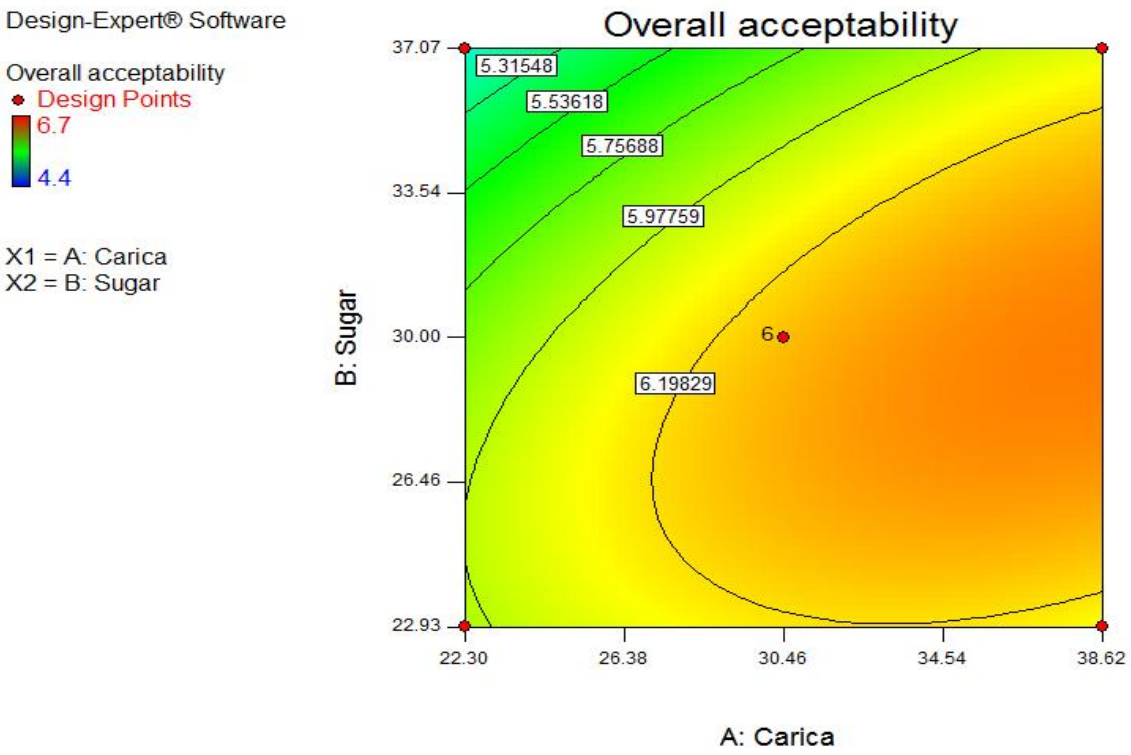
Table 4. The the results of measurements of the responses of each formula

Run	Overall acceptability	Spread ability	Stickiness	Taste	Springiness
1	6.7	6.4	6.2	6.9	6.4
2	4.4	5.6	5.9	5.6	6.2
3	6.4	7	5.2	6	5.9
4	6.4	6.9	6.4	5.9	5.7
5	6.2	7.2	6.4	5.9	5.2
6	6.2	7.1	7.1	5.8	6.1
7	5.4	5.5	7.3	5.6	6.5
8	5.7	7.3	6.9	6.1	5.1
9	6.3	6.7	6.1	6	5.9
10	6.2	6.8	6	6.5	5.9
11	5.8	6.7	7.1	5.6	5.9
12	6.6	6.7	5.6	6.5	5.8
13	6.3	6.9	5.4	6.5	5.7
14	5.5	6.7	5.8	5.5	5

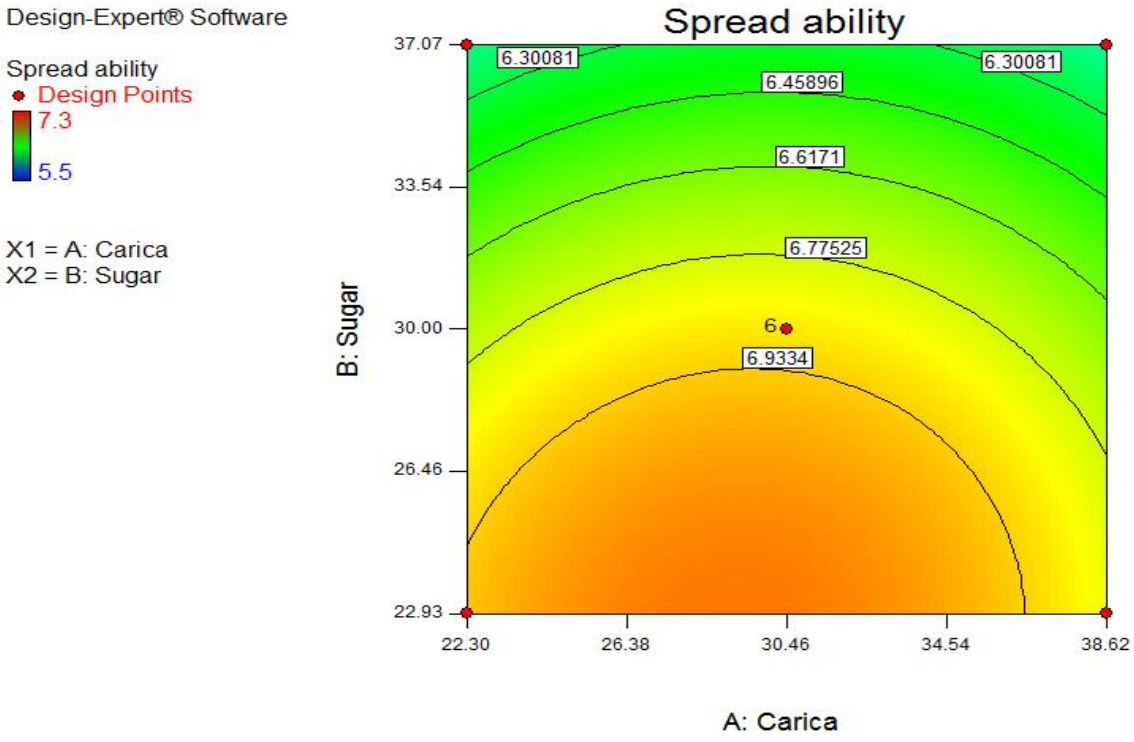
RSM analysis produce mathematics model for each response tested, From the data can be examined that the increase in the proportion of carica cause an increase in overall acceptibility, while the stickiness decrease, The increase in the proportion of sugar cause an increase in springiness and stickiness, while the spread ability decrease (Table 5)

Table 5. Mathematics mode for each response tested

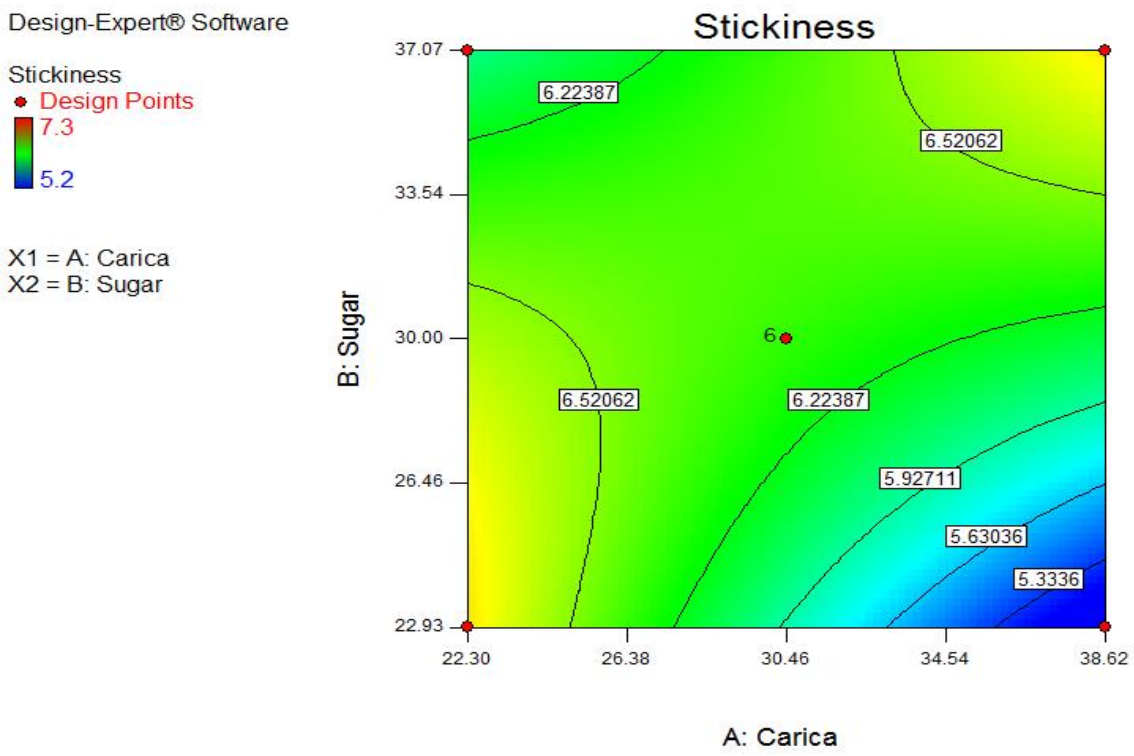
No	Response	Criteria of response	Importance	mathematics models	Determinate coeficient
1	Overall acceptability	Maximum	5	$6.27 + 0.29\ (A) - 0.23\ (B) + 0.20\ (AB) - 0.14\ (A)^2 - 0.31\ (B)^2$	0.43
2	Spread ability	Maximum	4	$6.88 - 0.037\ (A) - 0.37\ (B) + 0.025\ (AB) - 0.19\ (A)^2 - 0.17\ (B)^2$	0.46
3	Stickiness	In range	3	$6.35 - 0.37\ (A) + 0.36\ (B) + 0.40\ (AB) + 0.081\ (A)^2 - 0.14\ (B)^2$	0.54
4	Taste	Maximum	4	$6.15 + 0.17\ (A) + 0.089\ (B) - 0.025\ (AB) - 0.11\ (A)^2 - 0.14\ (B)^2$	0.24
5	Springiness	In range	3	$5.82 + 0.11\ (A) + 0.36\ (B) - 0.100\ (AB) + 0.092\ (A)^2 - 0.11\ (B)^2$	0.62



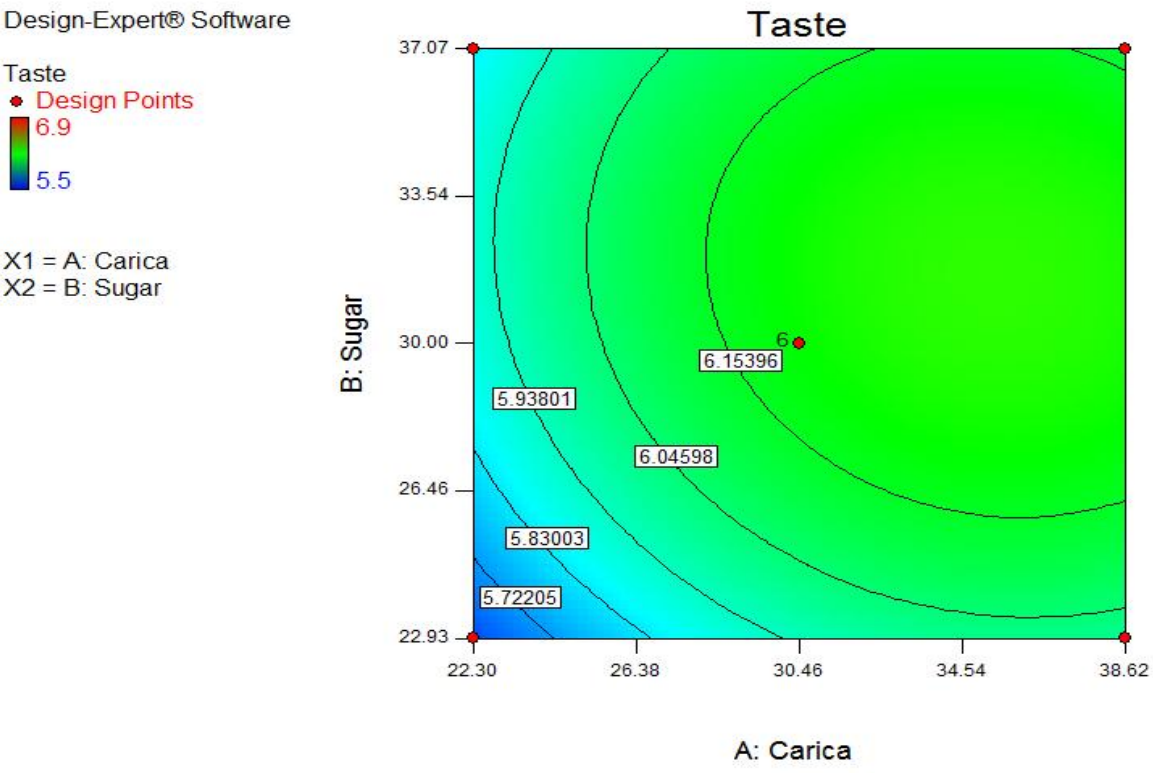
Picture 2. Two-dimensional contour of overall acceptibility



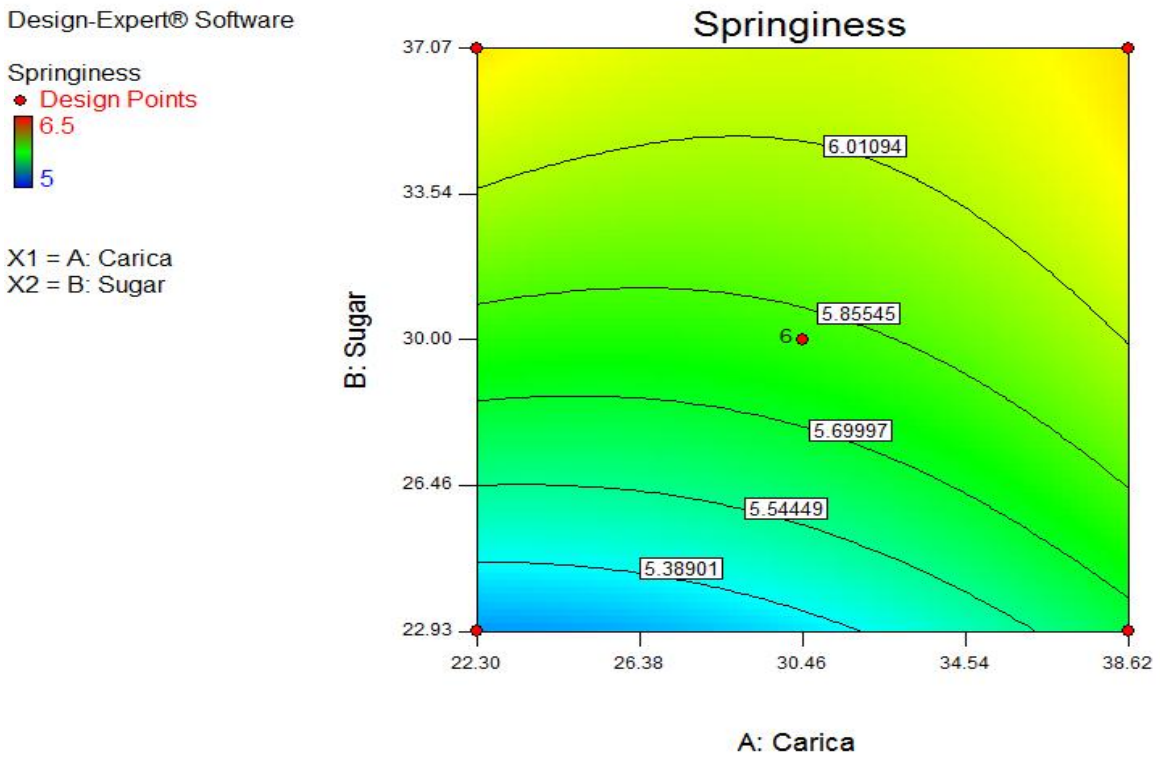
Picture 3. Two-dimensional contour of spread ability



Picture 4. Two-dimensional contour of overall stickiness



Picture 5. Two-dimensional contour of taste



Picture 6. Two-dimensional contour of springiness

Table 5. The optimum formula recommended by the Design Expert

Main ingredient	Proportion (%)
Sugar	28.46
Carica puree	33.34
Carica pulp	14.31
Chayote puree	23.82

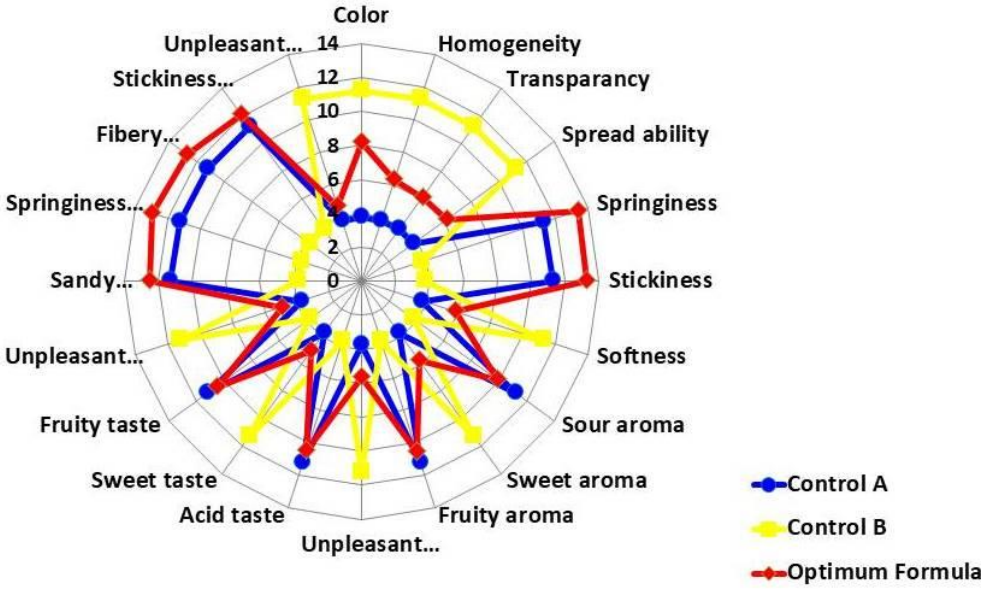
Table 6. The sensory score of optimum formula

Respons	Low PI	High PI	Prediction score	Actual score (Range 1-9)	Description
Overall acceptibility	4.82	7.96	6.39	6.58±0.52	Rather like to like
Spread ability	5.59	8.19	6.88	6.90±0.41	Easy to spread
Stickiness	4.54	7.58	6.06	6.64±0.37	Rather sticky
Taste	4.96	7.4	6.18	6.70±0.59	Rather like to like
Springiness	4.95	6.68	5.82	6.38±0.48	Rather chewy

The QDA test through focus group discussion by 10 trained panelists has produced a description of all the sensory attributes identified from carica jam.

Table 7. The description of sensory attributes identified from carica jam

Type of attribute	Description of attribute
Appearance	Greenish yellow color, spread ability, homogeneity, transparancy
Texture	Springiness, thickiness, softness
Aroma	Sweet, fruity (carica-like), sour, unpleasant aroma
Taste	Sweet, fruity (carica-like), acid, unpleasant taste
Mouthfeel	Springiness, thickiness, fibery, sandy
Aftertaste	Unpleasant taste (*langu*)



Picture 7. The spider web diagram of sensory attributes of optimum product compared to control

Table 8. The description of main attributes of carica jam

Product	Description of main attribute
Control A (100% of carica)	Sour/Acid aroma and taste, fruity aroma and taste
Control B (100% of chayote)	Color, homogeneity, transparancy, spread ability, softness, sweet aroma and taste, unpleasant aroma and taste
Optimum formula	Springiness and stickiness texture and mouthfeel, fibery and sandy mouthfeel

Table 9. The physicochemical properties of optimum product compared to control

Physicochemical properties	Control A (100% carica)	Control B (100% chayote)	Optimum formula
Water (%wb)	63.17±0.42	48.47±0.25	52.13±0.31
Ash (%db)	0.54±0.03	0.61±0.04	1.20±0.05
Protein (%db)	1.08±0.03	1.99±0.02	1.73±0.09
Fat (%db)	0.41±0.03	0.39±0.01	1.08±0.04
Crude fiber (%db)	19.35±0.11	14.35±0.09	13.59±0.11
Dietary fiber (%db)	21.34±0.19	15.39±0.15	15.76±0.13
pH	5.30±0.21	6.00±0.25	5.30±0.23
Total sugar (%db)	57.98±0.34	58.02±0.31	74.73±0.39
Na (ppm)	200.34±2.29	225.05±2.35	190.94±2.18
Acid (%db)	0.34±0.02	0.18±0.03	0.26±0.02
Vitamin C (mg/100g db)	42.99±0.26	23.49±0.21	31.52±0.27
Kalium (ppm)	139.90±1.54	123.90±1.29	120.57±1.37
Total Solid (%db)	42.70±0.27	50.76±0.31	48.72±0.29
Water activity	0.83±0.08	0.85±0.06	0.84±0.05
Color L	30.40±0.19	29.54±0.23	30.79±0.20
a value	-0.60±0.00	-0.98±0.00	-0.45±0.00
b value	11.70±0.08	7.85±0.05	12.47±0.06

CONCLUSION

Formula consisting of sugar 28.46%, carica puree 33.34%, carica pulp 14.31%, and chayote puree 23.82% produced jam which had an actual score (range 1-9) i.e. overall acceptibility 6.58 (rather like to like), spread ability 6.90 (easy to spread), taste 6.70 (rather like to like), adhesiveness 6.64 (rather sticky), and 6.38 (rather chewy). The product with optimum formula has more sticky, chewy and fibrous texture and mouthfeel and had higher hedonic acceptibility (from the appearance, color, texture, aroma and taste attributes) compared to control (which was made from 100% carica puree and 100% chayote puree); 3) The product with optimum formula has 52.13% wb water, 1.20% db ash, 1.73% db protein, 1.08% db fat, 43.86% db carbohydrate by different, 191.76 Kcal / 100 g energy, 15.76% db dietary fiber, 31.52 mg / 100g vitamin C, color brightness intensity (L) 30.79, green color intensity (a) -0.45, yellow color intensity (b) 12.47, respectively. Total sugar content and water activity of optimum product is still slightly high, i.e. 35.78% wb and 0.84, respectively. Reformulation of carica jam needs to be done to get product with low sugar and high vit.C

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Formula Optimization and Characterization of Jam based on Carica Fruit (*Carica pubescens*, L)

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1st International Conference on Multidisciplinary Approaches for Sustainable Rural Development (ICMA-SURE); Purwokerto, 14-15 November 2018

BACKGROUND

1

Carica is a geographical indication product of Dieng

2

It rich in Vit C, K, flavonoid, antioxidant, dietary fiber

3

It can only be consumed after processing

4

One of the processed carica is cocktails which is made from unripe fruit

5

The use of over-ripe fruit and byproduct from cocktails processing (pulp) has not been carried out

6

It have a strong flavor, soft texture, and become taint quickly when stored

BACKGROUND

7

A mixture of over-ripe carica fruit and its pulp can be used in jam production

8

Substitution of carica jam with chayote can reduce production costs

9

Chayote is rich in pectin and tasteless , Its suitable to be used as a substitute of carica fruit in jam production

In its application by SMEs, the carica jam formula must be optimized

10

OBJECTIVES

This research were aimed to :

1. **optimizing the proportion of the main ingredients in carica jam production using the surface response methodology (RSM),**
2. **Examine the sensory characteristics of carica jam with quantitative descriptive analysis,**
3. **Examine the physicochemical characteristics of carica jam,**

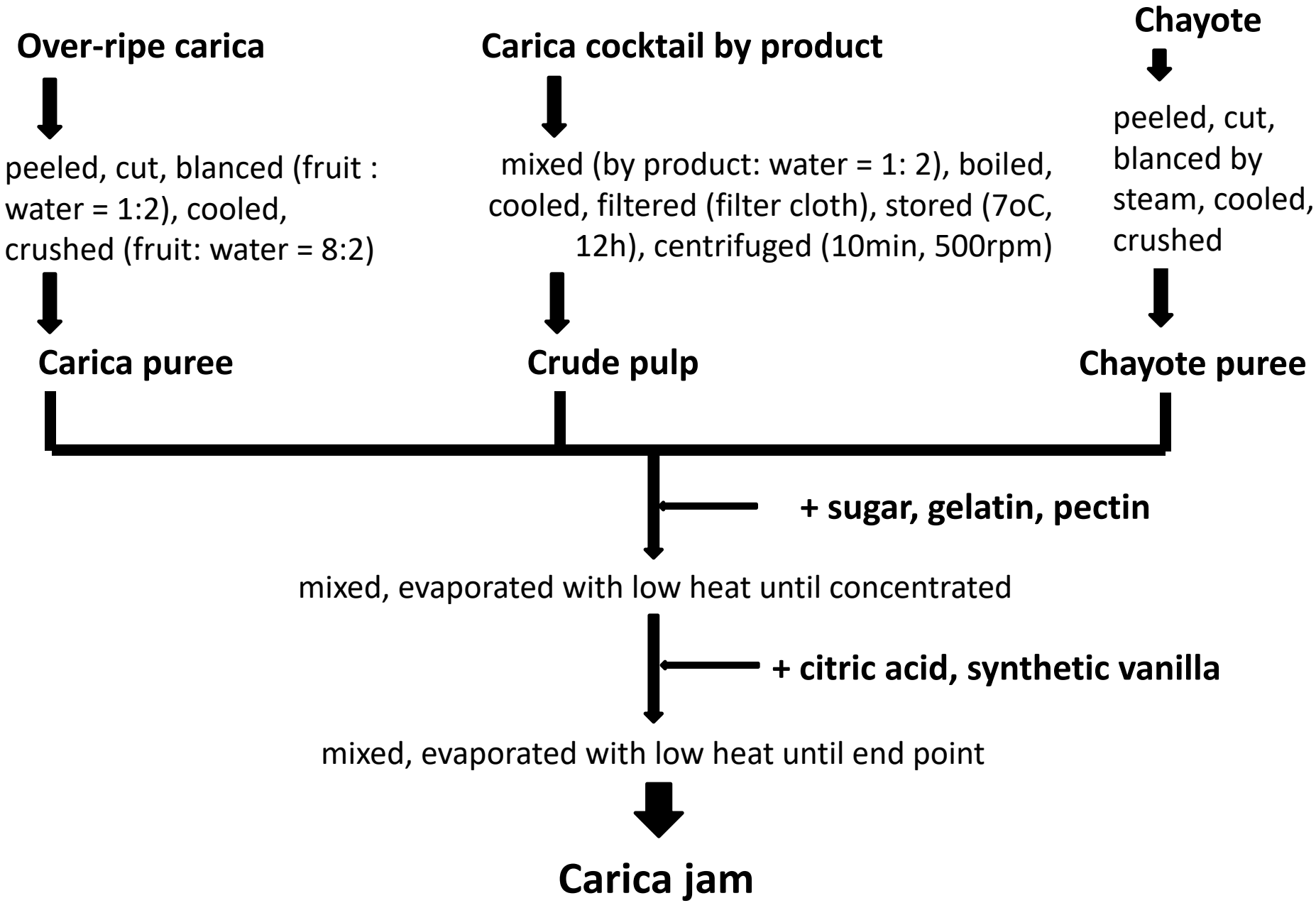
MATERIAL AND METHODS

Materials

1. Carica fruit and Chayote was obtained from Wonosobo district
2. Other ingrediens (gelatin, pectin, sucrose, citric acid, synthetic vanilla) were obtained from CV, Nuru Jaya Surabaya

The stages of research

1, Determination of basic formula and process
2, Recruitment of trained panelists
3, Formula optimization (intensity and hedonic rating test)
4, Quantitative Desriptive Analysis and hedonic ranking test of products with optimum formula
5, Physicochemical analysis of product with optimum formula


Over-ripe carica
Carica cocktail by product
Chayote
peeled, cut, blanced (fruit : water = 1:2), cooled, crushed (fruit: water = 8:2)
mixed (by product: water = 1: 2), boiled, cooled, filtered (filter cloth), stored (7oC, 12h), centrifuged (10min, 500rpm)
peeled, cut, blanced by steam, cooled, crushed
Carica puree
Crude pulp
Chayote puree
+ sugar, gelatin, pectin
mixed, evaporated with low heat until concentrated
+ citric acid, synthetic vanilla
mixed, evaporated with low heat until end point
Carica jam

BASIC FORMULA

Type of ingredient	Name of ingredient	Basic value (%)
Main ingredients	Sugar	20-40
	Non-sugar :	60-80
	Carica puree	46,67
	Carica pulp	20
	Chayote puree	33,33
Suporting ingredients	Gelatin	0,04
	Pectin	0,02
	Citric acid	0,07
	Synthetic vanilla	0,03

The basic formula consists of the main and supporting ingredients, The percentage of supporting ingredients was calculated based on the total of the main ingredients used

Recruitment of trained panelists

1, Selection of panelists:

a) filling out the questionnaire

b) Acuity test through:

i) introduction test of primary aroma and taste, intensity test of primary taste

ii) sensitivity test (taste, texture, color, and aroma)

2, Panelist training:

a) Introduction of the sensory quality attributes of jam (research and market products)

b) Training of rating and ranking test (3x) of carica jam using hedonic scale 1-9

c) Determination of the quality attributes of carica jam (by focus group discussion)

d) Training of rating test of carica jam using 15cm of unstructured scale (3x)

Formula optimization

Using Response surface methodology (RSM) :

1. **Design expert V,10 software (for trial)**
2. **Experimental design : central composite**
3. **2 treatment**
4. **2 replications**
5. **14 formula variations**

STAGES :

1. **Determination of the upper and lower limits**
2. **Making products with treatments result from RSM recommendations**
3. **Measurement of responses**
4. **Verification and validation**

Treatments were optimized

Main ingredients :

1. Sugar proportion
2. Non-sugar proportion

The upper and lower limits

Treatment	Unit	-alpha	- Level	+ Level	+alpha
Carica proportion	%	60	62,93	77,07	80
Sugar proportion	%	20	22,93	37,07	40

Result : Formula variation

The following are data from 14 formula variations recommended by DES

Formula	*Carica puree* (%)	*Chayote puree* (%)	Carica pulp (%)	Sucrose(%)	Total (%)
1	30,46	13,06	26,48	30,00	100
2	22,30	9,56	31,07	37,07	100
3	38,62	16,55	21,90	22,93	100
4	30,46	13,06	26,48	30,00	100
5	22,30	9,56	45,21	22,93	100
6	30,46	13,06	26,48	30,00	100
7	38,62	16,55	7,76	37,07	100
8	30,46	13,06	26,48	30,00	100
9	30,46	13,06	26,48	30,00	100
10	30,46	13,06	16,48	40,00	100
11	18,92	8,11	42,97	30,00	100
12	42,00	18,00	10,00	30,00	100
13	30,46	13,06	26,48	30,00	100
14	30,46	13,06	36,48	20,00	100

Result : Determination of Responses

The following are the results of measurements of the responses of each formula

Run	Overall acceptability	Spread ability	Stickiness	Taste	Springiness
1	6,7	6,4	6,2	6,9	6,4
2	4,4	5,6	5,9	5,6	6,2
3	6,4	7,0	5,2	6,0	5,9
4	6,4	6,9	6,4	5,9	5,7
5	6,2	7,2	6,4	5,9	5,2
6	6,2	7,1	7,1	5,8	6,1
7	5,4	5,5	7,3	5,6	6,5
8	5,7	7,3	6,9	6,1	5,1
9	6,3	6,7	6,1	6,0	5,9
10	6,2	6,8	6,0	6,5	5,9
11	5,8	6,7	7,1	5,6	5,9
12	6,6	6,7	5,6	6,5	5,8
13	6,3	6,9	5,4	6,5	5,7
14	5,5	6,7	5,8	5,5	5,0

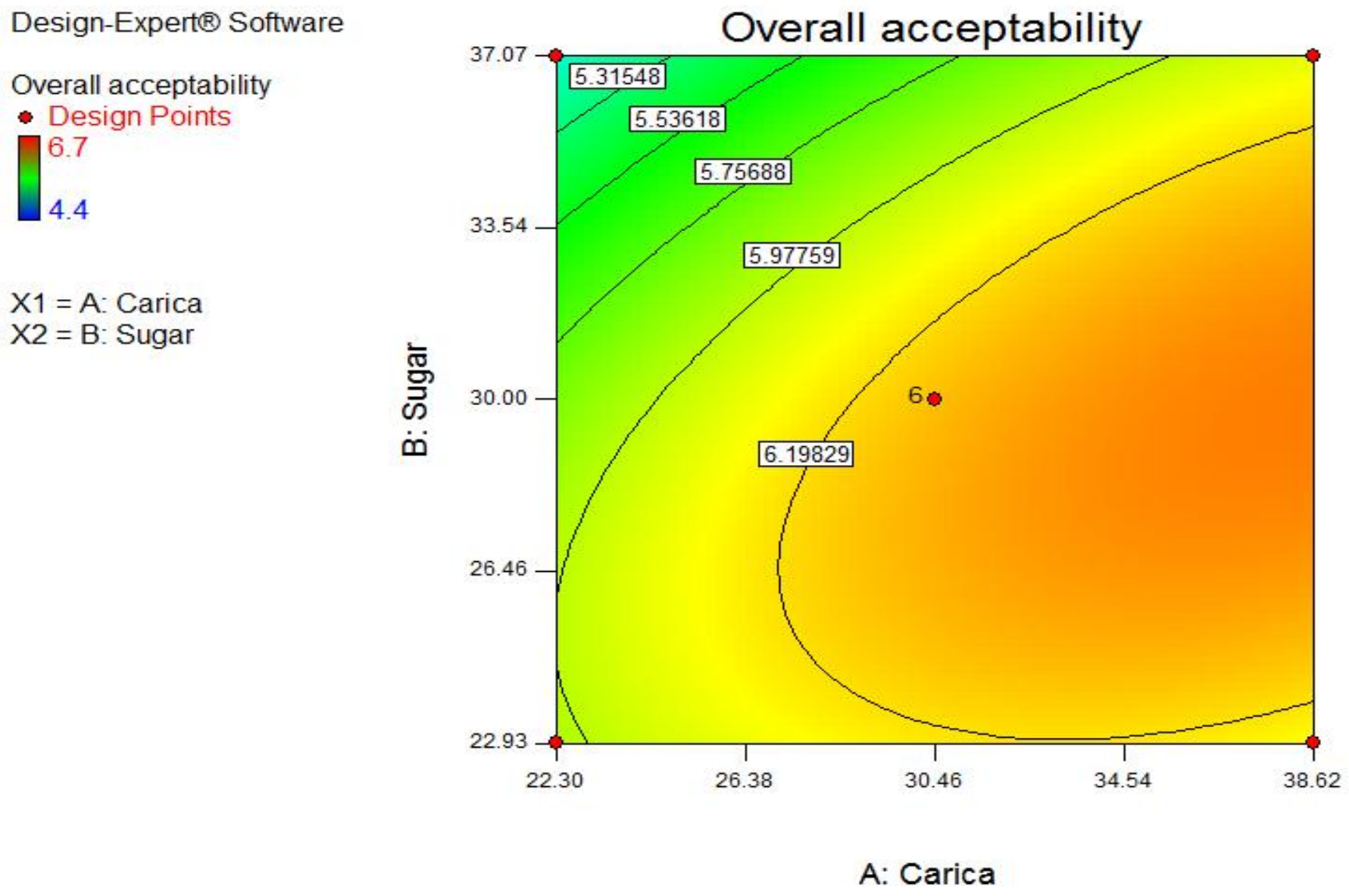
Result : optimum formula

No	Response	Criteria of response	Importance	mathematics models	Determinate coeficient
1	Overall acceptability	Maximum	5	$6,27 + 0,29 (A) – 0,23 (B) + 0,20 (AB) – 0,14 (A)^2 – 0,31 (B)^2$	0,43
2	Spread ability	Maximum	4	$6,88 – 0,037 (A) – 0,37 (B) + 0,025 (AB) – 0,19 (A)^2 – 0,17 (B)^2$	0,46
3	Stickiness	In range	3	$6,35 – 0,37 (A) + 0,36 (B) + 0,40 (AB) + 0,081 (A)^2 – 0,14 (B)^2$	0,54
4	Taste	Maximum	4	$6,15 + 0,17 (A) + 0,089 (B) – 0,025 (AB) – 0,11 (A)^2 – 0,14 (B)^2$	0,24
5	Springiness	In range	3	$5,82 + 0,11 (A) + 0,36 (B) – 0,100 (AB) + 0,092 (A)^2 – 0,11 (B)^2$	0,62

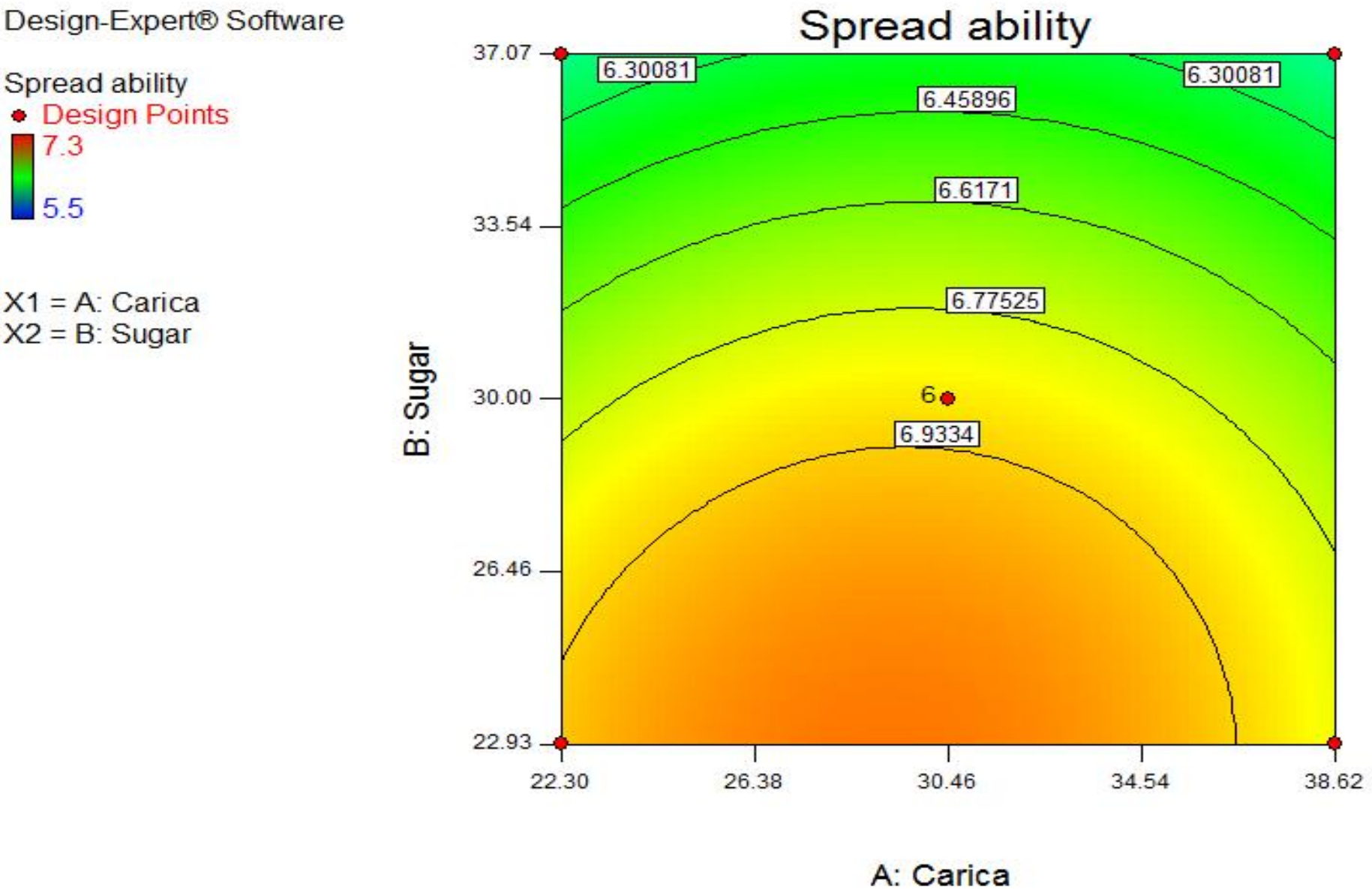
A = proportion of carica (%); ; B = proportion of sugar (%)

RSM analysis produce mathematics model for each response tested, From the data can be examined that the increase in the proportion of carica cause an increase in overall acceptibility, while the stickiness decrease, The increase in the proportion of sugar cause an increase in springiness and stickiness, while the spread ability decrease

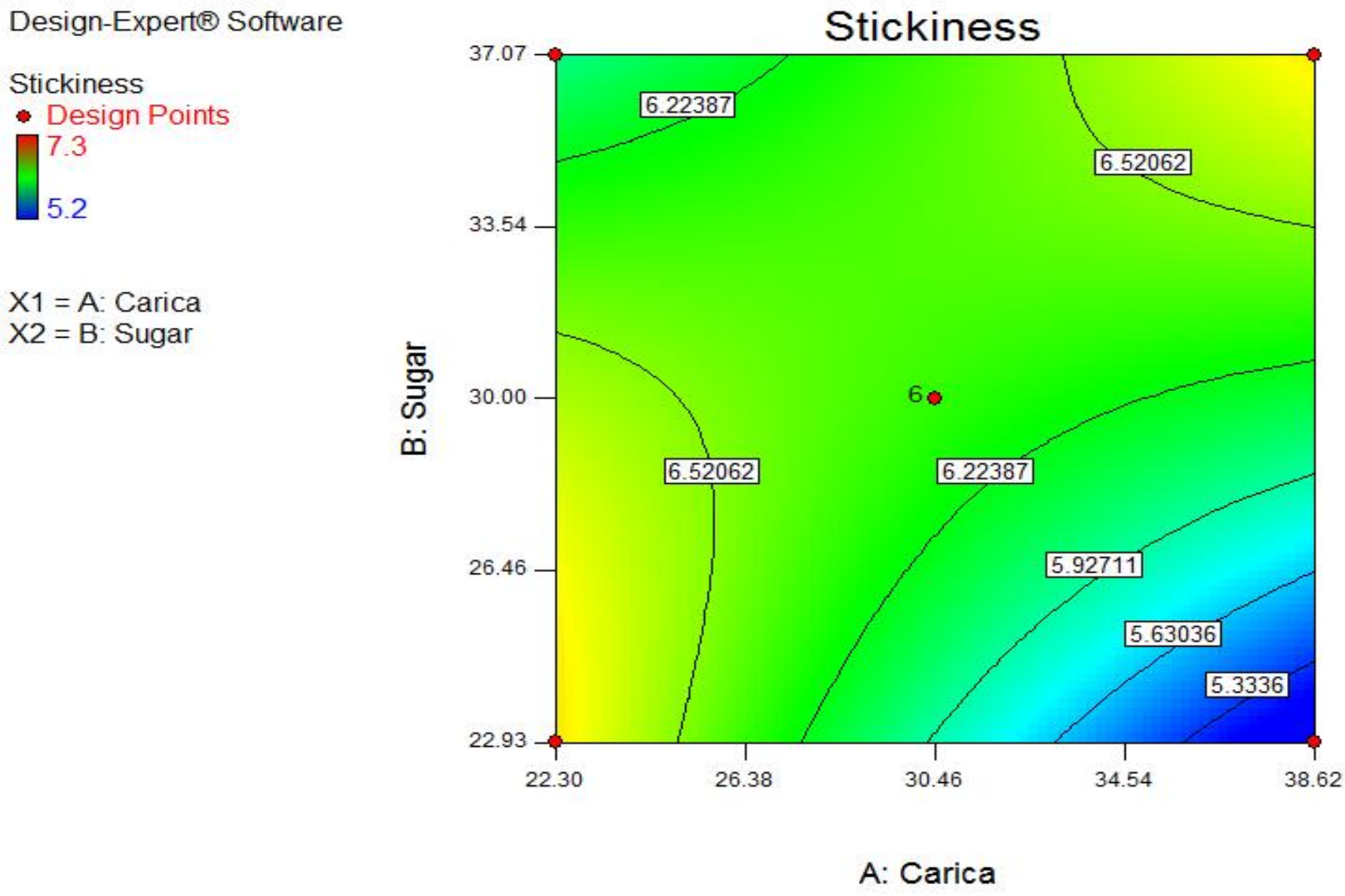
Two-dimensional contour of overall acceptibility



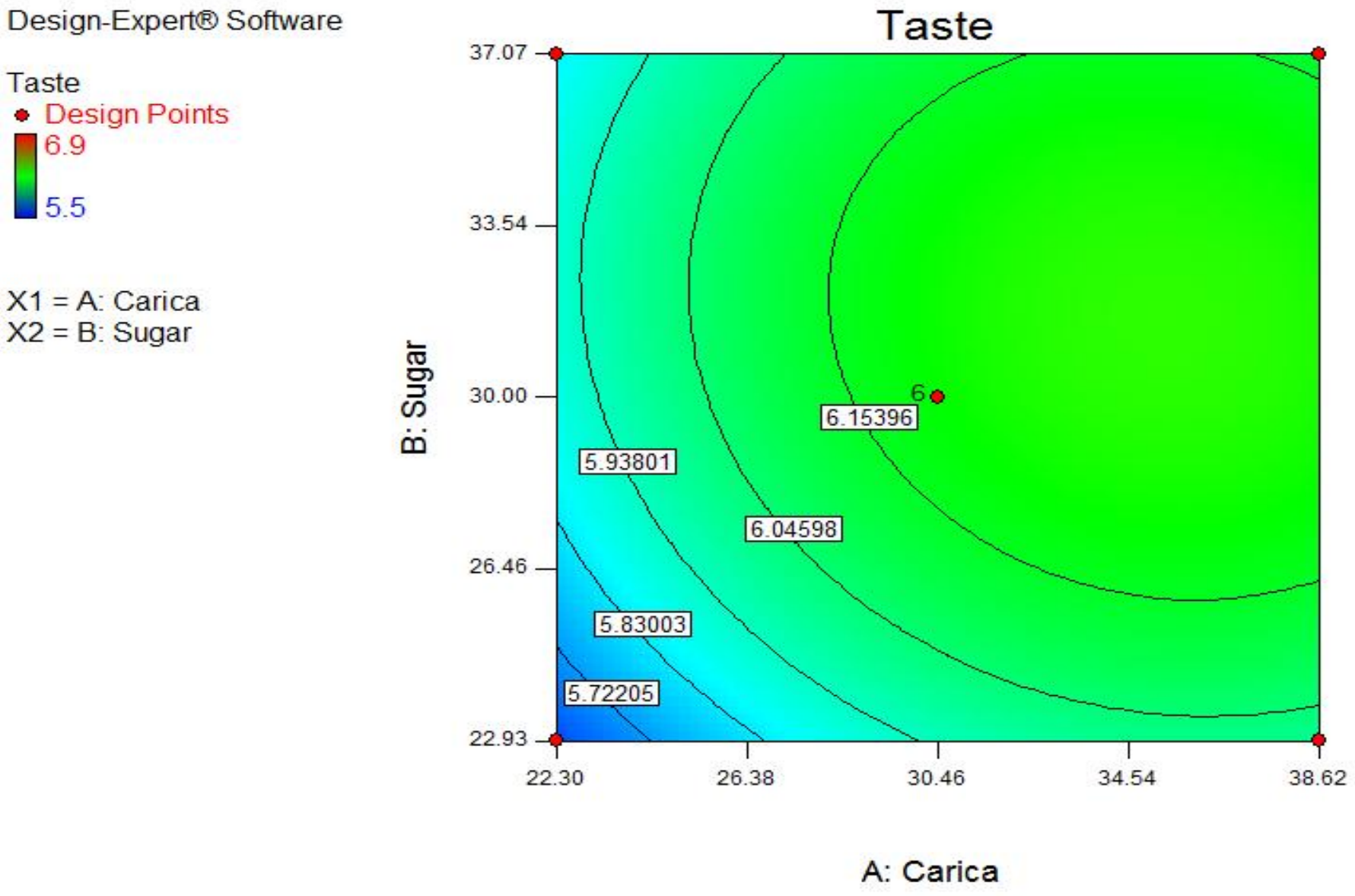
Two-dimensional contour of spread ability



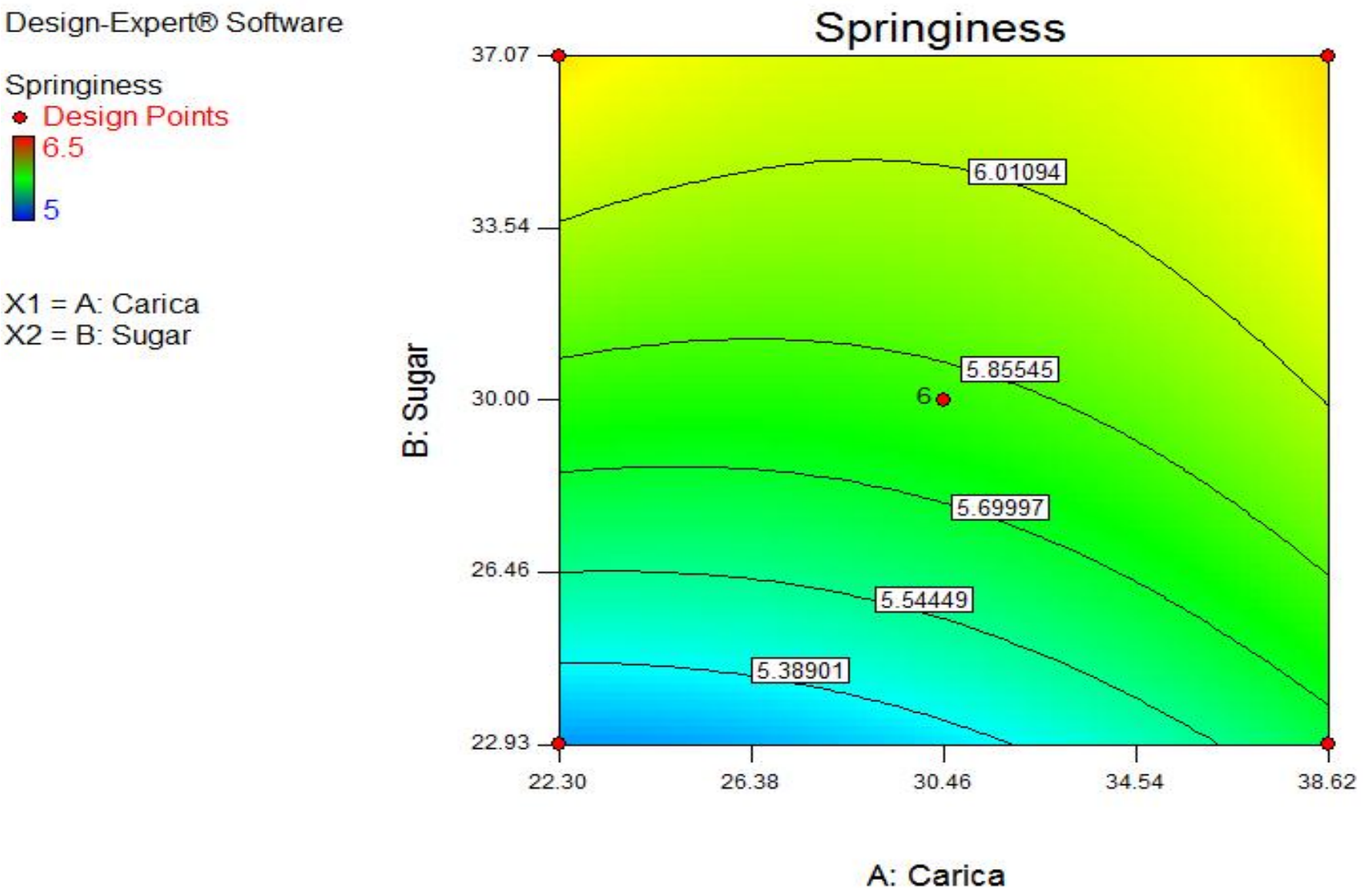
Two-dimensional contour of stickiness



Two-dimensional contour of taste



Two-dimensional contour of springiness



Result : optimum formula

The optimum formula recommended by the Design Expert

Main ingredient	Proportion (%)
Sugar	28,46
Carica puree	33,34
Carica pulp	14,31
Chayote puree	23,82

The sensory score of optimum formula

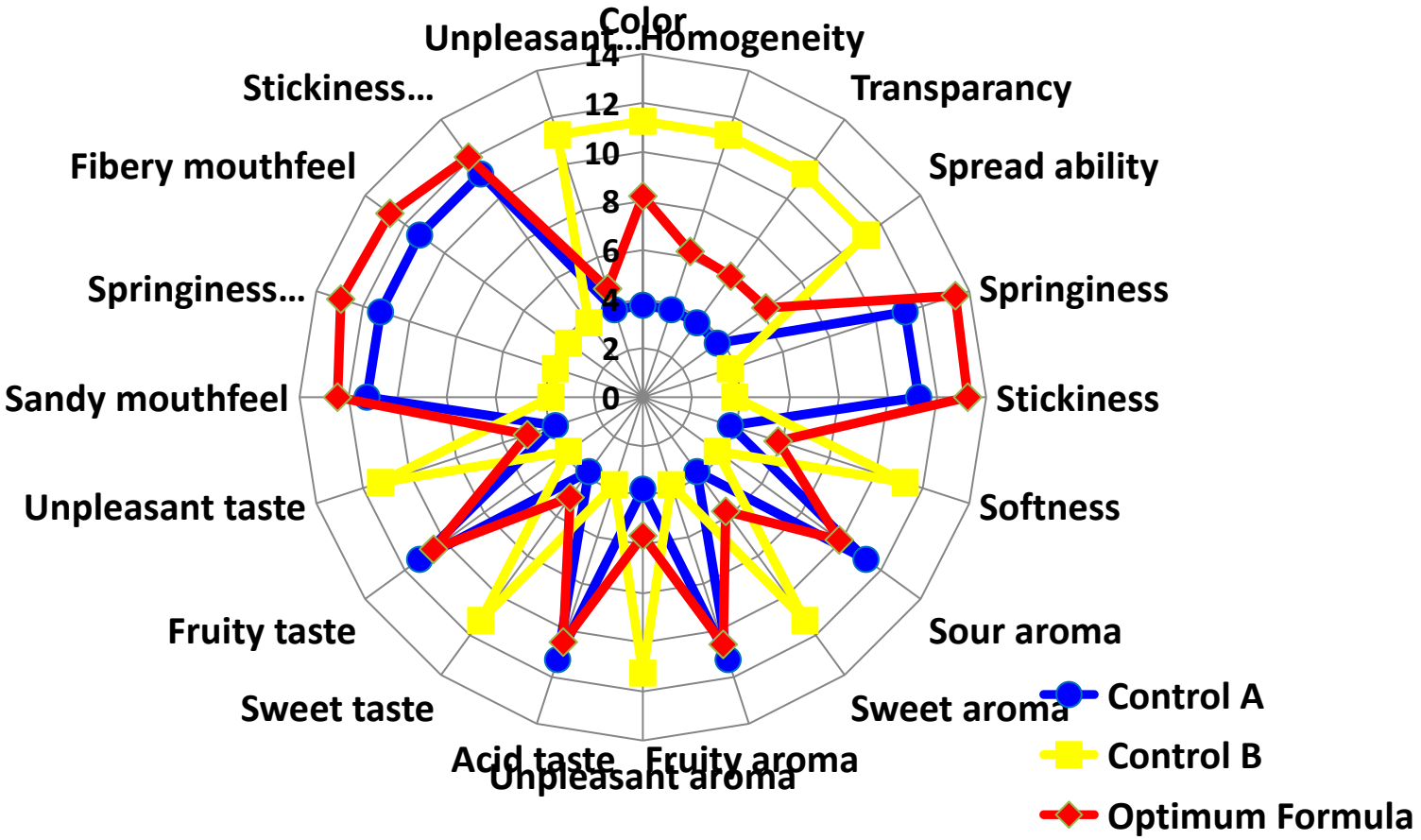
Respons	95% *Prediction Interval* (PI)		Prediction score	Actual score (Range 1-9)	Description
	Low PI	High PI			
Overall acceptibility	4,82	7,96	6,39	6,58±0,52	Rather like to like
Spread ability	5,59	8,19	6,88	6,90±0,41	Easy to spread
Stickiness	4,54	7,58	6,06	6,64±0,37	Rather sticky
Taste	4,96	7,40	6,18	6,70±0,59	Rather like to like
Springiness	4,95	6,68	5,82	6,38±0,48	Rather chewy

RESULT

The QDA test through FGD by 10 trained panelists has produced a description of all the sensory attributes identified from carica jam

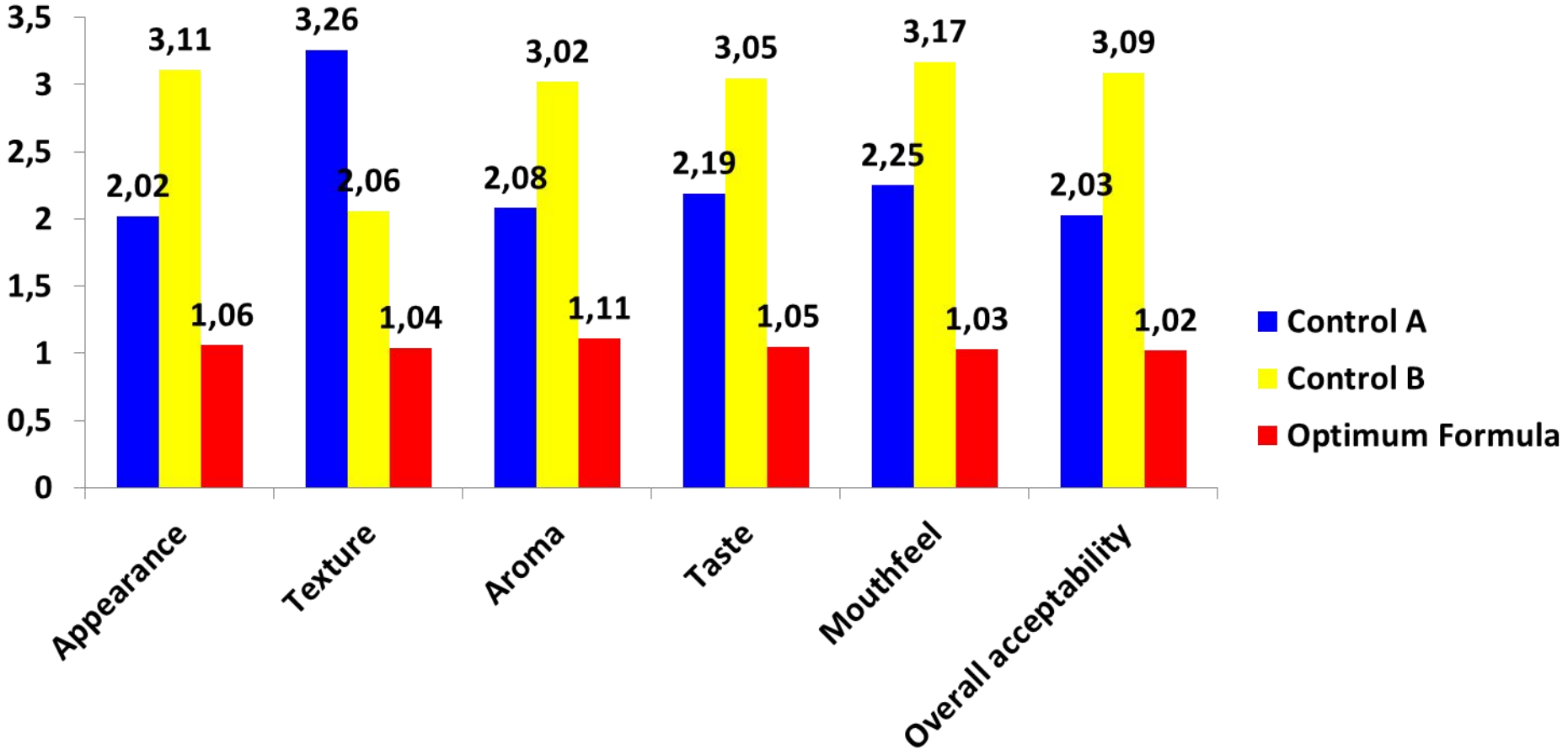
Type of attribute	Description of attribute
Appearance	**Greenish yellow color, spread ability, homogeneity, transparancy**
Texture	**Springiness, thickiness, softness**
Aroma	**Sweet, fruity (carica-like), sour, unpleasant aroma**
Taste	**Sweet, fruity (carica-like), acid, unpleasant taste**
Mouthfeel	**Springiness, thickiness, fibery, sandy**
Aftertaste	**Unpleasant taste (*langu*)**

The spider web diagram of sensory attributes of optimum product compared to control



Product	Description of main attribute
Control A (100% of carica)	Sour/Acid aroma and taste, fruity aroma and taste
Control B (100% of chayote)	Color, homogeneity, transparancy, spread ability, softness, sweet aroma and taste, unpleasant aroma and taste
Optimum formula	Springiness and stickiness texture and mouthfeel, fibery and sandy mouthfeel

Ranking hedonic test of optimum product compared to control



The optimum product was favored than controls (A and B) based on the attributes of appearance, texture, aroma, taste, mouthfeel, and overall acceptibility

Physicochemical properties	Control A (100% carica)	Control B (100% chayote)	Optimum formula
Water (%wb)	63,17±0,42	48,47±0,25	52,13±0,31
Ash (%db)	0,54±0,03	0,61±0,04	1,20±0,05
Protein (%db)	1,08±0,03	1,99±0,02	1,73±0,09
Fat (%db)	0,41±0,03	0,39±0,01	1,08±0,04
Crude fiber (%db)	19,35±0,11	14,35±0,09	13,59±0,11
Dietary fiber (%db)	21,34±0,19	15,39±0,15	15,76±0,13
pH	5,30±0,21	6,00±0,25	5,30±0,23
Total sugar (%db)	57,98±0,34	58,02±0,31	74,73±0,39
Na (ppm)	200,34±2,29	225,05±2,35	190,94±2,18
Acid (%db)	0,34±0,02	0,18±0,03	0,26±0,02
Vitamin C (mg/100g db)	42,99±0,26	23,49±0,21	31,52±0,27
Kalium (ppm)	139,90±1,54	123,90±1,29	120,57±1,37
Total Solid (%db)	42,70±0,27	50,76±0,31	48,72±0,29
Water activity	0,83±0,08	0,85±0,06	0,84±0,05
Color L	30,40±0,19	29,54±0,23	30,79±0,20
a value	-0,60±0,00	-0,98±0,00	-0,45±0,00
b value	11,70±0,08	7,85±0,05	12,47±0,06

The physicochemical properties of optimum product compared to control

CONCLUSIONS

1, The optimum formula of carica jam has :

- desired score of overall acceptibility and spread ability
- more sticky, chewy and fibrous texture and mouthfeel and had higher hedonic acceptibility compared to control
- high in dietary fiber content
- slightly high in total sugar and Vitamin C

2, Reformulation of carica jam needs to be done to get product with low sugar and high vit,C


PATARA
Diena Exotic Fruit
Carica Jam
100 % Original
Netto: 250 g
wonderful indonesia

Thank You,,,,