STABILITY TEST FOR THE COSMETIC CREAM CONTAINING OIL EXTRACTS FROM JEJU CROSSBRED HORSE

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Abstract – In this study, the stability of cream containing crude (abdominal and neck) oil extracts from Jeju crossbred was evaluated. pH and phase separation, viscosity, color, microbiological characteristics, mass change, TBARS value of cream were measured under the three different temperatures (4, 25 and 40℃) for 60 days. The control cream was made with olive oil. Except for pH, TBARS, color and viscosity, variation on mass change, phase separation, microbiological characteristics of crude horse oil creams were similar to control cream for 60 days. TBARS value of control was more higher than cream of crude horse oil extracts at 4℃ during storage. But total TBARS values (at 25, 40℃) of cream containing crude horse oil extracts were more lower than control cream. Fatty acid composition analysis finally retained C16 : 1n7, C18 : 0, C18 : 1n9, etc by horse fats was differentiated at 100%. In these results, C16 : 1n7 was included in horse neck fat and abdominal about 11.51 and 9.53%. It was thought as superior moisturizing effect. Therefore, This study showed that crude horse oil extracts could be used as a deserved new ingredient for healthy skin.

Key Words – horse oil extracts, cream, cosmetic stability test.

I. INTRODUCTION

In recent years, horses are used for the purpose of riding, food such as meat, etc. Horse products are commercially available to various form for consumers. Horse oil has been widely used for folk medicine and cosmetic compounds. Especially, Horse oil promotes the blood metabolism and activity of skin cell [4]. Horse fat contains more higher palmitoleic acid (C_{16}:1n-7) than other animal's fat. Generally, palmitoleic acid has beneficial effect on the skin, for example, increase moisturizing ability and burn treatment, antibiotic effects. Furthermore, horse oil contains unsaturated fatty acid about 65% and known as maintaining healthy skin [2]. Therefore, This study was conducted to analyze fatty acid compositions of jeju horse and stability of cream cosmetic containing oil extracts from jeju crossbred horse.

II. MATERIALS AND METHODS

Material The horse fats were brought from Rural Development Administration in Jeju island. Then, it conducted for this study.

Method Sample (300g) was added n-Hexane (1.5L) and stirred (Polytron ® PT*2500 E, Kinematica, Lucerne, Switzerland) for 3 hours. Then, the fats were concentrated at 40~50℃ by rotary evaporation after filtering (5C Advantec, toyo Roshi Kaisha, Ltd, Japan) and cream formulations is shown as Table 1.

Figure 1. Procedure of horse oil extraction.

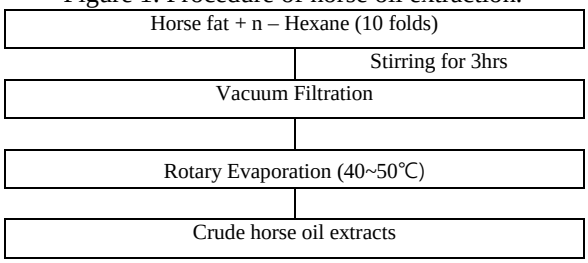


Table 1. Cosmetic cream formulations using horse oil (%)

ingredient	CON	HA	HN
Olive oil	20	-	-
Horse oil	-	20	20
Olive wax	5	5	5
Cetyl alcohol	1	1	1
Vitamin E	1	1	1
E-NAPRE	1	1	1
Water	72	72	72
Total	100	100	100

CON : Olive oil cream
HA : Crude horse abdominal oil extracts cream
HN : Crude horse neck oil extracts cream.

Fatty acid composition analysis Total lipids were extracted by using chloroform-methanol (2:1 v/v) Folch et al [1]. Then, It was analysis by gas chromatography (Agilent 6890N, Agilent Technologies, USA) equipped with flame ionization detector was used to identify fatty acid composition. **pH** pH determined with a pH meter (Orion 230A, Thermo Fisher Scientific, Inc., USA). **Phase separation** of cream was analyzed using a centrifuge at 783xg for 15mins. **Viscosity** Each cream were analysis using a Brookfield (Brookfiedld LV, Brookfield Engineering Laboratories, MA, USA). **Color** color (L^*lightness; a^*redness; b^*yellowness) of each cream were measured using a Chromameter (CR-310, Minolta Co, Japan). **Microbiological characteristic** Total bacterial count and fungus count were measured in plate count agar and potato dextrose agar. **Mass change** Weight change of each cream was measured at day 1, 7, 15, 30 and 60. **TBARS** As a lipid oxidation, the value was determined using a modified version of the method described by Witte et al [5]. **Statistical evaluation** All data were analyzed by SAS software (2010).

III. RESULTS AND DISCUSSION

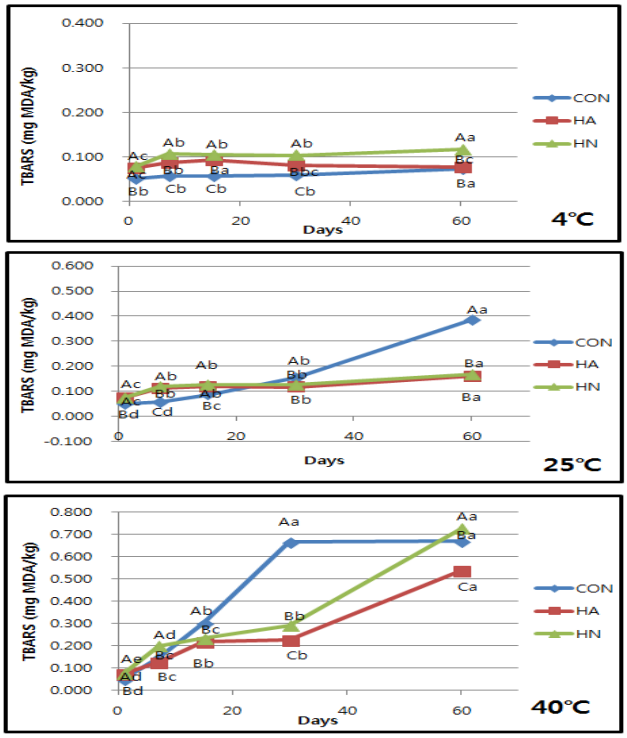
Fatty acid composition analysis Table 2 shows fatty acid composition, ratio of SFA (saturated fatty acid), USFA (un saturated fatty acid), w-3/w-6 and MUFA (monounsaturated fatty acid). Generally, horse fats contain higher palmitoleic acid than other animal fat. In this result, palmitoleic acid was shown about 11.51% and 9.53% in neck and abdominal fat, respectively, from Jeju crossbred horse.

Table 2. Fatty acid compositions of neck and abdominal fat from Jeju crossbred horse.

Fatty acid (% of fatty acid)	HN[1)]	HA[1)]
C14:0 (Myristic acid)	1.07±0.064^a	1.25±0.129^a
C16:0 (Palmitic acid)	26.91±0.036^b	31.84±0.075^a
C16:1n7 (Palmitoleic acid)	11.51±0.053^a	9.53±0.806^a
C18:0 (Stearic acid)	2.29±0.053^b	2.99±0.028^a
C18:1n9 (Oleic acid)	31.31±0.147^a	29.87±0.641^a
C18:1n7 (Cis-vaccenic acid)	5.26±0.002^a	5.46±0.318^a
C18:2n6 (Linoleic acid)	15.74±0.024^a	14.49±0.528^a
C18:3n6 (Gamma-Linoleic acid)	0.01±0.006^a	0.01±0.000^a
C18:3n3 (Linolenic acid)	4.19±0.004^a	3.75±0.131^a
C20:1n9 (Eicosenoic acid)	1.19±0.018^a	0.13±0.008^b
C20:4n6 (Arachidonic acid)	0.08±0.051^a	0.07±0.020^a
C20:5n3 (Eicosapentaenoic acid)	0.00±0.000^a	0.00±0.001^a
C22:4n6 (Adrenic acid)	0.04±0.001^b	0.04±0.004^a
C22:6n3 (Docosahexaenoic acid)	0.40±0.195^a	0.55±0.125^a
SFA	30.27±0.103^b	36.08±0.231^a
USFA	69.73±0.097^a	63.92±0.231^b
w-3/w-6	0.29±0.027^a	0.30±0.031^a
MUFA	49.27±0.216^a	44.99±0.491^b

$^{a-b}$Mean±SE within same row with different superscript differ sighnificantly at $p<0.05$.
[1)]Refer to Table 1 for CON, HA and HN.

Figure 2. TBARS values of each cream during storage at different temperature.



TBARS TBARS values of the each cream are shown in Figure 2. TBARS values of all treatments were increased from day 1 to day 60 at 25, 40℃. CON and HN also were increased from day 1 to day 60 at 4℃. On the other hand, HA was increased from day 1 to day 15 at 4℃. Then, it was decreased to day 60.

. Table 3. pH values of the cream during storage at different temperature

℃		days				
		1	7	15	30	60
4	CON[1)]	5.86± 0.032^{Aab}	5.88± 0.035^{Aa}	5.75± 0.018^{Bc}	5.82± 0.018^{Babc}	5.78± 0.022^{Bbc}
	HA[1)]	5.91± 0.015^{Aab}	5.93± 0.028^{Aab}	5.78± 0.023^{ABc}	5.95± 0.023^{Aa}	5.88± 0.013^{ABb}
	HN[1)]	5.87± 0.009^{Ab}	5.92± 0.038^{Aab}	5.83± 0.003^{Ab}	5.94± 0.032^{Aab}	5.99± 0.055^{Aa}
25	CON	5.86± 0.032^{Ab}	5.90± 0.009^{Aab}	5.78± 0.022^{Ac}	5.83± 0.032^{Bbc}	5.96± 0.015^{Aa}
	HA	5.91± 0.015^{Aa}	5.80± 0.009^{Bb}	5.73± 0.018^{Ab}	5.90± 0.015^{ABa}	5.91± 0.043^{Aa}
	HN	5.87± 0.009^{Ab}	5.92± 0.033^{Aa}	5.79± 0.012^{Ab}	5.93± 0.007^{Aa}	5.88± 0.033^{Aa}
40	CON	5.86± 0.032^{Aa}	5.78± 0.024^{Ab}	5.70± 0.003^{Ac}	5.68± 0.009^{Ac}	5.50± 0.023^{Ad}
	HA	5.91± 0.015^{Aa}	5.76± 0.025^{Bb}	5.61± 0.012^{Bc}	5.61± 0.013^{Bc}	5.61± 0.006^{Ac}
	HN	5.87± 0.009^{Ab}	5.86± 0.025^{Aa}	5.54± 0.021^{Cb}	5.42± 0.006^{Cc}	4.85± 0.045^{Cd}

$^{a-d}$Mean±SE within same row with different superscript differ sighnificantly at p<0.05.
$^{A-C}$Mean±SE within same column with different superscript letters differ sighnificantly at p<0.05.
$^{1)}$Refer to Table 1 for CON, HA and HN.

PH Usually, skin pH of human is one of the most important to biophysical condition [3]. The pH measurements of each cream were performed in 1, 7, 15, 30 and 60 days with each different temperature conditions (4, 25, 40℃). pH of the creams are shown in Table 3. The cream pH in HN and HA of the formulations ranged between 4.85 and 5.99. These pH values are thought as appropriate level on the skin. **Viscosity** Viscosities of creams containing crude horse oil were similar to control cream during storage, except in period 15, 30, 60day at 4℃ . The changes of viscosity for the each cream are shown in Table 4.

Table 4. Viscosity changes of cosmetic cream during storage at different temperature

℃		days				
		1	7	15	30	60
4	CON[1)]	20455.7± 349.286^{Aa}	20456.2± 414.782^{Aa}	20931.4± 318.478^{Aa}	20587.1± 122.708^{Aa}	20445.7± 168.442^{Aa}
	HA[1)]	20817.6± 345.276^{Aa}	20925.7± 276.462^{Aa}	19717.1± 94.485^{Bb}	19837.1± 63.210^{Bb}	19999.0± 102.322^{Bb}
	HN[1)]	21432.9± 194.827^{Aa}	21630.5± 446.690^{Aa}	20012.9± 174.083^{Bb}	19840.0± 310.001^{Bb}	20460.0± 32.744^{Ab}
25	CON	20455.7± 349.286^{Aa}	20274.8± 237.889^{Aa}	19545.7± 251.999^{Aa}	19879.5± 511.203^{Aa}	19710.0± 242.443^{Aa}
	HA	20294.8± 181.213^{Aa}	20177.6± 40.213^{Aa}	20085.7± 294.113^{Aa}	20129.1± 545.750^{Aa}	19928.1± 195.728^{Aa}
	HN	20800.0± 464.830^{Aa}	20351.4± 309.461^{Aa}	19671.4± 598.421^{Aa}	19801.4± 301.602^{Aa}	20241.4± 297.433^{Aa}
40	CON	20455.7± 349.286^{Aa}	20765.7± 425.752^{Aa}	19641.4± 628.306^{Aa}	20157.1± 395.065^{Aa}	19954.3± 139.825^{Aa}
	HA	20294.8± 181.213^{Aa}	19876.2± 441.188^{Aa}	19657.1± 637.363^{Aa}	20302.9± 456.598^{Aa}	20454.8± 377.757^{Aa}
	HN	20800.0± 464.830^{Aa}	21034.3± 306.980^{Aa}	19530.0± 569.895^{Aa}	20127.1± 584.304^{Aa}	19951.4± 172.277^{Aa}

$^{a-c}$Mean±SE within same row with different superscript differ sighnificantly at p<0.05.
$^{A-B}$Mean±SE within same column with different superscript letters differ sighnificantly at p<0.05.
$^{1)}$Refer to Table 1 for CON, HA and HN.

Table 5. CIE values of cosmetic creams during storage at different temperatures

℃		L*				
		1	7	15	30	60
4	CON[1)]	91.37± 0.379^{Aa}	91.86± 0.340^{Aa}	91.86± 0.209^{Aa}	91.14± 0.310^{Aa}	91.24± 0.118^{Aa}
	HA[1)]	91.13± 0.199^{ABa}	90.39± 0.372^{Aa}	90.83± 0.578^{Aa}	90.66± 0.101^{ABa}	90.38± 0.373^{Ba}
	HN[1)]	90.49± 0.183^{Ba}	90.83± 0.687^{Aa}	90.81± 0.243^{Aa}	90.20± 0.181^{Ba}	90.84± 0.211^{ABa}
25	CON	91.37± 0.379^{Aa}	90.33± 0.141^{Bb}	90.74± 0.211^{Aab}	90.76± 0.452^{Aa}	90.80± 0.339^{Ba}
	HA	91.13± 0.199^{ABa}	91.11± 0.237^{Aa}	91.58± 0.446^{Aa}	91.69± 0.424^{Aa}	91.55± 0.016^{Aa}
	HN	90.49± 0.183^{Bb}	90.57± 0.176^{ABb}	91.42± 0.459^{Aa}	91.68± 0.187^{Aa}	90.43± 0.199^{Bb}
40	CON	91.37± 0.379^{Aa}	88.86± 1.688^{Aa}	90.39± 0.362^{ABa}	90.52± 0.102^{Aa}	90.80± 0.339^{Aa}
	HA	91.13± 0.199^{ABa}	91.04± 0.506^{Aa}	91.25± 0.280^{Aa}	90.70± 0.191^{Aa}	90.61± 0.136^{Aa}
	HN	90.49± 0.183^{Ba}	90.53± 0.143^{Aa}	90.17± 0.329^{Ba}	90.54± 0.084^{Aa}	90.13± 0.266^{Aa}

℃		a*				
		1	7	15	30	60
4	CON	-2.10± 0.024^{Cb}	-2.17± 0.019^{Cc}	-2.12± 0.021^{Cbc}	-2.15± 0.009^{Cbc}	-1.48± 0.024^{Ca}
	HA	-0.64± 0.024^{Ac}	-0.25± 0.008^{Aa}	-0.46± 0.003^{Ab}	-0.61± 0.021^{Ac}	-0.63± 0.009^{Ac}
	HN	-0.80± 0.007^{Bc}	-0.68± 0.040^{Bab}	-0.64± 0.014^{Ba}	-0.72± 0.005^{Bb}	-0.73± 0.012^{Bb}
25	CON	-2.10± 0.024^{Cc}	-2.12± 0.020^{Cc}	-2.06± 0.034^{Bc}	-1.94± 0.012^{Cb}	-1.83± 0.007^{Ca}
	HA	-0.64± 0.024^{Ab}	-0.62± 0.032^{Ab}	-0.69± 0.024^{Ab}	-0.62± 0.009^{Ab}	-0.51± 0.025^{Aa}
	HN	-0.80± 0.007^{Bb}	-0.76± 0.006^{Bab}	-0.76± 0.034^{Aab}	-0.75± 0.010^{Bab}	-0.70± 0.031^{Ba}
40	CON	-2.10± 0.024^{Cab}	-2.14± 0.049^{Bb}	-2.01± 0.045^{Ba}	-2.10± 0.019^{Cab}	-1.99± 0.017^{Ca}
	HA	-0.64± 0.024^{Aa}	-0.60± 0.016^{Aa}	-0.58± 0.023^{Aa}	-0.63± 0.018^{Aa}	-0.62± 0.017^{Aa}
	HN	-0.80± 0.007^{Bcd}	-0.53± 0.020^{Aa}	-0.63± 0.012^{Ab}	-0.83± 0.012^{Bd}	-0.76± 0.010^{Bc}

℃		b*				
		1	7	15	30	60
4	CON	5.07± 0.227^{Aa}	5.07± 0.223^{Aa}	5.09± 0.046^{Aa}	5.05± 0.060^{Aa}	5.17± 0.011^{Aa}
	HA	0.77± 0.061^{Bb}	1.18± 0.204^{Ba}	0.89± 0.085^{Bab}	0.82± 0.049^{Bb}	0.81± 0.026^{Cb}
	HN	1.12± 0.205^{Bb}	0.93± 0.141^{Bb}	0.99± 0.080^{Bb}	1.06± 0.130^{Bb}	1.66± 0.030^{Ba}
25	CON	5.07± 0.227^{Abc}	5.37± 0.089^{Aab}	5.75± 0.101^{Aa}	4.93± 0.132^{Ac}	4.79± 0.022^{Ac}
	HA	0.77± 0.061^{Bbc}	0.99± 0.077^{Ca}	0.86± 0.097^{Cab}	0.69± 0.044^{Bbc}	0.61± 0.012^{Cc}
	HN	1.12± 0.205^{Bab}	1.25± 0.065^{Bab}	1.41± 0.132^{Ba}	0.59± 0.079^{Bb}	0.87± 0.051^{Bb}
40	CON	5.07± 0.227^{Ab}	5.66± 0.240^{Aa}	5.25± 0.111^{Aab}	4.85± 0.097^{Ab}	5.29± 0.179^{Aab}
	HA	0.77± 0.061^{Bab}	1.00± 0.229^{Ca}	0.84± 0.028^{Cab}	0.85± 0.028^{Cab}	0.60± 0.025^{Cb}
	HN	1.12± 0.205^{Bb}	2.10± 0.167^{Ba}	2.08± 0.279^{Ba}	2.13± 0.066^{Bab}	1.32± 0.015^{Bb}

[a-d]Mean±SE within same row with different superscript differ sighnificantly at $p<0.05$.
[A-C]Mean±SE within same column with different superscript letters differ sighnificantly at $p<0.05$.
[1)]Refer to Table 1 for CON, HA and HN.

Color The CIE values of each cream are shown in Table 5. L^* of HN cream was indicated similar values with control during storage except for 4℃ (1, 60 day), 25℃ (1, 7 day) and 40℃ (1 day). a^* of HA, HN cream were indicated more high values than control but b^* of HA, HN cream were indicated lower values than control during storage. **Phase separation** Phase separation stability of the each cosmetic cream was stable (data not shown). **Mass change** creams containing crude horse oil was similar to control cream for 60days (data not shown). **Microbiological characteristic** In all of treatments, Bacteria and Fungi count were detected less than 1000/g during storage.

IV. CONCLUSION

Cosmetic cream containing crude horse (parts of neck, abdominal) oil extracts were relatively stable during storage and also this crude horse oil extracts will be used as a improved material for skin health in the future.

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