J. Agric. Sci. Mansoura Univ., 26 (11): 7081 - 7091, 2001.

EFFECT OF CHAMOMILE ON LABENAH PROPERTIES

Mehana, M. Y.
Dairy Science Dept. Fac. of Agric. Mansoura Univ. Egypt.

ABSTRACT

Labenah was made by traditional method from goat's milk and from mix of goat's and cow's milk (75% goat's milk + 25 % cow's milk) and (50% goat's +50 % cow's milk) with adding chamomile powder (0.5 %– 0.75%- and 1%) of milk weight. Control labenah was made from goat's milk without any additives to study the effect of adding chamomile with the biological and medical characterization, on the specification and characteristics of labenah curd. The results showed that adding chamomile had no effect on the curd formation. Adding of chamomile powder had no effect on the chemical properties and total nitrogen content of labenah either fresh or after ripened . Soluble nitrogen , non protein nitrogen and total volatile acids increased with adding chamomile, compared with control and increased with increasing the added ratio of chamomile.Addition of the powder affected on the microbiological characteristics, i.e. the total counts of bacteria and lactic acid bacteria . The effect increased with increasing the added amounts of chamomile. No effect on the organoleptic properties of labenah made with the addition of chamomile was observed.

INTRODUCTION

In the last few years, herbs and medical plants are widely cultivated in Egypt. Chamomile is widely used in medicine in Egypt and most countries of the world. Flower's extract is used as a drink for calming, cold relief, and ant fever and spasm relief. It's extract also is used as a gargle for tonsil its inflammations, mouth ulcers, stomach ulcers, anti-fungal diseases and anti-skin inflammation (Abou-Zeid, 1986). So far, the addition of chamomile to milk during the cheese making was done to improve it;s characteristics.

The large number of varieties of dairy products made from goat's milk had resulted in great diversity in the nature of these products. The milk from which they are made significantly influences the final product. (Kosikowski 1978) reported that the manufacture of goat's milk cheese can be made from goat's or mixtures of it with cow's milk. The intensity of the goaty flavour was highly correlated with the free fatty acids content. Some consumers preferred such flavour (Anonymous 1978) Chamomile is used in some dairy products to improve their flavours and enhancing the shelf life without affecting the quality.

Labenah is one of the most popular dairy products in Middle East .It is usually made using milk inoculated with lactic acid bacteria ,then concentrating the curd in cloth bags using little pressure . The variation in quality of labenah in different countries is due to the variation of starter cultures used (Tamime ,1978 , Rasic , 1980, Tamime *et al* ,1988 ,and Abou –Donia *et al.*, 1992 .) .The present work is carried out to study the effect of Chamomile on technological, chemical microbiological and

organoliptic properties of Labenah made with the addition of different levels of chamomile

MATERIALS AND METHODS

Milk : -

Fresh whole goat's milk (Zaraibi) and cow's milk were obtained from the herd of El-Serw farm .Animal Production Research Institute . Agriculture Research Center .Ministry of Agric.

Starter:-

Starter was obtained from Ch. Hansen's Laboratories ,Denmark .Streptococcus salivarius sub sp. thermophillus and Lactobacillus delbrukii sub sp. Bulgaricus (1:1).

Chamomile flower powder was added to labneh milk at the rate of 0.00 - 0.5 - 0.75 - 1.00 %. Labenah was made by the traditional method as described by Hefney *et al.* (1992). Labenah treatments were kept under refrigeration 5 =1^0 C.

Experimental: -

Three different treatments could be summarized as follows: -

Treatment I = Labenah was made from Goat's milk with adding Chamomile (0.00 as a control, 0.50 ,0.75 and 1.00 %)

Treatment II = Labenah was made from 75 %goat's milk + 25 % cow's milk with adding Chamomile (0.50 , 0.75 and1.00 %).

Treatment III = Labenah was made from 50 % goat's milk + 50 % cow's milk with adding Chamomile (0.50 , 0.75 and1.00 %).

Chemical analysis: -

Labenah samples were examined for the moisture, fat, acidity, total nitrogen, and soluble nitrogen, according to the methods described by Ling (1963). Total volatile acidity was determined according to Ostoeux *et al.* (1958) with some modification described by El-nemre (1968). PH values were determined by pH meter with a glass electrode (HANNA Digital Instruments pH meter Hi, 8014 Italy).

Microbiological analysis: -

Total viable counts were estimated by plating suitable dilutions in duplicates on the Basal medium (El-Magdaub 1971) according to the method outlined by the American Public Health Association (1978), The plates were incubated at 30c for 48hr.De Man Rogosa, Sharpe Agar (MRS) was used for lactic acid bacteria according to De Man *et al*. (1960) Potato Dextrose Agar (P.D.A) was used for yeasts and moulds, MacConkey medium was used for coliform bacteria according to Difco'Manual (1984) and Blairs media for an aerobic spore former according to Harrigan &Maccance (1976) .

The organoleptic properties of Labenah were judged by the regular panels as described by Nelson and Trout (1968).

RESULTS AND DISCUSSION

Effect of adding Chamomile on the Labenah curd properties :-

Table (1) ,shows the effect of adding Chamomile with different ratios on curd tension and syneresis of labneh curd made from different kinds of milk .No change could be seen due to the added ratios of Chamomile to Labenah milk on the curd tension and syeneresis compared the control Labenah with milk . This means that Chamomile had no effect on the curd tension , synersis . The changes of synersis (gr) at 10 ,30 , 60, 120 mins in each treatment was found to be slightly decreased compared with control.

Effect of adding Chamomile on chemical composition of Labenah :-

Table (2), showed that there was no pronounced differences in the moisture content among all the Labenah treatments ,but it slightly decreased during storage period

Results are coinceded with data reported by Abd-Rabou (1987) and Tamine & Robinson (1988),found that the total solids (T.S)of Labenah averaged between 30 –40 % .On the other hand Gilles & Lawrence (1980)and Ragab (2000),reported lower T.S. in the Labenah being 26% , which might be attributed to some technological aspects.

The same table (2) ,shows the fat content in dry matter basis in all treatments . There was slightly increase during storage . The obtained results were in full agreement with those reported by Abd –Rabou (1987),Tamime & Robinson (1988),Omer (1995), Abd EL Moaty (1996) and Ragab (2000)..

Titratable acidity and pH values were recorded in the same table (2) .Data showed nearly the same values fresh Labenah treatment .The same trend was found during storage period .The obtained results were in full agreement with those reported by Abd El Moaty (1996) , and Ragab (2000) .

Ripening indices: -

Total and soluble nitrogen :

As shown in Table (3) , total nitrogen content in fresh Labenah and in all treatments were found nearly to be the same during storage. The attained result revealed that adding different additives did not show noticeable effect on the T.N. content of Labenah . The slight changes in moisture content was observed when small amount of chamomile was added to Labenah.The obtained results agreed with the data reported by many investigations (Abd -Rabou 1987 ,Tamime & Robinson 1988 ,Omer1995 and Ragab 2000 .

In the same table (3), the changes in the soluble nitrogenous compounds as % of total nitrogen in Labenah during the storage period .The obtained results showed a gradual increase in the soluble nitrogen contents in Labenah during the storage period .The obtained data were in agreement with the data given by (Tamime &Robinson 1988 ,Omar 1995, and Ragab2000.

Table (3) ,showed the changes in the non proten nitrogen (N.P.N) of Labenah made by traditional method using different kinds of milk with adding chamomile.

The obtained results illustrated a slightly increase in the NPN content as a percent of the total nitrogen .Whereas ,the attained results indicated that ,the NPN content of Labenah have the same trend in each treatments which slightly increased during storage up to four weeks .

Data in table (3) , reveal the changes in the total volatile acidity (TVA) of Labenah in different treatments during storage period. These data showed that there was a gradual increase in TVA of the labneh in each treatment during storage than the control .

Microbiological properties of Labenah:-

Table (3),illustrated the average of total count of bacteria, lactic acid bacteria, spore form bacteria, molds and yeasts, and coliform bacteria in Labenah treatments .

It's clear from this data that Labenah made by traditional method showed higher total count bacteria and lactic acid bacteria in control labneh, than the labenah made with adding chamomile in different ratios. The count of bacteria (total count and lactic acid bacteria) increased after one and two weeks of storage, then decreased by prolonging the storage to 4 weeks. The obtained results agreed with the data reported by Abou Donia *et al* 1992.

Spore formers bacteria were not detected in fresh and all treatments of labenah at the first week of storage. While they began to appear after two weeks of storage in control, and when adding 0.5 % chamomile. But it appeared in all treatment at the forth week of storage.

Organoleptic properties of labneh: -

The average values of the organoleptic assessment of the Labenah samples are shown in table (5) .The scores of the appearance and colour showed no significant differences in the fresh and storage period .

On the other hand the scores of body and texture for fresh and other treatments of Labenah showed no significant differences due to same of manufacture by the traditional method and the same the starter culture used (Abou –Donia *et al*., 1992) . However, higher scores were awarded to fresh Labenah and made from kinds of milk more than Labenah storage period until up to four weeks.

The type of milk and amount of used additives influenced the scores of the flavour of Labenah. Flavour scores were high in the fresh Labenah treatments, then decreased during progression in storage period .It was noticed that the Labenah made with small amount (0.5 %)of chamomile gave relatively high flavour scores .Raising the amounts of chamomile to 1.00% gave low flavour scores .

REFERENCES

Abd El –Moatty ,S.H.(1996). Studies on the Labneh cheese .Ph .D .Thesis Fac.of Agic. Cairo Univ. Egypt .

Abou –Donia ,S.A; I.A. Attia ;A.A.Khattab and S.M.EL- Khadragy (1992).Characteristic of labneh manufactured using different lactic starter cultures .Egypt.J.Food Sci.,20 (1): p .1-12 .

Abou –zeid, E.M. (1986) . Plants and Medicinal Herbs .Seas House .Beirut .(In Arabic).

American Public Health Association ,(1978) .Standard methods for the examination of Dairy products . Broadway , New York .N.Y. ,USA

Anonymous,(1978) .Ultra filtration the cheese factory and what on be currents expected from it ? Tech. Tail.,921-9, (C.F. File ,51 :FSTA,69-85 /FEB,2H301-81, 11-P,1991.

De-Man,J.C.; M . Rogosa and M.E. Sharpe (1960).A medium for the cultivation Lactobacilli ,J.App Bact., 23 :130

Difco' Manual (1984). Dehydrated Culture Media and Reagenis for Microbiological and Clincal Laboratory Procedures. Pub.Difco Lab.Detroits, Michigan, USA.

El-Magdoub ,M.N.I. (1971). The effect of hydrogen peroxide-catalase treatment on chemical and bacteriological properties of Domiati cheese . M .Sci. Thesis, Ain shams Univ. Egypt.

El-Nemre ,A.A. (1968) . Non enzymatic coagulation of milk and its use in soft cheese making . Ph.D. Thesis Fac. of Agri. Cairo Univ. Egypt.

Harrigan,W.F.and M.E. Maccance (1976). Laboratory Methods in Food and Dairy Microbiology .Part II ,A.P,New York.

Hefney ,A.A.;Sh.G.Osman and N.A.Hegazi(1992). Free fatty acids and quality of labneh made by different starter cultures and Glucono-Delta lacton . Egyption . J .Apple Sci., 7 (5)

Kosikowaski ,F.V.(1978) . Cheese and fermented milk foods . 2 nd . Ed Edwards brothers ,Ann,Arbor.MI.

Ling ,E.R.(1963). A text book of dairy chemistry .Vol. 2 practical 3 th. Ed .Champan and Hall Ltd . Landon

Nelson ,J.A. and G.M. Trout (1968). Judging Dairy products Uth .Ed .The Osden Publishing Co .Milwaukee Wis. 53212.

Omar , I. M. (1995). Some dairy products from reconstituted milk powerd with whey. M. Sc. Fac. of Agric. Mansoura. Univ. Egypt.

Ostoeux ,R ;.J.Gullaune and J .Laturaze (1958). Separation of volatile aliphatic acids by paper chromatography.J .Chromatography .! :70 .

Rasic ,J.L.(1987). Yoghurt and yoghurt cheese manufacture . Culture Dairy Products J., 22(4) :6-8 .

Tamime, A.Y.(1978) The production of yoghurt and concentrated yoghurt from hydrolyzed milk . Cultured Dairy Products .J., 13 (3):16.

Tamime ,A.Y and R.K.Robinson (1988). Yoghurt science and technology ,I.T.Ed.Weaton and CoLtd.England.

Tamime ,A.Y. and R .K. Robinson (1988).Fermented milk and their future trend . J .Dairy Res., 55:281 –286.

Tamime ,A.Y.; G.Davies ; A.S.Chehabe and H.A. Mahdi (1980). The production of labneh by ultra filtration a new technology . J .of the Society of Technology , 42 (2):35- 39.

تأثير الكاموميل على خواص اللبنة

محمد يونس مهني
قسم علوم الألبان – كلية الزراعة – جامعة المنصورة

تم تصنيع اللبنة بالطريقة التقليدية من لبن الماعز ومن خليط من لبن الماعز واللبن البقري بنسبة (٧٥% لبن ماعز + ٢٥% لبن بقري) وبنسبة (٥٠% لبن ماعز + ٥٠% لبن بقري) وذلك بإضافة مسحوق زهرة الكاموميل بنسبة (٠,٥ % - ٠,٧٥ % - ١,٠ %) من وزن اللبن . وقد صنع لبن الماعز كمقارنة . وذلك لدراسة اثر إضافة زهرة الكاموميل ذو الخواص البيولوجية والطبية المعروفة على خواص وصفات خثرة اللبن واللبنة الناتجة طازجة والمخزنة على درجة حرارة الثلاجة لمدة أسبوع وحتى أربعة أسابيع حيث وجد أن : -

١- لم يؤثر إضافة الكاموميل على قوة صلابة الخثرة وكذلك ترشيح الشرش بعد مدة ١٠-٣٠- ٦٠-١٢٠ دقيقة

٢-لم تؤثر إضافة الكاموميل وكذلك نوع اللبن المستخدم على الخواص الكيميائية للبنة الناتجة سواء طازجة أو المخزنة .وكذلك تطور الحموضة وال pH فيها.

٣- وجد أن إضافة الكاموميل ليس له أي تأثير على محتوى اللبنة من النيتروجين الذائب والنيتروجين الغير بروتيني

٤- محتوى اللبنة من الأحماض الكلية الطيارة تزيد مع زيادة الكمية المضافة من الكاموميل .

٥- وجد تأثير واضح على الخواص الميكروبيولوجية للبنة الناتجة حيث وجد انخفاض في محتوى اللبنة من العدد الكلى للبكتريا وكذلك عدد بكتريا حمض اللاكتيك نتيجة إضافة الكاموميل ويزيد هذا التأثير مع زيادة الكمية المضافة . وكان التأثير اكثر وضوحا في محتوى اللبنة من العدد الكلى للبكتريا المتجرثمة وكذلك الخمائر والفطريات وبكتريا القولون .

٦- عند دراسة الخواص الحسية للبنة في المعاملات المختلفة وجد ان إضافة الكاموميل ليس له تأثير واضح على مظهر اللبنة الناتجة ولكن وجد زيادة طفيفة جدا من اللون الأصفر يزيد مع زيادة الكمية المضافة .اما بالنسبة لمقطع وتركيب الخثرة الداخلى لم يظهر اى تاثير واضح .كما ان نكهة اللبنة المضاف اليها النسبة المنخفضة (٠,٥%)نالت اعلى الدرجات حيث كانت النكهة واضحة ونظيفة ومقبولة لكن مع زيادة الكمية المضافة حدث تدهور فى النكهة .

لذا يوصى البحث بامكانية صناعة اللبنة المضاف اليها الكاموميل بنسبة ٠,٥% كمنتج لبنى جديد ذو صفات حيوية وعلاجيه جيدة .

Table (1): Effect of adding Chamomile with different ration on curd tension and syneresis of the curd made from different kinds of milk.

Camomile ratio / Component	I				II			III		
	0.0%	**0.50%**	**0.75%**	**1.00%**	**0.50%**	**0.75%**	**1.00%**	**0.50%**	**0.75%**	**1.00%**
Curd tension(gr.)	40..325	40..674	38..137	36.978	38.978	36.322	35.441	35.054	34.766	32.150
Syneresis(gr.) after10(min.)	4.249	4.861	4.483	4..316	4.200	3.973	3.674	3.824	3.917	3.841
Syneresis(gr.) after 30(min.)	5.754	5.356	4.864	5.165	5.372	5.232	4.735	4.156	4.176	3.981
Syneresis(gr.) after 60(min.)	6.313	5.942	5.586	5.401	6.118	5913	5.389	5.488	5.066	4.531
Syneresis(gr.) after 120(min.)	6.506	6.350	6.012	5.885	6.524	6376	5.784	5.751	5215	5.048

I = Goat's milk.
II = 75 Goat` s milk + 25% Cow` s milk.
III = 50% Goat` s milk + 50% Cow` s milk.

Table (2) : Effect of adding Chamomile with different ratios on the some chemical properties of Labenah made from different kinds of milk

Camomile ratio / property		I			II			III		
		0.0%	0.50%	0.75%	1.00%	0.50%	0.75%	1.00%	0.50%	0.75%	1.00%
Moisture%	0	69.08	68.43	68.14	68.50	67.82	67.06	67.29	67.39	67.21	67.17
	1	66..48	65.69	65.05	65.62	65.07	65.59	64.73	64.95	64.17	64.10
	2	64.19	63.04	64.06	62.82	62.60	62.43	62.80	62.58	62.11	62.10
	3	62.09	61.68	61.50	61.08	60.82	60.94	60.38	60.78	60.33	60.19
	4	60.15	59.68	59.35	58.68	59.11	58.89	58.04	58.73	58.74	57.88
Fat / T.S	0	44.31	44.66	46.45	46.35	44.44	45..23	44.41	43.85	44.83	44.69
	1	44.15	45.47	44.06	45.95	44.67	44.64	45.65	44.79	45.54	45.12
	2	45.56	45.45	45.47	46.00	45.65	44.72	46.51	45.36	45.87	46.17
	3	46.16	47.00	46089	47.28	46.42	46.59	46.69	46.64	46.38	46.47
	4	46.92	47.37	47.48	47.68	47.20	47.19	47.19	46.87	47.00	46.77
Acidity	0	1.85	1.75	2.08	2.07	1.89	2.00	1.67	2.10	2.00	1.85
	1	2.00	2.02	2.26	2.15	2.10	2.24	2.00	2.15	2.15	2.00
	2	2.13	2.10	2..34	2.43	2.24	2.36	2.23	2.25	2.20	2.10
	3	2.16	2.20	2.49	2.50	2.46	2.40	2.35	2.35	2.40	2.25
	4	2.19	2.35	2.55	2.60	2.55	2.48	2.20	2.45	2.50	2.30
pH	0	4.30	4.35	4.40	4.45	4.35	4.40	4.45	4.52	4.50	4.5
	1	4.23	4.25	4.35	4.40	4.25	4..35	4.30	4.35	4.35	4.45
	2	4.15	4.20	4.15	4.25	4.20	4.20	4.25	4.25	4.25	4.30
	3	4.10	4.15	4.10	4.15	4.10	4.20	4.15	4.20	4.15	4.25
	4	4.06	4.10	4.05	4.00	4.00	4.10	.4.00	4.15	4.15	4.15

I = Goat's milk .
II = 75% Goat's milk + 25% Cow's milk .
III = 50%Goat's milk + 50% Cow's milk .
0,1,2,3 and 4 = Storage periods (frish,1 ,2,3 and 4 weeks).

Table (4): Effect of adding Chamomile with different ratios on the microbiological properties of Labenah made from different kinds of milk .

Camomile %		I				II			III		
Microbial properties		0.0%	0.50%	0.75%	1.00%	0.50%	0.75%	1.00%	0.50%	0.75%	1.00%
Totalcount Bacteria $X10^6$	0	30.5	23.2	22.1	20.6	31.6	28.2	26.8	28.5	27.2	26.8
	1	34.1	30.4	30.2	27.3	38.4	34.6	32.9	36.4	34.8	33.5
	2	30.3	26.5	26.2	26.0	34.4	30.3	30.2	33.5	31.6	30.4
	3	19.6	16.4	15.3	14.8	22.6	20.4	16.5	19.2	18.4	17.6
	4	16.3	14.3	13.5	12.6	18.0	17.5	15.4	17.5	16.5	15.8-
Lactic Acid Bacteria $X10^6$	0	24.3	21.3	19.4	18.3	26.1	25.1	22.8	28.2	25.4	23.8
	1	28.1	24.4	22.0	20.0	30.2	23.6	20.2	24.1	20.4	19.5
	2	25.7	22.3	20.8	182	24.02	20.3	16.28	20.1	18.9	16.4
	3	14.2	14.5	13.5	13.0	14.2	13.4	12.5	18.5	16.4	14.8
	4	12.4	11.2	10.2	10.0	13.4	12.4	11.8	12.8	14.5	12.4
Spore Forming -Bacteria $x10^2$	0	-	-	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-	-	-
	2	1.2	0.5	-	-	0.4	-	-	0.1	-	
	3	3.1	1.6	0.4	-	0.9	0.2	-	1.2	0.8	-
	4	4.3	2.8	2.1	1.8	1.6	1.3	0.6	2.8	1.6	1.2
Mold & Yeast x 10^2	0	-	-	-	-	-	-	-	-	-	-
	1	0.5	-	-	-	-	-	-	-	-	-
	2	8.0	4.1	3.8	2.6	5.8	4.1	2.8	6.4	4.2	2.1
	3	12.4	8.4	6.7	3.8	9.4	8.2	4.3	11.5	8.9	4.5
	4	20.1	11.2	10.0	8.5	12.5	10.9	8.4	13.8	10.5	8.1
Coliform Group	0	-	-	-	-	-	-	-	-	-	-
	1	-	-	-	-	-	-	-	-	-	--
	2	+	+	-	-	+	+	-	+	+	-
	3	+	+	+	-	+	+	_	+	+	+
	4	+	+	+	+	+	+	+	+	+	+

. 0 ,1 ,2 ,3, 4 =Storage proud- (fresh ,1 , 2, 3 and 4 weeks

Table (3): Effect of adding Chamomile with deferent ratios on ripening indices of Labenah made from different kind of milk

Camomil % / Ripening indices		I				II			III		
		0.0%	0.50%	0.75%	1.00%	0.50%	0.75%	1.00%	0.50%	0.75%	1.00%
TN	0	1,98	1,99	2.05	2.02	2.00	2.06	2.12	2.05	2.06	2.14
	1	2.03	2.02	2.14	2.13	2.06	2.12	2.18	2.14	2.12	2.19
	2	2.11	2.18	2.27	2.36	2.15	2.24	2.26	2.27	2.18	2.20
	3	2.25	2.29	2.31	2.38	2.20	2.28	2.30	2.38	2.26	2.27
	4	2.30	2.34	2.38	2.42	2.33	2.39	2.36	2.42	2.34	2.35
	5										
SN\TN	0	13.74	14.15	14.05	13.89	13.81	14.32	14.39	14.01	14.07	14.25
	1	14.52	14.32	14.63	14.92	14.83	14.92	15.01	14.62	14.63	14.03
	2	14.86	14.92	15.08	15.32	15.02	15.26	15.63	14.88	14.67	14.26
	3	15.26	15.49	15.86	15.82	15.92	16.01	16.00	15.42	15.32	15.26
	4	16.39	16.43	16.82	16.37	16.75	16.87	16.66	16.10	15.69	15.46
NPN\TN	0	4.34	4.71	4.80	4.68	4.49	4.52	4.20	3.98	4.45	4.45
	1	4.84	4.98	4.94	4.90	4.81	4.90	4.56	4.38	5.02	4.92
	2	5.02	5.76	5.32	5.32	5.32	5.42	5.62	5.42	5.26	5.24
	3	6.34	6.56	6.72	6.23	6.40	6.31	6.33	6.36	6.36	6.35
	4	7.82	7.90	7.04	7.00	7.64	7.38	7.10	7.21	7.15	7.25
TVFA	0	8.8	11.8	12.5	13.1	12.2	12.5	13.4	11.9	12.9	13.3
	1	10.4	14.1	14.7	15.0	14.4	14.7	15.3	13.5	15.3	15.6
	2	11.9	15.6	16.1	17.1	16.0	16.1	17.0	15.1	17.2	16.8
	3	13.1	16.4	16.8	18.2	17.2	17.2	18.2	16.3	18.4	18.5
	4	14.4	17.3	17.5	19.2	18.0	18.5	19.4	17.5	19.1	19.5

Table(5):- Effect of adding Chamomile in different ratios on the organoleptic properties of Labenah made from different kinds of milk

Camomil % / Treatment	Storage period	Fresh				1 Week				2 Weeks				3 Week				4 Weeks			
		A&C	B&t	F	T	A&C	B&t	F	T	A&C	B&t	F	T	A&C	B&t	F	T	A&C	B&t	F	T
		15	35	50	100	15	35	50	100	15	35	50	100	15	35	50	100	15	35	50	100
I	0.00	14	32	48	92	14	32	47	92	12	30	46	88	12	30	45	87	11	29	45	85
	0.50	14	33	48	95	14	33	48	95	13	33	48	94	13	32	48	93	13	32	47	92
	0.75	14	32	47	94	14	33	48	95	12	31	47	90	12	30	47	90	11	30	44	85
	1.00	13	32	46	92	13	32	47	92	10	31	44	85	10	30	43	83	11	30	42	82
II	0.50	14	33	47	94	14	31	46	91	13	30	48	91	12	32	48	92	12	31	47	90
	0.75	14	32	46	93	14	32	45	91	12	31	47	90	12	30	47	89	11	30	44	85
	1.00	13	31	45	90	13	31	43	87	11	30	44	85	10	30	43	83	10	28	40	78
III	0.50	14	33	46	93	14	32	46	92	13	31	47	91	12	31	47	90	12	31	46	89
	1.75	14	32	46	92	13	31	46	90	12	31	46	89	12	30	46	88	10	30	40	81
	1.00	14	30	44	88	12	30	45	87	11	30	44	85	10	28	40	80	10	28	40	78

Appearance & color (15)
Body & texture (35)
Flavour (50)
Total (100)