

報告書③：新たな条件による輸送実証

—新規個包装規格による輸送実証報告書—

2020 年 3 月 24 日

Wismettac フーズ株式会社

輸出カンパニー作成

■背景・目的

日本産リンゴは東南アジアを中心にニーズが高く主要な輸出品目である。りんごは他の青果物に比べて比較的品質の保持期間が長く、出荷形態は船便輸送が主に利用される。その為、青果物の輸送においては輸送中の温度変化や衝撃による品質劣化が発生し、輸出先国に到着時点で売り物にならず、ロスとなるケースも発生している。品質不良によるロスだけに留まらず、現地消費者の日本産に対する品位評価へもネガティブな影響を持たれる可能性がある。日本産の青果物は、他国産に比べて依然として高価帯で販売されており、それに見合う高品質な状態が求められる。今後の日本産青果物の輸出量を継続的に増やし、日本産としての評価を維持する為にも効果的な輸送技術を用いた新たな輸送方法を検討する必要がある。例として、従来のりんご輸送形態である発泡スチロール内にリンゴ専用のトレイを敷き輸送を行う方法は、鮮度保持という観点から長年に渡り採用されてきた規格である。しかし、近年では発泡スチロールの方が果実のガスを充満させてしまう可能性があり、段ボール輸送の方がより鮮度保持に効果的という意見もある。そこで、新たな個包装規格を使用した輸送実証し、既存規格との比較検証を行う事で前述の問題背景を解決する取り組みを行う。

■実施期間

2019 年 12 月 1 日～2020 年 2 月 28 日

■実施内容

1. 新規個包装について



規格：1袋6個もしくは10個入り

特殊鮮度保持フィルム（パルフレッシュ）を使用し、専用の個包装規格を作成。輸送中の鮮度保持だけではなく、輸出先国到着後の店頭販売時までを想定し、手に取りやすい6個入りの個包装を採用した。日本での選別時から個包装することで鮮度保持の効果をより高め、鮮度が維持された状態で消費者の元へ届くことを期待した。

2. 輸送先・輸送回数

輸送先：台湾

輸送回数：船便10回、エア一便1回

輸送温度：1℃（リーファーコンテナ）、エア一便の場合は温度調節なし

輸送品種：サンフジ

混載：比較検証の為発泡スチロール10kg箱のりんごを混載

輸送 No.	出港	到着	輸送量 (cs)
1 船便	12 月 14 日	12 月 18 日	10
2 船便	12 月 21 日	12 月 25 日	10
3 船便	1 月 9 日	1 月 12 日	10
4 船便	1 月 9 日	1 月 12 日	10
5 船便	1 月 9 日	1 月 12 日	10
6 船便	1 月 9 日	1 月 12 日	10
7 船便	1 月 11 日	1 月 15 日	10
8 船便	1 月 11 日	1 月 15 日	10
9 船便	1 月 19 日	1 月 22 日	10
10 船便	1 月 19 日	1 月 22 日	10
11 エア一便	2 月 20 日	2 月 20 日	1

3. 輸送実証

輸送後の品質調査は第三者機関である日本海事検定へ到着貨物調査の委託し調査を実行した。貨物の鮮度確認項目として下記に沿って調査実施した。

- ① 到着時果肉芯温測定
- ② 目視検査（腐れ、カビがないか）

S＝問題なし

A＝軽微な：オセ、生傷、ビターピット、果肉ベタつき

B＝やや重度な：オセ（一点以上）、生傷（一点以上）、ヤケ、黒星、ビターピット（一点以上）、果肉ベタつき

鮮度保持袋未使用品

輸送 No.	輸送温度	芯温測定 (平均値)	評価	検品
1 船便	1℃	6.3℃	B	10cs
2 船便	1℃	6.4℃	B	10cs
3 船便	1℃	5.9℃	A	10cs
4 船便	1℃	6.0℃	A	10cs
5 船便	1℃	6.2℃	B	10cs
6 船便	1℃	6.2℃	B	10cs
7 船便	1℃	7.4℃	B	10cs
8 船便	1℃	6.3℃	B	10cs
9 船便	1℃	6.5℃	B	10cs
10 船便	1℃	6.1℃	A	10cs
11 エアー便	常温	6.8℃	A	1cs

鮮度保持袋使用

輸送 No.	輸送温度	芯温測定 (平均値)	評価
1 船便	1℃	5.2℃	A
2 船便	1℃	5.4℃	A
3 船便	1℃	5.3℃	A
4 船便	1℃	5.7℃	B
5 船便	1℃	5.1℃	A
6 船便	1℃	5.2℃	A
7 船便	1℃	5.4℃	A
8 船便	1℃	5.3℃	B
9 船便	1℃	5.5℃	A
10 船便	1℃	5.1℃	A
11 エアー便	常温	6.8℃	B

■結論

新規個包装規格の使用による効果を下記に述べる。

1. 鮮度保持の効果を確認

輸送実証において鮮度保持袋を使用した効果として、混載した通常梱包（発泡スチロール）貨物に果肉の軟化が発生している一方で（発生が多い時で 40FT 約 1000cs 中約 20・30%）、新規個包装使用ロットは比較的に果肉が固い状態であった。輸出先国到着時点でまた、現地量販店や市場販売時においても鮮度保持の効果が確認できた（確認は顧客ヒアリングに基づく）。

2. 新たな販売方法の創出

本事業の目的は品質保持を主軸として進化したものである。しかし、今までにない新たな包装形態で販売をする事で新たな販売方法の創出につながった。従来の納品形態であるバラ箱での販売では、現地で再度選別を行う

必要があり、りんごにかかる負担や人件費が増大する。本事業で取り扱った個包装形態により、現地到着後そのまま店舗陳列が出来ることになり、コスト削減並びに品質保持につながる事となった。顧客からの評価も高く、更なる数量の増加を期待されている。

以上



Photo No.1:

Carry container SZLU6003653/40HQR was apparently in normal condition without remark on E.I.R., but the power had been off on arrival at cold storage.



Photo No.2:

----- Ditto -----

The original seal bolt, No.TSX2508241, was kept intact on the container door.



Photo No.3:

----- Ditto -----

The cargo was well stowed in the container and according to record of Ryan Recorder in the container, the inside temperature was kept at +1.0°C on the way from Kobe, Japan to Keelung, Taiwan.



Photo No.4:
Grade: Yellow Tokusen 2nd grade with size:
32s.
The condition with ratio of damage:
Stem Puncture: 1.6%
Bruising: 1.6%
Superficial Scald: 81.3%



Photo No.5:
----- Ditto -----
Superficial Scald
(Close view)



Photo No.6:
----- Ditto -----
Temperature of flesh: 5.1°C



Photo No.7:
Grade: Yellow Tokusen 2nd grade with size:
36s.
The condition with ratio of damage:
Stem Puncture: 4.2%
Superficial Scald: 29.2%



Photo No.8:
----- Ditto -----
Superficial Scald
(Close view)



Photo No.9:
----- Ditto -----
Temperature of flesh: 3.5℃



Photo No.10:
Grade: Yellow Tokusen 2nd grade with size:
40s.
The condition with ratio of damage:
Stem Puncture: 3.8%
Superficial Scald: 78.8%



Photo No.11:
----- Ditto -----
Superficial Scald
(Close view)



Photo No.12:
----- Ditto -----
Temperature of flesh: 4.6℃



Photo No.13:

Grade: Blue Tokusen 3rd grade with size: 28s.

The condition with ratio of damage:

Stem Puncture: 3.6%

Superficial Scald: 66.1%



Photo No.14:

--- Ditto ---

Superficial Scald

(Close view)



Photo No.15:

--- Ditto ---

Temperature of flesh: 3.8℃



Photo No.16:
Grade: Blue Tokusen 3rd grade with size: 32s.
The condition with ratio of damage:
Stem Puncture: 11.0%
Superficial Scald: 67.2%



Photo No.17:
---- Ditto ----
Superficial Scald
(Close view)



Photo No.18:
---- Ditto ----
Temperature of flesh: 5.2℃



Photo No.19:
Grade: Blue Tokusen 3rd grade with size: 36s;
The condition with ratio of damage:
Stem Puncture: 6.9%
Superficial Scald: 69.4%



Photo No.20:
----- Ditto -----
Superficial Scald
(Close view)



Photo No.21:
----- ditto -----
Temperature of flesh: 3.8℃



Photo No.22:

Grade: Blue Tokusen 3rd grade with size: 40s.

The condition with ratio of damage:

Superficial Scald: 88.8%



Photo No.23:

----- Ditto -----

Superficial Scald

(Close view)



Photo No.24:

----- Ditto -----

Temperature flesh: 4.8℃



Photo No.25:
Grade: A 1st grade with size: 60s.
The condition with ratio of damage:
Stem Puncture: 1.7%
Superficial Scald: 55.0%



Photo No.26:
----- Ditto -----
Superficial Scald
(Close view)



Photo No.27:
----- Ditto -----
Temperature of flesh: 5.1℃



Photo No.28:
Grade: A 1st grade with size: 72s.
The condition with ratio of damage:
Bruising: 1.0%
Superficial Scald: 59.7%



Photo No.29:
----- Ditto -----
Superficial Scald
(Close view)



Photo No.30:
----- Ditto -----
Temperature of flesh: 6.6°C



Photo No.1:
Carry container SZLU6006950/40HQR was apparently in normal condition without remark on E.I.R., but the power had been off on arrival at cold storage.



Photo No.2:
----- Ditto -----
The cargo was well stowed in the container and according to record of Ryan Recorder in the container, the inside temperature was kept at (+)1.0 -2.0°C on the way from Tokyo, Japan to Keelung, Taiwan.



Photo No.3:
Grade: Yellow Tokusen 2nd grade with size: 28s.
Unpacked for inspection.



Photo No.4:
Grade: Yellow Tokusen 2nd grade with size:
28s.
The condition with ratio of damage:
Decay: 1.8%
Superficial Scald: 64.3%



Photo No.5:
----- Ditto -----
Superficial Scald
(Close view)



Photo No.6:
----- Ditto -----
Temperature of flesh: 3.5°C



Photo No.7:
Grade: Yellow Tokusen 2nd grade with size:
32s.
The condition with ratio of damage:
Stem Puncture: 4.7%
Superficial Scald: 56.3%



Photo No.8:
--- Ditto ---
Superficial Scald
(Close view)



Photo No.9:
--- Ditto ---
Temperature of flesh: 3.8℃



Photo No.10:
Grade: Yellow Tokusen 2nd grade with size:
40s.
The condition with ratio of damage:
Superficial Scald; 48.8%



Photo No.11:
----- Ditto -----
Superficial Scald
(Close view)



Photo No.12:
----- Ditto -----
Temperature of flesh: 4.2℃



Photo No.13:
Grade: Blue Tokusen 3rd grade with size: 28s.
The condition with ratio of damage:
Stem Puncture: 7.1%
Superficial Scald: 39.3%



Photo No.14:
---- Ditto ----
Superficial Scald
(Close view)



Photo No.15:
---- Ditto ----
Temperature of flesh: 3.8℃



Photo No.16:
Grade: Blue Tokusen 3rd grade with size: 32s.
The condition with ratio of damage:
Superficial Scald: 43.8%



Photo No.17:
--- Ditto ---
Superficial Scald
(Close view)



Photo No.18:
--- Ditto ---
Temperature of flesh:4.2°C



Photo No.19:

Grade: Blue Tokusen 3rd grade with size: 36s:

The condition with ratio of damage:

Stem Puncture: 2.8%

Superficial Scald: 68.1%



Photo No.20:

—— Ditto ——

Superficial Scald

(Close view)



Photo No.21:

—— ditto ——

Temperature of flesh: 5.2°C



Photo No.22:
Grade: A 1st grade with size: 60s.
Unpacked for inspection.



Photo No.23:
----- Ditto -----



Photo No.24:
----- Ditto -----
The condition with ratio of damage:
Stem Puncture: 1.7%
Superficial Scald: 45.0%



Photo No.25;
----- Ditto -----
Superficial Scald
(Close view)



Photo No.26;
----- Ditto -----
Stem Puncture
(Close view)



Photo No.27;
----- Ditto -----
Temperature of flesh: 5.8℃



Photo No.28:

Grade: A 1st grade with size: 72s.
Unpacked for inspection.



Photo No.29:

----- Ditto -----

The condition with ratio of damage:
Bruising: 1.4%
Stem Puncture: 0.7%
Superficial Scald: 30.6%



Photo No.30:

----- Ditto -----

Superficial Scald
(Close view)



Photo No.31:

----- Ditto -----

Bruising and stem puncture
(Close view)



Photo No.32:

----- Ditto -----

Temperature of flesh: 5.1℃



Photo No.1:

Carrying container EMCU5422726/40RH was apparently in normal condition without remark on E.I.R. but the power had been off on arrival at cold warehouse.



Photo No.2:

----- Ditto -----

There were 2 pcs. of portable temperature record to be put in the container and found that the inside temperature was kept between (+)2.0 - 2.5°C on the way from Tokyo, Japan to Taipei, Taiwan.



Photo No.3:

----- Ditto -----

The cargo was well stowed in the container.



Photo No.4:

Unpacked at random from each variety, grade and size of fresh apples for inspection and had the following findings:

Variety: Sun-Fuji, 3rd grade with size: 28s.



Photo No.5:

----- Ditto -----

The condition with ratio of damage:

Stem Puncture: 1.8%

Bruising: 3.6%

Superficial Scald "YAKE": 3.6%

Bitter Pit: 3.6%



Photo No.6:

----- Ditto -----

Temperature of flesh: 5.1°C



Photo No.7:

Variety: Sun-Fuji, 3rd grade with size: 32s.



Photo No.8:

—— Ditto ——

The condition with ratio of damage:

Stem Puncture: 4.7%

Superficial Scald "YAKE": 6.3%



Photo No.9:

—— Ditto ——

Temperature of flesh: 5.6°C



Photo No.10:

Variety: Sun-Fuji, 3rd grade with size: 36s.



Photo No.11:

----- Ditto -----

The condition with ratio of damage:

Stem Puncture: 1.4%

Superficial Scald "YAKE": 7.0%



Photo No.12:

----- Ditto -----

Temperature of flesh: 6.0°C



Photo No.13:
Variety: Sun-Fuji, 3rd grade with size: 40s.



Photo No.14:
----- Ditto -----
The condition with ratio of damage:
Stem Puncture: 3.8%
Superficial Scald "YAKE": 2.5%



Photo No.15:
----- Ditto -----
Temperature of flesh: 5.2℃



Photo No.16:
Variety: Sun-Fuji, 3rd grade with size: 46s.



Photo No.17:
—— Ditto ——
The condition with ratio of damage:
Bruising: 2.2%
Superficial Scald "YAKE": 4.4%



Photo No.18:
—— Ditto ——
Temperature of flesh: 4.3℃



Photo No.19:
Variety: Sun-Fuji, 2nd grade with size: 28s.



Photo No.20:
--- Ditto ---
The condition with ratio of damage:
Stem Puncture: 8.9%
Bruising: 3.6%
Superficial Scald "YAKE": 3.6%
Bitter Pit: 1.8%
Rotten: 1.8%



Photo No.21:
--- Ditto ---
Temperature of flesh: 5.9℃



Photo No.22:

Variety: Sun-Fuji, 2nd grade with size: 32s.



Photo No.23:

----- Ditto -----

The condition with ratio of damage:

Stem Puncture: 3.1%

Superficial Scald "YAKE": 1.6%



Photo No.24:

----- Ditto -----

Temperature of flesh: 5.2°C



Photo No.25:
Variety: Sun-Fuji, 2nd grade with size: 36s.



Photo No.26:
---- Ditto ----
The condition with ratio of damage:
Stem Puncture: 1.4%
Superficial Scald "YAKE": 23.6%



Photo No.27:
---- Ditto ----
Temperature of flesh: 5.4℃



Photo No.28:

Variety: Shinano Sweet, 2nd grade with size: 28s.



Photo No.29:

----- Ditto -----

The condition with ratio of damage:

Stem Puncture: 7.1%

Bruising: 3.6%



Photo No.30:

----- Ditto -----

Temperature of flesh: 3.5℃



Photo No.31:
Variety: Shinano Sweet, 2nd grade with size:
32s



Photo No.32:
----- Ditto -----
The condition with ratio of damage:
Stem Puncture: 4.7%



Photo No.33:
----- Ditto -----
Temperature of flesh: 5.2°C



Photo No.34:

Variety: Sugoi Sun-Fuji, A grade with size: 60s.



Photo No.35:

----- Ditto -----

Every 10 pcs. was put on a paper tray and was packed into colored plastic bag with sealing at the mouth.



Photo No.36:

----- Ditto -----

Unpacking for inspection.



Photo No.37:

----- Ditto -----

The condition with ratio of damage:

Stem Puncture: 7.5%

Bruising: 0.8%

Superficial Scald "YAKE": 0.8%



Photo No.38:

----- Ditto -----

Temperature of flesh: 6.7°C



Photo No.39:

----- Ditto -----

(Close view)



Photo No.40:

Variety: Sugoi Sun-Fuji, 1st grade with size: 72s.



Photo No.41:

Every 24 pcs. were put on a paper tray then 3 trays were piled into 3 tiers to be wrapped in a plastic bag and then was packed in one carton box.



Photo No.42:

— Ditto —

Unpacking for inspection.



Photo No.43:

----- Ditto -----

The condition with ratio of damage:

Stem Puncture: 1.4%

Superficial Scald "YAKE": 1.0%



Photo No.44:

----- Ditto -----

Temperature of flesh: 5.1°C



Photo No.45:

----- Ditto -----

(Close view)



Photo No.1:
Carrying container WHLU7754220 was apparently in normal condition without remark on E.I.R. but the power had been off on arrival at cold warehouse.



Photo No.2:
--- Ditto ---
The original seal bolt, No.WHLI634280, was kept intact on the rear door of container.



Photo No.3:
--- Ditto ---
The cargo was well stowed in the container.



Photo No.4:

Unpacked at random from each variety, grade and size of fresh apples for inspection and had the following findings.

Variety: Sun-Fuji, 3rd grade with size: 28s:
Unpacked for inspection.



Photo No.5:

----- Ditto -----

The condition with ratio of damage:

Stem Puncture: 3.6%

Superficial Scald: 3.6%



Photo No.6:

----- Ditto -----

Temperature of flesh: 4.2°C



Photo No.7:
Variety: Sun-Fuji, 3rd grade with size: 32s:
Unpacked for inspection.



Photo No.8:
----- Ditto -----
The condition with ratio of damage:
Stem Puncture: 3.1%
Superficial Scald: 9.4%
Bruising: 1.6%



Photo No.9:
----- Ditto -----
Superficial Scald (Close view)



Photo No.10:

----- Ditto -----

Stem Puncture & Bruising in another carton.



Photo No.11:

----- Ditto -----

Stem Puncture (Close view)



Photo No.12:

----- Ditto -----

Temperature of flesh: 4.2°C



Photo No.13:
Variety: Sun-Fuji, 3rd grade with size: 36s:
Unpacked for inspection.



Photo No.14:
---- Ditto ----
The condition with ratio of damage:
Stem Puncture: 1.4%
Superficial Scald: 1.4%



Photo No.15:
---- Ditto ----
Stem Puncture (Close view)



Photo No.16:
Variety: Sun-Fuji, 3rd grade with size: 40s:
Unpacked for inspection.



Photo No.17:
----- Ditto -----
The condition with ratio of damage:
Stem Puncture: 1.3%
Superficial Scald: 1.3%



Photo No.18:
----- Ditto -----
Stem Puncture (Close view)



Photo No.19:
----- Ditto -----
Superficial Scald in another carton.



Photo No.20:
----- Ditto -----
Superficial Scald (Close view)



Photo No.21:
----- ditto -----
Temperature of flesh: 5.0°C



Photo No.22:
Variety: Sun-Fuji, 2nd grade with size: 28s:
Unpacked for inspection.



Photo No.23:
---- Ditto ----
The condition with ratio of damage:
Superficial Scald: 23.2%
Bruising: 1.8%



Photo No.24:
---- Ditto ----
Superficial Scald (Close view)



Photo No.25:
---- Ditto ----
Superficial Scald in another carton.
(Close view)



Photo No.26:
---- Ditto ----
Bruising in another carton. (Close view)



Photo No.27:
---- Ditto ----
Temperature of flesh: 3.0°C



Photo No.28:

Variety: Sun-Fuji, 2nd grade with size: 32s:
Unpacked for inspection.



Photo No.29:

The condition with ratio of damage:

Stem Puncture: 1.6%

Superficial Scald: 7.8%

Decay: 1.6%



Photo No.30:

----- Ditto -----

Superficial Scald (Close view)



Photo No.31:
----- Ditto -----
Decay (Close view)



Photo No.32:
----- Ditto -----
Stem Puncture (Close view)



Photo No.33:
----- Ditto -----
Temperature of flesh: 4.2°C



Photo No.34:
Variety: Sun-Fuji, 2nd grade with size: 36s:
Unpacked for inspection.



Photo No.35:
The condition with ratio of damage:
Bitter Pit: 1.4%
Superficial Scald: 19.5%
Bruising: 1.4%



Photo No.36:
--- Ditto ---
Superficial Scald (Close view)



Photo No.37:
----- Ditto -----
Bruising (Close view)



Photo No.38:
----- Ditto -----
Bitter Pit (Close view)



Photo No.39:
----- Ditto -----
Temperature of flesh: 3.6°C



Photo No.40:
Variety: Sun-Fuji, 2nd grade with size: 46s;
Unpacked for inspection.



Photo No.41:
The condition & ratio of damage:
Stem Puncture: 4.4%



Photo No.42:
----- Ditto -----
Temperature of flesh: 5.4℃



Photo No.43:
Variety: Sugoi Sun-Fuji, A grade with
size: 60s:
Unpacked for inspection.



Photo No.44:
The condition with ratio of damage:
Stem Puncture: 1.7%
Bruising: 0.8%
Superficial Scald: 0.8%



Photo No.45:
----- Ditto -----
Bruising (Close view)



Photo No.46:

----- Ditto -----

Stem Puncture (Close view)



Photo No.47:

----- Ditto -----

Superficial Scald (Close view)



Photo No.48:

----- Ditto -----

Temperature of flesh: 4.2°C



Photo No.49:

Variety: Sugo Sun-Fuji, 1st grade with
size: 72s:

5 cartons were sorted out at random for a
further examination.



Photo No.50:

----- Ditto -----

Unpacked for inspection.



Photo No.51:

----- Ditto -----

The condition with ratio of damage:

Stem Puncture: 1.7%

Superficial Scald: 2.0%

Bruising: 0.6%

Russet: 1.1%



Photo No.52:

----- Ditto -----

Stem Puncture (Close view)



Photo No.53:

----- Ditto -----

Russet (Close view)



Photo No.54:

----- Ditto -----

Superficial Scald (Close view)