

Milan, March 26th 2018

**SENSORY EVALUATION of the PERFORMANCES of DIFFERENT OILS
by means of RANKING TEST**

METHOD: Ref. S13C

CUSTOMER: **INT. JOJOBA EXPORT COUNCIL**
4250 N CIVIC CENTER
SCOTTSDALE – AZ - USA

PRODUCTS: **SUNFLOWER OIL, batch 8003877002-100**
Ref. 60/18/01 – 70/18

ALMOND OIL, batch 8003198002-102
Ref. 60/18/02 – 71/18

ARGAN OIL, batch 8003753001-001
Ref. 60/18/03 – 72/18

JOJOBA OIL GOLD, batch PAN-PG 170212
Ref. 60/18/04 – 73/18

STARTING DATE OF THE STUDY: 27/02/2018

COMPLETION DATE: 26/03/2018

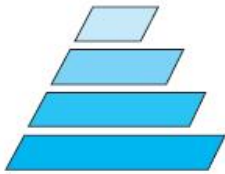
ETHICAL AND QUALITY CRITERIA

The current study was carried out in compliance with the quality assurance system requirements, according to the principles of good laboratory practice (GLP) and good clinical practice (GCP), as well as the principles established by the World Medical Association in the Declaration of Helsinki.

REFERENCES

The data given in this report are exclusively related to the tested sample. This report can be only in full reproduced.

ISPE s.r.l.
Director of the Laboratory
Dr. Luigi Rigano



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1. SAMPLES DATA SHEET

SAMPLES REF.: **SUNFLOWER OIL, batch 8003877002-100**
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Ref. 60/18/02 – 71/18

ARGAN OIL, batch 8003753001-001
Ref. 60/18/03 – 72/18

JOJOBA OIL GOLD, batch PAN-PG 170212
Ref. 60/18/04 – 73/18

SAMPLES ARRIVAL DATE: 12/02/2018

PRODUCTS:

- PHYSICAL FORM: oil / oil / oil / oil
- COLOUR: pale yellow / pale yellow / yellow / yellow

QUALITATIVE FORMULAE:

- KNOWN / no /
- OTHER INFORMATION //

OTHER INFORMATION RELATED TO THE PRODUCTS SAFETY:
None.

FILE: 4 samples with the code numbers **Ref. ISPE 60/18/01 – 70/18, Ref. ISPE 60/18/02 – 71/18, Ref. ISPE 60/18/03 – 72/18, Ref. ISPE 60/18/04 – 73/18** and the study findings will be kept filed in our archives for one year and for ten years respectively. After these periods, the samples and the findings report will be discarded, unless otherwise required by the client.



**SENSORY EVALUATION of the PERFORMANCES of DIFFERENT OILS
by means of RANKING TEST (Ref. S13C)**

2. AIM OF THE STUDY

The aim of the study is to evaluate and to compare four different oils, in order to establish if there are some differences based on the following sensory features: *spreadability, quick of absorption, stickiness, greasy residue, short-term emollient effect and long-term emollient effect.*

3. SELECTION of the ASSESSORS

3.a. Criteria for recruitment and admission

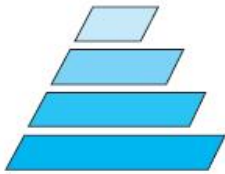
The test is carried out according to the Declaration of Helsinki, on 15 trained assessors, average age 54.1 years. Subjects are informed about the nature, purpose and risks of the study and give their written consent before participating in the test.

Assessors are selected from a large pool of candidates, according to their familiarity with the category of products under test and relating to their ability to discriminate differences in sensory properties, without involving their personal preferences. Panellists underwent a precise training in order to improve their sensory and discriminative skills.

The selection is carried out according to the following criteria:

3.b. Inclusion criteria

- Race Caucasian.
- Female and male subjects, 18 - 65 years old, in general good health.
- Subjects able to follow all study directions and to commit to all follow-up visits for the duration of the study.
- Subjects who complete the informed consent process.
- Subjects who avoid the exposure to UV radiation and the use of tanning beds for the duration of the study.
- Trained assessors.



3.c. Exclusion criteria

- Pregnant or nursing females.
- Subjects with a history of unusual skin reactions to skin care toiletry products, cosmetics, or sensitivity to any of the test article components.
- Subjects who are taking topical or systemic drugs that could affect the results of the test (anti-inflammatory agents, corticosteroids, etc.).
- Subjects showing systemic diseases or skin disorders (such as eczema, psoriasis, severe acne, etc.) that may affect the evaluation of the test articles or increase risk to the subject.
- Subjects who have been involved in another clinical investigation with comparable purposes within a period of 30 days prior to admission in this study.

3.d. Drop-out

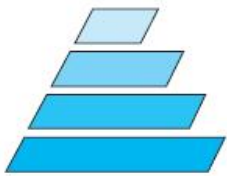
The following reasons are considered sufficient cause for interrupting the subject's participation in the study:

- free choice of the subject.
- medical reasons not correlated with the treatment (*e.g.*, onset of disease, surgical operation).
- reasons correlated with the treatment (*e.g.*, irritant or allergic reactions).

3.e. Restrictions

During the study, subjects are instructed to follow the preconditioning instructions:

- not to apply cosmetic products on the hands and on the forearms for at least 12 hours before the evaluation session;
- not to wash the forearm for at least 2 hours before each working session;
- not to use perfumes and not to wear perfumed clothes on the day of the test;
- not to smoke for at least 1 hour before the evaluation;
- do not eat foods cooked with garlic and onion and / or spicy foods for at least 1 day before the evaluation.



4. METHOD

4.a. Workstations

Each assessor performed the evaluation in a single workstation (booth) with the following characteristics:

- ✓ temperature and humidity-controlled room ($24 \pm 2^{\circ}\text{C}$; $50 \pm 10\%$ R.U.);
- ✓ noise free;
- ✓ odour free;
- ✓ neutral colours;
- ✓ uniform, controllable and adequate lighting.

4.b. Method of evaluation

Assessors were asked to follow the preconditioning instructions.

Each sample was identified with a three-digit codes and presented in anonymous containers to the assessors.

The assessment was performed on the forearms. The order of samples presentation and application was assigned to the judges following a balanced randomized study design. The four samples were evaluated during the same working session and according to the same standard protocol by each panellist.

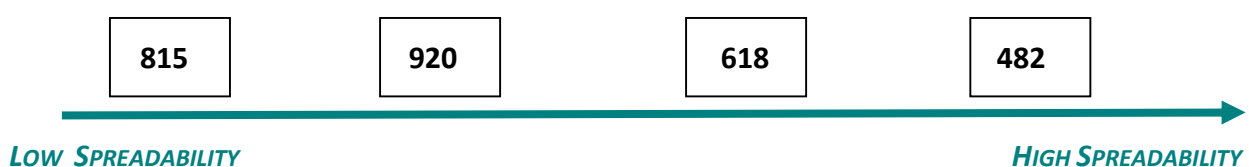
Each assessor was asked to rearrange the samples according to an increasing intensity degree of the following sensory parameters (see the example in the picture 1):

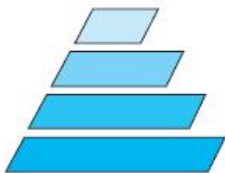
- ✓ Spreadability,
- ✓ Quick of absorption,
- ✓ Stickiness,
- ✓ Greasy residue,
- ✓ Short-term Emollient effect,
- ✓ Long-term Emollient effect.

The six sensory parameters were individually evaluated.

Each subject was asked to rearrange the samples according to an increasing degree of each selected attribute: the first rank from the least easy to spread to the easiest to spread; the second rank from the sample performed the lowest absorption to the sample that performed the quickest absorption, etc. See the following example:

Picture 1





4.c. Mathematical elaboration

For each sample and for each sensory feature under test the following parameters were calculated:

- ✓ the **Rank position** given by each panellist (e.g.: in Picture 1 sample 815 has rank position = 1, sample 920 has rank position = 2, etc.);
- ✓ the **Rank Sum** obtained by adding all individual rank positions of each assessors (see example in Picture 2)

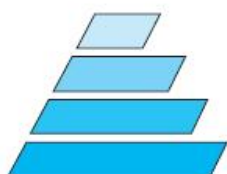
Picture 2

<i>Panellist n°</i>	<i>sample 815</i>	<i>sample 920</i>	<i>sample 618</i>	<i>sample 482</i>
1	2	1	3	4
2	3	4	1	2
3	4	1	2	3
-	-	-	-	
-	-	-	-	
15	3	2	4	1
<hr/>				
Rank Sum	12	8	10	10

Finally, the critical value of **LSD (Least Significant Difference)** was calculated, in order to identify the pairs of rank sums that differ from each other.

LSD value is the smallest difference between rank sums of any pair of samples, that is necessary in order to state that products are significantly different related to the selected parameter.

In this study the **LSD value**, at the α -risk = 0.05, is equal to **13.86**. Consequently the pairs of samples whose 'rank sum' differ by a value equal to or greater than 13.86 (= LSD value), were perceived significantly different with regard to the selected sensory feature.



5. RESULTS and TABLES

In *Table 1* is reported the 'rank sum' obtained for each sample and for each parameter. The greater the value, the better the performance.

Table 1

<u>RANK SUM</u>	Sunflower Oil	Almond Oil	Argan Oil	Jojoba Oil Gold
<i>SPREADABILITY</i>	53	23	31	43
<i>QUICK OF ABSORPTION</i>	37	19	55	39
<i>STICKINESS</i>	35	55	18	42
<i>GREASY RESIDUE</i>	37	56	15	41
<i>SHORT-TERM EMOLLIENT EFFECT</i>	35	37	26	52
<i>LONG-TERM EMOLLIENT EFFECT</i>	36	36	24	54

On the basis of **LSD** calculated value (= **13.86**) the samples which were perceived different with regard to each selected parameter were evidenced. The results are reported in *Table 2, 3, 4, 5, 6 and 7* where: $p > 0.05$ means that no significant difference exists in the evaluated sensory parameter between the two compared samples, while $p < 0.05$ means that the two compared oils are perceivably different as regards the investigated sensory feature.

Table 2

<u>SPREADABILITY</u>	Sunflower Oil	Almond Oil	Argan Oil	Jojoba Oil Gold
Sunflower Oil	-	$p < 0.05$	$p < 0.05$	$p > 0.05$
Almond Oil	$p < 0.05$	-	$p > 0.05$	$p < 0.05$
Argan Oil	$p < 0.05$	$p > 0.05$	-	$p > 0.05$
Jojoba Oil Gold	$p > 0.05$	$p < 0.05$	$p > 0.05$	-

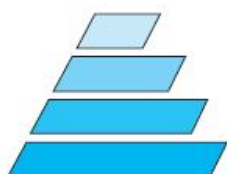


Table 3

<u>QUICK of ABSORPTION</u>	Sunflower Oil	Almond Oil	Argan Oil	Jojoba Oil Gold
Sunflower Oil	-	p < 0.05	p < 0.05	p > 0.05
Almond Oil	p < 0.05	-	p < 0.05	p < 0.05
Argan Oil	p < 0.05	p < 0.05	-	p < 0.05
Jojoba Oil Gold	p > 0.05	p < 0.05	p < 0.05	-

Table 4

<u>STICKINESS</u>	Sunflower Oil	Almond Oil	Argan Oil	Jojoba Oil Gold
Sunflower Oil	-	p < 0.05	p < 0.05	p > 0.05
Almond Oil	p < 0.05	-	p < 0.05	p > 0.05
Argan Oil	p < 0.05	p < 0.05	-	p < 0.05
Jojoba Oil Gold	p > 0.05	p > 0.05	p < 0.05	-

Table 5

<u>GREASY RESIDUE</u>	Sunflower Oil	Almond Oil	Argan Oil	Jojoba Oil Gold
Sunflower Oil	-	p < 0.05	p < 0.05	p > 0.05
Almond Oil	p < 0.05	-	p < 0.05	p < 0.05
Argan Oil	p < 0.05	p < 0.05	-	p < 0.05
Jojoba Oil Gold	p > 0.05	p < 0.05	p < 0.05	-

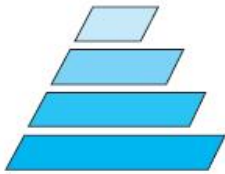


Table 6

<u>SHORT-TERM EMOLLIENT EFFECT</u>	Sunflower Oil	Almond Oil	Argan Oil	Jojoba Oil Gold
Sunflower Oil	-	p > 0.05	p > 0.05	p < 0.05
Almond Oil	p > 0.05	-	p > 0.05	p < 0.05
Argan Oil	p > 0.05	p > 0.05	-	p < 0.05
Jojoba Oil Gold	p < 0.05	p < 0.05	p < 0.05	-

Table 7

<u>LONG-TERM EMOLLIENT EFFECT</u>	Sunflower Oil	Almond Oil	Argan Oil	Jojoba Oil Gold
Sunflower Oil	-	p > 0.05	p > 0.05	p < 0.05
Almond Oil	p > 0.05	-	p > 0.05	p < 0.05
Argan Oil	p > 0.05	p > 0.05	-	p < 0.05
Jojoba Oil Gold	p < 0.05	p < 0.05	p < 0.05	-



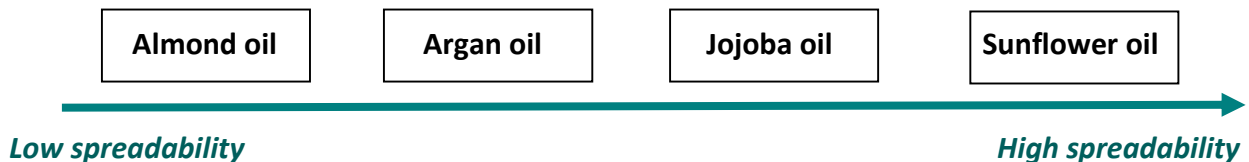
6. CONCLUSIONS

In order to evaluate and to compare the samples **SUNFLOWER OIL, Ref. 60/18/01 – 70/18, batch 8003877002-100; ALMOND OIL, Ref. 60/18/02 – 71/18, batch 8003198002-102; ARGAN OIL, Ref. 60/18/03 – 72/18, batch 8003753001-001 and JOJOBA OIL GOLD, Ref. 60/18/04 – 73/18, batch PAN-PG 170212** with regard to six sensory features, 15 trained assessors carried out a ranking test.

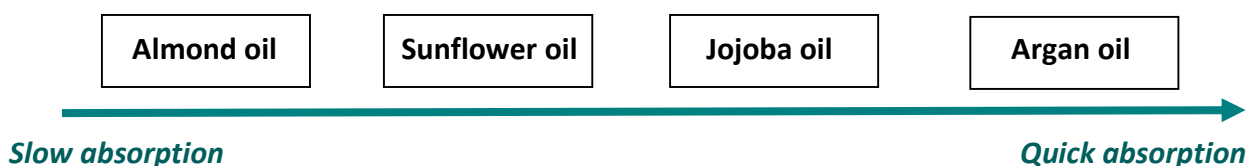
The assessors evaluated each sample by means of a standard protocol and ranked the oils according to an increasing degree of the following sensory parameters: *spreadability, quick of absorption, stickiness, greasy residue, short-term emollient effect* and *long-term emollient effect*.

On the basis of the obtained data, it is possible to rank the samples as follows:

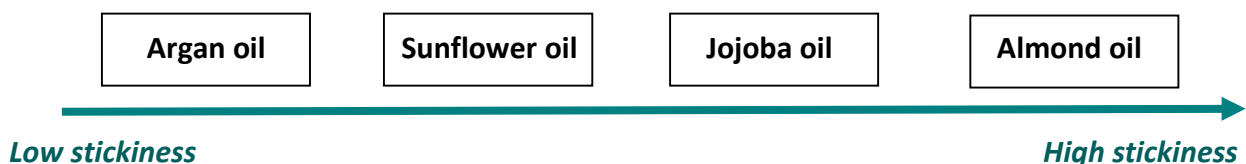
SPREADABILITY:



QUICK OF ABSORPTION:

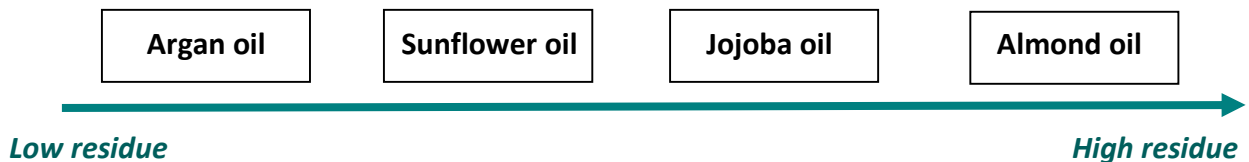


STICKINESS

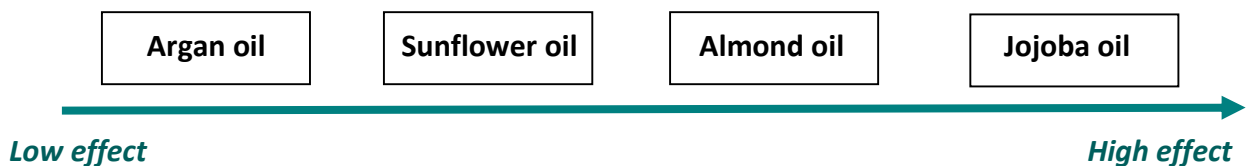




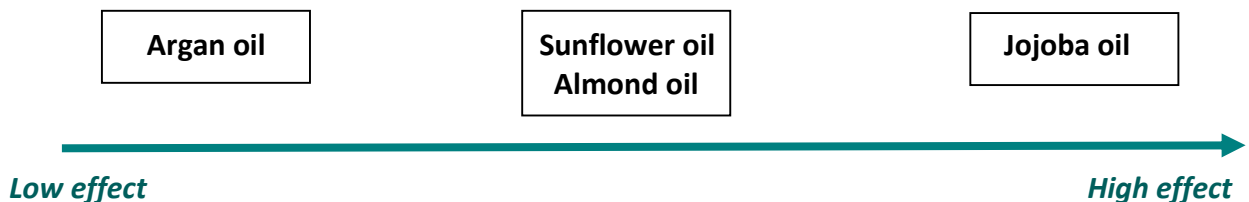
GREASY RESIDUE



SHORT-TERM EMOLLIENT EFFECT



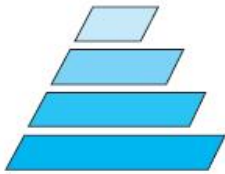
LONG-TERM EMOLLIENT EFFECT



As regards **spreadability**, *Jojoba oil* is perceived statistically different only from *Almond oil*; with regard to **quick of absorption** and **greasy residue** *Jojoba oil* is perceived statistically different only from *Almond* and *Argan oil*; about **stickiness** *Jojoba oil* is perceived statistically different only from *Argan oil* while in regard to **short** and **long-term emollient effect** *Jojoba oil* performed the best performance, statistically different from *Sunflower*, *Almond* and *Argan oil*.

Responsible for the evaluation
Dr. Simona Varesi

Responsible for the laboratory
Dr. Adriana Bonfigli



7. BIBLIOGRAPHY

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