(11) Application No. AU 2002225428 B2

(19) AUSTRALIAN PATENT OFFICE

(54) Title

Method of improving beef qualities

(51)6 International Patent Classification(s)

A23K 1/18 (2006.01) 1/00
A23K 1/00 (2006.01) 20060101ALI2005100
A23K 1/16 (2006.01) 8BMEP A23K
A23K 1/18 1/16
20060101AFI2005100 20060101ALI2005100
8BMEP A23K 8BMEP
PCT/JP02/00306

(21) Application No: 2002225428 (22) Application Date: 2002.01.18

(87) WIPO No: WO02/056704

(30) Priority Data

(31) Number	(32) Date	(33) Country
2001-11122	2001.01.19	JP

(43) Publication Date : 2002.07.30

(43) Publication Journal Date : 2003.02.13

(71) Applicant(s)

Kansai Technology Licensing Organization Co., Ltd.

(72) Inventor(s)

Yano, Hideo

(74) Agent/Attorney

Freehills Patent & Trade Mark Attorneys, GPO Box 128, Melbourne, VIC, 3000

(56) Related Art

WO 2000/044236

(12)特許協力条約に基づいて公開された国際出願

(19) 世界知的所有権機関
国際事務局

(43) 国際公開日
2002 年7 月25 日 (25.07.2002)

PCT

(10) 国際公開番号
WO 02/056704 A1

(51) 国際特許分類7: A23K 1/18, 1/16, A61K 31/375

(21) 国際出願番号: PCT/JP02/00306

(22) 国際出願日: 2002 年1 月18 日 (18.01.2002)

(25) 国際出願の言語: 日本語

(26) 国際公開の言語: 日本語

(30) 優先権データ:
特願2001-11122 2001 年1 月19 日 (19.01.2001) JP

(71) 出願人 (米国を除く全ての指定国について): 関西ティー・エル・オー株式会社 (KANSAI TECHNOLOGY LICENSING ORGANIZATION CO., LTD.) [JP/JP]; 〒600-8813 京都府 京都市 下京区中堂寺南町１７ 京都リサーチパークサイエンスセンタービル１号館２階 Kyoto (JP).

(72) 発明者; および
(75) 発明者/出願人 (米国についてのみ): 矢野 秀雄 (YANO,Hideo) [JP/JP]; 〒606-8502 京都府 京都市 左京区北白川追分町 京都大学大学院農学研究科内 Kyoto (JP).

(74) 代理人: 小林 良平 (KOBAYASI,Ryohei); 〒600-8091 京都府 京都市 下京区東洞院通四条下ル元悪王子町37 豊元四条烏丸ビル７階 小林特許商標事務所 Kyoto (JP).

(81) 指定国 (国内): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) 指定国 (広域): ARIPO 特許 (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), ユーラシア特許 (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), ヨーロッパ特許 (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI 特許 (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

添付公開書類:
— 国際調査報告書
— 補正書・説明書

２文字コード及び他の略語については、定期発行される各PCTガゼットの巻頭に掲載されている「コードと略語のガイダンスノート」を参照。

WO 02/056704 A1

(54) Title: METHOD OF IMPROVING BEEF QUALITIES

(54) 発明の名称: 牛の肉質の改善方法

(57) Abstract: It is intended to improve beef qualities and elevate the beef marbling standard (BMS) level, etc. This object can be established by administering vitamin C (L-ascorbic acid) to cattle. Although vitamin C may be administered by injection or the like, oral administration is the most convenient method. However, vitamin C which is orally administered alone is digested by microorganisms in the rumen and thus fails to establish the desired effects. Therefore, it is necessary to coat vitamin C so that it can pass the stomach and be absorbed in the intestine. As such a coating, it is favorable to use hardened soybean oil. The administration dose appropriately ranges from 20 mg/kg body weight/day to 60 mg/kg body weight/day in terms of vitamin C. As the results of a test on Japanese Black Cattle, no significant difference in yield is observed but significant differences are observed in beef qualities such as BMS, gloss, tension and texture between the test group and the control group.

[続葉有]

(57) 要約:

本発明は、牛の肉質を改善し、その脂肪交雑（ＢＭＳ。いわゆる霜降り）の等級を上げることを目的として成されたものである。このような目的は、牛にビタミンＣ（L-アスコルビン酸）を投与することにより達成される。ビタミンＣの投与は、注射等によってもよいが、経口投与するのが最も簡易である。しかし、単にビタミンＣのみを経口投与した場合、第一胃内の微生物により分解されてしまい、所期の効果を挙げることができない。そのため、胃を通過して腸において吸収されるように、ビタミンＣに何らかの被覆を施す必要がある。このような被覆剤としては、大豆硬化油脂が好ましい。投与量は、ビタミンＣとして20mg/kg体重/日～60mg/kg体重/日程度が適当である。黒毛和牛で試験を行った結果、歩留に関しては、給与／非給与群の間に有意差は認められないが、肉質に関しては、脂肪交雑（霜降り）及び光沢、締まり、きめに有意な差が現れた。

VERIFICATION OF TRANSLATION

Patent Application No. PCT/JP02/00306
by Kansai Technology Licensing
Organization Co., Ltd.

I, Kobayasi Ryohei

of 7th Floor, Hougen Building, Higasinotouin Sizyo-sagaru, Simogyo-ku, Kyoto-shi, Kyoto 600-8091, JAPAN

am the translator of the documents attached and I state that the following is a true translation to the best of my knowledge and belief of International Patent Application No. PCT/JP02/00306 filed 18 January 2002.

DATED this 7 day of July , 2003

小林良平

(Signature of translator)

METHOD OF IMPROVING BEEF QUALITY

TECHNICAL FIELD

The present invention relates to a method of improving beef quality and upgrading its fat marbling standard (which is called beef marbling standard, or BMS). The fat marbling state is generally called "Shimofuri" in Japanese.

BACKGROUND ART

Although fat-marbled beef (i.e. beef with an intermingling or dispersion of fat within it) is in great demand especially in Japan because of its tenderness, fine texture, etc., the problem is that it is difficult to produce. Therefore, in recent years, research in the production of the fat-marbled beef has been conducted not only in Japan but also overseas.

Many proposals to improve beef quality have been presented so far. For example, the Japanese Unexamined Patent Publication No. H6-22704 describes a method to improve the quality grade of beef, its fat marbling, firmness, flavor, tenderness, etc. by supplying feed containing calcium salt of fatty acid having a specific composition to cattle. Another method described in the Japanese Unexamined Patent Publication No. H06-169726 is to apply water-soluble magnesium oxide and metal chlorophyllin to cattle. By this method, when the meat is cooled during the processing of dressed carcasses after slaughter, myoglobin turns back into oxidized myoglobin by the oxygen remaining in its tissues, thus having good effects on the meat color, luster, etc. According to the Japanese Unexamined Patent Publication No. H07-132050, a daily intake of turmeric powder of approximately 0.1 g to 0.4 g per 10 kg of weight can prevent liver abscesses and its complications such as hepatization and liver congestion, which are frequently found in commercial cattle from the later raising stage to the fattening stage. With this improvement of hepatic function, the quality of the meat can be also enhanced. The Japanese Unexamined Patent Publication No. H10-113129 describes feed composed of metallic salt of fatty acid including unsaturated fatty acid and phosphorus compound optionally with antioxidant. This feed greatly contributes to improving the quality of beef, the gaining of body weight, etc. in a variety of breeds such as Japanese Black

Cattle, Holstein and F1. In the Japanese Unexamined Patent Publication No. H11-196776, supplying feed mixed with spices and vitamin E enables the production of beef which can be kept fresh for a long time as well as reduce its drip and thus can lead to its improved flavor.

The present invention provides a simple method of improving beef quality and upgrading its fat marbling standard, differently from those mentioned above.

DISCLOSURE OF THE INVENTION

A method of improving beef quality according to the present invention is characterized by giving vitamin C (i.e. L-ascorbic acid) to cattle.

Such ruminants as cattle have been conventionally known to synthesize vitamin C in their bodies. There are only a few reports mentioned about giving vitamin C to cattle with a well-developed ruminant stomach. Research conducted by the present inventor and others, however, indicated that the level of serum vitamin C in commercial cattle decreases as they become fatter in the fattening process and some cattle may even suffer from vitamin C deficiency (Takahashi Eiji et al., "Hiikugyu ni-okeru Kesseichu Vitamin C Nodo" [Serum Vitamin C Concentration in Fattening and Fattened Beef Cattle] in *Animal Science Journal* vol. 70 (1999) No. 8, p. J119). The Japanese Unexamined Patent Publication No. 2000-281575 describes giving oil-coated vitamin C to cattle etc. to develop the resistance to stress during the fattening period and to boost the immune ability to cold etc.

In the meanwhile, it is known that various kinds of vitamins affect adipose cell differentiation. The present inventor and others studied the effects of various kinds of vitamins on cultured adipose precursor cells derived from sheep and thus found that the vitamin C activates glycerol trophosphate dehydrogenase (or GPHD), which is an indicator of the differentiation into adipose cells (Torii Shinichiro et al., "Vitamin A, C oyobi D ga Hitsuji-Yurai-Baiyo-Shibo-Zenku-Saibo no Glycerol-3-phosphate Dehydrogenase Kassei ni Oyobosu Eikyo" [Effect of Vitamin A, C and D on Glycerol-3-phosphate Dehydrogenase Activity of Sheep Preadiocytes in Primary Culture] in *Animal Science Journal* vol. 66 (1995) No. 12, p. 1039).

However, there has been no research on how the administration of vitamin C

practically affects the quality of beef as commercial products. The present inventor focused on this point and conducted various experiments. As a result, the proper administration of vitamin C was discovered to be remarkably effective for the improvement of the quality of beef, especially the degree of its fat marbling (Shimofuri). This had not been conventionally known to those skilled in the art. Therefore, the knowledge of the above technology of the present invention can make significant contributions to nurturing industries in the present field.

The vitamin C can be administered by injection etc., but the easiest way is by oral administration. When only the vitamin C is administered orally, however, it is decomposed by microorganisms in the rumen and the desired effect cannot be obtained. For that reason, the vitamin C needs to be coated with something so that it can be absorbed by the intestinal tract after passing thorough the stomach. For such coating material, any kind of substance less subject to the decomposition in the rumen such as oils and fats of plant and animal origin, ethylcellulose, and silicone can be used. Hydrogenated oil and fat, which melts at relatively high temperature compared to other oils and fats, is desirable. From the viewpoint of stability and preference, soybean-hydrogenated oil and fat is particularly desirable.

It is desirable that the coated vitamin C should be administered to the cattle during the fattening period, especially from the middle to the later fattening stage, during which the adipose cell differentiation occurs. A desirable dose of the vitamin C (L-ascorbic acid) is 20 mg to 60 mg/kg of weight per day, and the most ideal is approximately 40 mg/kg of weight per day.

By this method of the present invention, at a relatively low cost, the beef quality can be improved and its fat marbling (i.e. Shimofuri) standard can be also upgraded, thus endowing the beef with great price competitiveness. Consequently, it is possible to generate proceeds exceeding the administration cost. In addition, the oral administration is simple enough to conduct with ease.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a table showing the effects of a feed additive as an embodiment of the present

invention on yield.

Fig. 2 is a table showing the effects of a feed additive as an embodiment of the present invention on beef quality.

BEST MODE FOR CARRYING OUT THE INVENTION

As an embodiment of the present invention, a feed additive for oral administration is explained. This additive is vitamin C whose surface is coated with soybean-hydrogenated oil.

Its production method is as follows. First, 300 kg of vitamin C (product of Takeda Chemical Industries, Ltd.) and 30 kg of soybean-hydrogenated oil and fat (Spray Fat VT; product of Riken Vitamin Co., Ltd.) are put into a propeller-driven blending machine (High Speed Mixer FS-1200 type; product of Fukae Industry Co., Ltd.) and heated in a jacket filled with 80 ℃ water while blending. When temperature of the mixture (i.e. product temperature) rises to over 70 ℃ and the soybean-hydrogenated oil and fat is melted, 30 ℃ water is poured into the jacket to cool the mixture. Then the mixture is discharged when its temperature drops below 40 ℃ and passed through a sieve having 16 meshes, thus producing a feed additive of the present embodiment.

The thus produced feed additive has the appearance of white to yellowish-white crystalline powder. The average grain diameter is 430 μm and the thickness of the coating of oil and fat is about 13 μm. It contains 908 mg/g of vitamin C (by HPLC method) and not more than 0.1 % of water.

By comparison between cattle given the thus produced feed additive (which is referred to as "test group") and those not given it (which is referred to as "control group"), the quality of the meat and the yield were examined in the both groups. The result is explained below. For the examination, 4 steers of Japanese Black Cattle were used in each group. The cattle in the test group were given feed mixed with 40 mg / kg of weight per day of the above feed additive for 12 months since they were 10 months old.

The result of the yield is as shown in Fig. 1. There was no statistically significant difference in the yield between the both groups. Fig. 2 shows the result of the quality of the

meat. There are significant differences in the fat marbling (Shimofuri), luster, firmness and texture of the meat. Accordingly, it was proved that the feed additive of the present invention has beneficial effects on the improvement of the quality of the meat.

The improvement of the degree of the Shimofuri endows the beef with great price competitiveness in the market. According to estimates based on the result as shown in Fig. 2, the administration of the feed additive to beef cattle makes it possible that the proceeds greatly exceed its cost.

2002225428 20 Feb 2007

The claims defining the invention are as follows:

1. A method of improving a fat marbling standard of meat by vitamin C administration to cattle.

2. A method of improving a fat marbling standard of meat by oral administration of oil-coated vitamin C to cattle.

3. A method of improving a fat marbling standard of meat according to claim 1 or 2, wherein a daily dose of the vitamin C is 20 mg to 60 mg/kg of weight.

4. A method of improving luster, firmness and texture of meat by vitamin C administration to cattle.

5. A method of improving luster, firmness and texture of meat by oral administration of oil-coated vitamin C to cattle.

6. A method of improving luster, firmness and texture of meat according to claim 4 or 5, wherein a daily dose of the vitamin C is 20 mg to 60 mg/kg of weight.

7. A method according to any one of claims 1 to 6, wherein the vitamin C is administered to the cattle from the middle to the later fattening stage.

8. A method according to any one of claims 1 to 6, wherein the vitamin C is administered to the cattle from the age of 10 months.

9. A method according to claim 1, 4 or 5 substantially as herein described.

Fig. 1

YIELD

Group	No.	Yield							Yield Grade
		Weight of Dressed Carcass (Left) (kg)	Weight of Dressed Carcass(Right)(kg)	Weight of Dressed Carcass (kg)	Area of Rib Eye (cm2)	Thickness of Flank (cm)	Thickness of Subcutaneous Fat (cm)	Standard Value of Yield	
Test Group	1	201.5	199.3	400.8	56.0	8.4	2.4	75.1	A
	2	217.0	211.8	428.8	62.0	7.8	2.5	76.0	A
	3	248.2	244.7	492.9	54.0	9.2	2.4	74.2	A
	4	213.4	211.8	425.2	58.0	8.8	1.5	70.1	A
	Average	220.03	216.90	436.93	57.50	8.55	2.20	73.85	
	Standard Deviation	19.92	19.45	39.33	3.42	0.60	0.47	2.61	
Control Group	1	179.5	179.3	358.8	48.0	6.8	2.4	73.6	A
	2	213.6	215.6	429.2	51.0	7.9	2.2	74.0	A
	3	248.0	243.5	491.5	67.0	8.8	1.7	76.3	A
	4	234.0	233.6	467.6	53.0	8.2	1.8	74.3	A
	Average	218.78	218.00	436.78	54.75	7.93	2.03	74.55	
	Standard Deviation	29.75	28.27	57.97	8.42	0.84	0.33	1.20	

1/2

Fig. 2

MEAT QUALITY

Group	No.	Meat Quality												Grade of Meat Quality
		Standard Value of Fat Marbling	BMS No.	Grade of Fat Marbling	BCS No.	Luster	Grade	Firmness	Texture	Grade	BFS No.	Luster and Quality	Grade	
Test Group	1	1.33	5	4	3	4	4	4	4	4	3	5	5	4
	2	2.00	7	4	3	4	4	5	5	5	3	5	5	4
	3	1.33	5	4	3	4	4	4	4	4	3	5	5	4
	4	1.67	6	4	4	4	4	4	4	4	3	5	5	4
	Average	1.58	5.8	4.0	3.3	4.0	4.0	4.3	4.3	4.3	3.0	5.0	5.0	
	Standard Deviation	0.32	1.0	0.0	0.5	0.0	0.0	0.5	0.5	0.5	0.0	0.0	0.0	
Control Group	1	0.33	2	2	3	3	3	3	3	3	3	5	5	2
	2	0.67	3	3	3	3	3	3	3	3	3	5	5	3
	3	1.00	4	3	3	3	3	3	3	3	3	5	5	3
	4	1.00	4	3	4	3	3	4	4	4	3	5	5	3
	Average	0.75	3.3	2.8	3.3	3.0	3.0	3.3	3.3	3.3	3.0	5.0	5.0	
	Standard Deviation	0.32	1.0	0.5	0.5	0.0	0.0	0.5	0.5	0.5	0.0	0.0	0.0	

2/2